



CONGRESSO DE PÓS-DOUTORANDOS DA USP

**Papel e Perspectivas dos
Pós-Docs no Brasil
(2023)**

VOLUME 3

**Sustentabilidade
e Saúde:
O Equilíbrio entre
Agricultura, Pecuária
e Meio Ambiente**

USP



UNIVERSIDADE DE SÃO PAULO

Reitor
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ORGANIZADORES

Celia R. S. Garcia

Raul Gonzalez



A Universidade de São Paulo (USP)

Fundada em 1934, a Universidade de São Paulo (USP) é uma Instituição reconhecida nacional e internacionalmente graças ao talento e à dedicação de seus mais de 5,500 professores, quase oitenta mil alunos e número de funcionários técnico-administrativos superior a 12 mil.

Desde 2003, a USP é incluída entre as 200 melhores universidades do mundo nos principais *rankings* mundiais que avaliam a qualidade das instituições de ensino superior.

No ensino de graduação, são 332 cursos em todas as áreas do conhecimento, oferecidos a quase 60 mil alunos em suas 43 unidades, distribuídas em oito campi localizados em Bauru, Lorena, Piracicaba, Pirassununga, Ribeirão Preto, São Carlos, Santos e São Paulo.

A qualidade da pesquisa e inovação na USP é comprovada pelas contribuições de grande relevância em todas as áreas do saber e pelo interesse aumentado em parcerias por parte de instituições de prestígio dos cinco continentes. Esta ação é alicerçada nos cerca de 2700 profissionais em seus programas de pós-doutorado. Devem ser mencionados recentes avanços na inclusão e pertencimento na USP, pela criação de uma nova pró-reitoria dedicada ao tema.

O sólido sistema de Pós-Graduação da Universidade é o principal responsável pelo seu desenvolvimento científico. Os 264 programas, em todas as áreas do saber, envolvem mais de 30 mil pós-graduandos.

É preciso destacar, também, a atuação expressiva da USP na difusão da cultura e na extensão universitária, atividades que desenvolve em suas Unidades e Órgãos afins, como os quatro museus, parques, centros, cinema, teatro, duas orquestras, grupos de corais, entre outros, e que congregam, a cada ano, dezenas de milhares de participantes, estreitando os laços com a sociedade em geral.

About USP

Founded in 1934, the University of São Paulo (USP) is a nationally and internationally recognized institution, thanks to the talent and dedication of its more than 5,500 professors, nearly eighty thousand students, and over 12,000 technical and administrative staff. Since 2003, USP has been ranked among the top 200 universities in the world in the main global rankings that evaluate the quality of higher education institutions.

At the undergraduate level, there are 332 programs offered across all areas of knowledge, serving nearly 60,000 students in its 43 schools and institutes, distributed across eight campuses located in Bauru, Lorena, Piracicaba, Pirassununga, Ribeirão Preto, São Carlos, Santos, and São Paulo.

The quality of the research developed at USP is evidenced by its significant contributions across all areas of knowledge and the growing interest from prestigious institutions across five continents in forming partnerships. This initiative is supported by the approximately 2,700 professionals in its postdoctoral programs. Advances in Inclusion and Belonging at USP should be noted, with the creation of a Provost Office dedicated to the subject.

The University's strong graduate system is the main driver of its scientific development. Its 264 programs, spanning all fields of knowledge, involve more than 30,000 graduate students.

It is also important to highlight USP's strong presence in cultural dissemination and university outreach, activities carried out through its Schools and affiliated bodies, including four museums, parks, cultural centers, a cinema, a theater, two orchestras, choir groups, among others, which gather tens of thousands of participants each year, strengthening ties with society at large.

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Prefácio

Carlos Gilberto Carlotti Junior, reitor da USP

Tenho muito prazer em fazer o prefácio destas obras, que são resultado dos trabalhos apresentados por nossos pesquisadores durante o congresso “O Papel e as Perspectivas do Pós-Doutorando no Brasil”. Estes quatro livros representam registro da importância da colaboração interdisciplinar de nossos pós-doutorandos para enfrentar os desafios globais e promover novas descobertas científicas – tais como as tecnologias de transição energética, incluindo a conversão de etanol em hidrogênio.

Hoje, a USP conta com cerca de 2.700 pós-docs desenvolvendo suas atividades acadêmicas em suas Unidades de Ensino e Pesquisa. O congresso teve como objetivo ampliar a colaboração e promover a integração entre pesquisadores de diferentes áreas, abrindo novos horizontes, fortalecendo projetos em andamento e incentivando o desenvolvimento de novos estudos.

A programação incluiu seis *workshops* dedicados a temas como empreendedorismo, saúde pública e processos de carbono zero, além de palestras de pesquisadores nacionais e internacionais que abordaram assuntos tão variados como “A Crise Contemporânea das Democracias e seu Impacto nas Universidades Públicas”, “Invernos e Verões da Inteligência Artificial” e “A USP Contribuindo para a Medicina do Futuro”.

Os diversos grupos de pesquisa participantes, formados por pesquisadores e pesquisadoras altamente qualificados, apresentaram 350 comunicações orais e 1.200 pôsteres, organizados em sessões temáticas e multidisciplinares, abordando desafios da humanidade. O evento proporcionou, ainda, importantes desdobramentos, como encontros e interações entre as mais variadas áreas científicas, incluindo agentes políticos públicos e do setor privado.

Merece também ser mencionada a premiação, em oito áreas do conhecimento – Ciências Agrárias, Ciências Biológicas, Ciências Exatas e da Terra, Ciências da Saúde, Engenharias, Ciências Humanas, Linguística, Letras e Artes e Ciências Sociais Aplicadas –, de trabalhos que foram selecionados por três comissões científicas, por meio de um processo em três etapas, sendo a última comissão composta por membros externos à USP.

Com a chegada da economia do conhecimento, as bases do desenvolvimento econômico dos países passaram por uma enorme transformação. Investir em ciência é o caminho que nações desenvolvidas têm seguido na busca por fontes de conhecimento profundo, cujo núcleo se baseia em pesquisa de excelência e inovação. Neste novo cenário, o papel do universo acadêmico como ator imprescindível na geração de conhecimento não pode ser desprezado.

A observação atenta dos ecossistemas de ciência, pesquisa e inovação, por sua vez, revela o enorme potencial dos pós-doutorandos e de seus supervisores para acelerar o desenvolvimento de um país.

O congresso de pós-doutores da USP exemplifica o papel crucial que os pós-docs desempenham no avanço do conhecimento científico e da inovação. A capacidade de tirar o melhor proveito de novas tecnologias depende dos recursos humanos que atuam tanto na academia quanto em setores privados. Um ambiente de apoio e colaboração para os pós-doutorandos beneficia a comunidade acadêmica e contribui significativamente para o desenvolvimento da sociedade.

Ademais, o evento foi uma oportunidade valiosa para reunir pessoas e instituições altamente qualificadas e suas contribuições para o progresso da ciência. A publicação desta coleção diversificada e abrangente de textos científicos vem intensificar o ambiente aberto e estimulante para a condução da ciência em benefício de todos.

Apresentação

Celia R. S. Garcia¹, Raul Gonzalez² e Arlindo Philippi³

Os ecossistemas da ciência, investigação e inovação são motores essenciais do crescimento de uma nação, estando os pós-doutorados entre os grandes impulsionadores do progresso nestes sistemas. Com a conclusão dos seus estudos de doutoramento, estes indivíduos ocupam uma posição única na intersecção da criação e aplicação de conhecimentos. São os futuros líderes dos mundos acadêmico e empresarial e os pioneiros que avançam sobre os limites do possível. Esse papel vital do Programa de Pós-Doutorado é exemplificado no âmbito da Universidade de São Paulo (USP), uma das principais instituições acadêmicas do Brasil, que em 2023 contava com aproximadamente 2.650 pós-doutores. Estes profissionais compõem a vanguarda da investigação científica, contribuindo significativamente para a reputação da universidade como um centro de inovação e excelência acadêmica.

A importância do Programa de Pós-Doutorado para a produção de pesquisa e para ampliar a vitalidade intelectual da USP foi evidenciada durante um importante congresso realizado de 17 a 19 de outubro de 2023. Intitulado “O Papel e as Perspectivas do Pós-Doutorando no Brasil”, o congresso serviu como plataforma para promover, discutir e analisar as contribuições desses acadêmicos para a universidade e para a comunidade científica em geral.

Mais do que um simples encontro de mentes, foi uma demonstração do empenho da universidade para promover um ambiente de pesquisa dinâmico, que prospera com a contribuição desses indivíduos altamente qualificados.

Como resultado do congresso foi gerada uma obra com quatro volumes, cada um deles sintetizando as pesquisas apresentadas durante o evento. Esses volumes trazem a essência de 350 comunicações orais e 1.200 pôsteres, refletindo a amplitude e a profundidade da pesquisa realizada pelos Pós-docs da USP. As apresentações foram organizadas em sessões temáticas e multidisciplinares, cada uma destinada a abordar alguns dos desafios mais urgentes da humanidade. Essa estrutura evidenciou a diversidade da pesquisa na USP e ressaltou a importância das abordagens transdisciplinares nas questões globais complexas. Ao reunir

1. Comissão Executiva do Congresso; Assessora do Gabinete do Reitor.

2. Comissão Executiva do Congresso; Pró-Reitor Adjunto de Inovação.

3. Conselho de Orientação do Congresso; Chefe do Gabinete do Reitor.

pesquisadores de várias disciplinas, o congresso demonstrou como os esforços de colaboração podem conduzir a soluções de caráter holístico e prático para os problemas contemporâneos mais prementes do mundo.

A conferência proporcionou também a oportunidade de promover interações críticas entre diferentes agentes, ampliando a sua influência para além dos limites da academia. Essas interações incluíram compromissos com agentes políticos dos setores público e privado, essenciais para traduzir as descobertas científicas em políticas públicas eficazes e produtos inovadores.

Esses diálogos são cruciais para garantir que os frutos da pesquisa não fiquem confinados às revistas acadêmicas, mas sejam utilizados para impulsionar o progresso e o desenvolvimento da sociedade.

Um dos principais objetivos do evento foi reforçar a interação, a colaboração e a integração entre pesquisadores de diferentes disciplinas. Este objetivo não consistia apenas em incentivar o trabalho em equipe, mas também em abrir novas vias de investigação, reforçar os projetos existentes e catalisar o desenvolvimento de novos projetos. Numa era em que os desafios que enfrentamos estão cada vez mais interligados e globais, essa colaboração multidisciplinar é essencial. As soluções mais inovadoras nascem da convergência de diversas perspectivas e conhecimentos, cocriação.

O programa da conferência foi rico tanto em conteúdo como em diversidade, apresentando seis *workshops* com tópicos de importância crítica para o futuro. Estes incluem o empreendedorismo, a saúde pública e os processos de carbono zero – áreas que não só estão na vanguarda da investigação atual, como também são cruciais para enfrentar os desafios globais. Os *workshops*, complementados por palestras de pesquisadores nacionais e internacionais, trouxeram para a discussão um vasto leque de perspectivas. Temas como “A Crise Contemporânea das Democracias e seu Impacto nas Universidades Públicas”, “Invernos e Verões da Inteligência Artificial” e “A USP Contribuindo para a Medicina do Futuro” proporcionaram aos participantes uma visão profunda sobre os rumos da pesquisa e da inovação. Essas discussões ressaltaram o papel fundamental que instituições como as universidades desempenham no avanço do conhecimento e na formação do futuro das sociedades.

A conferência também celebrou a excelência em todo o espectro acadêmico. Foram entregues prêmios em oito áreas do conhecimento: Ciências Agrárias, Ciências Biológicas, Ciências Exatas e da Terra, Ciências da Saúde, Engenharia, Ciências Humanas, Linguística, Letras e Artes e Ciências Sociais Aplicadas. O rigoroso processo de seleção desses prêmios, que envolveu três comissões científicas – sendo a última composta por membros externos à USP –, garantiu

o reconhecimento das mais destacadas contribuições à ciência e à pesquisa, estabelecendo uma referência para futuros projetos de investigação.

A história da ciência está repleta de estudos científicos básicos que conduziram a aplicações após algum tempo. Para deixar clara a conexão entre ciência e benefício da sociedade, permitam-nos mencionar duas moléculas, a Bergenin e a Aequorin.

Bergenin, uma molécula extraída da planta *Endopleura uchi*, é encontrada em várias espécies nativas da Amazônia e tem usos medicinais. No catálogo da empresa farmacêutica Sigma-Aldrich de 2024, o composto Bergenin é cerca de 4.400 vezes mais caro do que o ouro, em peso. Além disso, a extração de ouro está frequentemente associada a problemas socioambientais na mesma região.

As contribuições de Osamu Shimomura, Martin Chalfie e Roger Tsien foram reconhecidas por meio do Prêmio Nobel de Química de 2008. Nos Estados Unidos, na década de 1960, Osamu Shimomura dedicou-se a estudar o fenômeno da bioluminescência na medusa *Aequorea victoria*. Depois de purificar os extratos desses animais marinhos, isolou uma proteína chamada “aequorina”. Shimomura também descobriu outra proteína que exibía fluorescência verde, a Green Fluorescent Protein (GFP). A aequorina, por si só, emite luz azul, mas se a GFP estiver presente, é produzida luz verde. Douglas Prasher mostrou que a proteína era fluorescente no nematoide *Caenorhabditis elegans* e na bactéria *Escherichia coli*. A GFP pode ser vista como um farol de luz, abrindo caminho para várias aplicações dessa proteína como marcador biológico. A GFP pode rastrear múltiplos processos moleculares e celulares quando ligada a diferentes proteínas e expressa nas células. Consequentemente, a GFP tem sido utilizada em milhares de estudos que fazem avançar as ciências biológicas e médicas. Roger Tsien e o seu grupo descreveram a estrutura da GFP, desenvolveram proteínas fluorescentes de cores diferentes e várias ferramentas para monitorar funções celulares.

À medida que as nações se esforçam para alcançar a sustentabilidade do desenvolvimento e enfrentar os desafios globais, as contribuições destes pesquisadores, com seus respectivos supervisores, demonstram a relevância deles para moldar um futuro mais brilhante e inovador.

O Compromisso da USP com os Jovens Pesquisadores

Celia R. S. Garcia, Raul Gonzalez e Arlindo Philippi

O Congresso de Pós-Doutorandos da Universidade de São Paulo (USP) é um evento importante que reúne estudiosos de várias disciplinas acadêmicas. Com 1.233 participantes inscritos, esse congresso foi um fórum vital para o intercâmbio acadêmico, permitindo aos investigadores de pós-doutoramento apresentar os seus resultados, colaborar com os seus pares e participar em discussões multidisciplinares. As seções seguintes apresentam uma análise dos dados demográficos dos participantes, do enfoque temático e dos resultados notáveis do congresso.

O congresso contou com a participação de várias unidades da USP, tanto dos *campi* da capital quanto do interior. A Faculdade de Filosofia, Letras e Ciências Humanas (FFLCH) teve o maior número de inscritos, 158 participantes. A Faculdade de Medicina (FM) e a Escola Politécnica (EP) vieram em seguida, com 72 e 67 participantes, respetivamente.

Outras unidades com representação significativa foram o Instituto de Ciências Biomédicas (ICB) e o Instituto de Estudos Avançados (IEA), com 59 participantes cada (Figura 1).

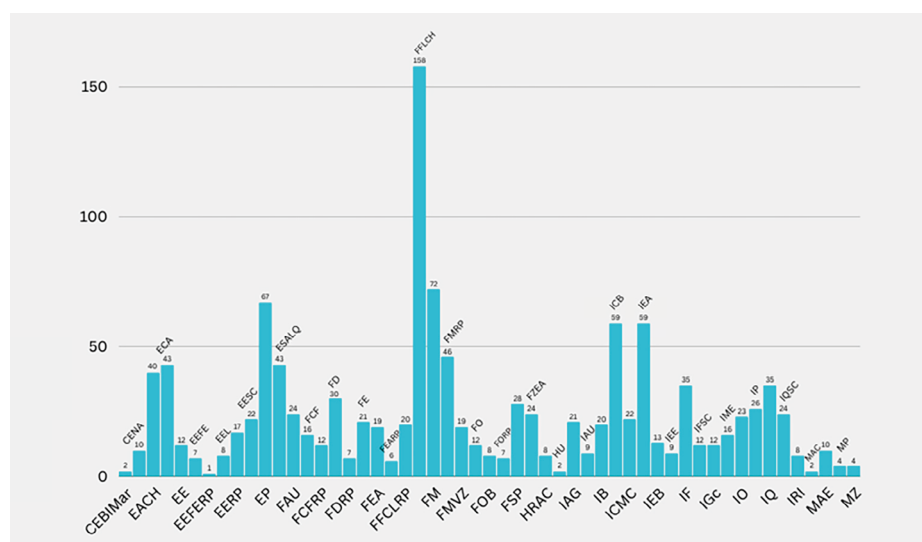


Figura 1 – Percentual de distribuição do cadastro de Pós-docs por Escolas da USP.

Dos 1.233 inscritos, 627 eram mulheres e 580 eram homens, o que revela uma representação de gênero relativamente equilibrada entre os investigadores pós-doutorados presentes no congresso (Figura 2).

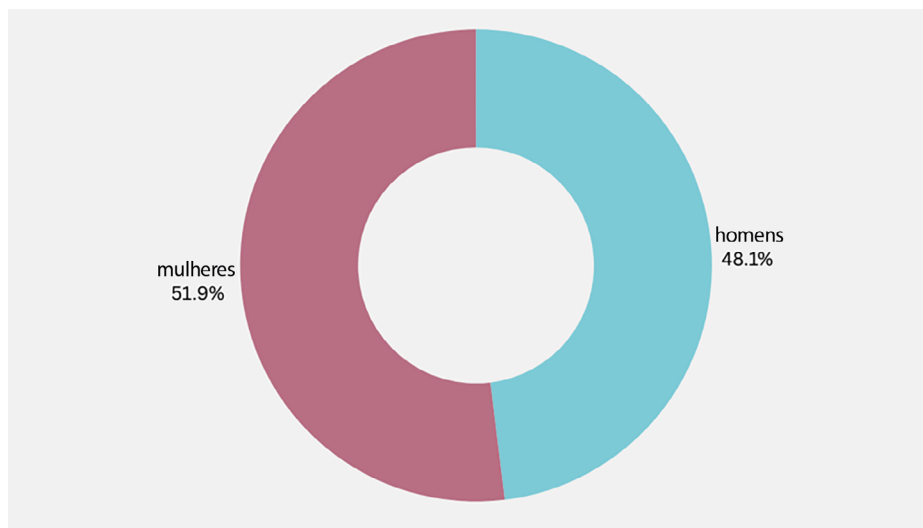


Figura 2 – Percentagem de Pós-Doutorados por gênero dos inscritos.

Para garantir a participação de pesquisadores de fora de São Paulo no congresso, a universidade disponibilizou auxílio financeiro para viagem e hospedagem. Dos 143 indivíduos que solicitaram auxílio para viagem, 108 foram contemplados. A maioria dos participantes (925) era proveniente dos *campi* da capital da USP, sendo 308 dos *campi* do interior. Dezenove participantes se identificaram como pessoas com deficiência ou com mobilidade reduzida, e a organização do evento disponibilizou os serviços de apoio necessários a todos os participantes.

O congresso atraiu investigadores das mais diversas áreas acadêmicas. A área das Ciências da Saúde foi a que registou maior participação, com 374 inscritos, seguida das Ciências Exatas, com 205 apresentações; das Humanidades, com 204 apresentações; das Ciências do Ambiente, com 190; e da Cultura e das Artes, com 136. Destacam-se ainda as Ciências Sociais (166), as Engenharias (108) e as Ciências Biológicas (155) (Figura 3).

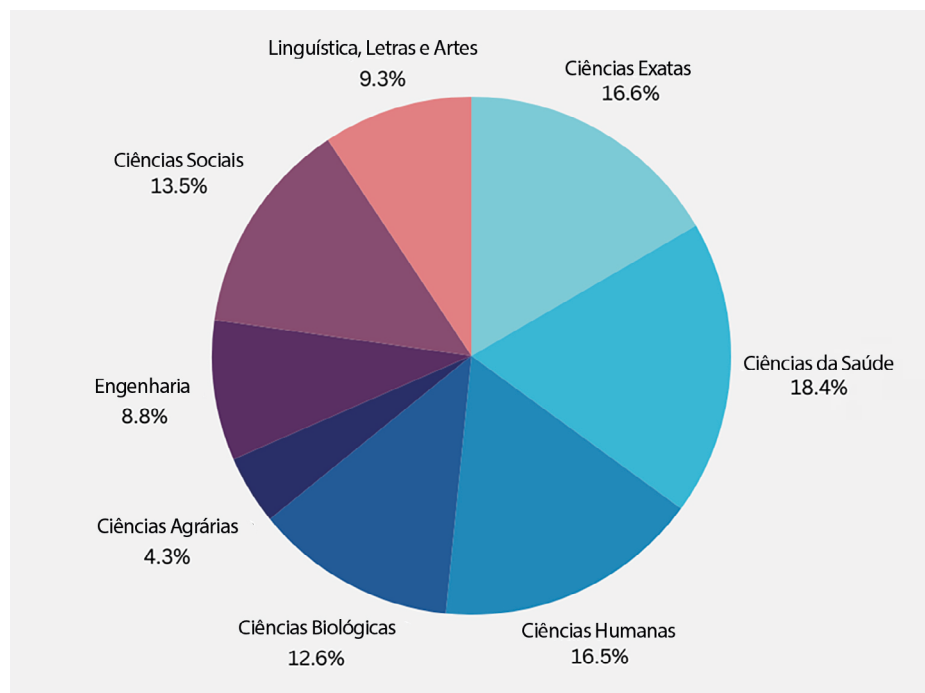


Figura 3 – Distribuição dos inscritos em pós-doutoramento por área.

As apresentações foram agrupadas em torno de desafios globais atuais e revelaram a interdisciplinaridade dos temas e da pesquisa realizada na USP. Foram selecionados 383 resumos para apresentações orais. Esses trabalhos foram divididos entre as diversas disciplinas, com destaque para as Ciências Exatas (65) e Ciências Humanas (64). Ciências da Saúde, Ciências Biológicas e Ciências Sociais também tiveram forte presença, com 61, 51 e 47 apresentações orais, respectivamente (Figura 4).

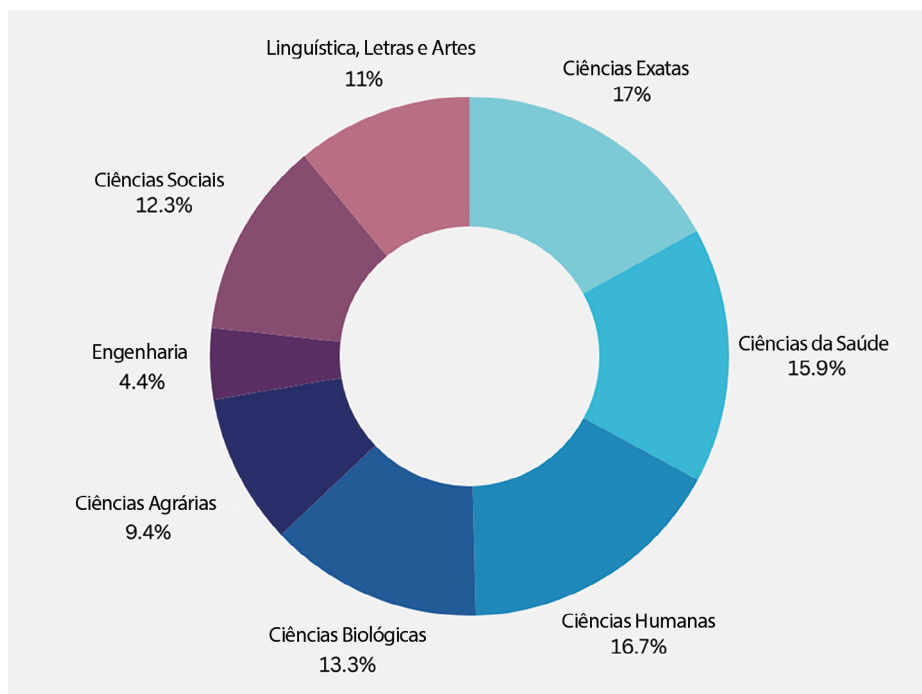


Figura 4 – Distribuição percentual das apresentações orais pelos diferentes domínios.

Oito investigadores em pós-doutoramento foram reconhecidos pelas suas contribuições excepcionais nos seus respectivos domínios. Estes indivíduos foram agraciados com o Prêmio de Pós-Doutoramento. Os premiados foram selecionados entre oito áreas que refletem o vasto âmbito da investigação de excelência no congresso. Na área de **Ciências Agrárias**: Flávia de Oliveira Scarpino Van Cleef, pelo seu trabalho sobre a redução da produção de metano pelos ruminantes. **Ciências Biológicas**: Mateus Vidigal Castro, pela sua investigação sobre a resistência natural à COVID-19. **Ciências da Saúde**: Marlón Juliano Romero Aliberti, pelo seu estudo sobre os efeitos a longo prazo da COVID-19 em idosos. **Ciências Exatas**: Hugo Luiz Oliveira, pelo seu trabalho sobre a modelação matemática da válvula cardíaca Wheatley. **Ciências Humanas**: Fabiana Barbi

Seleguim, por sua pesquisa sobre governança climática e direitos humanos. **Ciências Sociais:** Joana D'Arc de Oliveira, por seu estudo sobre memórias negras e justiça social. **Engenharia:** Raissa Antonelli, por sua pesquisa sobre purificação de água usando reatores eletroquímicos. **Linguística, Letras e Artes:** Cynthia Agra de Brito Neves, pela pesquisa sobre letramento literário em *slams* escolares.

Na mesma linha, a USP apoia diversas bolsas de pós-doutorado: o Programa de Formação em Gestão Acadêmica, com 35 bolsas; o Programa de Eixos Temáticos, 16 bolsas; o Escritório de Gestão Ambiental, 36 bolsas; e o Programa de Gestão da Inovação, nove bolsas em dois programas-chave. Um total de 96 bolsas, com rendimentos mensais compatíveis com os valores das bolsas de pós-doutorado da Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), foram apoiadas financeiramente pela universidade. Esses pesquisadores foram selecionados por meio de um edital bastante competitivo. Tais iniciativas evidenciam o investimento que a Universidade está a fazer nos jovens investigadores.

A USP dedica-se a promover as carreiras de jovens investigadores. Por meio de iniciativas como o Congresso de Pós-Doutoramento, a USP proporciona uma plataforma dinâmica para a colaboração interdisciplinar e o reconhecimento da excelência da investigação. Com mais de 1.200 participantes, o congresso incentivou a troca de conhecimentos em diversas áreas acadêmicas e premiou os investigadores de pós-doutoramento que se destacaram pelas suas realizações. Além disso, a atribuição de bolsas com valores competitivos em programas pela USP demonstra o seu apoio a jovens investigadores. Entre as iniciativas de longa data, a Universidade incluiu esses pesquisadores nos seus comitês de investigação, ou seja, deu-lhes direito a voto. Estas iniciativas evidenciam o compromisso da USP para capacitar os investigadores emergentes, reforçando o seu papel como catalisadora do crescimento acadêmico e científico e promovendo a próxima geração de líderes científicos e educativos.

Preface

Carlos Gilberto Carlotti Junior, rector of USP

It is my pleasure to write the foreword for these works, which are the result presented by our researchers during the conference “The Role and Perspectives of Postdoctoral Research in Brazil.” These four books represent a record of the importance of interdisciplinary collaboration among our postdoctoral fellows in addressing global challenges and fostering new scientific discoveries—such as energy transition technologies, including the conversion of ethanol to hydrogen.

Today, USP has approximately 2,700 postdoctoral researchers pursuing academic activities in its Teaching and Research Units. The conference aimed to expand collaboration and promote integration among researchers from different fields, opening new horizons, strengthening ongoing projects, and encouraging the development of new studies.

Four books, the result of 350 oral communications and 1,200 posters, were presented at the congress, organized into thematic and multidisciplinary sessions, and addressed the challenges of humanity. Thus, the congress drew attention to the multidisciplinary nature of research groups formed by highly qualified researchers. The event led to meetings and interactions among various scientific areas, including public and private sector policy makers.

The event aimed to promote greater collaboration and integration between researchers from different areas, open new horizons, strengthen ongoing projects, and encourage the development of new ones.

The program included six workshops dedicated to topics such as entrepreneurship, public health, and zero-carbon processes, as well as lectures by national and international researchers who addressed various topics, such as: “The Contemporary Crisis of Democracies and its Impact on Public Universities”, ‘Winters and Summers of Artificial Intelligence’ and ‘USP Contributing to the Medicine of the Future’.

The participating research groups, comprised of highly qualified researchers, presented 350 oral presentations and 1,200 posters, organized into thematic and multidisciplinary sessions, addressing challenges facing humanity. The event also provided important opportunities, such as meetings and interactions between a wide range of scientific fields, including public and private sector policymakers.

Also worthy of mention is the awarding of prizes in eight areas of knowledge – Agricultural Sciences, Biological Sciences, Exact and Earth Sciences, Health Sciences, Engineering, Human Sciences, Linguistics, Literature and Arts, and Applied Social Sciences – for works that were selected by three scientific committees, through a three-stage process, with the last committee being composed of members outside USP.

With the advent of the knowledge economy, the foundations of countries' economic development have undergone a profound transformation. Investing in science is the path developed nations have followed in their search for sources of deep knowledge, whose core is based on excellent research and innovation. In this new scenario, the role of academia as an essential actor in knowledge generation cannot be overlooked.

Close observation of science, research, and innovation ecosystems, in turn, reveals the enormous potential of postdoctoral researchers and their supervisors to accelerate a country's development.

The USP Postdoctoral Congress exemplifies the crucial role that postdoctoral researchers play in advancing scientific knowledge and innovation. The ability to take full advantage of new technologies depends on the human resources working in both academia and the private sector. A supportive and collaborative environment for postdoctoral researchers benefits the academic community and significantly contributes to the development of society.

Furthermore, the event was a valuable opportunity to bring together highly qualified individuals and institutions and their contributions to the advancement of science. The publication of this diverse and comprehensive collection of scientific texts strengthens the open and stimulating environment for conducting science for the benefit of all.

Presentation

Celia R. S. Garcia¹, Raul Gonzalez² and Arlindo Philippi³

Science, research, and innovation ecosystems are essential drivers of a nation's growth, and postdoctoral fellows are among the major drivers of progress in these systems. With the completion of their doctoral studies, these individuals occupy a unique position at the intersection of knowledge creation and application. They are the future leaders of the academic and business worlds and the pioneers who push the boundaries of what is possible. This vital role of the postdoctoral programs becomes visible at the University of São Paulo (USP), one of Brazil's leading academic institutions, which in 2023 had around 2,650 postdoctoral fellows. These professionals make up the vanguard of scientific research, contributing significantly to the university's reputation as a center of innovation and academic excellence.

The importance of the Post-Doctoral Program for research production and for expanding USP's intellectual vitality was highlighted during an important congress held from October 17 to 19, 2023. Entitled "O Papel e as Perspectivas do Pós-Doutorando no Brasil", the congress served as a platform to promote, discuss, and analyze the contributions of these academics to the university and the scientific community in general.

More than just a meeting of minds, it was a demonstration of the university's commitment to promoting a dynamic research environment that thrives on the contribution of these highly qualified individuals.

As a result of the congress, a four-volume book was produced, each summarizing the research presented during the event. These volumes contain the essence of 350 oral presentations and 1,200 posters, reflecting the breadth and depth of the research carried out by USP's Postdocs. The presentations were organized into thematic and multidisciplinary sessions, each designed to address some of humanity's most pressing challenges. This structure highlighted the diversity of research at USP and underscored the importance of multidisciplinary approaches to complex global issues. By bringing together researchers from various disciplines, the conference demonstrated how collaborative efforts

1. Congress Organizing Executive Committee; Advisor to the Rector's Office.

2. Congress Organizing Executive Committee; Deputy Provost on Innovation.

3. Congress Advisory Council; Head of the Rector's Office.

can lead to holistic and practical solutions to the world's most pressing contemporary problems.

The conference also provided the opportunity to promote critical interactions between different stakeholders, extending their influence beyond the confines of academia. These interactions included engagements with political agents from the public and private sectors, essential for translating scientific discoveries into effective public policies and innovative products. These dialogues are crucial to ensure that the fruits of research are not confined to academic journals, but are used to drive progress and development in society.

One of the main objectives of the event was to strengthen interaction, collaboration and integration between researchers from different disciplines. This goal was not only to encourage teamwork, but also to open up new avenues of research, improving existing projects and catalyze the development of new ones. In an age when the challenges we face are increasingly interconnected and global, this interdisciplinary collaboration is essential. The most innovative solutions are born from the convergence of diverse perspectives and knowledge, through co-creation.

The conference program was rich in both content and diversity, featuring six workshops on topics of critical importance for the future. These included entrepreneurship, public health, and zero-carbon processes – areas that are not only at the forefront of current research, but are also crucial to tackling global challenges. The workshops, complemented by lectures from national and international researchers, brought a wide range of perspectives to the discussion. Topics such as “The Contemporary Crisis of Democracies and its Impact on Public Universities”, “Winters and Summers of Artificial Intelligence,” and “USP Contributing to the Medicine of the Future” provided participants with an in-depth insight into the direction of research and innovation. These discussions highlighted the fundamental role that institutions such as universities play in advancing knowledge and shaping the future of societies.

The conference also celebrated excellence across the academic spectrum. Awards were presented in eight areas of knowledge: Agricultural Sciences, Biological Sciences, Exact and Earth Sciences, Health Sciences, Engineering, Human Sciences, Linguistics, Letters and Arts and Applied Social Sciences. The rigorous selection process for these awards, which involved three scientific committees, the last one was formed by members from outside USP – ensured that the most outstanding contributions to science and research were recognized.

The history of science is full of fundamental scientific studies that have led to practical applications over time. To make clear the connection between science

and societal benefit, let us mention the discovery of two molecules, Bergenin and Aequorin.

Bergenin, a molecule extracted from the *Endopleura uchi* plant, is found in several species native to the Amazon and has medicinal uses. The compound Bergenin is approximately 4,400 times more expensive than gold by weight, according to the Sigma-Aldrich catalog in 2024. Besides, gold extraction is often associated with socio-environmental issues in the same region.

The contributions of Osamu Shimomura, Martin Chalfie, and Roger Tsien were recognized with the 2008 Nobel Prize in Chemistry. In the United States, in the 1960s, Osamu Shimomura dedicated himself to studying the phenomenon of bioluminescence in the jellyfish *Aequorea victoria*. After purifying the extracts from these marine animals, he isolated a protein called “aequorin”. Shimomura also discovered another protein that exhibited green fluorescence, Green Fluorescent Protein (GFP). Aequorin emits blue light, but if GFP is present, green light is produced. Douglas Prasher showed that the protein was fluorescent in the nematode *Caenorhabditis elegans* and the bacterium *Escherichia coli*. GFP can be seen as a light source, supporting various applications of GFP as a biological marker. GFP can track multiple molecular and cellular processes when linked to different proteins and expressed in cells. Consequently, GFP has been used in thousands of advanced biological and medical sciences studies. Roger Tsien’s group described the structure of GFP, developed fluorescent proteins of different colors, and developed several tools to monitor cellular functions.

As nations strive to achieve sustainable development and tackle global challenges, the contributions of these researchers, with their respective supervisors, demonstrate their relevance to shaping a brighter and more innovative future. The event served as a reminder of the transformative power of research and the need to continually support and nurture the ecosystems that make this progress possible.

USP's Commitment to Young Researchers

Celia R. S. Garcia, Raul Gonzalez, and Arlindo Philippi

The Postdoctoral Congress at the University of São Paulo (USP) is a relevant event that brings together scholars from various academic disciplines. With 1,233 registered participants, this congress was a vital forum for academic exchange, allowing postdoctoral researchers to present their findings, collaborate with peers, and engage in interdisciplinary discussions. The following sections provide a breakdown of participant demographics, thematic focus, and notable achievements from the congress.

The congress saw participation from various units across USP, both from the capital and interior campuses. The Faculty of Philosophy, Letters, and Human Sciences (FFLCH) had the highest number of registrants, 158 participants. The School of Medicine (FM) and the Polytechnic School (EP) followed with 72 and 67 participants, respectively. Other units with significant representation included the Institute of Biomedical Sciences (ICB) and the Institute of Advanced Studies (IEA), with 59 participants each (Figure 1).

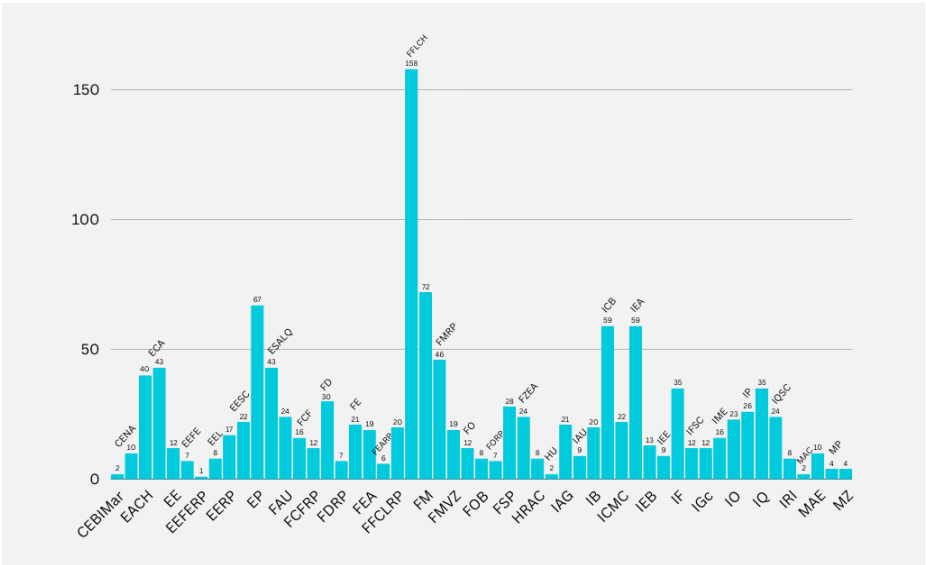


Figure 1 – Percentage of distribution of Postdocs registration per USP Schools.

Of the 1,233 registrants, 627 were women, and 580 were men, highlighting a relatively balanced gender representation among postdoctoral researchers at the congress (Figure 2).

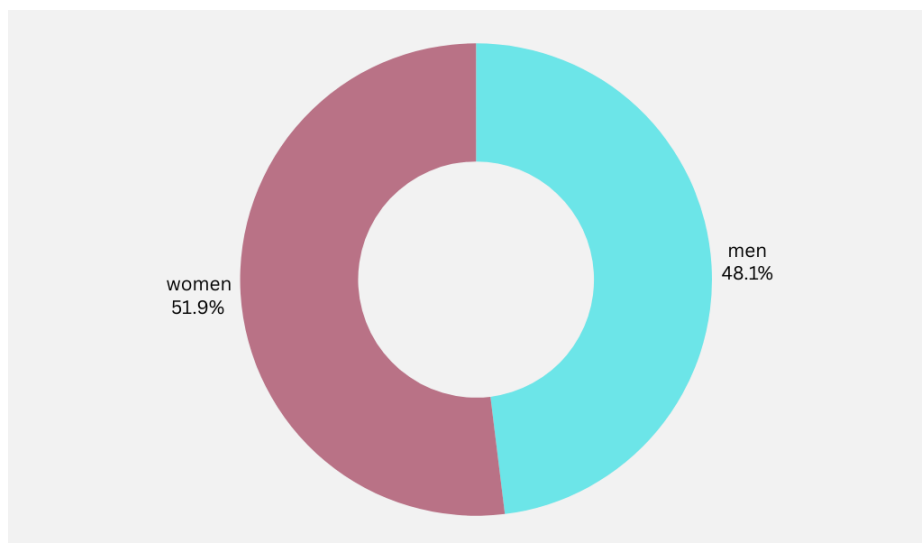


Figure 2 – Percentage of Postdocs by gender distribution of registrants.

To ensure that researchers from outside São Paulo could attend the congress, the university provided financial assistance for travel and accommodation. Of the 143 individuals who applied for travel assistance, 108 were granted. Most participants (925) came from USP's capital campi, with 308 from the interior campi. Nineteen participants identified themselves as having disabilities or reduced mobility, and the event organizers made necessary support services available to all participants.

The congress attracted researchers from a wide range of academic areas. The Health Sciences field saw the highest participation, with 374 registrants, followed by the Exact Sciences with 205 presentations, Humanities with 204 presentations, Environmental Sciences with 190, and Culture and the Arts with 136. Other notable fields included social sciences (166), engineering (108), and biological sciences (155) (Figure 3).

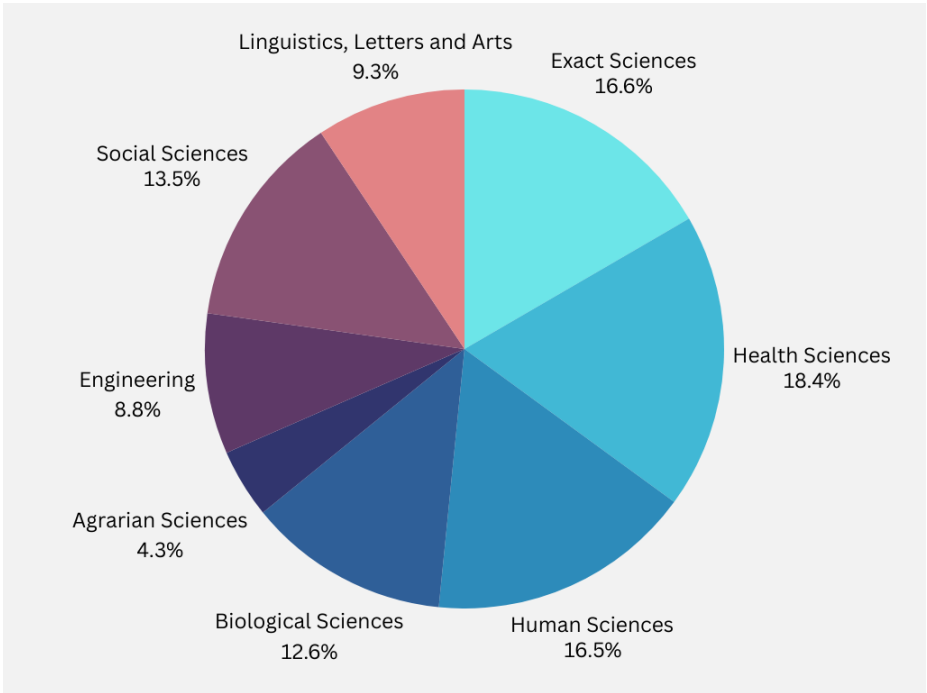


Figure 3 - Distribution of postdoc registrants by area.

The presentations were clustered around current global challenges and revealed the interdisciplinary nature of the themes and the research conducted at USP. A total of 383 abstracts were selected for oral presentations. These works were divided among the various disciplines, with the Exact Sciences (65) and the Humanities (64) leading the way. Health Sciences, Biological Sciences, and Social Sciences also had a strong presence, with 61, 51, and 47 oral presentations, respectively (Figure 4).

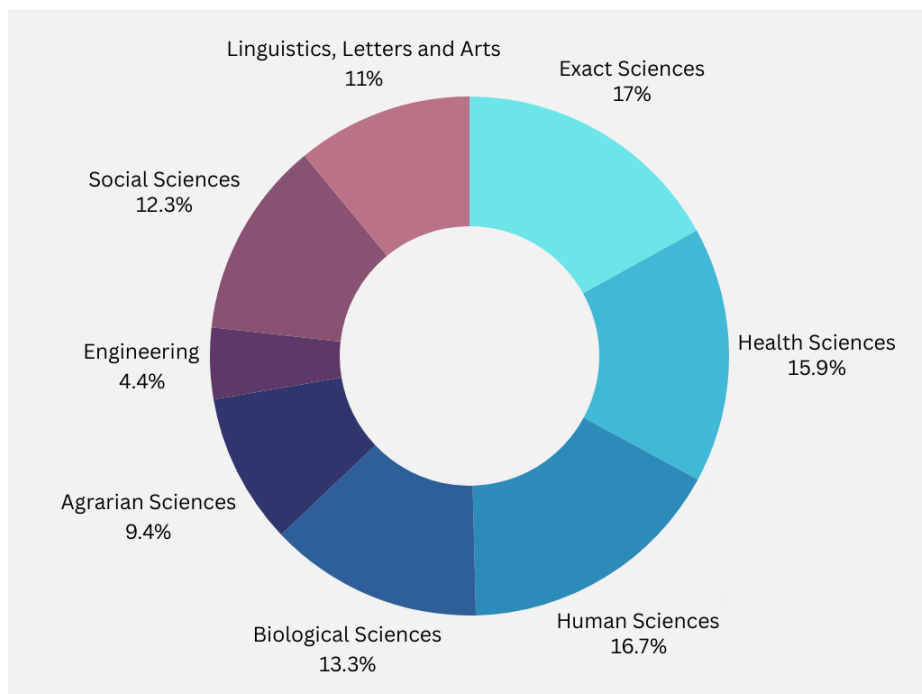


Figure 4 – Percentage distribution of oral presentations across different fields.

Eight postdoctoral researchers were recognized for their outstanding contributions to their respective fields. These individuals were awarded the Postdoctoral Prize. The awardees were selected from eight areas that reflect the broad scope of research excellence at the congress. The awardee was **Agrarian Sciences**: Flávia de Oliveira Scarpino Van Cleef for her work on reducing methane production from ruminants. **Biological Sciences**: Mateus Vidigal Castro, for his research on natural resistance to COVID-19. **Health Sciences**: Marlón Juliano Romero Aliberti, for his study on the long-term effects of COVID-19 in older adults. **Exact Sciences**: Hugo Luiz Oliveira, for his work on the mathematical modeling of the Wheatley heart valve. **Human Sciences**: Fabiana Barbi Seleguim, for her research on climate governance and human rights. **Social Sciences**: Joana D’Arc

de Oliveira, for her study on black memories and social justice. **Engineering:** Raissa Antonelli, for her research on water purification using electrochemical reactors. **Linguistics, Letters, and Arts:** Cynthia Agra de Brito Neves, for her research on literary literacy in school slams.

On the same line, USP supports several postdoc fellowships: the Academic Management Formation Program, 35 fellowships; Thematic Axis Program, 16 fellowships; Environmental Management Office, 36 scholarships; and the Program for Managing Innovation, nine fellowships in two key programs. A total of 96 scholarships, with monthly incomes compatible with FAPESP postdocs fellowships values, were financially supported by the university. These researchers were selected through a very competitive call for applications. These initiatives highlight the investment that the University is considering the young researchers.

The University of São Paulo (USP) is dedicated to advancing the careers of young researchers. Through initiatives like the Postdoctoral Congress, USP provides a dynamic platform for interdisciplinary collaboration and recognition of research excellence. With over 1,200 participants, the congress encouraged knowledge exchange across diverse academic fields and awarded outstanding postdoctoral researchers for their achievements. Moreover, USP's allocation of competitive fellowships across programs demonstrates its support for young researchers. Among long-standing initiatives, USP included them in university research committees, giving them voting rights. These initiatives highlight USP's commitment to empowering emerging researchers, reinforcing its role as a catalyst for academic and scientific growth, and fostering the next generation of scientific and educational leaders.

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SAÚDE

Physical functional performance, body composition, strength, and cognitive in Brazil north region cohort study aged above 59 years

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This study's aim was to establish reference data across women older adults of Amazonas based in young adult's value. Two-hundred and thirteen completed partial (handgrip strength test, 6-m walking test, and timed up and go) and one-hundred and twenty-six completed all the measurements (MoCA (Montreal Cognitive Assessment), anthropometric and body composition measure, SARC- F, handgrip strength; and physical functional performance (timed up and go and 6-m walk test). The study included three meetings (i.e., 2 weeks). On the first meeting, participants were informed about the study design and procedures. During the second meetings, 48 hours apart, participants were familiarized with the tests. In the following week, one more meeting was conducted to apply the assessments. T-score was calculated ((measured – measured of young healthy reference group)/standard deviation of young healthy reference group), thus, following classification was applied: above 0 (expected), below 0 to -1 (below expectations), > -1 to -2 (moderately below expectations), and $\geq$ -2 (severely below expectations). We demonstrated that cutoff changed in all measure compared to worldwide parameters, calf circumference should be attention below 32 cm, as well as handgrip strength test below 20.7 kgf, following to appendicular segment muscular mass below < 5,37 kg/m², and 6-m walking test velocity below 1.86 m/s, and timed up and go final time above 6.65 seconds. In summary, health professionals and researchers involved with older adult women should consider specific population outcomes application, positive-false diagnostic of sarcopenia could be avoided, and more realistic diagnostic will be reached.

1. Universidade Federal do Amazonas.

2. Escola de Artes, Ciências e Humanidades da USP.

3. Associação de Idosos do Coroado.

4. Faculdade de Medicina da USP.

The role of human milk microbiome on the infant whole brain networks connectivity

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Background and Aim: Emerging evidences have been linking differences in the human gut microbiome composition with neurodevelopment outcomes. It is also known that gut microbiome colonization is strongly driven by human milk microbiome; thus, we aim to investigate the association between human milk microbiome and neural network connectivity in 3-months-old infants from a population based cohort. Shotgun metagenomic sequencing of stool samples will also be surveyed on this cohort. **Methods:** We analyzed data from 90 infants (35 males) at 3 months of age from the GERMINA Cohort Study. Electroencephalography (EEG) was applied to assess whole brain network connectivity at alpha, beta, and theta frequencies (4–6Hz). Genomic DNA was extracted using QIAmp Blood DNA mini Kit (Qiagen) with a previous sample treatment. Genomic DNA was sequenced using primers for the V3/V4 region of the 16S rRNA gene. Library preparation and sequencing steps were performed on a single run using a MiSeq Illumina protocol, as previously described. Raw read files were analyzed using QIIME v.2 software. The Maaslin2 R package (Microbiome Multivariable Association with Linear Models) was performed to detect over-represented/depleted bacterial taxa in brain network connectivity frequencies comparisons. The significantly altered taxa were considered when $q\text{-value} < 0.15$. All analyses were conducted using the R software (<http://www.r-project.org>). **Results:** Microbiome alpha diversity was inversely associated with whole brain alpha connectivity ($\beta = -0.463$, $p = 0.053$). Beta and theta brain network connectivity were not significantly associated with the human milk microbiome diversity. Taxonomic analysis of human milk shows *Staphylococcus*, *Streptococcus* OTU1147 and *Rothia* inversely associated with whole brain beta connectivity ($\beta = -0.300$, $q = 0.012$; $\beta = -0.349$, $q = 0.134$ and $\beta = -0.261$, $q = 0.134$ respectively) while *Streptococcus* OTU1354 ($\beta = 0.352$, $q = 0.134$) was directly associated. **Conclusion:** This study indicates associations of the human milk microbiome with infant whole brain network connectivity based on a preliminary data analysis. These results will inform further analysis of shotgun metagenomic sequencing of stool samples.

The influence of walkability on walking for transportation during the COVID-19 pandemic in the city of São Paulo, Brazil: a cohort study

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There are few studies on the prospective pattern of walking for transportation and the influence of most walkable neighborhoods in middle-income countries, mainly after COVID-19. The objective was to analyze the influence of walkability on walking for transportation in São Paulo citizens in the periods 2014–2015 (baseline) and 2020–2021 (2nd wave). It was a cohort study was conducted with a sample of 1,434 individuals (35.5% of baseline) in the city of São Paulo, Brazil. The baseline information was collected through face-to-face interviews and in the 2nd wave by telephone interview. The outcomes analyzed were walking for transportation ≥ 10 minutes/week (yes) and ≥ 150 minutes/week (yes), measured by the IPAQ-long version. The exposure was the most walkable neighborhoods (2nd, 3rd, and 4th quartiles grouped) from the walkability index in the 500m and 1,000m network buffers. Multilevel logistic models were performed to examine the odds ratio of most walkable neighborhood influence longitudinally on walking for transportation considering both individual-level and neighborhood-level. There was a significant increase in adults who used walking for transportation during the COVID-19 pandemic period (≥ 10 minutes/week: 60.2% versus 71.0%; ≥ 150 minutes/week: 19.9% versus 23.3%). Individuals who lived in most walkable neighborhoods in the 1,000m buffer were more likely to walk for transportation ≥ 10 min./week (OR=1.44; CI95%:1.09–1.90), and ≥ 150 min./week (OR=1.39; CI95%:1.08–1.81), regardless of sex, age group, and educational level. Living in most walkable neighborhoods can influence positively walking for transportation, regardless of individual characteristics. Urban planning policies must encourage active transportation.

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2. Universidade do Estado de Minas Gerais.

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5. Pontifícia Universidade Católica do Paraná.

Adapted sport in the educational, performance and leisure fields as a means of promoting quality of life, health and social inclusion for people with disabilities

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Using as a theoretical reference the Category of Field that is part of the Reflexive Sociology developed by the French sociologist Pierre Bourdieu, the work and study proposal presents as a research problem to analyze the interfaces of the Environments of Educational Sports Practice, of Performance and of Leisure within the conjuncture of the Brazilian Adapted Sport as an educational tool to promote quality of life, health and social inclusion for people with disabilities. We will seek to answer the following question: The whole context of adapted sports practice can be configured as a tool within the process of promoting quality of life, health and social inclusion for people with disabilities in order to reduce the social inequalities that mark this Brazilian population segment? To answer this question, the work presents as a study sample subjects who participate and actively participated in the adapted sports context in Brazil. Data collection was performed from semi-structured interviews (CRESWELL, 2010). Data will be analyzed and categorized according to Campo's Bourdieusian theoretical perspective (BOURDIEU, 1978a; 2019). The study will have as main objective to analyze the adapted sports practice from its different meanings and environments as a tool that can develop the person with disability in all its dimensions (physical – cognitive – social) with the intention of reducing the social inequalities that mark this population in Brazil.

1. Escola de Artes, Ciências e Humanidades da USP.

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The importance of human milk microbiome in infant neurodevelopmental outcomes

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Epidemiological studies have suggested an important association of infant gut microbiome with neurodevelopment outcomes, which maternal bacteria are shared with infants via breastfeeding. Thus, we aim to determine associations between human's milk microbiota and neurodevelopmental outcomes (Bayley Scale – BSID-III) in 3-months-old infants from a population-based cohort. We analyzed data from 90 infants (35 males) from the GERMINA Cohort Study. Mother milk samples were collected, and genomic DNA was extracted using QIAamp DNA Blood Mini Kit (Qiagen). The sequencing was performed for the V3/V4 region of the 16S rRNA using MiSeq Illumina platform. Raw read files were analyzed using QIIME v.2 software. The Maaslin2 R package (Microbiome Multivariable Association with Linear Models) was performed to detect over-represented/depleted bacterial taxa in developmental scales comparisons. The significantly altered taxa were considered when q -value < 0.25 . Alpha diversity measures were not associated with Bayley scores ($q > 0.25$). The *Rothia mucilaginosa* was negatively associated with social-emotional score and positively associated with cognitive score ($\beta = -0.16$, $q = 0.22$; and $\beta = 1.34$, $q = 0.16$, respectively). Analyzing the language scores, *Haemophilus* was associated with better scores ($\beta = 0.07$, $q = 0.21$), while *Veillonella atypica* OTU-889 and OTU-898 were associated with worse scores ($\beta = -0.24$, $q = 0.21$; and $\beta = -0.20$, $q = 0.21$, respectively). Finally, *Blautia* ($\beta = 1.13$, $q = 0.16$), *Lachnoanaerobaculum* ($\beta = 1.23$, $q = 0.16$), *Stenotrophomonas* ($\beta = 1.38$, $q = 0.16$), *Gemella* ($\beta = 1.16$, $q = 0.16$) *Fusobacterium periodonticum* ($\beta = 2.36$, $q = 0.006$) and *Corynebacterium kroppenstedtii* ($\beta = 2.23$, $q = 0.16$) were positively associated with cognitive scores. This study found strong associations between key taxa from human milk microbiome and infant neurodevelopment based on preliminary data analysis. Future analyzes will be performed comparing the results obtained with shotgun metagenomic sequencing of stool samples.

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Age of peak performance of World-Class Scullers

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This study determined the age of peak performance of world-class single, double and four sculling boats and investigated the impact of the venue on performance. This study characterized the performance progression as the athletes matured in single, double and four sculling rowing boats. The performances were obtained from the Rowing World Championships by age groups from the year 2010 to the year 2022. All the data came from a publicly available database on the internet. Data were analysed by mixed modelling procedures and the significance level was set at $p < 0.05$. Scullers presented the age of peak performance at older age in single, followed by double and four scull boats for heavyweight men and this trend was similar for heavyweight women in single and double sculls. Lightweight men were older in the double scull boats. Performance is positively or negatively affected by the venue. The age of peak performance of world class scullers was similar for single and double men and women heavyweight scullers whilst the model for the women four scullers were older, all-in spite of dissimilar competition performances. Lightweight scullers presented a trend that differed from their heavyweight counterparts. Finally, sculling performance is affected by venue.

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Healthy food images of bricolage in Instagram publicity brands

Maria C. da V. S. Carvalho

Food content is spreading all over social networks. It provides huge transformations in food consumption. On one hand, Brasil innovate with new Public Policy criteria to protect people against chronic degenerative diseases, we made a new food classification that are applied by South and Central America countries. On the Other hand, we experienced more and more predictions of healthiness, convenience and practicality advertised by the commercial sectors. The coexistence of malnutrition and obesity at the same time in population implies dilemmas considering consumption of ultra-processed food. The need to understand it justify this study. The central problem on digital environment of social network is the remodeling food consumption trends effects of brands. The publicity is a communication phenomenon that expresses consumption trends. In fact, it doesn't create desires but enhances them. Then the purpose is to analyse the language of health consumption in advertising accounts Instagram of global circulation food brands. In a critically way, we'll observe social media of brands in Brazil, France and United States. There will be three axes: theoretical resources of the interface of Nutrition and Communication fields, intertextualities and references to the new food classification based on food processing and the structured character in the creation of elements of distinction and social impact about healthy food in digital media. The theoretical resources are based on concepts of cultural mediation and mediatization that operates studies of communication and consumption with technical-methodological procedure for reflections to analyzes brand institutionalization, products and services around eating and the commensality.

Translation and adaptation of the safety agenda mobile app to the Brazil

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When aiming at providing a safe and high-quality health care, the health sector is faced with many challenges, standing out among these the complexities in management, be it in hospitals, in primary care or nursing services. On that note, Spanish researchers have developed a mobile app named Safety Agenda Mobile App (SAMA), consisting of a dynamic schedule which includes a set of actions that must be implemented, alongside with the frequency and time of year in which they must take place. With the coming of the COVID-19 pandemic the app was updated and in its second version, SAMA introduced a list of recommended actions for patient and health worker safety, sorted by categories and the frequency in which each action must be implemented. This way, it become possible to properly manage risks inherent to the health sector as well as to prevent the impact of adverse events in the processes of health care for both patient and health professional. The usage of apps in the practice of nursing must take into consideration integral aspects of information technology, providing nurses with support to improve their professional performance, promoting quality and safety for patients and staff (Araujo et al., 2019). Also, having in mind the lack of research and resources for the management of interventions in the promotion of safety and health for patient and health professional, this study aimed at translating and converting the current version of SAMA to Brazilian context and culture. Method: The methodological approach for the study observed the following steps: translation, synthesis, back-translation, evaluation by specialists, finalization, and pre-tests. Results: A consensus index of 85% was reached by the specialist committee consisting of 14 judges. Therefore, the application was translated and adapted to Brazilian Portuguese. Conclusion: The availability of this tool may optimize and enable nurses in the process of management of safety concerning patients and health professionals in Brazil. In addition, it will subsidize the development and implementation of measures and strategies by managers and researchers intended to ensure patient and health worker safety, considering the development of research in the use of this application in a Brazilian context and the impacts caused by the pandemic.

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Alfabetismo em saúde e fatores associados à implementação de conhecimentos científicos por idosos

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Introdução: Apesar de já ter sido demonstrado que o alfabetismo em saúde compromete a adesão do idoso às recomendações de saúde, resultando em pior controle de doenças e maior risco de ocorrência de condições agudas e eventos adversos em saúde, ainda não se sabe se o alfabetismo em saúde interfere na decisão de implementação de resultados científicos, e em que medida essa interferência acontece, em sua vida cotidiana. Do mesmo modo, não se sabe quais os fatores associados à implementação do conhecimento científico, para além do alfabetismo em saúde. **Objetivos:** identificar os fatores associados à implementação do conhecimento científico e qual impacto do alfabetismo em saúde na implementação de conhecimentos científicos no cotidiano de idosos. **Metodologia:** estudo transversal realizado em ambiente virtual e dados coletados com formulário eletrônico. Incluídos idosos com idade ≥ 60 anos, que assinaram o Termo de Consentimento Livre e Esclarecido. Os dados estão sendo analisados por meio de estatística descritiva, testes paramétricos e não paramétricos para testar associações entre as variáveis, por meio do Software SPSS V. 24. O nível de significância adotado foi 0,05 e todos testes são bicaudais. **Principais resultados:** 75 idosos participaram do estudo. Em relação às categorias da European Health Literacy Survey Questionnaire, 52,7% (n=39) estão na categoria suficiente, 33,8% (n=25) na problemática e 13,5% (n=10) na inadequada. 77,3% (n=58) percebem que o conhecimento científico é importante para ser implementado (aceitabilidade), 85,3% (n=64) têm a intenção de usar o conhecimento científico (adoção), 48% (n=36) acham que o conhecimento científico produzido pela universidade é compatível com sua realidade (adequação), 44,6% (n=33) usam com sucesso o conhecimento científico (viabilidade), 42,7% (n=32) aplicam o conhecimento científico exatamente como foi recomendado (fidelidade), 42,7% (n=32) consideram que “talvez” seja caro aplicar conhecimento científico (custo de implementação), 53,3% (n=40) aplicam o conhecimento científico no ambiente que vive (penetração) e 49,3% (n=37) mantém a aplicação do conhecimento científico (sustentabilidade). Os fatores associados viabilidade ($p=0,045$) e fidelidade ($p=0,004$) são estatisticamente significantes para o nível de alfabetismo em saúde. **Conclusão:** viabilidade e fidelidade são fatores fortemente relacionados ao alfabetismo em saúde.

1. Escola de Enfermagem da USP.

R1T1 Robot: use of technology as an educational tool in health for organ and tissue donation for transplants

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Objective: To present the use of technology as a tool for health education activities for Organ and tissue donation for transplantation. **Methods:** Report of Health Awareness and Education activity carried out by postgraduates and undergraduates in partnership with the Intra Hospital Commission for Organ and Tissue Donation for Transplants (CIHDOTT) of a University Hospital in the Southern Region of Brazil. **Results:** R1T1 is a telepresence robot and is part of several activities in the health area for professionals in institutions, students in schools, universities and also the general population. Education is one of the attributions of CIHDOTT, so there was an interest in using the R1T1 robot as an ally for health education activities for organ and tissue donation through the application of an interactive game. The participants interact with the R1T1 and answer questions about myths and truths through the Kahoot® platform, which generates a ranking according to the time and correct answers. The CIHDOTT provides the theoretical basis for answering questions and provides a QR code® to access an educational folder. The activities are carried out in a wi-fi networked environment. The R1T1 robot arouses the curiosity of people of all ages. Among the activities, there is the GREEN SEPTEMBER, a month of awareness about organ donation where several in-hospital and out-of-hospital clarification and education activities are carried out, focused on this theme regardless of age, education level, and area of activity. **Conclusion:** Organ and tissue donation for transplants arouses interest not only in health professionals, but also in students from schools, universities and the general population, who have many doubts. Faced with the need for wide dissemination and demystification of the theme, that would really reach people, there was the idea of creating a strategy with the use of the R1T1 robot that would awaken interest, providing quality information and also solving the most frequent doubts in a playful way.

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3. Universidade Estadual de Campinas.

A bilingual competency self-assessment tool for infection preventionists: developing and content validation

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Maria C. Padoveze¹

Background: Specific competencies are essential for both the successful job performance and career progression for infection preventionists and the best outcomes of infection prevention and control programs. **Objective:** To develop and validate the content and the response process of a bilingual tool for self-assessment of infection preventionists' competencies. **Methods:** The development of the tool followed recommendations proposed for scale development according to DeVilles (2017) from January to August 2022. The conceptual structure and generation of items in Portuguese and English followed the World Health Organization's Core Competencies for Infection Prevention and Control Professionals. Content validity was evaluated by a panel of Portuguese or English native speakers with expertise in the subject studied. The experts received, via email, an invitation letter with the guidelines and concepts to be used, and an Excel® spreadsheet version of the tool. The assessed aspects of the tool content were: clarity, pertinence, and relevance. In addition, each expert was asked to rate each of the items as "essential", "useful", or "not necessary". To test response process, 30 Portuguese speakers and 30 English speakers' infection preventionists participated and informed whether the tool was understandable. Analysis was performed by calculating the Content Validity Ratio (CVR). In this study, a significance level of 0.05 was adopted, resulting in a minimum critical CVR value of 0.769. This study was approved by the institutional Research Ethics Committee. **Results:** The first Portuguese and English version of the tool had 118 items organized in five areas and 16 domains. The tool was evaluated by 13 Portuguese and 13 English speaker experts. The analysis showed that 63 items (74.3%) in Portuguese version and 70 items (82.6%) of the English version was considered "essential" and presented CVR equal or above the stipulated value of 0.769. In the response process, all participants agreed the self-assessment tool items were easy understandable. **Conclusions:** Portuguese and English versions of the tool presented evidence of content and response process validity. Currently both versions are under the psychometric analysis to test their internal structure.

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Implementation of the digital trauma registry in the urgency and emergency department of a public hospital in the western Amazon

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and Lilia de S. Nogueira¹

Objective: To promote the elaboration and implementation of a digital trauma registry in an emergency service of a public hospital in the Western Amazon. **Method:** Psychometric study of construction and survey of validity evidence of a digital content to be inserted in a notification platform related to the implementation of a digital trauma registry in an urgency and emergency unit of a public hospital in the Western Amazon located in the municipality of Rio Branco, Acre. The study will be developed in two phases: Phase I will have three stages. Step 1 – to create the digital content, we used the construct assessment of the traumatized person and assistance provided during the intra-hospital period, including from the emergency room admission to hospital discharge. Step 2 – to create the item bank, the National Trauma Data Standard of the American College of Surgeons was used. Step 3 – it was defined that the items of the instrument to be evaluated will have 5 likert-type response options defined in: “I totally agree”, “I partially agree”, “indifferent”, “I don’t partially agree”, “I don’t totally agree”. Phase II – Validation of the instrument will be carried out in two stages in which stage 1 is the evidence of content validity from the panel of judges. For the selection of the eight judges (nurses and physicians) who will validate the content of the trauma registry (phase II of the study), Fehring’s criteria will be followed and the following inclusion criteria will be considered: academic training time of up to 8 years, time working in care of up to 8 years and time of experience in caring for traumatized patients for more than 4 years. The judges will have the role of verifying aspects of clarity, theoretical relevance and practical relevance. In step 2 of this phase, the evidence of validity of the response process and evidence of validity of the internal structure will be carried out where the final version of the content evaluated by the specialists will be applied in the period of 4 months with trauma patients who meet the following inclusion criteria: age greater than or equal to 18 years old, victims of falls, traffic accidents, physical aggression or mechanical and/or physical self-harm, who were assisted by the pre-hospital team, referred to the study hospital and treated in the emergency room. To verify the evidence of content validity and the response process, the content validity ratio (CVR) index will be used. For internal structure analysis, exploratory and confirmatory factor analysis is intended to be used through item response theory and reliability analysis. Quantitative data will be analyzed using the statistical computing package R version 4.2.2.

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Violência de gênero e étnico-racial contra mulheres imigrantes venezuelanas profissionais do sexo

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O Brasil tem recebido milhares de imigrantes da Venezuela, fugindo da crise social e econômica que assola o país. Boa parte dessas mulheres imigrantes encontra na prostituição uma fonte viável de renda, agravando a vulnerabilidade social em que se encontram e, portanto, suscetíveis a formas específicas de violência ligadas a questões de gênero e étnico-raciais. Objetivo: conhecer e analisar as violências sofridas por mulheres imigrantes venezuelanas profissionais do sexo (MIVPS), na perspectiva de gênero e raça-etnia. Metodologia: Estudo exploratório qualitativo, realizado por meio de entrevistas semiestruturadas com MIVPS, em Boa Vista, Roraima. Os dados foram submetidos a análise de conteúdo temática. Gênero e raça-etnia foram as categorias analíticas adotadas. Resultados: foram entrevistadas 15 MIVPS, a maioria com idade entre 22 e 29 anos, com média de três anos e meio na prostituição. Dificuldades de ingresso no mercado laboral formal e, portanto, de sobrevivência econômica, foram os motivos que mais as levaram a essa ocupação, mesmo não referindo satisfação com isso. Identificou-se relação entre exploração social e econômica com propostas de sexo desprotegido e envolvimento em situações de violência sexual, física, verbal, financeira e psicológica. A violência física é predominante e a que mais marca as entrevistadas, sendo a mais temida. Conclusão: A abordagem qualitativa e o uso das categorias gênero e raça-etnia mostraram-se adequadas e pertinentes para compreender as vulnerabilidades específicas desse grupo social, entre elas as violências que, por sua vez, têm raízes profundas na cultura, nas normas sociais e nas estruturas institucionais que perpetuam as desigualdades e a discriminação de gênero e raça-etnia, em especial as imigrantes profissionais do sexo.

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Self-reported mental health disorder, alcohol use pattern and anxiety symptoms: cross-sectional phone survey among primary health care users

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There is evidence of a high degree of morbidity between mental disorders and other noncommunicable conditions, including cardiovascular disease, diabetes, cancer, and alcohol use disorders. As a result Mental health problems are very common and represent a significant proportion of health-seeking persons in primary care scenarios (MUGHAL et al., 2021). Despite many mental disorders being treatable in primary care through training of health care providers; most cases go undetected and untreated even when most such illness begins by the age of 14 years (SOLMI et al., 2021). In addition to managing 80% of health problems, Primary health care (PHC) is an essential level of care for people, both for reducing stigma and prejudice, and for coordinating treatment in the health care network. However, in all countries, the treatment gap in mental health care is greater than 50%, reaching 90% in low- and middle-income countries such as Brazil (RANZANI et al., 2021). The COVID-19 pandemic showcased evidence of an increase in mental health symptoms and disorders., Hence, primary care became more important as it expanded the scope of care for vulnerable populations that are subject to illness due to pre-existing mental health conditions. Although primary care manages many mental health cases, such as mild depression and anxiety, it is still necessary to strengthen the care network for this population and remove barriers to accessing the system for those who suffer from mental health problems (GRUDNIEWICZ et al., 2022). This is a concern in Brazil, given the prevalence of common mental disorders (for example, depression, anxiety, and alcohol use disorder) evident before the COVID-19 pandemic, which indicates the urgent need for better organization of the care network in the execution of mental health promotion actions, mainly considering that this population often presents comorbidity with these disorders (SALGADO; LIMA FORTES, 2021). The prevalence of harmful alcohol use in the Brazilian population over 18 years of age is approximately 18.8%; overall, data show that 26.4% of the population consumes alcohol once or more times per week (BRASIL, 2020). These are worrying data when considering that the most frequent psychiatric hospitalizations and deaths are due to disorders caused by the use of psychoactive substances, with emphasis on alcohol. However, evidence

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shows that high levels of anxiety and alcohol consumption were experienced on several continents during the COVID-19 pandemic. Additionally, anxiety symptoms can be aggravated in people who use alcohol excessively, and the pattern of harmful alcohol consumption is also related to people with mental disorders such as generalized anxiety disorder and depression (DE VARGAS et al., 2022). A high proportion of individuals with mental health disorders seek health care in PHC services (MUGHAL et al., 2021) and a significant portion do not receive any care for these conditions. In such scenario, (SOLMI et al., 2021) alcohol sweating and anxiety symptoms are often associated with mental health disorders (DE VARGAS et al., 2022) and that the pandemic scenario may have enhanced this phenomenon (SALGADO; LIMA FORTES, 2021), this study aimed to verify the prevalence of self-reported mental health disorders and their association with alcohol consumption and anxiety symptoms among users of Primary Health Care in the city of São Paulo, Brazil.

Indicadores de envelhecimento sustentável e saúde planetária: fundamentos para a promoção e reabilitação de idosos na Era Antropocênica

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INTRODUÇÃO: Consideramos que o envelhecimento saudável sofre interferências do desenvolvimento sustentável e também contribui para seu alcance, percebemos que o envelhecimento sustentável de fato interfere direta e indiretamente na saúde planetária. Esforços devem ser direcionados para seu alcance no mais alto nível: o envelhecimento sustentável e a saúde planetária. **OBJETIVO:** Construir indicadores de envelhecimento sustentável e saúde planetária na perspectiva da saúde humana, que possam servir de fundamentação para ações interdisciplinares de promoção e reabilitação em saúde. **MÉTODOS:** Os procedimentos metodológicos deste estudo foram divididos em 2 fases: Fase 1) Mapeamento dos indicadores de envelhecimento sustentável e saúde planetária, desenvolvido em 3 etapas: na etapa 1 feita identificação e análise dos fatores associados ao envelhecimento sustentável e saúde planetária através de uma revisão de escopo seguindo os procedimentos propostos pelo JBI utilizando os seguintes descritores: Idoso; envelhecimento; sustentabilidade; saúde humana e saúde planetária, na etapa 2 houve seleção de fatores associados ao envelhecimento sustentável relacionados aos fatores associados à saúde planetária, e na etapa 3 haverá a organização de uma listagem de fatores associados ao envelhecimento sustentável e à saúde planetária que sejam inter-relacionados entre si. Na Fase 2 haverá validação de conteúdo dos indicadores construídos de envelhecimento sustentável e saúde planetária que serão submetidos à apreciação de um painel externo de especialistas. As evidências de validade de conteúdo dos indicadores apontadas pelos especialistas serão analisadas por meio do índice Razão de Validade de Conteúdo (CVR). Serão considerados adequados valores críticos de CVR para um painel de 15 especialistas ($CVR=0,60$; $p\text{-valor} = 0,018$). **ASPECTOS ÉTICOS:** O estudo foi submetido à apreciação do Comitê de Ética da Escola de Enfermagem da USP. Por se tratar de um estudo psicométrico, os procedimentos do estudo seguem a Resolução 510/2016.

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Evolution of SAMU 192 in Brazil: dimensions of coverage, resources, production and professionals

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Introduction: In 2019, the World Health Organization highlighted the importance of emergency response systems as an essential component of health coverage, encouraging countries to assess their policies and needs. Emergency systems encompass resources for assistance from the location of the injury (pre-hospital care - PHC) to the hospital environment, playing a critical role in the results of the entire health system. In Brazil, in 2003, a PHC system standard was established, called Mobile Emergency Care Service (SAMU 192). At 20 years of implementation of this model, there are no studies on its performance in terms of coverage and available resources, production of assistance and workforce. Considering the period from 2015 to 2019, the objectives of the study are: 1. To describe and analyze the evolution of SAMU 192 coverage in Brazil, according to structure and performance indicators; 2. Describe and analyze the production of regulation centers and mobile resources according to procedures carried out; 3) Describe and analyze the pre-hospital workforce, according to composition, operational capacity, allocation of procedures and turnover, and; 4. Present proposals for improvements in the SAMU 192 model, considering the strengths and challenges of the model and the needs of users. **Method:** Exploratory-descriptive, census study, based on secondary public data from the Ministry of Health, the Brazilian Institute of Geography and Statistics (IBGE), the SUS Outpatient Information System (SIA/SUS) and the National Registry System of Health Establishments (SCNES). **Main results:** In 2019, SAMU had 191 Emergency Regulation Centers and 3648 mobile Basic and Advanced Life Support resources, reaching 85% of the country's population. That year, more than 19 million requests for help came to the service and 5.1 million people were assisted by 40,000 professionals across the country. With an annual growth of 1.1% in population coverage, the number of professionals grew by 14.3%, the volume of requests rose by 26.5% and the attendances grew by 28.5%. In the country, the general turnover rate of professionals is 8.0% and the exit rate is 6.8%, with a turnover of 1:6.2 professionals and variation according to categories, sector, regions and states. Operational capacity projections showed that there is a deficit of professionals to operate the entire fleet of resources.

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Creation and validation of a teaching tool in postpartum hemorrhage care

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Research on teaching in the health area, especially simulation methods and instruments, is essential for education qualification. Its results are significant for ethical teaching and in a safe environment so that students and professionals develop or improve their knowledge, skills, and behaviors. In Brazil, hemorrhagic conditions in the pregnancy–puerperal period are the second cause of maternal death and the leading cause of hospitalized puerperal women in intensive care units. This study aimed to create and validate a tool to guide assistance in postpartum hemorrhage (PPH) based on the Pan American Health Organization guidelines and to evaluate its applicability in simulated stations on PPH. It is a methodological study of the creation and content validation of a didactic tool, with the adoption of the Contextualized Instructional Design method, developed in five phases: analysis, design, development, implementation, and evaluation. Thus, the tool “Instructional Disc on the Management of Postpartum Hemorrhage” was produced, with the causes of PPH and the treatment protocol adopted in Brazil. Nine judges, specialists in maternal health, validated the content (six nurse–midwives, one midwife and two obstetricians), all with extensive experience in the area. The tool’s applicability was assessed by 30 students of the Midwifery Program at the School of Arts, Sciences and Humanities of the University of São Paulo. Both groups of participants completed a data collection questionnaire with closed questions and a Likert–type evaluation scale. The analysis of the judges’ evaluation results was obtained by the content validity index, reaching a value equal to 1; therefore, it considered the content valid. Suggestions for improving the layout were accepted. The results of the evaluation by the students are partial and will be finalized by the end of June 2023. The tool is expected to adequately equip students and childbirth care professionals in properly managing PPH, contributing to the transfer of knowledge and products developed at the academy and fulfilling its purpose of strengthening health services to improve maternal health.

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Development of audiovisual and virtual reality tools for health education

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Background: Educational technologies such as audiovisual resources and virtual reality are innovative teaching and learning tools in health that can complement traditional teaching methods of practical skills. **Aim:** To develop educational tools using audiovisual resources and virtual reality in the teaching of undergraduate health on Aspiration of Respiratory Secretions and administration of Intra-Muscular Medications. **Method:** Methodological study of the development of digital educational tools. The development will be carried out in five stages: 1) Analysis and planning; 2) Modeling; 3) Implementation; 4) Evaluation and maintenance; 5) Distribution. The tool will be evaluated in terms of objectives, content, efficiency, and usability by professors who are specialists in the area and undergraduate nursing students and students of other courses in the health area at University of São Paulo (USP). Data will be analyzed using descriptive statistics and the Content Validity Index (CVR). Items with an average CVR ≥ 0.80 will be considered relevant/adequate. The project was approved by the Research Ethics Committee of the School of Nursing, University of São Paulo (SNUSP), opinion: 6.031.444. **Expected results:** The tools will be used as a complement to practical laboratory classes and in the practical fields, by undergraduates in the health area to train technical skills and as educational material for patients. They will also be used to train health professionals, for evaluation (practical test), remote teaching and to contribute to the preservation of the environment.

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Strategies for training athletes into efficient promotional agents: an analysis of the perception of sports managers in the State of São Paulo

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Companies look to sports for brand awareness, visibility, positioning and sales. The closest point of contact with the fan, athletes have more and more media power, influence on behavior and consumption (DEMÉTRIO; OLIVEIRA, 2013). In the Resource-Based View theory (BARNEY, 1991), athletes can be defined as intangible assets and strategic resources of sports entities, generating economic benefits from their performance and appreciation (GALVÃO; DORNELAS, 2017). However, for an efficient performance of their roles, an assertive work by sports managers is essential (CEGALINI; ROCCO JÚNIOR, 2019). This research analyzed the perception of sports managers in the State of São Paulo in relation to the strategies developed in the market for training athletes into efficient promotional agents. For this, it was verified: a) determinant aspects for their hiring in addition to sports performance; b) efficient behavior; c) communication and training and d) strategies developed for promotional exploration. With a qualitative method, and a quantitative approach along with a sample of 31 managers of the main sports entities of that state, we tried to present a better format for the optimization of athletes, providing gains for all players in the sports industry. Thus, entities gain, valuing their intangible assets and strategic resources. Sponsors win by exploring the process for institutional and/or brand return. Sports managers gain, increasing their importance in the processes. And, finally, the athletes win, increasing their competitiveness in the market, valuing their current and/or post-career.

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Validation of the Equidyn protocol for evaluation of dynamic balance in older adults through a smartphone application

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Background: Different tasks and measurements have been employed to estimate dynamic body balance in older adults. However, due to limitations of these evaluations, results could hardly be taken as valid predictors of dynamic balance. **Research question:** Is the Equidyn smartphone application-based protocol valid and sensitive for the assessment of dynamic balance in older adults? **Methods:** Dynamic balance was evaluated in 52 physically active individuals, age range 60–80 years. The protocol was composed of two unipedal tasks and sit-to-stand with a narrow support base. The unipedal tasks required one leg sway either in the mediolateral (ML) or anteroposterior (AP) direction while supported on the contralateral leg. The three tasks were performed under standardized movement amplitude and rhythm. A smartphone was attached to the trunk, and a custom-made application (Equidyn) was employed to provide guidance throughout evaluation, timed beeps to pace the movements, and to measure three-dimensional trunk acceleration. **Results:** Our data showed (a) that both ML and AP leg sway tasks were sensitive to age and to direction of leg sway movements; (b) referenced to quiet unipedal stance, moderate/strong correlations for the ML/AP leg sway tasks and moderate correlations for the sit-to-stand task; and (c) moderate/strong correlations between the ML and AP leg sway tasks, and moderate correlations between the sit-to-stand and the two unipedal dynamic tasks in the ML acceleration direction. **Significance:** The current results showed that the Equidyn protocol is a sensitive and valid tool to evaluate dynamic balance in healthy older individuals. The protocol tasks standardized in amplitude and rhythm favor their reproducibility and trunk acceleration data interpretation. As the whole assessment is made through a smartphone application, this dynamic balance evaluation could be made both in the laboratory and clinical settings.

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Experimental model of breast cancer using 4T1 cells induces increased expression of pro-fibrotic genes in cardiac tissue

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Introduction: Breast cancer (BC) is a type of cancer that predominantly affects women, with high incidence and mortality rates in recent decades. Several studies address the effects of anthracyclines by promoting modification of gene expression inducing cardiotoxicity, inflammation and cardiac fibrosis in individuals with BC, however, the impact of BC alone on the gene expression of cardiac tissue without the use of anthracyclines has been little explored. **Objective:** Thus, our work aimed to analyze the expression of genes in the cardiac tissue of animals with BC without the use of anthracyclines. **Methodology:** Twelve 12-week-old female mice were used, 4 animals without BC for the control group (CG) and 8 animals with BC, all from the BALB/C model. Tumor cell culture (4T1 cell line) was performed, inoculating 20 μ l of culture medium with 4T1 cells in suspension directly into the mammary duct of the animals for the BC group. After euthanasia, RNA was extracted from the cardiac tissue of the animals and later, gene expression was analyzed by RT-qPCR. **Results:** An increase in the expression of pro-fibrotic genes was observed in the heart of animals with BC, such as: TGF- β ($127.8 \pm 5.8\%$ of the control $p= 0.0475$) compared to the CG ($100 \pm 11.0\%$ of the control); COL1A1 increase in the BC group ($135.8 \pm 9.2\%$ of the control $p= 0.0403$) compared to the CG ($100 \pm 2.7\%$ of the control) and MAPK increase in the BC group ($141.1 \pm 10.6\%$ of control $p= 0.0280$) compared to CG ($100 \pm 2.5\%$ of control). Other genes were also analyzed, identifying a trend towards increased IL-1 expression in BC ($p= 0.057$), while others pro-inflammatory genes, we did not observe statistically significant differences, such as: IL-6 ($p= 0.3979$) and TNF- α ($p= 0.0897$). Likewise, no statistical difference was observed in the expression of the anti-inflammatory gene IL-10 ($p= 0.4038$) and of pro-apoptotic genes, such as: BAD ($p= 0.1911$), BAX ($p= 0.4977$) and Caspase-3 ($p= 0.1782$). In addition to these results, we also observed a reduction in cardiac mass in the BC group ($p= 0.0424$) compared to the CG and a reduction in the weight of the skeletal muscles in the BC group: gastrocnemius ($p= 0.0296$) and soleus ($p= 0.0028$) compared to the CG. **Conclusion:** BC promotes anthracycline-independent increase in the expression of pro-fibrotic genes in the heart, resulting in loss of cardiac muscle mass.

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Impacts of physical exercise on autonomic and immune dysfunction secondary to cancer therapy: a randomized controlled clinical trial with breast cancer survivors

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Background: Autonomic nerve dysfunction is a clinical condition commonly observed in cancer survivors and may result from conventional neoplastic therapy. It may affect the regulatory capacity of the autonomic nervous system (ANS), culminating in sympathetic hyperactivity and parasympathetic hypoactivity, which can negatively affect heart health, increasing cardiovascular burden and impairing physical function. The immune system communicates intimately with the sympathetic nervous system (SNS) and erroneous activation of the SNS can result in dysfunctional immune responses. Women breast cancer survivors (WBCS) may exhibit some degree of dysautonomia. Physical exercise stimulates important hemodynamic and immunological alterations and has been associated with improved cardiovascular health and immune response, including restoration of autonomic balance with reduced sympathetic input, and increased parasympathetic activation leading to a better autonomic balance in cancer survivors. **Objective:** address an intervention that combines supervised group exercise with active lifestyle recommendations, analyzing its functional, and immunological outcomes in WBCS. **Methods:** Women aged 35–75 years who have completed conventional treatment for breast cancer were recruited from the Cancer Institute of the State of Sao Paulo (ICESP) and underwent a 16-week, parallel-group, randomized, and controlled trial. They received a booklet with recommendations for achieving a physically active lifestyle by increasing overall daily movement and undertaking at least 150 min/week of structured exercise. They were randomized into two groups: the supervised group participated in two canoeing group exercise sessions every week; and the unsupervised group increased their overall physical activity level by any means, such as active commuting, daily activities, or home-based exercise. Post-exertion heart rate response (recovery from physical exercise) was used to investigate the occurrence of dysautonomia in WBCS. Serum samples were assayed for circulating inflammatory markers, including tumor necrosis factor (TNF- α) and interleukins (IL)-6, IL-8, and interferon gamma (INF- γ). **Discussion:** This study should contribute to advance knowledge on the impact of an exercise intervention on health-related outcomes including physical functioning, and immune response in WBCS.

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Effects of combined aerobic and resistance training on the response to chemotherapy in patients with metastatic colorectal cancer: autonomic nervous system responses

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The autonomic nervous system (ANS) is a system that innervates most organs and regulates several physiological processes, such as respiratory rate, blood pressure, body temperature and metabolism. ANS alterations have been related to tumor progression in several types of cancer, such as colorectal cancer, favoring the development of metastases. In fact, 80% of patients with metastatic cancer have autonomic dysfunction, which has been associated with decreased survival in this population. In this sense, strategies that help regulate the ANS in metastatic cancer can contribute to improving the prognosis and increasing survival of these patients. In this way, physical training, especially the combined one, proves to be an interesting adjuvant tool for the treatment of metastatic cancer and ANS alterations, since training promotes benefits before, during and after the treatment of several types of cancer, in addition to contributing to the positive modulation of the ANS. Thus, this proposal will consist of two cross-sectional studies and one longitudinal study with patients with metastatic colorectal cancer undergoing chemotherapy. Cross-sectional studies will aim to verify whether there is an association between the level of physical activity and autonomic function before (Transversal I) and during (Transversal II) chemotherapy treatment. In the longitudinal study, the effect of combined physical training on autonomic dysfunction, physical activity level, cardiac structure, blood flow and symptoms will be evaluated. Our study hypotheses are: 1) a higher level of physical activity will be associated with greater parasympathetic activity and better sympatho-vagal balance both before and during chemotherapy; 2) patients undergoing chemotherapy and combined physical training program will have greater heart rate variability, increased vagal tone and improvement in cardiovascular parameters when compared to individuals who did not train.

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Acute effect of doxorubicin and cyclophosphamide on the profile of Exosomal microRNAs and their predictive potential in cardiotoxicity

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Some therapies for breast cancer are performed by cardiotoxic agents, such as anthracyclines, which can lead to irreparable damage to cardiomyocytes and heart disease. Despite molecular mechanisms of cardiotoxicity due to the use of anthracyclines to be investigated, there is much to be elucidated, such as the mechanisms regulated by microRNAs (miRNAs). These short RNAs inhibit the translation by binding to target messenger RNAs (mRNA) regulating physiological cellular processes and pathological. miRNAs-208a, 208b, and 499 encoded in the myosin heavy chain genes (MCP) and also other enriched-cardiac muscle miRNAs such as miRNA-1 and -133 have been highlighted in research cardiovascular disease, as they are biomarkers in acute and chronic cardiac lesions, and also a potential therapy. Aerobic physical training decreases the expression of these miRNAs in the heart of rats and it improves the α -MCP/ β -MCP ratio and cardiac function. miRNA-208a deletion in mice inhibits the transcription of β -MCP, by increasing the expression of its targets (5). Objectives: Show results of the in vivo study and in patients proposed by the project, investigating in translational character the miRNAs involved in the acute cardiotoxicity induced by Doxorubicin (DOX) in mice with cancer and in adjuvant patients treated with DOX and Cyclophosphamide. To understand about molecular mechanisms involving miRNAs with therapeutic potential and new biomarkers of cardiac stress, plasma and exosomes from patients undergoing DOX therapy. Results: 1. In vitro. The results refer to miRNAs encoded from myosin genes and their targets showing evidence that miRNA-208a, -208b and -499 expression induced by DOX is involved with cardiotoxicity (increased ANF and loss of cell viability) and preventive inhibition by anti-miR-208a increases the expression of Sox6, Pur β , Med13, SP3 and CBX targets, improving the α / β -MCP (myosin heavy chain) ratio, attenuating cardiotoxicity and stress in neonatal cardiomyocytes. 2. In vivo: Due to the results obtained in the culture of cardiomyocytes, the executor chose to inhibit miRNA-208a before acute DOX treatment. The results show

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that the inhibition of miRNA-208a, performed by an expression plasmid of an antisense sequence complexed to nanoparticles, was able to improve the function, the α/β -MCP ratio, the expression pattern of fetal genes, increase mass and decrease cardiac fibrosis in animals treated with DOX, showing preventive and cardioprotective effect of miRNA-208a inhibition against induced acute cardiotoxicity by DOX, due to the derepression of its target genes: Pur/β, CBX and SP3.3. In Patients: Were performed collection in 16 patients in total, and contrary to what was expected miRNAs-1, -133a did not show change and miRNAs-499 and -133b decreased in human plasma. Thus, the isolation of vesicles extracellular cells are being standardized by the size exclusion chromatography method, by the researcher together with Imperial College London Researchers (Sprint FAPESP 2018/22579) and for a performed the size distribution results of 6 patients. Two patients presented decrease in the concentration of exosomes, three showed an increase and one remained stable, however with significant increase in vesicles from 800 to 1000 nm. Large-scale sequencing with transcriptome coverage was performed for two patients in the pre and post CA and currently the result of Bioinformatics are being processed. Conclusion: Despite the complexity of the project, which comprises 3 sub studies, and that the pandemic has greatly delayed the progress of the study in mice and patients, most of it is already finished. Although some results show divergence in the study in vivo compared to the in vitro study, they point to the preventive potential of miRNA-208a inhibition in cardiotoxicity caused by DOX.

Sexual assault and vulnerability to sexually transmitted infections among homeless women

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Background: homeless women have complex life conditions and are often exposed to violence, sexual exploitation, rape, prostitution, reproductive disorders, survival sex trading, unintended pregnancies and sexually transmitted infections. Thus, the aim was to explore the experiences of homeless women with regard to sexual and reproductive health. **Methods:** fifteen interviews were conducted with homeless women who were admitted to a women's shelter in a large city in Brazil. Data were collected through semi structured and audio-recorded interviews, subjected to inductive thematic analysis and analyzed in light of the social relations of gender. **Results:** two themes were constructed: "Being a woman on the streets: a look at gender inequalities" and "Pain and the raped body: the scars of homeless women's. The transgression of women's rights was observed with reports of sexual abuse interspersed with physical violence. Unprotected sexual practices were part of the daily lives of these women, with repercussions for their exposure to sexually transmitted infections. Dependence on psychoactive substances was mentioned by women, and transactional sex was used as a source of income to maintain such dependence, as well as to promote the women's livelihood. **Conclusion:** homeless women experience complex situations on the streets involving exposure to different types of violence, the use of transactional sex as a survival strategy and unprotected sexual practices. The direction of public policies and attention to the sexual and reproductive health of homeless women is essential, considering the vulnerability of this population.

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Barriers and facilitators to self-inflicted violence notification: construction and validation of an instrument based on the Theoretical Domains Framework

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Objective: Develop and validate an instrument to identify barriers and facilitators in reporting self-inflicted violence. **Method:** A methodological approach divided into three stages 1) Construct instrument based on Pasquali's reference and Theoretical Domains Framework; 2) Validate instrument online with 15 experts selected through snowball sampling; 3) Construct validation, involving semi-structured interviews with a randomly selected sample of 50 healthcare professionals enrolled in an online course on the topic and a pilot test with 150 professionals. Analyze data using Content Validity Index, Gwet's AC1 Test, factor analysis, and Cronbach's Alpha. **Results:** Instrument has 21 Likert scale questions across 14 TDF domains and three open-ended questions. Until June, 14 experts participated: mostly female (11), nurses (11), PhD holders (6), Caucasian (10), and from the Southeast region (11). Most questions exceeded minimum criterion ($CVI \geq 0.70$). Notable scores: knowledge (0.85), capability (0.85; 0.78), identity and professional role (0.85), beliefs about capabilities (0.85), optimism (0.85), beliefs about consequences (0.85), reinforcement (0.64; 0.64), intentions (1.00; 0.92), goals (0.71; 0.57), memory, attention, and decision processes (0.71), context and environmental resources (0.57), social influences (1.00; 0.78), emotions (0.64; 0.64), behavioral regulation (1.00; 1.00), barriers (0.64), facilitators (0.71), and suggestions (0.71). Questions that did not meet the predetermined level will be revised based on suggestions, and the questionnaire will undergo evaluation by the target population. **Conclusion:** Study yields validated instrument for identifying barriers and facilitators in reporting self-inflicted violence. Instrument employed in nationwide research project approved by Conselho Nacional de Desenvolvimento Científico e Tecnológico.

1. Escola de Enfermagem de Ribeirão Preto (USP).

Socioeconomic repercussions of families with technology-dependent children after ten years

Aline C. C. Okido¹

and Regina A. G. Lima

Overall objective: To analyze the socioeconomic repercussions of families with technology-dependent children after ten years. Method: A sequential explanatory mixed-methods study was conducted between May 2022 and April 2023, consisting of two subsequent stages. In the first stage, a quantitative approach was used, and the research questionnaire, originally employed ten years ago, was re-administered. The questionnaire comprised the following socioeconomic indicators: maternal education, occupation, housing conditions, social benefits, family income, and access to goods and consumption. The potential participants were the 102 mothers of technology-dependent children included in the doctoral thesis defended by the postdoctoral researcher in 2013. Subsequently, through intentional sampling, mothers were invited to respond to an open-ended question about their experiences regarding financial and work-related issues over the past ten years. The quantitative data analysis was conducted using descriptive and inferential statistics. The qualitative data analysis followed the steps recommended by the inductive thematic content analysis technique. The integration of results occurred during the data discussion phase. Ethical principles were respected. Results: 32 mothers participated in the quantitative stage, as 36 children had passed away, eight mothers declined to participate, and 26 could not be located at the time. Maternal education and average family income did not show significant changes between the evaluated periods, with primary education and a monthly income equivalent to two minimum wages prevailing. Ten years ago, 56% of the families were recipients of the Continuous Cash Benefit, whereas in 2022, this percentage increased to 80.9%. In 2012, 60% of the mothers were not engaged in any remunerated activities, whereas currently, informal remunerated activities prevail (53%). In the second stage, 11 mothers participated, and their testimonies allowed the construction of two thematic categories: a. The constant difficulty of entering the formal job market, and b. "Living in hardship": the financial challenges faced by single mothers. Conclusion: Although the indicators suggest the maintenance of the socioeconomic conditions, the qualitative testimonies revealed an experience marked by daily challenges to meet basic survival conditions, particularly among mothers without the support of a partner. It is recommended that pediatric nurses consider the socioeconomic needs of families when planning their actions.

1. Escola de Enfermagem de Ribeirão Preto (USP).

Predictors of anxiety, depression and stress in the Long Covid: systematic prevalence review

Daniel de M. Rocha¹

and Laelson R. M. Sousa¹; Elucir Gir¹; Renata K. Reis¹

Objective: To analyze the prevalence and predictors of anxiety, depression or perceived stress in adults and elderly people who experience the Long Covid syndrome. **Method:** Systematic review of prevalence with search and selection in MEDLINE databases via PubMed®, CINAHL-Ebsco, Web of Science™, SCOPUS, EMBASE, LILACS and BDNF. Additional research was performed in the gray literature using Google Scholar. The methodological quality was carried out by Joanna Briggs Institute Critical Appraisal Checklist for Studies. For synthesis and analysis, use descriptive data methods. **Results:** Ten observational studies were controlled to estimate outcomes of interest among adults and older adults. Anxiety and depression were the most expressive results, being recorded after mild, moderate and severe cases of Covid-19 infection. Prevalences were high in the international scenario, totaling an indicator of up to 47.8% for anxiety and 37.3% for depression. Perceived stress predominated in up to 23% of the people evaluated. The female gender, the presence of anxiety disorders or associated clinical comorbidities, as well as the severity of the infection in the acute phase and the type of hospitalization were the predictors of abandoned symptoms. **Conclusion:** Long Covid was a significant phenomenon and the prevalence of anxiety, depression and stress was high. Sociodemographic, clinical and care conditions were the predictors of satisfactory results. Knowing these repercussions can guide care planning and the structuring of effective public policies, processing and recording evidence.

1. Escola de Enfermagem de Ribeirão Preto (USP).

Systematic reviews on oncology nursing: evaluation of methodological quality

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Background: Systematic reviews represent an increasing number of studies published in the Health Sciences. Oncology nursing does not escape this reality. Although systematic reviews with or without meta-analysis are located at the top of the evidence pyramid as they provide the highest level of evidence for clinical practice, it has been noted that authors still have difficulties in adequately conducting their methodology. **Aim:** To carry out a bibliometric survey of systematic reviews published in oncology nursing and to evaluate the methodological quality of systematic reviews published in oncology nursing from 2012 to 2022. **Method:** A systematic review of reviews (umbrella review) carried out in eight databases: CINAHL, COCHRANE, EMBASE, LILACS, PubMed, SCOPUS, and Web of Science. Additional searches will be performed in the grey literature using Google Scholar, ProQuest and OpenGrey and a manual search in the included studies' reference lists. The selection process will include all systematic reviews published from 2012 to 2022. Two reviewers will independently evaluate titles, , and full texts to identify those that meet the eligibility criteria. In this step, the methodological quality of the reviews will be assessed using the AMSTAR-2 tool. **Expected results:** An overview of the methodological quality of systematic reviews in oncology nursing will be produced. The critical and methodological assessment instrument's proposition is expected to contribute to evaluating systematic reviews performed, thus collaborating with reviewers, editors, and authors, promoting necessary methodological incomes in the systematic reviews conducted, especially in Brazil.

1. Universidade de Brasília.

2. Escola de Enfermagem de Ribeirão Preto (USP).

WHO QualityRights Initiative: empowering healthcare professionals and reducing stigma in mental disorders

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People with mental disorders experience human rights violations, being excluded from community life and stigmatized and discriminated against in various aspects such as work, education, housing, and leisure. In this regard, the World Health Organization (WHO) presents the QualityRights Initiative, which offers the main benefit of providing means to facilitate the end of human rights violations that occur in health and social care settings, improving the quality of care for these individuals, as well as the training and skill development of healthcare professionals. Studies that applied the QualityRights modules in countries such as Iceland, Tunisia, and India have indicated positive changes in knowledge and attitudes after the completion of training in different mental health services. Therefore, the evidence from these studies suggests that the QualityRights initiative promotes knowledge of human rights for people with mental disorders and reduces stigma and discrimination towards this vulnerable group. In this sense, the objective of this study is to translate and culturally adapt the basic modules of the QualityRights Initiative for Brazil, which include: 1) Human rights; 2) Mental health, disability, and human rights; 3) Legal capacity and the right to make decisions; 4) Recovery and the right to mental health; 5) Prevention of coercion, violence, and abuse. To achieve these objectives, an adaptation of the methodological approach proposed by Beaton et al. (2000) and Pasquali (1998) was carried out, involving the following steps: 1) Translation of the material into Portuguese; 2) Evaluation by a panel of judges to verify semantic, idiomatic, cultural, and conceptual equivalences; and 3) Pretesting, with the application of the QualityRights modules to healthcare professionals through a training course in Basic Health Units. Based on the results of this study, it will be possible to provide an innovative educational resource on human rights to the Brazilian public, contributing to the capacity-building in combating stigma and discrimination, as well as promoting human rights. The relevance of this study to the nursing field is emphasized, as the translated and validated material aims to stimulate healthcare professionals' ability to understand and promote human rights, recovery, and independent living in the community, thereby improving the quality of care and services provided to inpatients, outpatients, and community-based patients, as well as empowering professionals and patients for health advocacy.

1. Escola de Enfermagem de Ribeirão Preto (USP).

O sistema e-SUS APS como ferramenta de gestão: um estudo avaliativo com proposta de intervenção

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O estudo teve como um dos objetivos elaborar e propor uma intervenção por meio de infográfico, como material de apoio às equipes para registro de cadastros de usuários no sistema de informação. Para tal, realizou-se oficinas com as equipes de saúde dos municípios de uma região de saúde. Utilizou-se o Arco de Charles Maguerez como estratégia de ensino-aprendizagem para o desenvolvimento da Problemática, em cinco etapas, que acontecem a partir da realidade social: a observação da realidade, os pontos-chave, a teorização, as hipóteses de solução e aplicação à realidade. No primeiro momento os participantes trouxeram observações do cotidiano do trabalho. Na segunda etapa, identificou-se os postos-chaves, a saber: Exclusão de cadastro domiciliar e individual; Duplicação de cadastro; Tempo gasto; Relato manual; Digitação; Acesso restrito apenas a enfermeira; Unificação do CNS; Cadastro da população rural; sem vínculo com domicílio; mudança de território, cadastro fora da área não saírem da microárea; Falta de opção de exclusão de cadastro; Exclusão de cadastro; Duplicidade de cadastro; Divergência de dados; Cartão SUS duplicado; Cadastro individual duplicado; Pessoas já cadastradas no cidadão com número de cartão SUS, não é possível mudar para o CPF; Facilidade em encontrar dados do paciente; Encontrar registros anteriores de atendimentos; Cadastro fora de área não saírem da microárea; Sistema sair do ar com frequência; Identificar duplicidade de cadastro no e-SUS e CNS do profissional duplicado. Na terceira etapa, a teorização, os participantes foram motivados a discutirem sobre os pontos-chaves encontrados e a relação com a organização do serviço na APS mediante o arcabouço teórico do tema. Houve reflexão a respeito das implicações das inconsistências nos registros. A quarta etapa, as hipóteses de solução, consistiu na elaboração de alternativas viáveis para solucionar os problemas identificados a partir do confronto entre teoria e realidade e estimulou a discussão para estabelecer critérios constituintes das ações para prevenção de inconsistências de registro e no processo de trabalho, onde emergiu elaboração de infográfico. Na quinta etapa, aplicação à realidade, ficou estabelecida a utilização deste material pelos municípios e os participantes como multiplicadores nas atividades de educativas sobre a temática de cadastro e gestão do cadastro, a fim de atender às diretrizes do Programa Previne Brasil.

1. Escola de Enfermagem de Ribeirão Preto (USP).

2. Universidade Federal do Paraná.

3. Ministério da Saúde.

Effect of educational intervention on adherence, quality of life and coping of people living with HIV (PLHIV)

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Introduction: Currently, treatment for people living with HIV is highly effective, therefore, the longevity of these people is a frequent situation. **Objective:** To evaluate the effect of an educational intervention on the quality of life, adherence to treatment and coping strategies of the PLHIV under study. Identify the sociodemographic characteristics and assess the quality of life of PLHIV before and after the educational intervention with the application of the instrument “WHOQOL-HIV BREF – Assessment of life”; Identify the degree of adherence to the treatment of PLHIV before and after the educational intervention using a “Questionnaire for adherence to antiretroviral treatment (CEAT-VIH)”; Understand the coping strategies adopted by the PLHIV under study through the “Problem Coping Mode Scale (EMEP)”; Carry out an educational activity with guidelines for improving quality of life, adherence to treatment and strategies for coping with the disease. **Methodology:** A quasi-experimental, before-after study will be carried out with the same group. Two meetings will be held with an interval of two months. Initially, the TCLE will be applied and then three instruments will be applied to better elucidate their quality of life, adherence to treatment and the coping strategies they use. They are: Life assessment (WHOQOL-HIV BREF); Adherence to antiretroviral treatment questionnaire (CEAT-VIH); Problem Coping Mode Scale (EMEP). In the second meeting, the carrying out of the educational activity, which will be reinforced through WhatsApp, making a total of five messages, one per week. Replication of instruments to compare the effectiveness of educational activity on quality of life, adherence to treatment and application of coping strategies for the subject under study. The sample will consist of 75 PLHIV. Finally, the effectiveness of the educational intervention will be reassessed. **Data analysis:** In the statistical analysis, the average statistical measures and standard deviations of the quantitative variables will be calculated. To compare the means before and after, Student’s t test for paired data will be applied. All instruments that will be applied are validated and already have specific guidance for interpreting the results. At the moment, the data obtained in the survey are being analyzed.

1. Universidade do Estado de Minas Gerais.

2. Escola de Enfermagem de Ribeirão Preto (USP).

Fadiga entre enfermeiros brasileiros - Uma análise “pós-pandemia”

Laelson R. M. Sousa¹

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Introdução: A pandemia da COVID-19 provocou consequências negativas para enfermeiros que atuam na assistência às vítimas da infecção causada pelo SarsCov 2. Desde o início da pandemia, foram expostos a uma carga de trabalho exaustiva, dedicando corpo e mente tanto para salvar as vidas em risco, quanto para prestar apoio emocional aos familiares das vítimas. **Objetivo:** o objetivo deste estudo foi analisar os riscos de fadiga decorrentes da Pandemia COVID-19 entre enfermeiros brasileiros nos anos de 2022 e 2023. **Método:** Estudo transversal, realizado em todos os estados do Brasil. A coleta de dados ocorreu por meio de um inquérito online com coordenadores da pesquisa nas cinco regiões do país. Foram realizadas estatísticas descritivas. **Resultados:** Participaram do estudo 4.040 enfermeiros, 1.076 (26,6%) do estado de São Paulo, 587 (14,5%) do estado da Paraíba, 3.328 (82,4%) do sexo feminino e 1.924 (47,6%) brancas. Quanto à fadiga, 1.630 (40,3%) referiram frequentemente sentir necessidade de descansar mais e 1.247 (30,9%) referiram frequentemente tem sido mais difícil se concentrar em uma coisa por muito tempo. **Conclusão:** Conclui-se que enfermeiros inseridos em ambientes de assistência à saúde, especialmente em contextos de pandemia, vivenciam experiências de fadiga no trabalho, o que interfere na concentração e desempenho.

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1. Escola de Enfermagem de Ribeirão Preto (USP).

The health status of elderly people living on the streets and/or in slums in Brazil: evidence from the COVID-19 social thermometer project

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Introduction: From the beginning of the pandemic outbreak and throughout its evolution, the most affected population (with the highest mortality rate and high risk of the disease) by SARS-CoV-2 were people over 60 years old and people who had some fragile health conditions (cardiovascular disease, chronic respiratory disease, diabetes, or cancer) and extreme vulnerability. The elderly have an impaired clinical picture due to the natural aging process, together in combination with the effects of comorbidities may lead to weaker protection against SARS-CoV-2 infection in this population. Also, the great challenge of confronting COVID-19, the disease itself, and its impacts is observed, especially in vulnerable subpopulations, such as homeless people, patients with one or more chronic diseases, the elderly population, indigenous people, and people in deprivation of liberty. Thus, in view of the extreme social and health vulnerability of the elderly population in this scenario of the pandemic of COVID-19, it is necessary to investigate the intersectionality in this population. **Objective:** To analyze the impact of COVID-19 on the health and social situation of elderly people in contexts of social vulnerability in Brazil. **Materials and Methods:** Cross-sectional, descriptive-analytical study, data coming from field interviews, conducted from May 2022 to March 2023. The interviews are from a matrix project entitled “Social Thermometer – COVID-19 in Brazil”, which has as its unit of analysis the capital cities of the 26 federative units (UF) and the Brazilian Federal District. For the present study, we will only consider the population aged 50 years or older living on the streets or in slums/communities. The data will be analyzed using descriptive statistics and bivariate logistic regression, considering as dependent variables: having a non-communicable chronic disease (NCD), having more than one NCD and not having NCD. **Perspectives and expectations:** Expected that there will be a considerable impact on the health status of elderly people in street and/or slum areas and communities with one or more of an NCD on influence of medication use, mental health and accessibility to health services, in the period of the COVID-19 pandemic.

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1. Escola de Enfermagem de Ribeirão Preto (USP).

Influência do transtorno depressivo na autoeficácia materna para amamentação

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A prática do aleitamento é a ação isolada mais eficaz que promove impacto na saúde integral da mãe e da criança, além de nutrir, reforça vínculo, promove afeto e proteção, impactando nos indicadores de saúde de toda sociedade. A literatura ressalta o envolvimento dos fatores psicossociais no processo de aleitamento como a autoeficácia e os transtornos mentais como fortes determinantes desta prática. Assim, os objetivos deste estudo foram: verificar a associação entre os indicativos de transtorno depressivo entre puérperas com a autoeficácia para amamentação. Tratou-se de um estudo analítico, longitudinal e prospectivo, com usuárias do Sistema Único de Saúde em Ribeirão Preto/SP. Participaram 186 puérperas. A coleta de dados foi realizada utilizando-se três instrumentos: um questionário de caracterização, a Edinburgh Postnatal Depression Scale (EPDS) e a Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF). Os dados foram processados e analisados utilizando-se do Statistical Package for Social Sciences, SPSS, versão 17.0. Foram considerados significativos os valores de p menores que 0,05. A autoeficácia elevada apresentou associação com a ausência de transtorno depressivo aos 60 dias. Conclui-se que é necessária uma maior atenção à saúde mental das puérperas, considerando que mulheres que não apresentavam indicativos de depressão tiveram maiores níveis de autoeficácia para amamentação, situação que pode implicar em maior tempo de aleitamento materno exclusivo. Esforços devem ser realizados para diminuir as chances de desmame precoce e melhorar a saúde mental das mulheres no período pós-parto, contribuindo assim com a melhores indicadores de condições de vida da mulher e seu bebê no processo de aleitamento materno, auxiliando na consolidação dos benefícios desta prática.

1. Escola de Enfermagem de Ribeirão Preto (USP).

Development of an educational program on empathy for undergraduate nursing students: a quasi-experimental study

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Objective: To test an educational program, developed and implemented through simulated virtual activity, to contribute to the empathic development of nursing students. **Methodology:** This is a cross-sectional, prospective, exploratory and descriptive study with a quantitative approach with a quasi-experimental design using an intervention group. Undergraduate Nursing Students at a Public and Private University will be invited to participate in the educational program that will be carried out in person. **Data analysis:** Data will be encoded and double-entered into Excel spreadsheets, which will be exported and analyzed using SPSS (Statistical Package for Social Science), version 11.5 (Windows).

1. Pontifícia Universidade Católica de Minas Gerais.
2. Escola de Enfermagem de Ribeirão Preto (USP).

Academic and health profile of Brazilian postgraduate students in the context of the Covid-19 pandemic

Nayara P. F. M. Molina¹

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Objective: This study aimed to describe the sociodemographic, economic, academic, and health characteristics of Brazilian master's and doctoral students during the Covid-19 Pandemic. **Method:** A cross-sectional and descriptive research was conducted in Brazil among 5344 graduate students using an electronic form on the REDCap platform. Data on sociodemographics, economics, academics, and health were collected and analyzed descriptively with SPSS version 24. The project received ethical approval (opinion number 5,384,965). **Results:** Female participants comprised the majority (67.2%), most were single (52.0%), aged 18–39 years (80.7%), with an income of one to three minimum wages (45.7%). They identified as heterosexual (77.1%), white (63.2%), had no children (75.2%), lived with two people (37.9%), had no religious affiliation (41.0%), and resided in the Southeast region (55.1%). Regarding academia, most were pursuing a master's degree (55.9%), primarily in health sciences (17.2%), with scholarships (48.6%), and dedicating up to 40 hours per week to their studies (81.0%). During the pandemic, 73.9% had online classes, with 49.8% considering them equivalent to in-person classes. Notably, 30.1% postponed their qualification and/or defense, and 26.9% perceived educational setbacks due to the pandemic. Regarding health, 16.8% reported being at risk for Covid-19, 71.7% visited healthcare services three times or more, 56.3% required medical follow-up (36.4% for mental health) and 51.5% sought psychological support. Additionally, 39.1% had no health insurance, 93.6% experienced psychological distress in the past year, 33.0% had a mental disorder diagnosis (17.8% depression, 21.3% anxiety), 37.0% required activity withdrawal, 21.9% initiated psychotropic drug use (11.2% anxiolytics, 22.3% antidepressants), with 8.4% self-initiating and 8.2% starting smoking. **Conclusion:** These findings underscore the importance of addressing the mental health of graduate students during the pandemic and their overall well-being in the academic context.

1. Escola de Enfermagem de Ribeirão Preto (USP).

Religiosity/spirituality and coping with the pandemic: a comparative study between Brazilian and Portuguese nurses

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The literature has studied how, in times of crisis as the pandemic, religiosity/spirituality (R/S) can be a coping resource for nursing professionals. However, the appreciation of this resource can be different depending on the culture. This is a comparative study, with data collected in Brazil and Portugal. We used the Spiritual Well-Being Scale (SWBS) and socioeconomic issues, characteristics of the profession, and working conditions of nurses before and during the COVID-19 pandemic. The participants were 141 nurses, 73 Brazilians and 68 Portuguese, most of them women, married, working on the front lines of COVID-19, and with an average age of 42.76 years. There was a change in job satisfaction with the pandemic, especially in Brazil, which went from 52.1% to 35.6%. Both samples declare a high presence of religious/spiritual beliefs (Brazil, 94.5%; Portugal, 86.8%). For Brazilian nurses, religious/spiritual belief helped a lot (43.8%) or completely (47.9%) cope with the pandemic. In comparison, 32.4% of Portuguese believe that religious/spiritual belief helped a lot, and 11.8% believe it helped utterly. Brazilians have frequent religious/spiritual practice (42.5%) and higher than the Portuguese (27.9%). Data indicate that Brazilian nurses use R/S more than Portuguese nurses in crises such as the pandemic. Despite differences in coping with the pandemic, the data reinforce a trend found in the literature that Brazilian nurses are more open to employing the R/S in their personal and work practices compared with Portuguese. Cultural specificities are present in professional knowledge and the articulation of health care.

1. Universidade de São Paulo.

2. Universidade do Porto.

Ultra-personalized breast prostheses by 3D scanning and 3D printing

Mario A. Gazziro

There is a significant scientific production showing the psychological, social and self-esteem impact of women, from the diagnosis of breast cancer to the complete removal of the breast, which makes it essential to seek beyond medical needs, aesthetic and social needs for rehabilitation of postoperative mastectomy patients. This initiative is justified by the needs of patients and the absence of companies that offer breast prostheses which are personalized for each patient individually (ultra personalized) using 3D technology, given the research and development challenges for their production.

Intervening factors in patient engagement in improving the quality and safety of healthcare services

Ana M. Saut

Currently, patients are regarded as “experts by experience” and their involvement can catalyze quality improvement through “influential stories”, “different perspectives”, or “experiential knowledge”. However, it is also observed that, in most healthcare institutions, their involvement can be classified as at the ‘consultation’ level, which is characterized by a unidirectional flow of information. Engagement using mechanisms that allow the dialogue between stakeholders, such as councils or committees, can increase patients’ contribution to quality improvement. In this context, the objective of the project is to deepen the discussion on the intervening factors in the engagement of patients for the improvement of the quality and safety of healthcare services. The project aims to contribute to the knowledge of the intervening factors, internal and external to the institutions, in the structural, financial and personal and cultural dimensions, considering the different levels of patient engagement. The analysis will be performed considering the perspectives of patients, healthcare professionals and managers. Furthermore, it will be considered two levels of care: primary care and hospitals.

André C. M. Cavaleiro¹

and Diolino J. dos S. Filho¹; Marcos de S. G. Tsuzuki¹; Aron J. P. de Andrade²; José R. Cardoso¹

Just like any electromechanical equipment, a VAD (Ventricular Assist Device) can experience failures. These failures may originate from hardware issues or be caused by inappropriate interaction of the device with the cardiovascular system. Some of these failures could be prevented if the VAD has intelligent control, capable of learning and making decisions in order to anticipate actions, before a real medical intervention is necessary. Therefore, this work proposes a safe, patient-oriented control architecture, using Artificial Intelligence (AI) techniques in conjunction with Discrete Event Systems (DES) modeling techniques, which provide autonomy and intelligence to the VAD control, enabling safe actions in the system for prevention and mitigation of failures. Furthermore, due to the embedded computational system, it is possible to create a maintenance system that can manage routines and a global database (Big Data), in order to provide diagnostic information to the physician about the system conditions and the VAD control decisions. By applying machine learning techniques, it is possible to refine the VAD control, preventing recurrence of failures and enhancing system performance. Thus, the applied control techniques are in line with the trends of a device adapted to the new reality of the concepts of Industry 4.0, which extends to Health 4.0 within a Hospital 4.0, providing VADs with the connectivity and adaptability of network-connected devices (IoT) to meet the needs of patients who use this type of device, offering a fault-tolerant control system, that provides interoperability and connectivity with other devices, while being autonomous and secure at the same time.

1. Escola Politécnica da USP.

2. Instituto Dante Pazzanese de Cardiologia.

Activated carbon material obtained from black liquor processing with silver nanoparticles for bone regeneration

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Carbon structures have interesting characteristics for biomedical applications considering the biocompatibility and porous structure that can improve tissue regeneration. The recovery of surgeries, specially the orthopedic procedures, requires complete and satisfactory regeneration for replacement of injured bone, however, postoperative infection cases compromise this process. The aim of this study was to develop a porous carbon material impregnated with silver nanoparticles capable of to improve cell regeneration and to reduce the infections problem. A waste of cellulose paper industry was used as precursor of carbon material and synthesized by chemical polymerization. The silver nanoparticles were produced by chemical reduction in different concentration and posteriorly added by adsorption process on material surface. Structural aspects were evaluated by SEM-EDX and RAMAN. The antibacterial efficiency was analyzed by microbiological tests using gram-negative bacteria (*Escherichia Coli*). The results showed average pore diameter appropriate to bone cell growth and reductions on bacterial proliferation about 18 and 24%.

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Mapping and simulation of multidomain congruence in Pre-Design Evaluations: a case of adaptation of healthcare environments at HU-USP, São Paulo/SP to epidemic control conditions

Lucas Melchiori Pereira¹

and Sheila Walbe Ornstein

The need to make physical and procedural changes in complex services is neither a new nor a unique problem, however, the discussion of new sanitary parameters for human care after the urgency of combating the pandemic, and even in its interim, highlighted the importance of research to subsidize decision-making in the allocation of activities in the Built Environment (BE). When changes in health service activities occur, it is necessary to make the physical-spatial domain of the health environment congruent with the organizational-procedural domain of such changes to offer good operating conditions. The formulation of such a congruent arrangement depends on evaluation resources that support an Evidence-Based Design (EBD). The objective of the research is to develop a Pre-Design Evaluation (PDE) method/software, called Multidomain Congruence Mapping and Simulation (MS-C-MD), which offers subsidies to an EBD for the formulation of such a more congruent arrangement. As part of the work, a paper was published that discusses the relationships between PBE, APP, and Post-Occupancy Evaluation (POE), and another article presents a demonstration of the MS-C-MD functionality and the program versions, in open format. These are the already completed results of a Systematic Literature Review and a Pilot Study (PS) carried out at the Emergency Room (ER) of the University Hospital of the University of São Paulo (HUUSP). In addition, a workshop was held to discuss forms of data visualization and data analysis collected in the 1st PS and processed in the MS-C-MD; the results of these two activities are about to be published. A 2nd PS is in progress, in which the conditions of use will be tested and improved. The activities involving humans were approved on March 26, 2021, by the Research Ethics Committee of HU/USP (Record 05.508-000), identified by the Certificate of Presentation of Ethical Appreciation number CAAE: 44679021.0.0000.0076. Once the research is completed, it is expected that relevant theoretical and practical results will be achieved to improve the design, management, and evaluation of complex BE such as healthcare buildings. It is also expected to contribute directly to the particular case, in addition to providing a free and open method/software for academic and professional use in architecture, building management, and other areas of interest in BE.

1. Faculdade de Arquitetura e Urbanismo da USP.

Canastra artisanal cheeses and endogenous starter cultures are sources of proteolytic lactic acid bacteria capable of reducing cow milk caseins' allergy

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Cow milk is one of the most important members of the so-called “Big 9”, a list of the nine foods with the highest incidence of allergic reactions, affecting mainly children under 4 years of age. Studies have shown that proteolytic lactic acid bacteria (LAB) may be a promising alternative for reducing the antigenicity of allergenic proteins present in milk. The aim of this work was to evaluate if proteolytic LAB strains obtained from Canastra artisanal cheeses (CAC) and endogenous starter cultures (ESC) are capable to hydrolyse immunoreactive proteins in milk, resulting in a reduction of the immunoreactivity of these proteins. 130 LAB isolates from CAC and ESC were screened for the ability to hydrolyse the main milk proteins, using SDS-PAGE. Positive isolates were identified to species level by RAPD-PCR and sequencing of the 16S rRNA gene. Their safety for potential food application was evaluated by investigation of potential virulence genes by PCR. The extension of protein hydrolysis and the profile of peptides generated by fermentation of skimmed milk, caseins and denatured whey protein concentrate (WPC) with the safe proteolytic strains were analysed by RP-HPLC/MS/Q-ToF. Reduction of immunoreactivity of milk proteins after hydrolysis was evaluated by ELISA using two commercial kits (RIDASCREEN®FASTcasein and RIDASCREEN®β-Lactoglobulin. Seventeen strains were able to hydrolyse the milk proteins. These LAB were grouped in 17 different clusters and based on the absence of virulence genes, four isolates [*Leuconostoc* (Leu.) *mesenteroides* QSC 468, *Lactiplantibacillus plantarum* QSC 472 and QSC 507, and *Leu. fallax* QSC567] were selected for evaluation of the extension of proteolytic activity and reduction of immunoreactivity of milk protein fractions. The peptides derived from the hydrolysis of milk proteins and the casein fractions presented masses between 4 kDa and 5 kDa, while low hydrolytic activity against whey proteins was observed. When compared to the controls (caseins or WPC solution), a significant reduction ($p < 0.05$) in the immunoreactivity of caseins was achieved ($> 80\%$), while no effect on the immunoreactivity of whey proteins was observed. Canastra artisanal cheeses (CAC) and endogenous starter cultures (ESC) can be used as sources of safe proteolytic LAB strains capable to hydrolyse allergenic proteins in cow milk, reducing their immunoreactivity. These strains present a potential application for production of hypoallergenic dairy products.

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Biological effects of pectin polysaccharides from ripe and unripe papaya using 3D colon cancer spheroids and intestinal organoids

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Introduction: Pectins are a class of highly fermentable dietary polysaccharides found in vegetables and fruits. Several pieces of evidence suggest that pectins may have anti-cancer and anti-inflammatory properties, including the capacity to induce apoptosis, reduce cell viability, regulate cytokine production, and interact with TLRs. However, little is known about the underlying mechanisms by which pectins exert these functions and how the pectin structures influence them. **Objective:** This study was conducted to evaluate the biological effects of pectins in colon cancer 3D spheroids and normal intestinal organoids. **Methods:** Colon cancer spheroids were formed using HT29, HCT116, and NIH3T3 by nanomagnetism. Spheroids were grown for 24h and then exposed to treatment with ripe and unripe papaya pectins at 0.1mg/ml for 24h, 48h, and 72h. Cell viability was measured by Alamar Blue and cytotoxicity was by staining with Live/dead solution. After staining, imaging was performed using a fluorescent microscope. The organoid model was generated using Small intestinal stem cells from neonates in a transwell system composed of polarized intestinal epithelial cells. After full differentiation, the inflammation was induced by the addition of E.coli HS and the pectin polysaccharides from ripe and unripe papaya at 0.3mg/ml. After 5h, cytotoxicity was measured by LDH, IL-6, and IL-8 cytokine concentrations were measured by ELISA in the top supernatant. **Results:** Ripe and unripe papaya pectin treatment for 24h reduced cancer spheroid viability for HCT116 spheroids only, and ripe pectin treatment for 24h reduced 3D co-culture spheroid viability for both HT29 and HCT116 models compared to the control ($P < 0.05$). After 48h, unripe pectins reduced viability for HT29 and ripe for HCT116. Ripe and unripe papaya pectin treatment at 0.1% for 72h reduced the viability of unicellular HCT116 spheroids ($P < 0.05$). In the co-culture models, HCT116 spheroids had the highest reduction in cell viability. HT29 co-culture spheroids reduced viability only after treatment with ripe papaya pectin ($P < 0.05$). Treatment with unripe pectins for 48h had the strongest effect on cell toxicity for HCT116/NIH3T3 cancer spheroids. Treatment with only ripe and unripe pectins was not toxic to the intestinal organoids even in the presence of bacteria. Pectin treatment kept the organoids viable and healthy even during exposure to E.coli

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HS ($P < 0.005$). Both treatments with ripe and unripe papayas pectins alone decreased the production of IL-6 ($P < 0.005$). Adding pectins with the bacteria still reduced the production of IL-6, showing that both pectins modulated the inflammatory response by decreasing the production of the pro-inflammatory cytokine IL-6 ($P < 0.005$). However, no effect was observed for IL-8. Conclusions: These results suggest that treatment with native pectin reduces cell viability and induces cell toxicity in colon cancer spheroids and also has potential anti-inflammatory effects, mainly by reducing IL-6, but not IL-8. This could be beneficial in future applications for the treatment of different inflammatory conditions that can lead to cancer and other inflammatory diseases.

ArchipelaGO: unveiling the biological process landscape of human cancer through spatial transcriptomics analysis

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Ten years ago, Bindea et al., (2013) proposed a spatiotemporal dynamics model of the immune landscape of human cancer using genomics data. Thanks to the emerging technologies of spatial transcriptomics (ST), we can now picture such landscape at single-cell and gene expression levels. In this study, we introduce ArchipelaGO, an R package designed for the analysis of ST data. By inputting the gene expression matrix, cell spot location, and user-defined geneset of interest, ArchipelaGO identifies overrepresented regions (islands) within the sample. Users can then explore the co-occurrence of biological processes in array-based models by combining different gene sets. Moreover, ArchipelaGO provides insights into the prevalence of cell types associated with specific biological processes. We tested 617 non-redundant genesets of biological processes from gene ontology in lung cancer samples to validate the algorithm. Out of these, 217 genesets (~35%) were found to be represented in the sample, with 12 sets associated with a panel of 960 onco-immunology genes. Additionally, we investigated the cell types involved in regulating cell adhesion (GO:0030155). Our analysis revealed regions of the sample enriched with B cells (~30%), T CD4+ cells (~20%), and fibroblasts (~7.6%), highlighting the immune system's role in this process. ArchipelaGO provides a statistical framework for visualizing 3D landscapes of spatial transcriptomics data and analyzing represented islands, offering valuable insights into novel cellular mechanisms of biological processes.

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MicroRNAs-mRNA molecular networks potentially involved in SARS-CoV-2 infection of cardiomyocytes

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Beyond the respiratory syndrome, patients with COVID-19 may experience cardiac complications, including viral myocarditis and arrhythmias, due to mechanisms poorly characterized. Here we histologically analyzed the heart tissue of patients who died from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, presenting myocarditis, inflammatory infiltrate of lymphoid and myeloid cells. Hence, we conducted an integrative analysis of publicly available RNAseq datasets of SARS-CoV-2-infected cardiomyocytes (CM). We analyzed 42 transcriptomes of cardiomyocytes (including primary human cardiomyocytes, iPSC-CMs, or hESC-CMs) infected with SARS-CoV-2 compared to 36 uninfected control samples. We characterized the interactome of messenger RNA (mRNA) and microRNAs, a class of small noncoding RNAs that post-transcriptionally regulate gene expression that have therapeutic potential in several pathologies. While up-regulated differentially expressed genes (DEGs) enriched immune response (e.g., T cell activation, cytokine production, and regulation of hematopoiesis), we found a down-regulation in genes involved with metabolic dysregulation and muscle contraction pathways. We identified a network of 331 potential microRNAs associated with 601 common DEGs among the data sets. Besides microRNAs related to genes encoding proteins of the extracellular matrix and coagulation, we found microRNAs linked to immune response genes, such as the miR-155-5p, a well-known modulator of the inflammatory response and interferon type I signaling pathway. To better understand the alteration caused by genes associated with extracellular

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matrix remodeling, we performed a fractal dimension analysis to measure the organization of matrix regions and nuclear disorganization in cardiac tissues of patients with COVID-19. Moreover, we identified microRNA modulators of genes involved in cardiac muscle contraction, such as miR-29a-3p, miR-29b-3p, and miR-146b-3p. Concomitantly, our results suggest miRs involved with inflammation of cardiac tissue, and miRs associated with matrix remodeling caused after tissue injury, which compromises cardiac function in patients with COVID-19. Hence, our study suggests new potential microRNA-mRNA molecular networks and pathways involved in inflammatory state of SARS-CoV-2 infection of cardiomyocytes.

Atopic dermatitis 3D in vitro model in reconstructed human epidermis and the exposure to particulate matter from environmental pollutants

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Introduction: The skin is the largest organ of the human body and its main function is to act as a barrier against external agents. Atopic dermatitis (AD) is one of the most prevalent inflammatory skin diseases and is considered an expensive and difficult disease to control. It is estimated that at least 230 million people worldwide are affected by this condition. AD is a chronic disease that involves genetic and environmental factors with impairment of the epidermal barrier, changes in the immune system and skin inflammation. A factor still little explored about this disease is its interaction with environmental pollutants such as particulate matter (PM). Recent data from our group showed that exposure of healthy epidermis to PM can alter the expression of different proteins involved in the AD process, suggesting the potential participation of PM in the development of the disease. **Aims:** The project aims to investigate the molecular and morphological changes caused by PM exposure to the skin and its AD model modulation in reconstructed human epidermis (RHEDA). **Methods:** For that, the histological technique was performed and the markers of FLG (filaggrin), LOR (loricrin), IVL (involucrin), CK 10 and 14 (cytokeratin 10 and 14) will be evaluated by immunohistochemistry. The quantification of proteins LOR, IVL, CA2 (carbonic anhydrase II), CK10, CK14, AQP3 (aquaporin 3), CLND (claudin 1), NOTCH1 and AhR will be performed by western blotting and gene expression by Rt-PCR. The evaluation of the integrity of the epidermal barrier will be performed using the TEER technique. We will also assess inflammatory cytokines (IL1 α , IL6, IL8) and oxidative stress. Finally, the genotoxic potential will be evaluated using the “Tunel assay”. **Results:** The results contribute with information regarding the characterization and involvement of particulate matter with the skin in vitro for the onset or aggravation of AD. Histology data revealed changes in the thickness of the epidermis layers and evident intercellular spacing, suggestive of spongiosis characteristic of patients with AD. Furthermore, the association of AD and MP apparently intensifies these alterations. The model characterization with the markers is already in progress, by the date of the event I will have the results. **Conclusion:** The acquired information adds knowledge for the development of biomimetic skin models for toxicological studies of new formulations safety and efficacy data that may have a protective effect against environmental pollution and mainly in the pathophysiological understanding of atopic dermatitis. So far, our model has proven to be valid for studying pathophysiological aspects of both AD and PM exposure.

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Development of new constructs for the expression of *Plasmodium falciparum* receptors SR1 and SR10 in HEK293T cells

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Malaria parasite *Plasmodium falciparum* presents a synchronous intraerythrocytic cycle and develops in coordination with the host rhythms indicating that the parasite is able to sense the environment in which it is inserted. The host hormone melatonin was shown to be involved in the synchronization of the parasite development cycle¹. However, the mechanism responsible for this synchronous development is still poorly understood. Four serpentine receptors were previously identified in the parasite genome (PfSR1, PfSR10, PfSR12 and PfSR25)². PfSR10 was the only predicted seven-transmembrane receptor to show rhythmic expression and to be related to the coordination of parasite development cycle³. In this study we aimed to express and characterize the PfSR1 and PfSR10 receptors in HEK293T cells. We constructed plasmids to express the *Plasmodium* receptors PfSR1 and PfSR10 fused to the HiBiT and SNAP peptides in their N-terminus. The HiBiT and SNAP tags are important tools that enable the study of receptors without the need for antibodies. The HiBiT is a small peptide that can be complemented with the LgBiT peptide forming a nanoluciferase which in presence of its substrate is able to emit luminescence. The SNAP is a polypeptide that covalently binds to its substrate, which can act as a fluorophore. The results obtained with the complementation of nanoluciferase using HiBiT-SR1 and HiBiT-SR10 show that only a small fraction of PfSR1 and PfSR10 is expressed at the cell surface with the N-terminus facing the extracellular milieu. In addition, our data show that PfSR10 can act as a chaperone increasing PfSR1 expression. These tools will help us understand functional aspects of the GPCRs candidates from *P. falciparum* SR1 and SR10, and elucidate their role in the development cycle of the parasite.

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Postprandial lipemia and inflammatory responses in overweight postmenopausal women

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Introduction: The decline in the secretion of sex hormones during menopause and postmenopause leads to long-term changes in metabolism increasing the risk of non-communicable chronic diseases. **Objective:** The current study investigated the postprandial metabolic and inflammatory responses from postmenopausal and reproductive-age women challenged with a standardized, energy-dense mixed meal. **Methodology:** Twenty-four postmenopausal (PM) and twenty-one reproductive-age (RA) women were included in the study. An anthropometric evaluation and body composition using bioelectrical impedance were performed. Participants underwent a standardized mixed meal tolerance test that include the intake of an energy-dense standardized meal (60 g lipids, 75 g glucose, 20 g protein) and a serial blood sampling at 10 time points for 6 hours was performed. Hematological and biochemical parameters were analyzed, and the gene expression of inflammatory markers were evaluated in PBMC. **Results:** PM women exhibit slightly higher body weight (~10%, $p < 0.05$), but much larger fat mass (21%, $p < 0.05$), predominantly visceral obesity in comparison to RA women. Furthermore, PM women showed increased circulating levels of postprandial glucose, triglycerides, cholesterol, LDL-C, HDL-c and lactate. The number of circulating leukocytes increased during the dietary challenge in both groups, indicating an inflammatory response to the meal. The expression levels of IL-6, TNF- α and TLR-4 were higher in PBMC from PM women compared to RA women in the fasted state and throughout the postprandial period. In contrast, the IL-1 β expression was increased in RA women (10%), a cytokine that plays a role in regulating postprandial insulin secretion. **Conclusion:** Our study reveals that PM women exhibit an exacerbated postprandial inflammatory response in comparison to RA women, a feature that is accompanied by elevated serum levels of markers of lipid metabolism and central adiposity.

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Advancements in 3D reconstruction techniques for human epidermis model: a comparative study of bioprinted and manual methods for in vitro skin irritation assessment

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Background: The ban on using animals for several tests cosmetics tests has encouraged the production of artificial skin models. Biochemical assays in in vitro skin are essential for evaluating the efficacy and safety of consumer products. Moreover, due to its advantages in automation, precision, and scalability, bioprinting technology holds promise in tissue engineering for in vitro skin production. Therefore, for the first time in the literature, we discuss the comparative biochemical response of bioprinted reconstructed human epidermis (B-RHE) with the manually reconstructed human epidermis (M-RHE) regarding a relevant dermal test, such as the skin irritation in in vitro models as described in the Organization for Economic Co-operation and Development (OECD) guideline 439 (TG 439). **Objectives:** In this study, we report the use of bioprinted epidermis as a platform for irritation potential assays and compare bioprinted and manual human epidermis production. **Methods:** B-RHE and M-RHE were produced by bioprinting and traditional manual dispersing systems. Morphological characterization of the samples was made by histological analysis. We evaluated the morphological characteristics of the samples through histological analysis. We also evaluated the epidermal model's stratification features through specific protein detection expressed by the keratinocytes by immunofluorescence. A barrier function assay with sodium dodecyl sulfate was used to characterize the epidermal barrier function of the samples. According to OECD protocols (by TG 439), we tested the applicability of epidermal models for irritation capacity. Finally, we determined the secretion of inflammatory interleukins by quantification of IL-1 α . **Results:** Both B-RHE and M-RHE models exhibited a well-stratified and multiple-layered epidermis. The epidermal barrier function of the B-RHE model achieved equivalent performance standards to the validated RHE models described in TG 439. As a platform for skin irritation assays, the B-RHE models performed similarly to the M-RHE models, correctly discriminating the selected reference substances classified as irritant or non-irritant. However, the bioprinting technique that utilizes cylindrical needles for extrusion can indirectly exacerbate the inflammatory response. The IL- α assay results

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revealed that the inflammatory response was detected in the bioprinted methodology, even after exposure to non-irritative substances. Conclusion: Even though the morphological characteristics and results of irritation assays are not altered when comparing bioprinted or manual in vitro epidermis, the mechanical stress inherent in the bioprinting process can indirectly influence the chemical-induced inflammatory response profile on bioprinted models by affecting cell growth. This point is relevant in bioprinting technology because it is used in a broad area for human tissue bioengineering.

Inhibitor induced conformational changes in SARS-CoV-2 papain-like protease

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SARS-CoV-2's papain-like protease (PLpro) interaction with ligands has recently been explored with a myriad of crystal structures. We used molecular dynamics (MD) simulations to study different PLpro-ligand complexes, their ligand-induced conformational changes, and interactions. We focused on inhibitors reported with known IC₅₀ against PLpro, namely GRL-0617, XR8-89, PLP_Snyder530, and Sander's recently published compound 7 (CPD7), and compared these trajectories against the apostructure (Apo), with a total of around 60 μ s worth simulation data. We aimed to study the conformational changes using molecular dynamics simulations for the inhibitors in the PLpro. PCA analyses and the MSM models revealed distinct conformations of PLpro in the absence/presence of ligands and proposed that BL2-loop contributes to the accessibility of these inhibitors. Further, bulkier substituents closer to Tyr268 and Gln269 could improve inhibition of SARS-CoV-2 PLpro by occupying the region between BL2-groove and BL2-loop, but we also expand on the relevance of exploring multiple PLpro sub-pockets to improve inhibition.

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Solubilidade do ciprofibrato em polímero para formulação por Hot Melt Extrusion

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Introdução: Hot Melt Extrusion (HME) é uma tecnologia que pode ser utilizada para contornar problemas de formulação de fármacos pouco solúveis. Ela permite a produção de dispersões sólidas amorfas (DSA) do fármaco lipossolúvel em uma matriz polimérica hidrossolúvel, por meio da fusão da mistura seguida de um rápido resfriamento. A matriz impede a recristalização do fármaco, que fica molecularmente disperso na matriz, e, dessa forma, aumenta sua solubilidade. Para obter uma DSA estável, um dos parâmetros avaliados é a solubilidade do fármaco no polímero. **Objetivo:** O objetivo desse trabalho foi iniciar o estudo da solubilidade do ciprofibrato (CIPR) no polímero Parteck MXP® (álcool polivinílico) para o desenvolvimento de uma formulação sólida oral por HME. **Método:** Calorimetria Exploratória Diferencial (DSC): equipamento DSC7020 (SII Nano Technology, Japan), cadinhos de alumínio, faixa de 30°C a 135°C, e razão de aquecimento de 10°C min⁻¹, fluxo de nitrogênio a 50 mL min⁻¹. O polímero e o fármaco foram analisados individualmente, em seguida, foram preparadas e analisadas misturas com 30% e 10% de fármaco. **Resultados:** A curva DSC do CIPR apresentou um pico endotérmico intenso e bem definido, característico de um composto cristalino, com temperatura de fusão Tonset = 117,4°C e entalpia de fusão $\Delta H_{\text{fusão}} = 119,4 \text{ J/g}$. O polímero não apresentou evento na faixa de fusão do fármaco. A solubilização completa do CIPR no polímero, se reflete no desaparecimento do pico de fusão do fármaco na análise da mistura. No entanto, foi observada uma solubilização incompleta, com redução significativa do pico e da entalpia de fusão, porém não total. As entalpias de fusão foram 9,4 J/g e 3,0 J/g para as amostras com 30% e 10% de CIPR, respectivamente. Enquanto, caso não houvesse solubilização alguma, os valores esperados seriam 35,8 J/g e 11,9 J/g, respectivamente. **Conclusion:** O Parteck MXP® não se mostrou favorável para a formação de DSA com CIPR. Uma alternativa a ser testada é o uso de uma mistura ternária com a adição de um surfactante ou cossolvente para potencializar a solubilização.

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PfMORC modulates gene expression through interaction with heterochromatin in *Plasmodium falciparum*

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Malaria is one of the leading lethal parasitic diseases in developing countries where eradication efforts lack proper infrastructure. The 2022 malaria report by the World Health Organization estimates 247 million new cases and 619,000 deaths in 2021 (World Malaria Report 2022). Malaria is caused by a parasite of the genus *Plasmodium*, a unicellular protozoan of the Apicomplexa. Among the human *Plasmodium* species, *Plasmodium falciparum* is the most virulent and responsible for the highest number of fatalities. The clinical symptoms of malaria are associated with the periodic rupture and exponential increase of parasites in the host's circulatory system. Tight control of gene expression is crucial for the development of malaria parasites during the blood stage. In this study, we have used previously identified chromatin-associated microorchidia protein PfMORC (PF3D7_1468100) to investigate its role during the asexual blood stage development of *P. falciparum* through multi-omic analyses. Co-immunoprecipitated fraction with PfMORC revealed several nuclear proteins, including APETALA2 (AP2) transcription factors (PfAP2-G5, PfAP2-O5, PfAP2-I, PfAP2-MRP, PF3D7_0420300, PF3D7_0613800, and PF3D7_1239200), a DNA helicase DS60 (PF3D7_1227100), and other chromatin remodelers (PfCHD1, PfeELM2, and PfISWI). Through in vivo genome-wide chromatin occupancy analysis during both trophozoite and schizont stages of development, we have demonstrated that PfMORC is recruited to repressed multigene families, including the var genes in subtelomeric chromosomal regions. Transcriptomic analysis of PfMORC knockdown parasites revealed 163 differentially expressed genes belonging to hypervariable multigene families, with most of the upregulated genes involved in host cell invasion. Overall, our findings indicate that PfMORC is present in chromatin complexes that play a role in the epigenetic control of asexual blood stage transcriptional regulation.

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HPLC-TBARS-EVSC (high performance liquid chromatography – thiobarbituric acid reactive substances – ex vivo stratum corneum) Protocol

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OBJECTIVE: Nowadays, it is recognized the need for improved safety and efficacy protocols to evaluate the human stratum corneum (SC) and its interaction with topical and cosmetic formulations by minimally or non-invasive methodologies. The aim of our research work was to streamline the HPLC-TBARS-EVSC (high performance liquid chromatography – thiobarbituric acid reactive substances – ex vivo stratum corneum) methodology, by exploring the results of a group of 18 subjects. **METHODS:** The study included 9 women and 9 men aged between 19–57 years old with phototypes from II to V. Sites in the forearm of each volunteer were randomly delimited and the SC was collected by tape stripping. HPLC was used to quantify the MDA-TBA2 (malondialdehyde – thiobarbituric acid) adduct from the tape-stripped SC, irradiated and not by an ultraviolet (UV) simulator chamber. **RESULTS:** Observing the findings of our present investigation, and the statistical approach applied, the use of the ratio between the treatment site and control would be an adequate strategy to better discriminate and evaluate the results. Additionally, an optimal selection of the volunteers to respond specifically to the purpose of the ex vivo assay also can be considered advantageous. **CONCLUSIONS:** It seemed that in future studies focusing on the impact of SC UV-induced lipid peroxidation, determined by the HPLC-TBARS-EVSC, the most suitable subjects are females aged less than 35 years old, with phototype II.

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Single cell analysis of immune responses in Leishmaniasis

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Leishmaniasis is an intracellular protozoan parasitic disease caused by the bite of an infected female phlebotomine sandfly. It ranked among the top 10 neglected tropical diseases affecting more than 12 million people globally (WHO factsheet). *Leishmania* parasite cutaneous leishmaniasis (CL), a disease characterized by disfiguring, ulcerative skin lesions. Depending upon parasite species, environmental and social factors, nutritional status and immunocompetence of the host, the disease can vary in severity. Analysis of human blood and skin immune response provides insights into regulated response to parasitic infection caused by *Leishmania* parasite. To interrogate the immune response elicited by CL in skin single cell RNA sea (sc-RNA seq) was performed on peripheral blood mononuclear cells (PBMC) and skin samples of patients suffering from CL. Samples were collected from 4 different body sites (mouth, arms, thigh, hips). Integrative analysis of single-cell transcriptomes from healthy individuals along with 3 other diseased individuals provide information of molecular signatures perturbed at single cell level specific for CL infection. Through integrative analysis, we tried to uncover the immune landscapes of these diseases and identified both common and distinct inflammatory signatures.

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Development of novel series of potent and selective heterocyclic compounds as anti-infective agents

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Significant effort has put into designing and developing new medicines for infectious diseases. With collaborations all around the world, the focus of the research is the discovery and development of new potent and selective heterocyclic compounds as anti-infective agents. During the period of the postdoc, were synthesized new imidazopyridine/pyrimidine, furopyridine, and isoindole compounds arising from medicinal chemistry optimization. Based on promising results of in vitro activity ($EC_{50} < 100$ nM), cytotoxicity, metabolic stability, protein binding and pharmacokinetics (PK) properties, imidazopyrimidine compound was selected as a candidate for in vivo efficacy studies. In addition, the novel compound can cross the blood-brain barrier and are effective inhibitors of neurological pathogens such as trypanosomes. It represents a potential lead for the development of drugs to treat trypanosomiasis. A novel isoindolone-based agents against Trypanosomiasis-induced HAT infections were discovered. The most potent derivative displays selective potency for *Trypanosoma brucei rhodesiense* ($IC_{50} = 40$ nM), no detectable side activity against *T. cruzi* and *Leishmania infantum*, no cytotoxicity against MRC-5 and PMM cell lines and high in vitro metabolic stability, making it a promising lead for further drug development. However, due the low solubility of the most potent compounds and the absence of the target identification, we could not select the most promising compounds for future translational work towards much-needed new therapies for infectious diseases. Understanding the PK/PD is critical and can help to understand what is required for a drug to progress. Also, seeking for the target is important to help with rational modifications of the lead compounds to improve PK/PD properties. A Young Investigator Project (JP-FAPESP) will be submitted to Fapesp this year through collaboration with University of Dundee in Scotland, under the supervision of Professors Kevin Read and Susan Wyllie to overcome these challenges.

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Exploring immunoliposomes as a promising therapeutic approach for Pompe disease

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INTRODUCTION: Pompe disease is a debilitating condition characterized by impaired lysosomal enzymatic activity. The current FDA-approved treatment falls short in delivering recombinant human Acid Alpha-Glucosidase (rhGAA) to muscle tissue due to low specificity and cellular uptake. **OBJECTIVE:** In this study, we propose utilizing immunoliposomes to encapsulate rhGAA, thereby enhancing its selective uptake into muscle tissue. **METHODOLOGY:** Liposomes were prepared using the thin lipid film method followed by hydration. The liposomes were then functionalized through a simple reaction between partially anti-NRP1 monoclonal antibodies (LIP-NRP1) and the maleimide group present in the liposome structure. The uptake dynamics of this nanoparticle were evaluated by using FACs and confirmed with confocal microscopy. **RESULTS:** Physicochemical analysis revealed a diameter ranging from 130–140 nm, a PDI of 0.110–0.170, and a zeta potential varying between –9.5 and –16.2 mV. Fluorescence confocal microscopy confirmed the static interaction of LIP-NRP1 with the plasma membrane of myotubes. LIP-NRP1 exhibited superior internalization dynamics (10.7%) compared with the control one (4.9%). Finally, fluorescent confocal microscopy demonstrated the staining and co-localization of LIP-NRP1 within lysosomes. **CONCLUSIONS:** These findings validate the potential of our immunoliposome approach for encapsulating rhGAA and improving its delivery to affected muscle tissues. In the near future, our research group will analyze the use of the OoC platform in combination with endothelial and muscle cells to demonstrate the feasibility of this therapeutic strategy.

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SIGMAR1 as a novel prognostic biomarker in Oral Squamous Cell Carcinoma

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The SIGMAR1 protein plays an intriguing role in the immunomodulatory response and cancer progression. Nevertheless, the role of SIGMAR1 in Oral Squamous Cell Carcinoma (OSCC) remains elusive. Here, we investigated the gene expression profile and the prognostic value of SIGMAR1 in OSCC. We evaluated the SIGMAR1 expression profile using TCGA Pan-Cancer Data, multiple large datasets, and in our cohort-based study of OSCC by qRT-PCR and immunohistochemistry (IHC). Kaplan-Meier plotter and receiver operating characteristic (ROC) curve analyses were performed to evaluate the diagnostic and prognostic value of SIGMAR1. Next, an overview of the potential correlated tumor-infiltrating immune cells (TIICs) with SIGMAR1 was estimated by CIBERSORT and Tumor Immune Estimation Resource (TIMER2.0) databases. SIGMAR1 expression was considerably increased in oral cancer, and this was significantly associated with poor survival rates. We identified a positive correlation between SIGMAR1 expression with TIICs, including M1 macrophages, neutrophils, Natural Killer cells, T cells (such as CD4+ memory activated, CD8+, CD4+, regulatory). Based on these findings, we suggest that SIGMAR1 is a novel potential oral cancer diagnostic biomarker associated with tumor-infiltrating immune cells. Furthermore, studies are essential to explore the therapeutic targeting of SIGMAR1.

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In vitro testing platform for bioavailability and metabolism prediction in drug discovery: examples of marine and plant natural products

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In addition to adequate pharmacological efficacy and safety profile, a balance of optimized bioavailability and reduced drug metabolism maximizes the chance of a natural product becoming a successful therapy. Bioavailability and metabolism screening must be evaluated firstly in vitro, which provides pharmacological orientation for in vivo design studies. Considering the demand for innovative products from Brazilian biodiversity, an in vitro platform for preclinical studies was developed, applied to lead compounds with highlighted in vitro pharmacological activity. The compounds were evaluated regarding its lipophilicity (shake-flask method), permeability (Caco-2 cells), plasma protein binding (ultracentrifugation), metabolites survey (Human Liver Microsomes – HLM; metalloporphyrins; Electrochemistry–Mass Spectrometry), kinetic parameters of metabolism, phenotyping and drug interactions studies (HLM). Quantitative determinations were performed by Liquid Chromatography–Mass Spectrometry.

Compound	seriniquinone	specioside	casearin X	licarin A
Structural class	Quinone	Iridoid glycoside	Clerodane diterpene	neolignan
Log P	4.5	-1.6	5.9	3.8
Apparent permeability (x10 ⁻⁶ cm/s)	3.9 (moderate)	11.2 (high)	0.0 / 66.9*	-
Plasma protein binding (%)	80.1	43.3	87.3	26.0
Hepatic clearance (mL/min/kg)	6.1 (moderate)	2.4 (low)	19.5 (high)	20.0 (high)
Metabolic stability: half-life (min)	40.2	59.7	8.7	31.5
Metabolism phenotyping	CYP1A2, 2E1	CYP1A2	carboxylesterase	CYP1A2, 2B6
Metabolites elucidated	-	1	1	7
Drug interactions	Isoforms inhibited	CYP1A2	NA	CYP1A2
IC ₅₀ (μM)	CYP1A2, 2E1, 3A < 1.5 (strong)	100.0 (weak)	NA	87.0 (weak)
Recommendations for next steps	<i>In vivo</i> PK	<i>In vivo</i> PK	Chemical modification	Formulation development

Our in vitro testing platform provides a data panel that allows the researcher team to rank order of molecules, not only based on their potency, but also in relation to the predicted bioavailability, which is decisive for drug development, clinical trials and possible market reach.

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Effects of a nitro-ruthenium porphyrin complex on lung cells in 2D and 3D models

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Lung cancer is a prevalent and deadly disease. Photodynamic therapy (PDT) emerges as a potential option in the treatment of lung cancer, either as a standalone treatment or as a complementary approach to traditional therapies. PDT utilizes a photosensitive drug called a photosensitizer (PS), activated by light, to trigger the release of free radicals that induce cell death. Transition metals, particularly platinum group metals, have shown promise as PSs due to their efficient triplet excited states and favorable biological characteristics. However, PDT faces a limitation in oxygen-deprived tumor regions where it requires oxygen to be effective. Nitric oxide (NO), a signaling molecule, can either induce cell death or promote cell survival depending on its concentration and microenvironment. Ruthenium complexes have exhibited potential in vitro and in vivo for treating various cancers. They possess advantageous photophysical and photothermal properties suitable for PDT. In this study, we investigated a nitro-ruthenium porphyrin complex capable of releasing NO upon irradiation, to assess its effects on lung cells in both 2D and 3D cell cultures. Our findings suggest that this complex hold promise for PDT in lung cancer treatment. Low concentrations of ruthenium porphyrin complex demonstrated cytotoxicity to lung cells under light irradiation, making it viable candidates for PS. Additionally, the complex displayed intriguing properties such as apoptotic and anti-migratory effects, as well as the ability to modify tumor cell structures and induce cytotoxicity in 3D cultures. These findings present exciting prospects for the development of novel approaches to cancer treatment.

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Investigation of the NLRP3 inflammasome on the extinction deficits observed in a genetic model of PTSD and possible modulation by histone acetylation mechanisms

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Introduction: Post-traumatic stress disorder (PTSD) is a disorder related to exposure to strong psychological trauma, resulting in debilitating symptoms such as generalized anxiety, cognitive impairment and difficulty in extinguishing aversive memories. Pharmacological treatment for PTSD is very limited and ineffective in many patients. Given this scenario, understanding the altered mechanisms in this disorder is crucial to develop possible pharmacological approaches. PTSD is associated with important alterations in the neuroimmune system and increasing evidence supports the idea that stress-induced activation of microglial cells and NLRP3 inflammasome could contribute to the development of the behavioral consequences of trauma exposure. Furthermore, epigenetic mechanisms are also altered by exposure to stressors, and may regulate the expression of immune system mediators and the activation of the NLRP3 inflammasome, though, for example, the acetylation of histone proteins. **Aim:** to investigate whether the extinction deficits observed in a genetic model of PTSD are accompanied by activation of the NLRP3 inflammasome in the animals' brains, and also to verify the possible involvement of epigenetic mechanisms in the extinction deficits observed in the model. **Methodology:** C57Bl/6 wild-type and knockout mice for the inducible isoform of nitric oxide synthase (iNOS) will be used as a genetic model for PTSD. The animals will be submitted to the contextual conditioned fear protocol and treated with vehicle, paroxetine or MCC950, an NLRP3 inhibitor. Molecular analyzes will be performed at different times and will involve western blotting, chromatin immunoprecipitation and real-time PCR techniques.

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Using *D. melanogaster* as a model to study muscle atrophy and its consequences on mitochondrial dynamics and metabolism

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The muscle tissue comprises 40–50% of the body mass in *Drosophila* and humans. Maintenance of this tissue integrity is critical to mobility as well as metabolism in both species since muscles are the main amino acid reservoirs. Muscles have high plasticity, being responsive to exercise, nutrient supply, and endocrine factors with alterations in fiber composition and size, which is determined by the synthesis/degradation of sarcomeric proteins. Muscle grows by protein synthesis via activation of a nutrient sensor – the Insulin/AKT/TOR signaling cascade. Muscle atrophy due to protein degradation is mediated by the ubiquitin–proteasome system and the autophagy–lysosomal pathway. Since mitochondria are highly dynamic organelles that suddenly respond to nutrient levels, they should accomplish the metabolic state of the muscle cells. Here, we evaluated the effects of genetically induced muscle atrophy/hypertrophy on mitochondrial dynamics and metabolism *in vivo*, using *D. melanogaster* as a model. We obtained these phenotypes by altering Akt1 levels with the UAS–Gal4 system in muscle cells. Mitochondrial dynamics was determined by confocal microscopy of indirect flight muscles (IFMs) in a time course experiment. The metabolic mitochondrial state was assessed by quantifying both oxygen consumption levels in high-resolution respirometry and hydrogen peroxide (H₂O₂) release using a Amplex® Red assay in the adult thorax. Muscle-specific knocking down of akt1 led to severe atrophy and high lethality, whereby only a few adult females were born. IFMs dissected from these individuals showed a fragmented mitochondrial population, lower levels of oxygen consumption, and higher production of H₂O₂. Overexpression of akt1 also induced lethality and few adults were born. However, the mitochondria of these flies were very fused, presenting higher levels of oxygen consumption and lower release of H₂O₂. Our results demonstrate that both mitochondrial dynamics and metabolism are very sensitive to changes in muscle cell size and metabolic state.

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Complex FACT and SK2 can predict a poor prognosis in patients with head and neck cancer

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Background: Oral squamous cell carcinoma (OSCC) is the most common malignancy of the head and neck. Biomolecules of the sphingolipid metabolic pathway, such as sphingosine kinases 2 (SPHK2) and sphingosines-1-phosphate (S1P) have been shown to be abnormally expressed in head and neck squamous cell carcinoma (HNSCC), but their function in epigenetic regulation have not been fully elucidated. In this context, histone chaperones from the FACT complex actively participate as key chromatin regulators during the steps of the invasion-metastasis cascade and might be SK2/S1P-regulated targets in driving OSCC progression. The present study was designed to evaluate the expression of two subunits, SUPT16H and SSRP1, and their prognostic value as well as their relationship with SK2/S1P in OSCC patients. **Methods:** The expression levels of genes of FACT complex and SPHK2 in HNSCC and normal samples were screened out from The Cancer Genome Atlas (TCGA) using TNMplot website and GSE30784 database. Kaplan-Meier plotter were performed to evaluate the prognostic value of SUPT16H, SSRP1, and SPHK2 using KMplotter. Subsequently, the correlations of SUPT16H and SSRP1 with SPHK2 were assessed by GEPIA database. **Results:** SUPT16H, SSRP1 and SPHK2 were significantly upregulated in HNSCC tissues compared with paired normal samples using TCGA data. According to the GSE30784, high levels of SUPT16H and SSRP1 also were found in tumor samples compared normal samples. SUPT16H and SSRP1 overexpression and SPHK2 underexpression were related to decreased overall survival in patients with HNSCC. Additionally, SPHK2 was correlated positively with SUPT16H and SSRP1 by GEPIA. **Conclusions:** There high levels of SUPT16H and SSRP1 in HNSCC/OSCC patients and associated with poor survival. These initial findings will be used to study the relation between FACT and SK2/S1P in OSCC.

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Optimized protocol for protein and RNA extraction from extracellular vesicles from people living with HIV

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Despite the antiretroviral treatment (ART) evolution having promoted effectiveness in controlling HIV infection, different types of pathological manifestations have been related to the chronicity of the infection. Lipodystrophies, neurocognitive disorders, metabolic and epigenetic alterations have been associated with an early immune-senescence phenotype and with an elevated chronic basal inflammation in people living with HIV (PVH). In this inflammatory context, we believe that extracellular vesicles (EVs) released by deficient immune cells play a role in the pathological development. EVs are efficient means of intercellular communication that, recently, have shown great relevance in different pathological conditions, as well as in HIV infection. However, little is known about how much its composition can affect the evolution of an immune response. For these reasons, the objective of this work was to establish protocols for obtaining high quality protein and RNA from EVs from plasma and peripheral blood mononuclear cell (PBMC) culture, with sufficient yield to perform omics assays. Due to the great and recent interest and the little conceptual uniformity in the knowledge about vesicles, the availability of protocols is scarce, and these still provide low yield of high-quality samples. To carry out this work, peripheral blood samples from sixteen people living with HIV were collected to compare with samples from sixteen control donors. The inflammatory profile of the donors was also characterized using the multiplex technique and flow cytometry to evaluate, in the future, correlations with the studied components of the vesicles. In conclusion, we have established a protocol with high efficiency for the isolation of two types of high-quality vesicles, both from blood plasma and from primary culture of PBMC cells. Protein and RNA content were extracted from these samples, which are being characterized in terms of composition using omics techniques.

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Investigation of the participation of the ADAM10-NEGR1-FGFR2 pathway in vitro and in vivo effects of Cannabidiol in stress conditions

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The ADAM10-NEGR1-FGFR2 pathway plays a key role in the development of the neural structure. Evidence shows that the biology of this pathway influences several neuropsychiatric conditions and disorders, such as anxiety and depression, Alzheimer's Disease (AD), Autism Spectrum Disorder (ASD) and schizophrenia, even obesity. Recent results have indicated that the biology of this pathway is related to the molecular events underlying therapeutic interventions with some antidepressants. However, several limitations involve the use of these medications, including delay in therapeutic response, diversity of side effects, a large percentage of people unresponsive to treatment, among others. In this way, Cannabidiol (CBD) has been shown to be an important effective alternative in the treatment of these and the other conditions, with evidence of rapid action, sustained effects, and a better profile of side effects. Although numerous therapeutic targets have already been described, the interaction of CBD with the ADAM10-NEGR1-FGFR2 pathway is not yet known. Thus, this work aims to investigate, in a stress model, in vitro and in vivo, whether the effects of CBD involve the modulation of the ADAM10-NEGR1-FGFR2 pathway. For this, differentiated SH-SY5Y cells and adult male and females C57BL/6 mice will be exposed to chronic stress induced by corticosterone and later, still facing the stressor stimulus, treatments with the vehicle, CBD, Escitalopram, and Nortriptyline will be administered. In another experiment, ADAM10 will be pharmacologically inhibited, in vitro, to assess whether the effects of CBD depend on this pathway. Cell viability will be assessed for all treatments. To evaluate the effects of CBD and the other drugs against the stressor stimulus, the levels of active ADAM10 (60 kDa), NEGR1 and FGFR2 will be quantified in cells and in biological materials from animals (platelets, hippocampus and cortex). In addition, changes in dendritic ramifications will be evaluated. Additionally, physical, dietary, behavioral, and cognitive measures will be analyzed in vivo, in order to verify the effectiveness of the treatment performed with CBD and the efficiency of the chosen stress model. With this same intention, the production of Reactive Oxygen Species (ROS) will be properly measured in vitro. It is expected that the results of this study may contribute to the elucidation of CBD's mechanism of action, as well as open new therapeutic possibilities for the treatment of a range of disorders that present alterations in the ADAM10-NEGR1-FGFR2 pathway.

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Seleção de candidatos a biomarcadores de câncer oral utilizando espectrometria de massas acoplada à cromatografia líquida de alta eficiência

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O carcinoma epidermoide oral (CEO) é um problema de saúde mundial com alta mortalidade. Em geral, o diagnóstico da doença é tardio, sendo obtido a partir da análise histopatológica do tecido da lesão oral. Recentemente, tem sido mostrado a expressão de genes relacionados ao metabolismo dos esfingolipídios está alterada no CEO, mas pouco é conhecido sobre o perfil destes lipídios em CEO. O objetivo deste trabalho foi determinar o esfingolipidoma em amostras biológicas de pacientes para gerar uma ferramenta diagnóstica e/ou prognóstica para CEO usando Cromatografia Líquida acoplada à Espectrometria de Massas de Triplo Quadropolo (LC-QqQ-MS/MS). Neste estudo clínico prospectivo foram incluídos pacientes com CEO (n= 50), indivíduos saudáveis para obtenção de amostras saliva (n= 20, controle) e plasma sanguíneo (n= 30, controle). Inicialmente, a metodologia de extração foi otimizada, com redução do tempo de preparo da amostra e aumento da recuperação dos esfingolipídios. Posteriormente, o método bioanalítico LC-QqQ-MS/MS foi validado para quantificação de 28 esfingolipídios nas diferentes amostras biológicas, com determinação dos níveis de linearidade, precisão, exatidão, limites de detecção e de quantificação. Em relação às características da casuística, a idade dos pacientes teve média de 61,72 anos, contando com a participação de 31 homens (62%) e 19 mulheres (38%), a maior parte diagnosticados nos estágios 3 e 4 de CEO. Até o momento, as análises de amostras de saliva e plasma foram realizadas, os dados analisados e os resultados revelaram diferenças significativas de alguns esfingolipídios nos pacientes CEO, que podem ser de grande relevância no diagnóstico e prognóstico rápido de câncer oral por LC-QqQ-MS/MS. Além disto, o método validado para determinação de esfingolipidoma a partir de amostras biológicas, já está sendo aplicado para o monitoramento da doença, eficácia terapêutica e outros estudos relacionados à fisiopatologia do câncer oral, tanto in vitro quanto em modelos in vivo pelo nosso grupo de pesquisa. Espera-se que os nossos resultados sobre esfingolipidoma em CEO, ampliem o conhecimento sobre o papel destes esfingolipídios nesta doença e indiquem lipídios com potencial para marcadores moleculares.

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Evaluation of the innate immune response induced by Bothrops moojeni crude venom and its protein and lipid fractions

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Accidents caused by venomous snakes are an important and neglected public health problem. In the global scenario, among the countries with the highest incidence of snakebites, Brazil is in 3rd place, with those caused by species of the Bothrops genus with the greatest epidemiological relevance. The snake *B. moojeni* is the main species in the cerrado and presents an extremely aggressive behavior, being a potential target for studies of clinical importance. Snake venoms contain hundreds of molecules with a broad spectrum of biological actions. In bothropic venom, the protein portion can be equivalent to about 90% of the dry weight, being the main target of study, due to the wide variety of pharmacological actives. Our research group, in an unprecedented way, characterized the profile of non-protein constituents, mainly those of a lipidic nature, present in the *B. moojeni* venom, and also demonstrated that the scorpion venom lipids induce the release of cytokines. Although lipid functions are already well established in several pathologies, in the context of the action of venoms, the role of these molecules has not yet been investigated. Our hypothesis is that molecules from the non-protein fraction contribute to cell activation and to the innate immune response in *B. moojeni* envenomation. Thus, our aim is to investigate the mechanisms of cell activation *in vitro*, and evaluate *in vivo* the innate immune response induced by *B. moojeni* venom, and its protein and lipid fractions. We expected to contribute to the understanding of the role of venom lipids in snake envenomation, aiming to optimize treatment.

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Law analysis of private health care plan contracts

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The bases of constitutionalism were forged by the historical and social facts arising from the intrinsic relationship between Society, Law and State. Its evolution requires a new feature, able to provide a basis for social coexistence in an ever changing reality, including rearranging the State organization. Social Rights, seen as second-dimension Fundamental Rights in the evolution of Constitutionalism, create a new perspective on this relationship between State and individual, establishing obligations of the State and lifting it to the status of provider of a dignified existence for the individual. The Right to Health falls within the context of Fundamental Social Rights in two senses. The first grants positive freedom to individuals and recognizes their capacity to decide about their own health; the second is manifested by the subjective position that grants to the State, and to the private individual, conducts that do not harm or mitigate the psychophysical state of the individual, i.e. they impose a duty of abstention. The Constitution of the Federative Republic of Brazil of 1988 was the first to deal broadly with the right to health, and was responsible for creating the private health care system. Thus, in addition to the public system, both individuals and legal entities (e.g. hospitals, clinics, and health Plan Operators) can provide services through payment by the beneficiaries themselves. Within the framework of the realization of the Right to Health, it is evident that the judicial intervention model, created from a judicial protagonism that aims to achieve social justice and reduce inequality, leads to the relativization of Contracts from a standpoint of micro-justice; parameterizes the public and private systems; and, in decisions involving contracts, adopts legal bases that are incompatible with the proposed jurisdictional discourse. The erroneous reception of foreign legal theories in Brazil resulted in a theoretical mixing, which come into effect at the time of delivery of the judgment. In other words, the judge – linked to the theoretical context in which he/she is inserted – uses such receptions and combines them in his/her legal discourse, in order to lend weight to the judgment. This Thesis is part of the line of research: Constitutional Principles and Law Policy.

Study cases of mass murders in Brazil: characteristics, motivations and legal repercussions

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Objectives: Mass murders consists of a criminal modality characterized by the attempt to produce the greatest possible number of fatal victims in a single incident, which typically occurs in a confined and crowded space. This modality of crime has been progressively growing in Brazil. This study aimed to investigate the phenomenon. **Methods:** Between 1999 and 2022, 18 mass murders occurred in Brazil, in addition to 5 records of massacres that were planned but failed to be perpetrated. To gather information for this study, research relied on official police records, judicial documents and open sources, such as digital and print media vehicles. **Results:** In Brazil, schools were target in 15 (83.0%) of the 18 mass murder events. In 16 of the 18 incidents, the perpetrator was a child, an adolescent or a young person (From 10 to 25 years old). In 10 of the 18 incidents, the perpetrators used exclusively a firearm weapon. Nevertheless, from 2019 to 2021, knives and offensive weapons were used in 70% of the incidents. Young criminals appear to be motivated by bullying and to exhibit some narcissistic and/or schizotypal personality traits, while the older ones appear to be odd recluses with some angry agenda. Suicidal tendencies also seem to be a common feature among perpetrators. Since 1999, casualties (victims killed and wounded) totaled 150 individuals (the individual murders are not included in this total). Only in the last decade (2011–2021), there were 15 mass murders reported in Brazil, consummated or attempted, at increasingly smaller intervals, especially in the last 4 years. In 2019 alone, there were 6 events. **Conclusions:** Although mass murders are still considered uncommon events in Brazil, it is a type of criminal offense that has progressively increased over the last decade. The widespread use of the internet and social networks makes the contagion effect alarming in mass killings. It sets an undeniable backdrop to this criminal phenomenon in Brazil, where several similar characteristics to the attacks that occur in the United States were observed, especially regarding to the offender's traits and motivations.

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Assessment of steroidal hormones and inflammatory mediators in transgender patients' plasma: correlations with pathology markers of COVID-19

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Introduction: The 2019 Coronavirus Disease (COVID-19) has exhibited gender-specific differences in terms of severity and mortality rates. These disparities may be influenced by physiological variables associated with steroidal hormones. Eicosanoids (EICs), known as inflammatory lipid mediators, have shown promise in understanding COVID-19 pathogenesis and can serve as potential biomarkers for disease severity. Thus, evaluating the levels of steroidal hormones and EICs in human plasma is crucial for identifying gender-severity-associated pathways and improving therapeutic approaches. **Objectives:** The objective of this study was to investigate the immunoendocrine mediators and their associations with the clinical presentations of COVID-19 in transgender individuals. **Material and Methods:** Plasma samples were collected from cis and transgender patients (n = 127) with or without COVID-19 using modified liquid-liquid and solid-phase extraction methodologies for steroidal hormones and EICs, respectively. The samples were then analyzed using LC-MS/MS. Clinical parameters were obtained from medical records. Cytokines IL-6, IL-8, IL-1 β , IL-10, TNF- α , and IFN- γ were quantified using ELISA kits. **Results and Discussion:** Results revealed that in male COVID-19 patients, cortisone, testosterone, and 11-DHC levels decreased significantly, while cortisol levels remained unaffected. This modulation of steroids may be attributed to hormone replacement therapy in transgender patients, indicating potential immunoregulatory properties and their association with COVID-19 clinical indicators. Regarding EICs, arachidonic acid (AA), eicosapentaenoic acid (EPA), 5-HETE, 8-HETE, 11-HETE, 12-HETE, and 15-oxo-ETE were identified as the most abundant EICs in plasma. COVID-19 patients exhibited reduced levels of AA, EPA, 5-HETE, and 11-HETE, while 8-HETE, 12-HETE, and 15-oxo-ETE levels were elevated. Interestingly, HIV-1 patients showed a similar pattern, except for AA. Co-infected patients appeared to be protected against COVID-19-induced hyperinflammation, as evidenced by lower EIC production and cytokine levels. **Conclusion:** Our findings suggest that COVID-19 infection may disrupt the steroidal hormone pathway. Moreover, understanding the effect of hormone therapy and the COVID-19-induced increase in inflammation is vital

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for devising appropriate treatment strategies for transgender patients. These insights contribute to a better understanding of the complex interplay between hormones, immune response, and COVID-19 pathology, thereby aiding in the development of personalized therapeutic interventions.

Acknowledgement: Fapesp; CNPq; Capes

Development of new extractive stationary phases for innovative analytical methods to determine Alzheimer's disease biomarkers in biological fluids

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In this study, an innovative fiber-in-tube SPME capillary was developed. To this end, a PEEK tube segment was longitudinally packed with fine fibers (nitinol wires coated with zwitterionic polymeric ionic liquid (Zw-PIL)) as the extraction medium. This capillary was successfully used to preconcentrate A β peptides (potential biomarkers for Alzheimer's disease (AD)) in two different methods and applications: (i) offline fiber-in-tube SPME and UHPLC-MS/MS and (ii) online fiber-in-tube SPME directly coupled to an MS/MS system. The first method (state-of-the-art of new sorbent materials) was applied to estimate the fraction of protein A β peptides binding to human serum albumin (HSA) in cerebrospinal fluid (CSF) and plasma samples (Protein Binding Assays). Approximately 40% and 95% of A β ₄₂ was bound to HSA in CSF and plasma samples, respectively. These results helped to understand the dynamics of these molecules, as potential biomarkers, in the biological system of patients with AD. The second method (fiber-in-tube SPME-MS/MS; state-of-the-art of separation science) was applied to determine A β in CSF samples of two groups: patients with AD and controls (healthy volunteers). The selectivity of the biocompatible fiber-in-tube SPME and the MS/MS system allowed fiber in-tube SPME to be directly coupled to the MS/MS system without the need for chromatographic separation. Compared to control samples, CSF samples from AD patients had significantly decreased A β ₄₂ concentrations and A β ₄₂/A β ₄₀ concentration ratio. The fiber-in-tube SPME-MS/MS method was able to distinguish AD patients from the controls with sensitivity and specificity of 88% and 90%, respectively. In conclusion, the innovative extraction capillary is highly selective for A β peptide pre-concentration. Fiber-in-tube SPME-MS/MS presented more advantages in terms of versatile (can be applied in protein binding assays or high-throughput analysis) and ease to implement in routine analyses compared to immunoassay methods for prognostic purposes.

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Can a context tree model predict the primary motor cortex excitability? An electromyography and electroencephalography robotized navigated transcranial magnetic stimulation study

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Transcranial magnetic stimulation (TMS) is a noninvasive brain stimulation technique. A strong pulse can excite the neurons by an induced electric field in the cortex. The time interval between TMS pulses and the TMS intensity are crucial parameters for brain interventions. Depending on the intensity and the time interval of TMS pulses, applied at the same location, we can evoke distinct brain excitability responses. Studies have been done to optimize the parameters to enhance the reliability of cortical excitability. However, the cortical excitabilities have a high variability across subjects and sessions, and the causes are not fully understood. Reducing the TMS variables, such as coil positioning reproducibility, is a critical component to having a reliable foundation. To increase the TMS reproducibility, we highlight the navigated robotic TMS coil positioning, providing an accurate and reliable placement of the stimulator. Furthermore, new approaches to investigating the brain could help the understating of the cortical excitabilities' mechanisms. Recent studies from the CEPID NeuroMat group have shown that the brain responses to auditory stimuli, given by a stochastic chain, can model the auditory sequence stimuli with the electroencephalography (EEG) signal (HERNÁNDEZ et al., 2021). A stochastic chain with a memory of variable length, also known as context tree models, is a structure of the chains generating the stimuli sequence, in summary, the past stimuli govern the choice of the next stimulus, i.e., we can retrieve the structured stimuli sequence from the physiological data. We hypothesize that the primary motor cortex (M1) can hold a memory from the sequence of TMS pulses driven by a context tree model. Thus, the goal is to develop neurostimulation protocols based on the time interval and TMS intensity, to apply a sequence of TMS pulses driven by a context tree in the primary motor cortex and retrieve the physiological signatures, such as the motor evoked potential (MEP) and EEG response of the TMS protocol.

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Characterization of osteoblast Matrix Vesicles: insights into their role in biomineralization

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INTRODUCTION. Matrix Vesicles (MVs) are calcifying extracellular vesicles that actively participate in bone formation. These bioactive vesicles, with sizes ranging between 100 to 300 nm in diameter, carry lipids and proteins, and play a crucial role in the mineralization process, starting from the initial formation of hydroxyapatite crystals to the subsequent propagation of minerals within the extracellular matrix. **OBJECTIVES:** This study aimed to obtain MV at different stages of growth, and characterize them according to their biochemical and physical chemical Properties, in order to understand their role in the biomineralization process. **MATERIAL AND METHODS:** MVs were isolated from MC3T3-E1 subclone 14 cell line at different time points (7, 14 and 21 days) using differential centrifugation. They were characterized by Dynamic Light Scattering and Zeta potential for their size and surface charge, respectively. The number of vesicles was determined using Nanoparticle Tracking Analysis. Morphology was examined by Transmission Electron Microscopy (TEM), and the surface topography by Atomic Force Microscopy (AFM). The total protein concentration was measured using the Hartree method. Alkaline Phosphatase (ALP) activity was assessed using the pNPPase and ATPase activity assays. In vitro mineralization was evaluated using the turbidity assay and Alizarin Red Staining, followed by mineral characterization using Fourier Transform Infrared spectroscopy (FTIR) and RAMAN spectroscopy. **RESULTS AND DISCUSSION:** Our results showed that the 14-day MVs were smaller, with a lower zeta potential, compared to both the 7-day and 21-day MVs. TEM and AFM analysis revealed that MVs were heterogeneous and spherical, with some differences in their surface roughness. The vesicle concentration was higher on day 14, and the total of protein content was elevated (~50%) in 14-day and 21-day MVs compared to 7-day MVs. ALP median activity was elevated in 21-day MVs. The mineralization capacity was higher in the 21-day MVs; however, it is noteworthy that all MVs produced minerals with a similar composition. **CONCLUSIONS:** In conclusion, our findings provide insights on the dynamic nature of MVs by revealing changes in their size, zeta potential,

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morphology, protein content, ALP activity, and mineralization capacity over a 21-day period. These observations suggest that MVs undergo functional changes during the mineralization process, which can potentially impact their biological roles and interactions within their environment. Understanding the role of MVs in biomineralization holds promise for the development of novel therapeutic applications.

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Metastability in a stochastic system of spiking neurons with leakage

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We consider a finite system of interacting point processes with memory of variable length modeling a finite but large network of spiking neurons with two different leakage mechanisms. Associated to each neuron there are two point processes, describing its successive spiking and leakage times. For each neuron, the rate of the spiking point process is an exponential function of its membrane potential, with the restriction that the rate takes the value 0 when the membrane potential is 0. At each spiking time, the membrane potential of the neuron resets to 0, and simultaneously, the membrane potentials of the other neurons increase by one unit. The leakage can be modeled in two different ways. In the first way, at each occurrence time of the leakage point process associated to a neuron, the membrane potential of that neuron is reset to 0, with no effect on the other neurons. In the second way, if the membrane potential of the neuron is strictly positive, at each occurrence time of the leakage point process associated to that neuron, its membrane potential decreases by one unit, with no effect on the other neurons. In both cases, the leakage point process of the neurons has constant rate. For both models, we prove that the system has a metastable behavior as the population size diverges. This means that the time at which the system gets trapped by the list of null membrane potentials suitably re-scaled converges to a mean one exponential random time.

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Network-based high-level classification for EEG analysis

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In this postdoctoral research we investigate new learning architectures for the classification of sequential patterns, such as Electroencephalogram signals (EEG), infrared spectroscopy, and others. The developed architectures are based on models and measures of Complex Networks. As salient features they are able to consider high-level information of the input data, like structural and topological properties. Unlike most supervised learning techniques in the literature, which are essentially based on the physical features of the input data (e.g., distance, distribution etc.), the high-level classification techniques proposed here exploit the representation of the data into a network (graph) to capture semantic patterns, like the pattern formation for example. To evaluate our techniques we consider the problem of Prognostic of Patients in Coma from their EEG records, which aims to support medical doctors in the identification of the probable outcome of a patient, which can be active (alive), clinical death and brain death, with this last particularly important to organ donation clinical protocols. Extensive experiments considering different formulations of the problem as well as a wide range of techniques for comparison revealed the potential of the proposed high-level architectures, which outperformed even state-of-the-art techniques, like convolutional neural networks. Furthermore, this research paves a way in the investigation of high-level classification based on complex networks for other classification tasks related to sequential patterns.

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Bidirectional genetic selection of behaviors involved in social interaction of Wistar rats and its effect on anxiety and nociceptive tests

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Bidirectional selection is a procedure in which an characteristic is chosen as a selection criterion and animals exhibiting more of this characteristic are bred in one group and animals exhibiting less are bred in another group. The procedure is repeated along generations, resulting in two strains that are opposite in relation to the chosen characteristic. The study aimed at selectively breeding rats exhibiting high or low tendency to socialize by using the proximity test and to analyze possible differences in tests of anxiety and nociceptive. We tested male and female Wistar Hannover rats in a square open field with a communicating cage, containing a co-specific rat on the outside. Subjects that remained more time in front of the cage, interacting with the co-specific rat were bred in a group considered of high sociability (SOC+). Likewise, subjects that remained little time in front of the cage, were bred in a group considered of low sociability (SOC-). In the fifth generation, the rats were tested in the elevated plus maze (EPM) and in the nociceptive von Frey, hot plate and acetone tests. Student's t-test applied to the time spent in the front of the cage showed that SOC+ (293.1 ± 12.6 , $t[47] = 7.745$, $p < 0.001$) spent more time interacting than SOC- (174.0 ± 18.1). In the EPM, SOC+ (129.2 ± 11.1) rats spend more time in the open arms than SOC- (92.2 ± 10.9 , $t[27] = 2.465$, $p = 0.020$). Hot Plate test showed that the SOC-animals exhibited a lower latency (SOC-: 9.5 ± 1.4 - SOC+: 19.17 ± 2.2) than SOC+ ($t[24] = 3.804$, $p < 0.001$). There were no significant differences in relation to the Von Frey test and to the test with Acetone. The results obtained so far reinforce the idea that aspects of social behavior are subject to hereditary transmission. The EPM reinforce the idea that the SOC-animals exhibit a more anxious profile. Finally, regarding the nociceptive tests, the strains not underwent any procedure aimed at increasing or decreasing the animal's sensitivity. Thus, it is possible that this difference found is due to SOC-animals being more anxious, they are also more reactive to strange or slightly aversive stimuli.

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History and ethnography of biomedical approaches to transsexuality in Brazil: clinical medicine, surgery, and genetic biology from the University of São Paulo

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In this presentation, I aim to analyze the historical emergence and contemporary formation of transsexual medicine in Brazil, specifically in the city of São Paulo. I seek to understand the clinical and surgical practices of doctors involved in research and patient care, focusing on individuals who require biomedical support for body modifications during gender transition. I reflect on the intersection of sciences at the University of São Paulo, which, along with the socioeconomic conditions of the region, provided a conducive environment for professionals from the Faculty of Medicine, the Institute of Biosciences, and the Institute of Psychology during the 1960s and 1970s. These historical developments hold significant continuities and discontinuities with the present-day practice of medicine in the health services within the scope of the Unified Health System and the supplementary market. The investigation was divided into two phases. The first phase involved examining medical archives at the Historical Museum “Prof. Carlos da Silva Lacaz”, as well as accessing serial publications in specialized academic journals stored at the Faculty of Medicine, the Faculty of Law, the School of Public Health, and the Institute of Psychology at USP. Additional sources included archives of non-governmental organizations actively involved in LGBTQIA+ rights, the archive of the Court of Justice of the State of São Paulo, the Hemeroteca of the National Library, and newspapers such as *Folha de São Paulo* and *Estado de São Paulo*. Ethnographic research was also conducted in plastic surgery clinics, hospitals, and activism contexts advocating for trans health access. This was complemented by long-term interviews with doctors, patients, and trans activists in São Paulo. In both historical and contemporary emergency scenarios, it is possible to perceive the centrality that the city of São Paulo and its university and health institutions hold at the forefront of the development of surgical techniques, clinical care, and studies on transsexuality in the country. This is reflected in the current migration of patients from different regions of the country to the capital of São Paulo in search of medical care and the circulation of doctors for specialized training in the subject.

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The Portuguese participation in the Seventh International Congresses of Tropical Medicine and Malaria in 1963: the defense in Brazil of the “civilizing mission” of Portugal in Africa in times of decolonization

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This communication proposal aims to address the relationship between Portuguese and Brazilian tropicalist doctors in the context of the struggle for the decolonization of Portuguese territories in Africa, having as an object of analysis the Portuguese participation during the Seventh International Congresses of Tropical Medicine and Malaria, which took place in September 1963 in Rio de Janeiro city. In the early 1960s, the war began against Portuguese colonial rule in Angola and Portugal, increasingly isolated in the UN, was the target of international pressure for not recognizing the principle of self-determination of peoples in its colonies. This period also saw an important inflection point in Brazil's official posture: full support for Lisbon's overseas cause, manifested in the 1950s, gave way to a more critical stance towards colonialism from the government of Jânio Quadros. However, for Salazar's authoritarian regime, which had elected Freyrian Lusotropicalism as the theoretical basis of the foreign policy guided by Lisbon, the realignment of Brazil with Portugal in the colonial question because a pursued objective. Given this scenario – and through the documentation consulted, such as reports and the annals of the aforementioned congress – it is clear that the Portuguese authorities sought to make use of the Seventh International Congresses of Tropical Medicine to defend the Portuguese overseas policy in Brazil. In Rio de Janeiro, the Portuguese delegation, one of the largest at the event, was made up of doctors linked to the Institute of Tropical Medicine, the Institutes of Medical Research in Angola and Mozambique and the Missions to Study and Combat Endemic Diseases in Guinea, Cape Verde, Timor and São Tomé and Príncipe. The call for professionals from overseas, in addition to pointing to the existence of medical services in the colonies, reinforced the rhetoric of the Salazarist regime in defense of the Portuguese State as unitary and pluricontinental.

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This project aims to create a psychological assistance service under the psychoanalytical bias of groups for children and adolescents who present manifestations pointing to a gender divergence in relation to their biological sex, severe depression, aggressive self and hetero violent acts, and, in this way, constitute the most socially vulnerable groups, and, in addition, are users of the Unified Health System (SUS) in cities where there are societies, nuclei, groups linked to the International Psychoanalytic Association (IPA, in English), to recognized psychoanalytic institutions and/or open-air psychoanalysis collectives. The group, as a psychoanalytic clinical work device, aims to facilitate identification processes, creation of social, care, personalized, community and life-promoting ties. Demanding a strengthening of ties between the patient, the service, the territory, the psychoanalysts and their training institutions, with data collection for research. This work in mental health requires an active attitude from the caregiver in recognizing the other in their freedom, dignity and uniqueness. In this sense, psychoanalysis, and consequently the institutions of training, transmission and psychoanalytic teaching are involved in the formation of the citizen subject, that is, in giving access to different ethnicities, social segments, which constitute the Brazilian population. With this, we have the exercise of the psychoanalytical craft extended to the exercise of the ethics of care, in which hospitality, empathy, the analyst's health and the acceptance of diversity stand out.

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Exploring structural breaks in time series analysis of COVID-19 across Brazilian states

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Brazil is among the countries with the highest number of cases and deaths from COVID-19, with more than 37,449,418 cases and 701,494 deaths by May 2023. However, the evolution of the pandemic is not occurring homogeneously in all Brazilian federative units (27 states and one federal district). Using time series methods, this study identifies the number and length of Covid-19 waves in each of the federation's states by identifying the multiple structural breaks in COVID-19 cases, hospitalizations, and deaths for each state between March 2020 and December 2022. By estimating these interruptions and the distinct waves in each state, we assess the heterogeneity in the spread and lethality of SARS-CoV-2.

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The neural nitric oxide synthase is associated with cognitive decline and Alzheimer's disease pathology

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Background: Although Alzheimer's disease (AD) etiology is partially explained by the deposition of aggregated forms of β -amyloid proteins and neurofibrillary tangles in the brain, the process that triggers the deposition of these proteins is still unknown. The neural, endothelial, and inducible nitric oxide synthases (nNOS, eNOS, and iNOS, respectively) may play an important role in AD pathophysiology according to previous studies in animals. Therefore, we aimed to quantify the expression of NOS enzymes in the hippocampus of individuals with AD compared to individuals without the disease and investigate the association of NOS expression with cognition and AD-related pathology. **Method:** We evaluated the expression of the enzymes nNOS, eNOS, and iNOS using immunohistochemistry in the cornu ammonis (CA) and the dentate gyrus (DG) from hippocampi from subjects with pure AD and the sex-matched controls. Cognitive abilities were evaluated using the Clinical Dementia Rating (CDR) and AD pathology using Braak staging for neurofibrillary tangles and the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) for neuritic plaque. We used linear regression to examine the association of NOS with cognition and AD pathology. **Results:** In individuals with AD, nNOS was overexpressed in the CA ($\beta=23.62$, IC95%=5.13;42.10), $p=0.01$) and DG ($\beta=16.76$, IC95%=3.18;0.35, $p=0.01$), while eNOS and iNOS were increased in the CA ($\beta=0.93$, IC95%=0.02;1.84, $p=0.04$; $\beta=0.19$, IC95%=0.09;0.90, $p=0.01$, respectively). Larger nNOS levels were associated with worse cognitive abilities (CA, $\beta=0.24$, IC95%=0.12;0.36, $p<0.001$; DG, $\beta=0.35$, IC95%=0.20;0.50, $p<0.001$), Braak stage (CA, $\beta=0.07$, IC95%=0.03;0.11, $p<0.001$; DG, $\beta=0.10$, IC95%= 0.05;0.15, $p<0.001$), and CERAD (CA, $\beta=0.03$, IC95%= 0.012;0.06; $p=0.004$; DG, $\beta=0.05$, IC95%=0.02;0.08, $p=0.003$). **Conclusion:** The nNOS, eNOS, and iNOS were increased in the hippocampi of subjects with AD. However, only nNOS overexpression was associated with cognitive impairment and AD-related pathology.

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Developing empathy, resilience, and learning styles - Analysis of impacts on medical education after the COVID-19 Pandemic - A national study

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Introduction: Medical practice and the environment where it develops are increasingly complex and structural, political and funding organizations in health remain in constant change. This scenario presents itself as a challenge for today's physicians, who increasingly need to be engaged in issues related to management and leadership, at their most different levels. The formal inclusion of these themes in training is increasingly important, with the organization of axes aimed at reflection on professionalism, ethics in relationships, empathy, resilience, motivation, engagement and leadership. Competency-based training comprises not only the acquisition of technical skills and knowledge - always in context, but mainly of attitudes that develop a professional capable of creating positive bonds throughout his professional career. **Objectives:** Deepen reflections on building empathy in medical students after the COVID-19 pandemic, considering its relationship with resilience and learning styles. **Method:** A national cross-sectional study was carried out, covering medical courses in four regions of Brazil, with students who were studying up to the eighth semester. With quantitative and qualitative methodology, open questions were used with request for narrative of critical incidents. A sociodemographic and academic profile was evaluated, and the Wagnild and Yong Resilience Scales, Kolb's learning styles inventory, the Davis questionnaire - IRI (Interpersonal Reactivity Index), and the Jefferson questionnaire, which measures empathy in the doctor-doctor relationship, were applied. Questionnaire was applied out in person, using QR CODE and the study was evaluated on the Brazil platform. **Results:** 1470 medical students answered the questionnaire, with a mean age of 25 years (18 and 57 years), 63% female. Preliminary analyzes show that 83% of the sample claimed to have a religion, 61% of which said they were practitioners. 42% said they are very spiritual. **Considerations:** Information on aspects of spirituality can be used in planning of interventions that seek greater well-being in academic community, bringing together diverse views on relationships, strengthening the humanities axis throughout the course.

Effect of a digital unguided self-help psychosocial intervention on recovery from depression among older adults in Brazil: the PRODIGITAL-D randomised clinical trial

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Introduction: There is an urgent need to provide scalable solutions to treat depression amongst older adults in poorly resourced settings. The aim of this study was to assess the effectiveness of a digital unguided self-help psychosocial intervention for the management of depression among older adults in Guarulhos, Brazil. **Methods:** It was a pragmatic, two-arm, individually randomised controlled trial with a 1:1 allocation ratio. Older adults (aged 60+ years) registered with 24 participating primary care clinics, identified with depressive symptomatology (9-item Patient Health Questionnaire (PHQ-9) scores ≥ 10) and who use WhatsApp were eligible to participate. A digital self-help psychosocial programme, named Viva Vida, was offered to the intervention arm. A total of 48 audio and visual messages based on psychoeducation and behavioral activation were delivered via WhatsApp over six weeks. Health professionals were not involved. The control arm received a single audio message with information about depression. Both groups received routine primary care. Primary and secondary outcomes were recovery from depression (PHQ-9 scores < 10) at three and five months. **Results:** This study was conducted between September 2021 and September 2022. Of 603 participants (mean age, 65.1 years; 451 (74.8%) women), 527 (87.4%) completed the first follow-up assessment. At three months, 109 of 257 (42.4%) participants who completed the follow-up in the intervention arm had recovered from depression, compared with 87 of 270 (32.2%) participants in the control arm (adjusted odds ratio: 1.56; 95% CI: 1.07, 2.27; $p=0.02$). This benefit was not maintained at the five-month follow-up visit (adjusted odds ratio: 1.02; 95% CI: 0.71, 1.47; $p=0.89$). **Conclusions:** Our results demonstrate the usefulness of an unguided self-help intervention in offering relief from depression that can be integrated into primary care programmes. More research is needed to understand how the intervention can be optimised to maintain benefits in the longer term.

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Serum cytokines associated with lower physical performance in people with post-acute sequelae of SARS-CoV-2 infection

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Around 80% of the patients who had COVID-19 present post-acute sequelae of SARS-CoV-2 infection (PASC) showing symptoms that vary from fatigue and pain to organ lesion/loss of function, and many patients describe a plethora of neurological alterations that markedly compromise quality of life. Objectives: As a derangement in systemic inflammation seems to be involved in the pathogenesis of PSC, our aim was to evaluate a range of cytokines present in the bloodstream and explore any potential associations they might have with physical performance tests in a cohort of 228 participants. These individuals had been admitted to the hospital in 2020 due to acute COVID-19 and underwent a follow-up assessment 5-12 months after their hospitalization. Methods: We divided the participants into three distinct groups: a Control group (n=77), which exhibited infrequent self-reported symptoms during the follow-up evaluation; a Self-Reported Symptoms group (SR, n=97), characterized by the presence of various symptoms like fatigue and muscle weakness; and the Self-Reported Symptoms with Lung Lesions group (SRL, n=54), comprised of patients who reported symptoms simultaneously with diagnosed pulmonary lesions. we aimed to evaluate several circulating cytokines and test if they were associated with physical performance tests in 228 participants, who were hospitalised in 2020 due to acute COVID-19 and came back for a follow-up assessment 5-12 months after hospitalization. Results: A multiple linear regression analysis, accounting for age, sex, and follow-up interval, revealed a moderate predictive capacity of plasma cytokine profiles for the total number of self-reported symptoms observed ($R^2=0.25$). The partial F test yielded a value of 1.94 ($p=0.029$). A negative association was found between interferon ($IFN-\alpha_2$) and the number of symptoms ($p=0.031$, $\beta=-2.51$, CI 95% [-4.78; -0.23]), while interferon gamma Induced protein (IP)-10 exhibited a positive association with symptom count ($p=0.035$, $\beta=3.73$, CI 95% [0.27; 7.19]). Conclusions: $IFN-\alpha_2$ and IP-10 are cytokines associated with changes in physical capacity. PASC represents a debilitating syndrome that requires additional focus, and it is crucial to acknowledge the impact of decreased muscle function as a significant consequence with sustaining effects.

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Effects of elastic tape in pulmonary rehabilitation of COPD – Randomized clinical trial

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Background: Chronic Obstructive Pulmonary Disease (COPD) reduces exercise capacity and health-related quality of life (HRQoL) and induces greater dyspnea on exertion. The use of Elastic Tape (ET) reduces ventilatory demand during exertion. However, whether ET can improve the response to PR is still unknown. **Aim:** To evaluate the effect of ET on physical capacity, health status, anxiety and depression symptoms, and HRQoL outcomes in subjects with COPD undergoing PR. **Methods:** Individuals with COPD were randomized into the ET (elastic tape) and Sham (SH, micropore) groups, the tapes were fixed to the chest wall and abdomen during the PR period. Before and after PR, subjects were assessed in physical capacity (Endurance Shuttle Walking Test – ESWT), health status (CAT), anxiety and depression symptoms (HADS), and HRQoL (CRQ). The PR was performed 2x/week for 8 wk. **Results:** After PR, ET and SH groups showed minimal clinically important difference (MCID) in ESWT time (455 ± 374 vs. 276 ± 298 sec) and distance (577 ± 460 vs. 340 ± 356 m). However, the improvement in exercise capacity in the ET group was, on average, 60% greater. The ET group reached the CAT MCID (-4.43 ± 10.6), it was not observed in the SH group (2.33 ± 3.51). Furthermore, in the assessment of HADS after PR, only the ET group reached the anxiety symptoms MCID (-1.4 ± 3.6 vs. SH 1.0 ± 2.0), although none of the groups reached the MCID in depression symptoms, there was a greater reduction in the ET group (-1.14 ± 4.02) when compared to the SH group (0.33 ± 1.15). Regarding CRQ, SH group reached the MCID in the dyspnea (0.8 ± 0.8) and fatigue domains (1.17 ± 1.59), ET group reached the MCID only in the emotional domain (0.69 ± 1.07). **Conclusion:** The use of ET during PR improves the effects of PR into exercise capacity and contribute to the reduction of disease symptoms and symptoms of anxiety and depression subjects with COPD.

Surviving COVID-19, living with Long-COVID: a one-year study on post-discharge functional disabilities in older adults

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Prêmio Pós-Doc USP

Background: The evolution of the pandemic has spotlighted the extended effects of COVID-19, or Long-COVID. Yet, understanding of the long-term, patient-centered outcomes, especially functional disabilities, remains incomplete. Such comprehension is critical, as it directly impacts patients' quality of life and their ability to regain pre-infection independence. **Objectives:** To investigate the association between Long-COVID and functional disabilities in survivors of severe COVID-19 over a 1-year follow-up. **Methods:** As part of the CO-FRAIL study, this large cohort included patients aged ≥ 50 years who survived hospitalization for severe COVID-19 between March and December 2020. Trained investigators assessed patients every 3 months for 1 year after discharge. We registered data on 16 COVID-19 symptoms at hospital admission and after discharge. Long-COVID was defined as the persistence of ≥ 1 COVID-19 symptom for 2 months post-infection. We also evaluated functional disabilities as the need for help performing 15 basic (ADL), instrumental (IADL), and mobility activities before the infection and after discharge. **Results:** Of 1,830 COVID-19 patients, we included 1,042 hospital survivors (median age=63 years; female=45%). Fatigue, myalgia, dyspnea, cough, and paresthesia were the most common post-discharge symptoms. After 1 year, 34% presented ≥ 1 persistent COVID-19 symptom, and 26% had more disabilities than before infection; 56% of patients were classified as having Long-COVID. In linear mixed models adjusted for sociodemographic factors, comorbidities, and severity of illness acuity, patients with Long-COVID had a higher disability risk in ADL (OR=1.55; 95% CI=1.21-1.98), IADL (OR=1.68; 95% CI=1.40-2.00), and mobility (OR=1.67; 95% CI=1.41-1.97). **Conclusions:** Long-COVID is prevalent in older patients who survived severe COVID-19. Clinicians should be aware of the elevated risk of functional disabilities tied to persistent COVID-19 symptoms, and be prepared to implement robust, long-term care rehabilitation strategies.

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Prospective association of ultra-processed foods consumption and weight gain in young adults at the NutriNet-Brasil cohort study

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Background & aims: few longitudinal studies have been conducted on ultra-processed food (UPF) and weight gain in low- to middle-income countries (LMIC), especially with young adults and with an innovative appropriate instrument to capture UPF consumption. We aim to evaluate the prospective associations between UPF consumption and incidence of 10% or more gain in body mass index (BMI) in Brazilian young adults. **Methods:** the study population are 18–29 years old Brazilians enrolled at NutriNet-Brasil study, an open web-based cohort for volunteers that started enrollment in January 2020. All variables were self-reported. UPF consumption (percentage of caloric contribution in diet) was assessed by two 24-hour food recalls and categorized into quartiles. The participants had 1–3 measures of weight at follow-up. Multivariable cox regression models were performed to examine the association between the exposure and the incidence of 10% or more gain in BMI. Included covariates were sex, age, housing macro-region, years of schooling, goods and services score, skin color, leisure physical activity, smoking, sleep, leisure screen time, alcohol consumption, lower than usual caloric intake and BMI at baseline. Participants who reported pregnancy at any time point of follow-up or who had implausible measurements of weight, height, age, and caloric intake were excluded. **Results:** 2,105 young adults were included in the analyses. With a mean follow-up of 17.2 months, there were 234 outcome cases. The higher the UPF consumption, the greater the chance for weight gain in the adjusted models for the total sample and of women (p -trend < 0.05). Using the first quartile of UPF consumption as a reference, in the last quartile the risk of weight gain increased by 65% for the total sample, and in 72% for women. **Conclusions:** The results confirm the direct relationship between the consumption of ultra-processed foods and weight gain and reinforce the need to implement and/or strengthen public policies that discourage UPF consumption.

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Keratin 6, keratin 16 and keratin 17 expression in early and advanced stage of skin biopsy of cutaneous T cell lymphoma patients

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Primary cutaneous T-cell lymphomas (CTCL) are a heterogeneous group of non-Hodgkin lymphomas that initially manifest in the skin. Mycosis fungoides (MF) is the most prevalent CTCL, and Sézary syndrome (SS) is an aggressive leukemic variant. The advanced form of CTCL is correlated with severe pruritus, a dysfunctional immune system, and chronic skin inflammation. In fact, bacterial infections in immunocompromised patients with advanced-stage CTCL often leads to sepsis and death. Dysfunctional skin barrier are common in CTCL, however, the origins of these changes are still not completely understood. Tumor cells influence and modulate other cells behavior in different ways, e.g., via the secretion of nanovesicles into the extracellular space (sEV). sEV are spherical structures with a lipid bilayer that carry within them a great diversity of bioactive components. sEV can be captured and internalized by other cells, considered mediators of intercellular communication. We have previously shown that sEV derived from the CTCL cell lines are absorbed by keratocytes (HaCaT cells) and incorporated into their cytosol. Gene expression profile of sEV-CTCL-treated HaCaT cells revealed downregulation of molecules related to skin barrier maintenance, stratum corneum formation related genes (STAB1, LCE1E, HRNR and S100A8), pro-angiogenic factors expression (ESM1, VEGF-A/C/D and PGF) and pruritogens (NFG). Moreover, the multifunctional cytoskeletal proteins keratin 6, 16 and 17, which are not commonly expressed in the epidermis under normal physiological conditions but overexpressed in psoriatic lesions were also among the differentially expressed genes in the treated HaCaT cells samples. Our study aims to evaluate the expression of keratin 6, keratin 16 and keratin 17 in paraffinized skin biopsy of CTCL patients (early and advanced stage, n=30) by immunohistochemistry.

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Distribution of energy intake throughout the day and energy contribution from ultra-processed foods in the United Kingdom

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Introduction: Studies suggests that the distribution of energy intake and the types of food consumed throughout the day may influence health. **Objective:** To verify the energy consumption and the contribution of ultra-processed foods (UPF) in three periods of the day in the United Kingdom population. **Methods:** cross-sectional analysis using data from the National Diet and Nutrition Survey (2008 to 2019). Dietary information was collected through a food diary and UPF were identified using NOVA classification criteria. Food consumption data were analyzed according to three periods of the day (from 0 to 11:59 am; 12:00 to 5:59 pm; 6:00 pm to 11:59 pm). The energy percentage (%) contribution of each period and the energy contribution from UPF were calculated in relation to the total daily energy (% of total daily energy) and in relation to the total daily energy from UPF (% of daily energy from UPF). The results were described by age group (4 to 10 years; 11 to 18 years; 19 to 64 years; ≥ 65 years). Statistically significant differences were observed by the non-overlapping of the 95% CI. **Results:** Of the 14,262 participants, 63.4% were adults and 50.9% were female. A higher % of energy was observed in the afternoon (42%), followed by night (36%) and morning (22%). In relation to the % of UPF (% of total daily energy), the highest percentage was observed in the afternoon (24.9%), followed by night (17.9%) and morning (13.4%). The distribution of the % of UPF (% of daily energy from UPF) showed that 25.8% were allocated in the morning, 43.4% in the afternoon and 30.5% in the night. A higher % of energy and from UPF (% of daily energy from UPF) was observed for adults at night (39% and 32.7%, respectively) when compared to the other ages. Regarding the contribution of UPF (% of total daily energy), adolescents had a higher percentage at night (20.5%). **Final considerations:** the results showed that almost 1/3 of total energy and UPF (% of daily energy from UPF) are consumed at night. The results help to advance knowledge about Chrononutrition.

1. Faculdade de Medicina da USP.

Investigation of neuroimaging assessments and current flow modeling as biomarkers of target engagement and predictors of convulsive therapies

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The project's theme stems from the limited understanding of the neural circuits underlying the antidepressant effects associated with treatment and the cognitive effects of convulsive therapies. Magnetic resonance imaging (MRI) can be used to measure phenotypic variations in specific brain circuits that are a unique representation of the interaction between genes and environment and are associated with specific behavioral changes. However, most studies looking at these biomarkers in electroconvulsive therapy (ECT) studies have used only one MRI modality. The use of multimodal MRI can help in the construction of more accurate endophenotypes, which, together with the clinical characteristics, will help in the identification of responders to ECT, which may, consequently, allow to increase the effectiveness of the treatment and reduce the adverse effects. Furthermore, by comparing the effects of ECT with magnetic seizure therapy (MST), it is expected to better elucidate the role of brain changes observed in previous studies, and their relationship with clinical outcomes. To this end, baseline and endpoint MRI scans will be performed in a non-inferiority randomized clinical trial comparing the efficacy of bilateral ECT versus MST in treatment-resistant depressed patients. To date, baseline and endpoint MRI scans have been acquired for 4 ECT patients and 5 MST patients. For this sample, there was no statistically significant difference between groups with regard to gender, age, baseline depression scores, education, and socioeconomic status. For the ECT group, there was a statistically significant increase in the regions of the left hippocampus ($p\text{-FWE} < 0.0001$, $ke = 1005$), right hippocampus ($p\text{-FWE} = 0.0001$, $ke = 1056$) and left anterior insula ($p\text{-FDR} = 0.019$, $ke = 243$) in voxel-level analyses. There were no statistically significant changes for the MST group, nor for the post-treatment > pre-treatment & ECT > MST interaction. The regional analyzes for the ECT group indicated a statistically significant volumetric increase in the following regions: right and left amygdala ($p\text{-FDR} = 0.007$), left ($p\text{-FDR} = 0.007$) and right hippocampus ($p\text{-FDR} = 0.014$), right ($p\text{-FDR} = 0.015$) and left temporal lobules ($p\text{-FDR} = 0.02$) and left entorhinal area ($p\text{-FDR} = 0.018$). There were no statistically significant changes for the MST group.

1. Hospital das Clínicas.

High-intensity interval training (HIIT) versus constant-load exercise (CLE) on the short-acute beta agonist (SABA) consumption and peak-expiratory flow (PEF) in subjects with moderate to severe asthma

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Background: HIIT and CLE reduce dyspnea and fatigue in individuals with moderate to severe asthma; however, the effects of both exercise modalities on medication consumption and lung function in this population are poorly known. **Aim:** To evaluate the effect of HIIT and CLE on SABA consumption and PEF in individuals with moderate and severe asthma. **Methods:** Adults with asthma (n=55), aged between 18–59 years, clinically stable, were screened and randomized to HIIT(n=28) or CLE(n=27). HIIT (30x30 sec) was performed at an intensity of 80–140% of maximum Watts (Wmax), while CLE was performed at an intensity of 60–80% of Wmax. Both were performed for 12 wks, 2x wks, 40min/session. Cardiopulmonary exercise testing, lung function (LF), symptoms were evaluated before and after the intervention with exercise (Ex) CLE or HIIT. SABA and PEF were assessed before (BfEx) and after (AfEx) Ex sessions. **Results:** During the first week of the intervention, no difference was observed in the use of SABA and PEF between HIIT vs. CLE BfEx (307±500 vs. 385±526 mcg and 340±69 vs. 295±87.8; p>0.05). AfEx, patients performing HIIT used less SABA than CLE (42±139 vs. 81±177 mcg; p<0.05). ApEx: HIIT 367(±102) vs. CLE 310(±91) liters, p<0, 05. After the intervention, both groups had controlled asthma (HIIT 16.2(±3.6) and 2.04(±4.0) vs. CLE 17.1(±4.6) and 0.63(±4.6) delta score, p>0.05). LF was unchanged. Peak VO₂ increased in both groups compared to baseline (HIIT 2.0(±2.6) and CLE 2.5(± 2.9) ml.kg.min, p<0.05). **Conclusion:** Both exercise modalities reduced SABA and increased PEF, but HIIT reduced the use of SABA and increased PEF in AfEx, showing that this training model could be used in the pulmonary rehabilitation program.

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Exploring the levodopa-paradox surrounding freezing of gait using levodopa-naïve Parkinson's disease populations

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Background and Objectives: The relationship between dopaminergic treatment and freezing of gait (FOG) in Parkinson's disease (PD) is complex: levodopa is the most effective treatment for FOG, but long-term pulsatile levodopa treatment has also been linked to an increase in the occurrence of FOG. This concept, however, continues to be debated. Here, we compared the occurrence of FOG between a levodopa-naïve PD cohort and a levodopa-treated cohort. **Methods:** This was an observational study. We included levodopa-treated and levodopa-naïve (who had never been exposed to levodopa or any other type of symptomatic dopaminergic pharmacotherapy) PD patients; time since first motor symptoms: 5-years. Assessments took place at home or clinic. Levodopa-treated PD patients were assessed at least 12 hours after the last intake of dopaminergic medication. Disease severity was assessed using the MDS-UPDRS part III. Occurrence of FOG was assessed subjectively (using the new freezing-of-gait-questionnaire) and objectively (rapid turns test and Timed Up-and-Go test). The presence of FOG was compared between the levodopa-treated and levodopa-naïve groups using a chi-square test of homogeneity. We also performed a binomial Firth logistic regression with disease duration, disease severity, location of assessment as covariates. **Results:** Forty-nine treatment-naïve PD patients and 150 levodopa-treated PD patients (median time since first levodopa exposure 5 years; median levodopa-equivalent dose 0.775 g/day) were included. Subjective FOG was more common in the levodopa-treated cohort (n=41, 27%) compared to the levodopa-naïve cohort (n=2, 4%, $p<0.001$). The association between FOG and levodopa treatment remained statistically significant after adjustment for covariates (OR=6.04, 95% CI [1.60, 33.44], $p=0.006$). Objectively verified FOG was more common in the levodopa-treated cohort (n=21, 14%) compared to the levodopa-naïve cohort (n=1, 2%, $p=0.02$), although the association with levodopa treatment was not statistically significant after adjustment for covariates. **Discussion:** We found an association between long-term pulsatile levodopa treatment and an increased occurrence of FOG. Future studies should further explore the role of nonphysiological stimulation of dopamine receptors in generating FOG.

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Gay, bisexual, and other men who have sex with men negotiating pleasure and prevention through HIV pre-exposure prophylaxis (PrEP)

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Of the many arenas where discourses about sexualities intersect, that of HIV prevention discourse can be taken as a field of investigation. This discourse proposes to guide preventive practices, in addition to articulating and producing norms, subjectivities, supposed identities, parameters and guidelines in order to go beyond the exclusively biomedical vision and reach the agenda of the social movement around the AIDS epidemic. Therefore, current policies, based on the concept of combined prevention, advocate integrating structural interventions and new biomedical resources, such as, for example, Pre-Exposure Prophylaxis to HIV – PrEP, to behavioral strategies. PrEP, based on the use of antiretroviral drugs, has the potential to protect populations most vulnerable to infection, which renews the optimism of those who work directly to control the HIV epidemic. In this scenario, the aim of this article is to understand the perceptions, negotiations and tensions regarding the use of PrEP, in the context of combined prevention, by gay men and other men who have sex with men (GB&MSM). This is a qualitative cross-section of a demonstrative multicenter study (Study Combina!), with analysis of semi-structured interviews with 18 users of specialized services in HIV/AIDS in the city of São Paulo/SP. The findings allowed us to observe that the negotiation of the use of PrEP among GB&MSM permeates situations of search for partners, in which different sexual scenes and the use of alcohol or drugs take place. Users gave PrEP the sense of facilitating the negotiation about (non) use of condoms, the offer of follow-up in the health service and the meaning of care for the so-called open relationship. The research broadens the debate on subjective aspects involving HIV prevention among GB&MSM, especially with regard to its management in negotiation situations involving other prevention strategies.

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Impact of obesity, sarcopenia, and sarcopenic obesity on health markers and quality of life in community-dwelling older adult women with frailty

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Frailty is a multifactorial geriatric syndrome featured as a cumulative decline in biological reserves and functional capabilities, predisposing less resistance to stressors and greater vulnerability to multimorbidity, disability and death. Frailty, per se, deals with elevated healthcare costs, fractures, and in-patient/1-year mortality, which increases exponentially if nested with sarcopenia. Despite guidelines for maintaining or increasing muscle mass in older adults, the overlap of sarcopenia and increased body fat, i.e., sarcopenic obesity, is a common and life-threatening condition. To date, there are no studies investigating sarcopenic obesity in frail older adults. Therefore, the present study aimed to compare the impact of obesity, sarcopenia and sarcopenic obesity on functional performance, quality of life, and health markers in community-dwelling older adult women with frailty. This cross-sectional study had ethics committee approval (CAAE: 31958520.4.0000.0068), and the sample size calculated for 102 older adults (≥ 65 years) with frailty (i.e., Fried criteria) allocated into one of three groups: obesity ($n = 34$), sarcopenia ($n = 34$) or sarcopenic obesity ($n = 34$). The project is currently recruiting, and participants have been evaluated for gait speed test, lipid and glucose profile, inflammatory cytokines, quality of life, bone microarchitecture assessed by HR-pQCT, visceral adipose tissue (VAT), body composition and bone parameters measured by DXA. The presence of outliers will be checked, and all variables will be tested for parametric assumptions. In the case of parametric statistics, Generalized Estimating Equations (GEE) will be adopted for independent samples, with Bonferroni's post hoc for multiple comparisons. Data will be expressed as mean (standard deviation, SD), median (interquartile range, IQR), or n (%). The significance level adopted will be a two-tailed P value ≤ 0.05 . Analyses will be performed using the SPSS program (26.0).

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c-JUN and P53 cooperation in β -HPV-38 transcriptional regulation

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While the role of mucosal high-risk HPVs (HR HPVs) in cervical carcinogenesis is well understood, less is known about the cutaneous β -HPVs transforming properties. To become transcriptionally active and express E6 and E7 oncogenes, HPVs essentially require a permissive cellular environment. Particularly, cellular transcription factors (TFs) are essential for determining the fine-tuned magnitude and temporal regulation of viral transcription. The most notable refers to the composition of TFs that directly bind to the non-coding region of the HPV genome, designated as Long Control Region (LCR). It is well known for all alpha-HPV types investigated so far that the activator protein 1 (AP-1) binding at the LCR plays a crucial role in viral transcriptional activation and therefore leads to constitutive expression of E6 and E7. c-Jun is the most extensively studied and the major transcriptional activator of the AP-1 family. The stress response of c-Jun has an important synergistic interaction with p53-regulated pathways, such as DNA repair and cell cycle checkpoints regulation. However, few studies address the role of these TFs upon cutaneous β -HPV transcription. Therefore, we investigated the cooperation of c-Jun with p53 on the regulation of the transcriptional activity of the cutaneous HPVs. The transcriptional activity of HPV-5, -38, and -49 was measured by luciferase reporter assays. Next, we address the question of whether c-Jun and p53 directly interact with HPV-38 LCR by EMSA, DNA-pull-down, and ChIP assays. We found that the ectopic co-expression of c-Jun and p53 resulted in strong activation of the HPV-38 promoter, but not HPV-5 and -49. Furthermore, we demonstrated that c-Jun and p53 interact directly in multiple sites along the HPV-38 LCR. The data presented in this study provide novel insight regarding an interplay between these important cellular players and the cutaneous β - HPV transcriptional status.

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Proteomic approaches to drive advances in the identification of deafness genes products

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Hearing loss (HL) affects millions of people worldwide and has medical, social, and economic impacts, which makes it imperative to seek to understand the pathophysiological mechanisms behind it. Given the difficulty of accessing the human cochlea, is fundamental to use animal models to elucidate the complex underlying gene networks. Advances in mass spectrometry technology have made proteomics a powerful approach to identifying gene products associated with HL, raising the understanding of the genetic disorders that affect the cochlea. Moreover, the knowledge of the numerous proteins involved in hearing physiology and how they are related to the pathophysiology of the different types of deafness can be expanded. Nano LC-MS/MS analysis of mice cochlea (P28) with normal hearing (NH) and with noise-overexposure-induced hearing loss (NIHL) was performed in biological triplicates. Brainstem Auditory Evoked Potential evaluated Hearing and deafness. Statistical analyzes were performed to identify differentially expressed proteins. In silico studies have investigated expression in cochlea, gene ontology, associated human diseases, deafness genes or locus mapped without identified genes. We identified a total 1742 proteins: 1572 in NH and 1606 in NIHL profile, being 1436 proteins common to both. The respective genes have their expression described in the cochlea and 23 are known human deafness genes. 52 proteins showed statistically significant differential expression ($p < 0.05$; 26 downregulated and 26 upregulated in NIHL compared to NH), 21 were exclusive to NH and 10 to NIHL, totalizing 83. Among 83 proteins, 17 have their genes mapped to human deafness locus without an identified gene to date, three of which are associated with human diseases, but not HL. One example is Aldh7a, a multifunctional enzyme that protects cells from oxidative stress by metabolizing a number of lipid peroxidation-derived aldehydes. The proteomic data are robust and demonstrate a rich and diverse work that has the potential for novel deafness genes discovery.

1. Hospital das Clínicas.

The symbiotic effect of a newfangled nutraceutical with yeast beta-glucan, prebiotics, minerals, and *Silybum marianum* (silymarin) – Pre-clinical and clinical trial

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Obesity and diabetes are noncommunicable chronic diseases characterized by increased visceral adipose tissue and sub-acute inflammation. These conditions can lead to insulin resistance, hyperglycemia, oxidative stress, and lipotoxicity as well as the development of metabolic syndrome. The use of natural products and derivatives for the prevention and control of noncommunicable chronic diseases is a way to achieve homeostasis through different metabolic pathways. Thus, male C57BL/6 mice were divided into the following groups: high-fat diet (HFD) vehicle, HFD + Supplemented [containing prebiotics, yeast β -glucans, minerals and silymarin (*Silybum marianum*)], HFD + Supplemented_S, and isolated compounds. The vehicle and experimental formulations were administered orally by gavage once a day over the four weeks of the diet (28 consecutive days). We evaluated the energy homeostasis, cytokines, and mitochondrial gene and protein expression in these groups of mice. After four weeks of supplementation, only the new nutraceutical group (HFD + Supplemented) experienced reduced fasting glycemia, insulin, HOMA index, HOMA- β , dyslipidemia, ectopic fat deposition, and hepatic fibrosis levels. Additionally, the PPAR γ coactivator 1 α (Pgc-1 α), interleukin-6 (IL-6), and interleukin-10 (IL-10) gene expression; and Pgc-1 α , AMP-activated protein kinase-1 α (AMPK-1 α), PPAR γ , and mitochondrial transcription factor A (tFAM) protein expression were augmented. While levels of inhibitor of nuclear factor- κ B kinase subunit α (IKK- α) and p65 nuclear factor- κ B expression (p65NF κ -B), and oxidative markers were recovered. We discovered that the synergic effects of a novel oral supplement formulation were able to improve insulin resistance and hepatic steatosis mainly by regulating IL-6, IL-10, and Pgc-1 α gene expression, and the modulation of proteins involved in mitochondrial biogenesis.

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ASD and ADHD in children: a preliminary study

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Early detection of ADHD symptoms in autistic children can significantly impact the course and prognosis of the disorder. The present study aimed to screen the symptoms of ADHD in autistic children using the Brazilian version of Swanson, Nolan and Pelham rating scale – 4 th (SNAP-IV) applied to 72 parents of children diagnosed with ASD, as well as to assess whether there was a significant difference between children who used words to communicate of those who did not speak any words. The findings revealed a significant frequency in the presentation of symptoms of inattention and of hyperactivity and/or impulsivity, when comparing children who had diagnosis of ASD, but who did not have the symptoms of ADHD. Regarding language, no significant differences were found in this preliminary study. In general, this finding can be considered clinically worrying, especially when considering that the subclinical symptoms of ADHD may overlap in possible interventions.

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Assessment of Calcium Score in the prediction of coronary artery disease in young women with Polycystic Ovary Syndrome

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Polycystic ovary syndrome (PCOS) is considered the most frequent endocrinopathy in women of reproductive age. The presence of insulin resistance (IR) and hyperinsulinemia significantly increase the risk of cardiovascular disease (CVD) in women with PCOS. Studies demonstrate that IR and hyperinsulinemia seem to be the link between PCOS and metabolic changes associated with increased risk of CVD, and susceptibility to coronary heart disease (CAD). The presence of coronary artery calcification (CAC), related to subclinical atherosclerosis, can be quantified resulting in the calcium score (CE). The objective is evaluated the presence of CAC in young women with PCOS. A cross-sectional comparative study will be carried out. The main population group will consist of patients monitored at Clinical Hospital of Botucatu Medical School. Will be included 200 patients aged between 20–40yo. The PCOS group will consist of 100 women with of the diagnostic criteria established by the Rotterdam Consensus. The non PCOS group will consist of 100 women with same age. Exclusion criteria: patients with another endocrine disorders, clinical manifestations or diagnosis of CVD, alcoholics and drug addiction. The selected patients will be submitted to computed tomography (CE) of the heart, without the use of contrast. During image acquisition, CT slices with a thickness of 2.5 to 3.0mm will be performed, limited to the cardiac area, acquired in synchronization with the electrocardiogram. The values obtained from the CE will be classified in absolute values with fixed cutoff points, using the Agatston Method and values adjusted for age, sex and ethnicity and using the MESA tool. The observed results will be recorded in specific protocols and stored in a database developed in a spreadsheet using MS-Excel for Windows. The initial results will be presented in tables.

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Investigation of mother-infant synchrony as a predictor of executive function performance in infants

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Brazil is a country marked by high social inequality, which negatively affects the lives of most of the population. Millions of children are deprived of reaching their development potential due to exposure to environmental risk factors that are associated with medium and, mainly, low socioeconomic status (SES). Babies who develop within a more inclement environment, such as a lack of resources, cognitive and social stimulation, and parental care, are generally of a lower SES level. The first three years of life are fundamental for neurodevelopment, and may directly influence the development of executive functions (EF) and language. Child neurodevelopment and neural maturation trajectories, especially in such different environmental circumstances, still need to be further investigated. The use of technology has helped this investigation over the years, allowing, for example, the assessment of brain activity by measuring the difference in neuronal electrical activity in milliseconds (electroencephalogram, EEG). With constant technological innovations, hyperscanning emerged, a technique that allows recording the brain activity of two or more people simultaneously and has enabled the investigation of different types of social interactions, including the interaction between mother-baby when performing activities together, being excellent to investigate factors that may be associated with neurodevelopment. Therefore, our aim was to investigate how mother-infant synchrony is related to the EF performance of children aged 9 to 15 months and 28 days. Mothers were recorded playing two games with their infants that tested the infants' EF skills while both using EEG and electrocardiogram. Brain activity and movement synchrony analyzes are still in progress and will be related to children's EF performance. The answers found in this study could serve as a basis for future early interventions, working with mothers from an early age on how to strengthen their interactions with their children so that they can increase the chances of having an adequate development.

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Association between positive serology for COVID-19 and Chagas cardiomyopathy progression

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Introduction: Chagas Disease (CD) is a serious public health problem and Chagas cardiomyopathy is the main consequence of the disease. The new coronavirus disease (COVID-19) also affects the cardiovascular system and may worsen Chagas cardiomyopathy. However, the cardiac evolution of patients with CD infected by COVID-19 is not known. Thus, the objective of this study is to assess, within one year, whether there was cardiac progression after COVID-19 in CD. **Methodology:** Longitudinal study with CD patients. The outcome was cardiac progression, considered from the comparison of electrocardiograms (ECGs) performed with an interval of one year. The occurrence of COVID-19 was the independent variable of interest. For each analysis, a final multiple binary logistic regression model was constructed, adjusted for sociodemographic, clinical, and pandemic-related characteristics. **Results:** Of the 404 individuals included, 94 (22.8 %) had positive serology for COVID-19 and 10.9 % had cardiac progression, of which 17.4 and 9 % had cardiac progression in the groups with positive and negative serology for COVID-19, respectively. Among individuals with a previous normal ECG (n=219), 22.2 % and 9.2 % had cardiac progression in the groups with positive and negative serology for COVID-19, respectively. In the final model, positive serology for COVID-19 was the only factor associated with cardiac progression in the group as a whole (OR=2.65; 95 % CI= 1.27–5.53) and for new-onset cardiomyopathy in the group with normal previous ECG (OR=3.50; 95 % CI=1.21–10.13). **Conclusion:** COVID-19 is strongly associated with cardiac progression and new-onset cardiomyopathy in CD.

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2. Faculdade de Medicina da USP.

3. Universidade Federal de São João del Rei.

4. Universidade Federal de Minas Gerais.

5. Hospital Sírio-Libanês.

6. Universidade Estadual de Montes Claros.

7. Secretaria de Estado de Saúde de Minas Gerais.

8. Fundação Oswaldo Cruz.

Mobile app for assessing postural adjustments and balance in elderly: Momentum

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Postural adjustments are triggered by the central nervous system and consist of anticipatory (APAs) or compensatory (CPAs) adjustments to minimize external disturbances, such as when anticipating an impact, or self-induced as during gait initiation. Currently, the study of APA and CPA is restricted to research laboratories due to the need for specific equipment, difficult to handle and the high cost of carrying it out. We present the development and validation of the “Momentum”, a smartphone application tool to evaluate static balance and anticipatory (APA) and compensatory postural adjustments (CPA) in the elderly. This project consists of two studies: The first study was developed during the pandemic and aimed to develop a mobile application to evaluate body displacements in components of human static balance regulation, both at rest and in the face of a predictable disturbance. The second study aims to evaluate the effectiveness of its application in the evaluation of static balance and anticipatory and compensatory postural adjustments in the elderly compared with the gold standard in the literature (force platforms and kinematics). Three test protocols will be performed: static balance evaluation, postural control evaluation against anteroposterior disturbance and postural control evaluation when starting the gait. The evaluations will be applied to healthy elderly and elderly with increased risk of falls. The hypothesis of this work is that a mobile application is an effective way to promote the measurement of center of mass (COM) oscillations, and that records made with the smartphone’s accelerometer, through the Momentum application, are able to assess APAs and CPAs, with validation relative to the gold standard in the elderly population. Thus, this application is expected to provide the potential for accurate and objective assessment of postural control, overcoming cost limitation and taking advantage of the public’s familiarity with smartphone technology and built-in accelerometer.

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Unveiling pro-inflammatory modules in Juvenile Idiopathic Arthritis: transcriptomic profiling of classical monocytes

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Juvenile Idiopathic Arthritis (JIA) is an autoimmune disorder characterized by both systemic and localized bone damage. The presence of bone erosions is a significant indicator of disability, disease severity in JIA. These erosions occur due to persistent inflammation, primarily driven by immune cells. Among these cells, classical monocytes (CD14⁺⁺CD16⁻) are the primary source of osteoclast precursor cells, which play a crucial role in the process of bone resorption. While previous transcriptomic studies have highlighted the significance of CD14⁺⁺CD16⁻ monocytes in arthritis, the specific mechanisms involved in their contribution to JIA pathogenesis remain unclear. Therefore, the objective of this study is to uncover the differential gene expression patterns within CD14⁺⁺CD16⁻ monocytes derived from polyarticular JIA, with a particular focus on their role in the progression of the disease. Twenty-two premenopausal women with polyarticular JIA and twenty healthy subjects were included. Classical monocytes were isolated using a commercial kit and RNA-Seq was performed. Differential expression was carried out using DESeq2 to compare JIA patients with the control group. Differentially expressed genes (DEGs) were identified and gene set enrichment analysis (GSEA) was performed. The significant GSEA pathways and their interconnected shared genes were used to construct a network, and hub genes were identified. We identified 685 DEGs in JIA patients, with 513 up-regulated and 172 down-regulated. GSEA highlighted an overrepresentation of TNF and interferon gamma signaling. Notably, the analysis detected genes and pathways already targeted by JIA therapy but also unveil new immunoinflammatory pathways that will be further explored. Network analysis of the activated GSEA pinpointed PLAUR, CDKN1A, and MAFF as hub genes with potential roles in modulating chronic inflammation in these patients. Moreover, we have identified genes associated with bone erosions in Rheumatoid Arthritis (RA), thereby confirming the shared characteristics between these conditions. Remarkably, when integrating with GWAS results, several genes previously linked to JIA and RA were identified. These findings indicate the pivotal role of immune-inflammation in JIA pathogenesis. Further exploration of our list of gene might reveal genes potential biomarkers or novel therapeutic targets in JIA.

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Effect of oxysterol 7-KC on bone formation

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Cholesterol is a structural component of all cellular membranes. It is easily oxidized by enzymatic or non-enzymatic reactions, being transformed in products known as oxysterols. 7-Ketocholesterol (7-KC) is an auto-oxidation compound produced non-enzymatically. Oxysterols have action in different pathophysiological processes. We proved that 7-Ketocholesterol favors the osteogenic differentiation in mesenchymal stem cells, revealing an early osteogenic gene expression. The goal is to demonstrate that 7-Ketocholesterol is able to promote bone formation in vivo experimental model. Some evaluated parameters will be newly formed bone area (primary outcome), bone volume fraction (BV/TV) and bone mineral density using micro-CT analyses. The secondary outcomes comprise the hepatic and renal toxicity of 7-KC to ensure the compound safe, and quantification of bone biomarkers and metalloproteinases to understand the bone dynamic in the 7-KC presence. All analyses will be performed in a blinding condition. The normality and homogeneity will be checked before the parametric statistical tests, having significant level of 5% and error β of 20%.

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Seroprevalência de infecção por *Leishmania* spp. e quantificação parasitária na reativação entre os pacientes reumatológicos - Um estudo prospectivo

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Leishmaniasis is a neglected parasitic disease with a worldwide geographic distribution. It has multiple clinical forms, from isolated cutaneous involvement, to destructive mucosal forms and life-threatening too. There is no prospective study in Brazil of prevalence of leishmaniasis in rheumatologic patients and the effect of immunosuppression on the evolution of asymptomatic infection and parasitemia by *Leishmania* spp., among endemic species in Brazil. The primary objective of the study is to evaluate the seroprevalence and parasitemia in this specific group of patients from July 2022 to January 2022. The secondary objective is to evaluate the occurrence and time of clinical and laboratory reactivation of Leishmaniasis in rheumatologic patients in follow-up at the rheumatology undergoing immunosuppressive treatment with immunobiologicals outpatient clinic of Clinical Hospital of FMUSP. The evaluation will be through collection of peripheral blood sample (10 mL) in a dry tube for serology among all immunobiological candidates in the pre-immunobiological period that will be selected through a questionnaire to collect epidemiological data (travel, living in endemic regions, contact with infected vectors); clinical data (age, type of immunobiologicals, duration of immunosuppression, time from diagnosis of the rheumatological disease to the beginning of the use of the immunobiological, time of occurrence of the event (disease or reactivation), severity or form of presentation of the disease – (cutaneous, mucocutaneous and visceral), treatment of Leishmaniasis, time of suspension of immunosuppression in the diagnosis and treatment of Leishmaniasis, clinical outcomes (cure, rheumatologic disease decompensation, and death). The serological methods used for leishmaniasis, ELISA and IFI, will be performed at the Seroepidemiology Laboratory of the Instituto de Medicina Tropical da FMUSP (LIM 38). All patients with positive serology for *Leishmania* spp. perform PCR for DNA detection and speciation of the parasite in the post-immunobiological. All will be followed up with regular visits according to the institution's pre-established protocol for patients using immunobiological for 5 years. In the post-immunobiological period, the molecular methods will be performed in the laboratory of Parasitology – LIM

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46. There are no published studies that define a specific protocol for monitoring and follow-up of individuals positive for *Leishmania* infection in the post-immunobiological period. Therefore, the present study will use the protocol defined for rheumatologic patients using immunobiologicals infected by *Leishmania* spp., following: monthly for the first 2 months, every 3 months from the third to the sixth month, and every six months at the end of the fifth year of post-immunobiological. If immunosuppression intensifies, it will be at any time. Exploratory data analysis will include mean, median, standard deviation and variation for continuous variables and frequency and proportion for categorical variables. Comparison between groups will be performed using Student's t test or Mann-Whitney test for continuous variables and Pearson's chi-square test or Fisher's exact test for categorical variables, when appropriate. Outcome curves according to the presence or absence of the use of anti-TNF immunobiologicals will be constructed using the Kaplan-Meier method and compared using the Mantel log rank test. The time will be calculated between the start date of immunobiological use and the outcome date. Values of $p < 0.05$ will be considered significant.

Inovações metodológicas no campo da prevenção ao HIV: proposição de metodologia qualitativa interseccional

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Estudos qualitativos oportunizam abordagens compreensivas. De maneira geral, a pesquisa qualitativa em saúde agrega uma série de tradições em pesquisa, partilhando o pressuposto básico de que todos os fenômenos do humano devam ser analisados a partir da atribuição de significados às coisas e às pessoas em seus diferentes contextos de interações sociais. Porém, de acordo com Taquette & Minayo (2016), as pesquisas qualitativas em saúde vêm apresentando algumas limitações importantes, expressas em artigos publicados no Brasil. Apesar das dificuldades impostas, especialmente na Saúde Coletiva, tem-se em mente o pressuposto de que elementos metodológicos, contextuais e compreensivos oportunizados pelos estudos qualitativos são fundamentais para a elaboração de políticas públicas voltadas à prevenção de HIV. Além da importância da combinação de diferentes abordagens metodológicas para as pesquisas no campo da saúde. Nesse sentido, evidências científicas qualitativas produzidas sobre escolha, acesso e utilização dos métodos de prevenção ao HIV, além de interrelações entre diferentes atores sociais e serviços de saúde, contribuem como apoio para elaboração de documentos norteadores de políticas públicas de prevenção ao HIV/Aids. Esta pesquisa tem como objetivo geral analisar o componente qualitativo de um estudo de coorte multicêntrica (2016 a 2021) e as potencialidades da utilização da metodologia qualitativa no campo da prevenção ao HIV. Foi realizada uma revisão integrativa da literatura de pesquisas realizadas no campo de conhecimento em prevenção ao HIV com abordagem metodológica qualitativa e que tenham interface com o referencial teórico da interseccionalidade.

1. Faculdade de Medicina da USP.

Depression, stress, and anxiety trajectories during the COVID-19 pandemic: a longitudinal study

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Evidence indicates most people were resilient to the impact of the COVID-19 pandemic on mental health. However, evidence also suggests the pandemic effect on mental health may be heterogeneous. Therefore, we aimed to identify groups of trajectories of common mental disorders' (CMD) symptoms assessed before (2017–19) and during the COVID-19 pandemic (2020–2021), and to investigate predictors of trajectories. We assessed 2,705 participants of the ELSA-Brasil COVID-19 Mental Health Cohort study who reported Clinical Interview Scheduled-Revised (CIS-R) data in 2017–19 and Depression Anxiety Stress Scale-21 (DASS-21) data in May–July 2020, July–September 2020, October–December 2020, and April–June 2021. Group-based trajectory modeling was used to identify CMD trajectories and adjusted multinomial logistic regression was used to investigate predictors of trajectories. Six groups of CMD symptoms trajectories were identified: low symptoms (17.6%), low-decreasing symptoms (13.7%), low-increasing symptoms (23.9%), moderate-decreasing symptoms (16.8%), low-increasing symptoms (23.3%), severe-decreasing symptoms (4.7%). The severe-decreasing trajectory was characterized by age < 60 years, female sex, low family income, sedentary behavior, previous mental disorders, and the experience of adverse events in life. In conclusion, more than half of the sample presented low levels of CMD symptoms. Predictors of trajectories could be used to detect individuals at-risk for presenting CMD symptoms in the context of global adverse events.

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Evolution of workforce density in rehabilitation in Brazil

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Introduction: The rehabilitation workforce represents a significant factor within healthcare systems. Investing in this sector strengthens the healthcare system, generates employment, and contributes to economic growth, resulting in increased investments in this field and providing numerous benefits to the healthcare sector. **Objective:** To identify the percentage evolution of workforce density in rehabilitation in Brazil from January 2010 to December 2022. **Methods:** Workforce density in rehabilitation was calculated by summing the number of hours worked per week divided by 40 hours per week for each year studied and then calculated per 10,000 inhabitants. The percentage evolution was identified for each profession in Brazil from January 2010 to December 2022, including physiotherapy, speech therapy, occupational therapy, and psychologists with ties to the Unified Health System (SUS). The levels of healthcare considered were primary healthcare, specialized healthcare, and hospital care. **Results:** There was a percentage increase for all professions included in this study across the three levels of healthcare in the SUS. In primary healthcare, the increase was 139.27% for physiotherapists, 52.51% for speech therapists, 46.13% for occupational therapists, and 101.81% for psychologists. In specialized healthcare, the increase was 90.22% for physiotherapists, 59.54% for speech therapists, 41.00% for occupational therapists, and 92.71% for psychologists. In hospital care, the increase was 252.81% for physiotherapists, 154.57% for speech therapists, 37.43% for occupational therapists, and 113.91% for psychologists. **Conclusion:** The rehabilitation workforce from January 2010 to December 2022 expanded across the three levels of care. The highest percentage increase for physiotherapists, speech therapists, and psychologists occurred in hospital care, while for occupational therapists, it was more significant in primary healthcare.

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Predictors of survival after stereotactic radiosurgery for untreated single non-small cell lung cancer brain metastases: 5- and 10-year results

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BACKGROUND: Stereotactic radiosurgery (SRS) presents as a good treatment option for smaller, deep-seated brain metastases (BMs). This study aims to determine predictors of SRS failure for patients with non-small cell lung cancer BMs. **METHODS:** This was a retrospective study of single non-small cell lung cancer BMs treated using SRS. We included patients >18 years with a single, previously untreated lesion. Primary outcome was treatment failure, defined as BMs dimension increase above the initial values. Demographic, clinical, and radiological data were collected to study potential predictors of treatment failure. **RESULTS:** Worse rates of progression-free survival (PFS) were associated with heterogeneous contrast enhancement (18.1 4.1 vs. 41.9 4 months; $P < 0.001$). Better rates of PFS were associated with volumes $<1.06 \text{ cm}^3$ (log-rank; $P [0.001]$). Graded prognostic assessment was significantly associated with survival at 120 months (log-rank; $P < 0.001$). Karnofsky Performance Scale was evaluated in 3 strata: 90e100, 80, and £70. Mean survival rates for these strata were 31.8 3.9, 10.6 2.2, and 9.8 2.3 months, respectively (log-rank; $P < 0.001$). There were no differences regarding presence of extracranial metastases, age, or lesion location. A multivariable logistic regression found that volume $<1.06 \text{ cm}^3$ was associated with higher survival rates at 10 years (odds ratio: 3.2, 95% confidence interval: 1.3e8.0). **CONCLUSIONS:** Contrast-homogeneous metastases and lesions $<1.06 \text{ cm}^3$ are associated with better rates of PFS. Karnofsky Performance Scale and graded prognostic assessment were associated with more favorable survival rates after 10 years. Volume $<1.06 \text{ cm}^3$ was the only significant predictor of survival in the multivariable analysis.

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Physical activity or sedentary behavior: which one is more important for clinical control of moderate to severe asthma?

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Background: Physical activity and sedentary behavior are distinct treatable traits that may impact asthma control differently, but this remains poorly known. **Aim:** To evaluate the influence of physical activity and sedentary behavior separately or in combination on clinical control in adults with asthma. **Methods:** This cross-sectional bicentric study included 426 individuals with moderate-to-severe asthma. Assessments included: physical activity and sedentary time (Actigraphy), clinical asthma control (Asthma Control Questionnaire-ACQ), quality of life (Asthma Quality of Life Questionnaire), anxiety and depression symptoms (Hospital Anxiety and Depression Scale), anthropometric data, and lung function. Participants were grouped by steps/day and sedentary time. **Results:** Participants who walk $\geq 7,500$ steps/day present better ACQ scores than those who walk less ($p < 0.05$), independent of sedentary levels. The percentage of controlled asthma was higher in active/sedentary (43.9%) and active/non-sedentary (43.8%) groups compared to inactive/sedentary (25.4%) and inactive/non-sedentary (23.9%) ($p < 0.02$). The likelihood of having uncontrolled asthma according to the treatable traits: physical inactivity (Odds Ratio [95% CI]: 2.36 [1.55–3.59]), anxiety (2.26 [1.49–3.42]), and depression (1.95 [1.28–2.95]) was significant ($p \leq 0.002$) while obesity and sedentary lifestyle were not significant. **Conclusions:** More than 7,500 steps/day is associated with better asthma control independent of sedentary time in adults with moderate-to-severe asthma. Physical inactivity, anxiety, and depression symptoms also have higher odds of uncontrolled asthma. Behavioral interventions should prioritize reaching $\geq 7,500$ steps/day than reducing sedentary time.

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Influence of brain dead donors with estradiol treatment on lung primary graft dysfunction

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The available treatment in advanced lung diseases is lung transplantation, with most grafts coming from individuals in brain death (BD). The etiology and BD per se affect organ viability for transplant recipients, with the lung being one of the organs most affected by BD repercussions. These generate hemodynamic instability, immunological and inflammatory changes, which are the result of pituitary failure. The effects of BD together with ischemia and reperfusion, inherent to transplant, are determining factors to the success of transplant and development of primary graft dysfunction in patients. Clinical studies highlight that the combination of female donors with male recipients presents a higher risk of transplant outcome. Where female sex is possibly associated with the development of primary graft dysfunction. Experimental studies indicate that the differences between donors in BD occur due to the resulting pulmonary inflammation, with females showing a more exacerbated inflammatory response than males, which may generate greater post-transplant repercussions. Female sex hormones, especially estradiol, are considered pulmonary protection factors in cases of trauma/sepsis. Thus, in the case of BD, they are pointed out as one of the factors responsible for sexual dimorphism. Since, in BD models, after the loss of the hypothalamic-pituitary-ovarian axis, such protection is lost in females. Previous studies by the group indicate that treatment with estradiol attenuates pulmonary inflammation after the establishment of BD, possibly exerting long-term effects. Thus, in the present study, we intend to evaluate the repercussions of a treatment with estradiol in the lungs of donors of both sexes undergoing BD after lung transplantation. Thus, it will be possible to understand if the reduction of lung inflammation in treated donors with estradiol reflects positively in the primary graft dysfunction, mechanisms involved and lung transplant.

1. Instituto do Coração; Faculdade de Medicina da USP.

Health care for people and population groups in a situation of vulnerability: contributions from the theoretical frameworks of vulnerability, care, recognition, and the rights-based approaches to health to face health inequities

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Historical legacies of the founding modes of differentiation and hierarchization of Western modernity pose challenges to the field of Collective Health. The articulation of the concepts of Vulnerability, Care and Recognition can contribute to the confrontation of health inequities experienced by people and groups in vulnerable situations, understood as avoidable, unfair, and unnecessary. Thus, we seek to contribute to the reconstruction of health practices, reorienting the organization of care, work, communication, and health education. The framework of Vulnerability guides the construction of health situation analysis, characterizing the social and political determinants of the processes and relationships that make up the distribution of injuries and undesirable health outcomes, while the concept of Care indicates more suitable knowledge and practices in response to the unique needs of individuals and groups, entangling biomedical, social science and humanities knowledges with practical knowledge of users and professionals. In dialogue with Honneth's Theory of Recognition, we understand the processes of vulnerability in health as resulting from processes of (non)recognition, or disrespect thus placing the need to guarantee Public Care – a set of policies, services, and actions derived from the identification of situations of disrespect, to provide means of overcoming them. In this way, we bet on the construction of regulations based on human rights, understanding them as “a set of ‘desires’ laden with (healthy) contradictions: about the individual protected by the State and from the State; on rights to equality and difference; specificity and universality”. We therefore propose the adoption of rights-based approaches to health, by guaranteeing the principles of human rights – non-discrimination; availability, accessibility, acceptability and quality of information and services; informed decision-making (respect for autonomy), privacy and confidentiality, participation, responsibility/accountability – across the entire public policy cycle (diagnosis and situation analysis, planning and design, deployment/implementation, and monitoring and evaluation).

1. Faculdade de Medicina da USP.

Fatores associados a recuperação da mobilidade em pacientes oncológicos sobreviventes da Unidade de Terapia Intensiva

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Introdução: As neoplasias malignas são uma questão de saúde pública em todos os continentes. No Brasil, para o triênio 2020–2022 são esperados 625 mil casos novos de câncer. De acordo com a GLOBOCAN, ocorreram cerca de 10 milhões de mortes relacionadas ao câncer em 2020. Durante internação na unidade de terapia intensiva (UTI) os pacientes com câncer apresentam maior risco de morte em comparação aos pacientes sem câncer, apesar disso, entre 40% e 70% dos pacientes críticos oncológicos recebem alta da UTI para enfermaria e são considerados sobreviventes de seu estado crítico. Durante o processo de reabilitação desses pacientes há estímulos a recuperação da mobilidade, como ficar sentado, atingir o ortostatismo e alcançar a deambulação. Estudos já demonstraram que a mobilidade de pacientes com câncer pode melhorar entre a admissão do UTI e alta hospitalar, porém é do nosso conhecimento, que os fatores associados a recuperação funcional na população oncológica não são bem documentados. **Objetivo:** Analisar os fatores associados a melhora da mobilidade de pacientes com câncer após alta da Unidade de Terapia Intensiva do Hospital do Câncer I do Instituto Nacional de Câncer (HCI/INCA). **Metodologia:** Estudo de coorte prospectiva. Será estudada a população total de pacientes com câncer que receberam alta da UTI do HCI entre 1 de janeiro de 2023 e 31 de dezembro de 2023. O nível de mobilidade será avaliado à beira do leito através da ICU Mobility Scale (IMS), índice de Barthel (IB) e do teste de sentar e levantar de 30 segundos (TSL30). Após 3, 6 e 12 meses de alta hospitalar o nível da IMS, IB e a TSL30 serão reavaliados. As variáveis clínico-patológicas, sociodemográficas, dados sobre a internação serão coletadas de informações disponíveis no prontuário eletrônico (INTRANET) ou no prontuário físico hospitalar. Será realizada análise descritiva por meio das medidas de tendência central e de dispersão e frequência absoluta e relativa. Para as associações, será utilizado regressão logística e regressão de Cox univariada e múltipla. Os cálculos serão realizados por meio do software SPSS.

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Impact of interleukin-6 receptor blockade on acute response to exercise on insulin sensitivity and muscle glucose uptake in patients with rheumatoid arthritis

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Background: The interaction between IL-6 blocking agents and insulin sensitivity in patients with rheumatoid arthritis (RA) is unknown. This study aims to investigate the acute effect of exercise on insulin sensitivity in RA patients treated with tocilizumab, a humanized monoclonal antibody against the IL-6 receptor. **Methods:** We are recruiting women (≥ 18 years old) diagnosed with RA ($n_{\text{target}}=20$) and healthy controls ($n_{\text{target}}=10$) for an acute session of aerobic exercise. Patients with RA are divided into two subgroups according to pharmacological treatment (anti-IL-6 or anti-TNF drugs). Acute response of insulin sensitivity following exercise is assessed by the hyperinsulinemic euglycemic clamp. Glucose metabolized by the whole body (M-value) is calculated as the mean rate of glucose infusion measured during the steady state (expressed as milligrams per kilogram per minute). The M-value is commonly used as an indicator of whole-body insulin sensitivity (higher M-values indicate greater insulin sensitivity). **Results:** To date, 17 patients completed the protocol. On average, they were 58.6 ± 5.0 years old and had a body mass index of 28.2 ± 5.0 kg/m². Nine participants were using the anti-IL-6 drug and eight were using an anti-TNF drug. The M-value was 4.87 ± 1.40 mg/kg/min for the anti-IL-6 group and 4.01 ± 1.29 mg/kg/min for the anti-TNF participants. **Conclusion:** This study is currently ongoing and preliminary results show no difference on M-value in the anti-IL-6 group compared to the anti-TNF group. Further analysis and completion of the study will provide a more comprehensive understanding of the relationship between IL-6 blockade, exercise, and insulin sensitivity in RA patients.

1. Faculdade de Medicina da USP.

Gastric bypass improves gut hormone responses and insulin sensitivity, but does not modulate inflammatory markers after acute exercise training in women with severe obesity

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Aim: To investigate the effects of gastric bypass on gut hormone responses, glucose metabolism, and inflammatory markers after an acute exercise session in adult women with severe obesity. **Methods:** Thirteen women aged 37 ± 7 y (BMI: 47.6 ± 5.6 kg/m²) performed a single exercise session consisting of seven strength exercises for major muscle groups and 30 minutes of moderate-intensity treadmill running before and 3 months after gastric bypass. Body composition (dual-energy X-ray absorptiometry), aerobic capacity (ergospirometry test: relative VO₂ peak), and muscle function (one-repetition maximum test) were assessed before and 3 months after bariatric surgery. Blood levels of gut hormones (ghrelin, GIP, GLP-1, PP and PYY; Luminex xMAP), inflammatory markers (INF γ , IL-1 β , IL-1ra, TNF α , MCP1, IL-6, IL-8, IL-17A, IL-4 and IL-10; Luminex xMAP), glucose (colorimetric enzymatic assay), and insulin (electrochemiluminescence) were measured before (12-hour fasting), immediately after the exercise session, and after 30 minutes of recovery, before and 3 months after gastric bypass. **Results:** Body weight (-20%, $P < 0.001$), BMI (-19%, $P < 0.001$), fat mass (-27%, $P < 0.001$), and fat-free mass (-10%, $P < 0.001$) were reduced 3 months after gastric bypass. Surgery also reduced muscle function in the lower limbs (-30%, $P < 0.001$) and upper limbs (-35%, $P < 0.001$), but improved aerobic capacity (21%, $P = 0.006$). By analyzing the area under the curve (AUC) of each blood marker, we observed that gastric bypass induced reductions in PP (-52%, $P = 0.046$), GIP (-30%, $P = 0.078$), and insulin (-57%, $P = 0.046$), and increases in GLP-1 (511%, $P = 0.007$), and PYY (2165%, $P < 0.001$). No significant difference was observed in the AUC of inflammatory markers, glucose, and ghrelin ($P > 0.05$). **Conclusion:** In women with severe obesity, gastric bypass was able to promote important changes in gut and hormonal responses (i.e., decreased PP and insulin; increased GLP-1 and PYY) after acute exercise. These results suggest that surgery may enhance acute metabolic adaptations to exercise, which may translate into chronic benefits for the patient.

1. Hospital das Clínicas.

2. Escola de Educação Física e Esporte da USP; Faculdade de Medicina da USP.

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4. Faculdade de Medicina da USP.

Determination of fosfomycin resistance uropathogens isolated from patients attended in Primary Care Units (PCU) and comparison of disk-diffusion (DD) and agar dilution methods

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Background: Urinary tract infections (UTI) are common bacterial infections and the empirical use of oral fosfomycin in the community is increasing. To determine the main uropathogens, we evaluated the results of cultures obtained from patients attended in 34 PCUs. **Methods:** Urine culture data were obtained from January to December 2021. Microbial identification and susceptibility testing were performed by BD Phoenix system and RESIST-3® Coris BioConcept were done for carbapenemases detection. Fosfomycin disk-diffusion method was compared to agar dilution. Epidemiological and clinical data were evaluated, and a database was built using EpiInfo. **Results:** A total of 56,949 urine cultures were performed in 2021. Positive results were detected in 12.9% from 6,033 patients (87.3% women; average age 49.3; median 50). Among 7,264 positive cultures 61.4% showed growth of *E. coli*, 8.6% *K. pneumoniae* and 8% *E. faecalis*. A total of 1.1% fosfomycin-resistant bacterial isolates were obtained from different patients. *K. pneumoniae* was identified in 38.75% and *E. coli* in 30%. 22.5% Enterobacterales were resistant to at least one carbapenem, 10% KPC-type carbapenemase and 12.5% ESBL positive. Fosfomycin MICs varied from 0.25 to 256 µg/mL. Only 8.75% of major errors were found in DD fosfomycin. 1,917 single-dose sachets of oral fosfomycin were prescribed in all PCUs (average 161.5/month). Seven (8.75%) fosfomycin-resistant isolates were detected at Alvarenga PCU, where 8.4% sachets were dispensed. Among 44 patients who answered a questionnaire, 68.2% reported recurrent UTI and 50% used antimicrobials in the last 6 months. **Conclusions:** *E. coli* is still the most frequent uropathogen and carbapenem's resistance can be detected in PCU. Screening for fosfomycin resistance can be done by DD, a good and simple technique. Fosfomycin-resistance is uncommon, and it can still be used for UTI treatment in Brazilian PCUs.

1. Universidade de São Paulo.

2. Centro Universitário Faculdade de Medicina do ABC.

3. Secretaria Municipal de Saúde de São Bernardo do Campo.

Perspectives on the mental health of adolescents and young people: preliminary readings

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Three months ago, I entered the postdoctoral program with the project: Mental Health of adolescents and young people (A&J): interfaces between care, emancipation, and health education, linked to the Thematic Project “Youth vulnerabilities to STI/HIV and to dating violence: evaluation a human rights-based psychosocial intervention”. My project proposes to analyze barriers and identify potentialities for the construction of actions, in the field of mental health, and prevention practices and promotion integrating health services and school. As a researcher, I am responsible for conducting a part of the health field. Until now, I did observation, interviews with health professionals and with the A&J who access or not the UBS. One of the first findings is the lack of a municipal health care policy for A&J, and the absence of specific programs aimed at promoting health and preventing illnesses and other injuries. The professionals interviewed, said that it is a challenging to access the A&J, given the particularities of their age. They point out that the A&J usually access the service in occasional situations of illness – viral syndrome; vaccination; and/or to seek a contraceptive method at the beginning of sexual experiences. Few use the service as a means of clarifying doubts regarding diseases, prevention and/or guidance on sexuality. They indicate an increase in mental health demands, associating the pandemic experience with the increase in psychological suffering of A&J and socioeconomic factors – low income, little access to courses, professional activities, culture, and leisure. The A&J point out that they know that there are many demands to be met at the UBS, and that when they have doubts about their health, they use to talk to a closer family member – mother, sister – or access the internet – google, websites, or chat with friends. When they need to use the UBS, they contact the community health agent. They indicated that they would like a space that could welcome them for dialogue and sharing, mainly about Mental Health conditions. These are some of the preliminary findings, on which we will deepen the analyzes and weave proposals for feasible actions to the public health and school contexts.

1. Faculdade de Medicina da USP.

Exploring health care concepts for adolescents and young people

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This work analyzes the understanding of adolescents and young people about a health care approach. The study is part of an intervention–research focused on producing a comprehensive prevention model for the promotion of sexual and reproductive health, mental health and STI/HIV and Covid prevention. A qualitative research was carried out in a peripheral community located in the southeastern zone of the city of São Paulo. The methodological instruments used were the observation of daily care and external activities of a basic health unit, interviews with 19 workers and interviews with 11 young people between 16 and 23 years old, residents of the region. Adolescents and young people consider that the core of a health care approach aimed at these social groups is welcoming. The open posture, receptivity, respect and dialogue in the young–professional interaction were highlighted. The humanized service must occur from the reception. Comprehensive dialogue is considered fundamental for building care practices that cover issues related to age experiences, especially in the post–covid pandemic context. They scored as health needs: sexuality, involving both the prevention of STIs and teenage pregnancy, and the construction of gender and sexual identities, and mental health, with the effects of social isolation. Adolescents and young people recognize the challenges posed by the underfunding of the public system, such as deficits in professionals and units of primary care services in view of the demands of the general population. Youth attendance at health services involves the development of a care approach that recognizes both the protagonist participation of adolescents and young people and aspects of youth cultures and situations, in order to contemplate intersections of gender, sexuality, life context and race/ color.

1. Faculdade de Medicina da USP.

Effect of exercise training on Treg cell response in severe COPD individuals: a randomized and controlled trial

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Exercise capacity has an important role in the immune response in healthy and chronic obstructive pulmonary disease (COPD) subjects. Clinical and experimental studies have demonstrated that COPD induces an imbalance in the T helper (Th)17/regulatory T(Treg) that contribute to a failure of inflammation control. Also, the imbalance in Treg subtypes plays a key role in COPD progression. Aims: To evaluate the effect of exercise training on Th17/Treg responses, Treg phenotypes differentiation, and clinical symptoms in COPD individuals. Methods: COPD individuals with severe COPD were randomized to Control (CG, n=21) or Exercise groups (EG, n=19). The EG underwent 24 exercise sessions (3/week, 60min/session) while the CG had no intervention. Exercise training included aerobic (50–80% of HRmax) and resistance training (50–70% of 1RM). T cell subsets and systemic inflammatory cytokines (IL-17, -10, IFN- γ) were assessed by flow cytometry. Also, peripheral muscle strength (1RM), quality of life (CRQ), and dyspnea symptoms (mMRC) were assessed. Results: After the intervention, the EG presented an increase in the total ($p=.02$) and resting Treg frequencies ($p<.01$). The increase in IFN- γ +CD8+cells ($p=.001$) and a reduction of Th17 cells ($p<.01$) and IL-10+CD4+cells ($p=.005$) was observed in the EG. EG also presented an improvement in the CRQ ($p=.003$) and the muscle strength ($p<.01$). At last, a moderate linear association between Th17 and Treg response ($r=-.62$; $p=.05$) and between pro-inflammatory Tregs and mMRC ($r=.64$; $p=.06$) was observed in the EG. Conclusion: Exercise training improves the balance between the pro- and anti-inflammatory T cell subsets and improves peripheral muscle strength and quality of life in severe COPD individuals.

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1. Faculdade de Medicina da USP.

NHE3 and SGLT2 proteins comigrate in native electrophoresis as part of a protein complex in kidney

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Gliflozins, a novel class of selective inhibitors of Na⁺-glucose cotransporter type 2 (SGLT2), have been demonstrated to improve cardiovascular health in heart failure patients even in the absence of diabetes. We have recently shown that chronic empagliflozin treatment in nondiabetic heart failure rats was able to inhibit Na⁺/H⁺ exchanger-3 (NHE3), the most important Na⁺ reabsorptive route in the proximal tubule, an effect that was associated with correction of edema in these animals. Nonetheless, the underlying mechanism by which gliflozins affect NHE3 activity remains elusive. Protein-protein interaction studies led us to hypothesize that NHE3 and SGLT2 might be indirectly associated with each other through the accessory proteins MAP17 and PDZK1, thus forming a complex that might be affected by gliflozins. We took advantage of blue-native PAGE (BN-PAGE), a polyacrylamide gel electrophoresis experiment that enables the conservation of native protein-protein interactions by not using denaturing detergents. As expected for proteins comprising a same complex, part of NHE3, MAP17, PDZK1, and SGLT2 proteins in rat renal cortex samples solubilized with nonionic detergents comigrate in BN-PAGE and their bands colocalize around 480 kDa. In order to validate antibody specificity and molecular identity of the observed BN-PAGE bands, we also eluted the complexes from different regions of BN-PAGE gels in denaturing buffer and submitted the samples to SDS-PAGE. Accordingly, the localization and intensity of bands present in BN-PAGE for these proteins was correlated with the respective lanes in immunoblotting. Our results thus support that SGLT2, NHE3, PDZK1 and MAP17 may exist as multiprotein complexes in renal proximal tubule. Future studies will be directed to evaluate whether gliflozin's action mechanism involves disruption of this multiprotein complex.

Acknowledgement: Fapesp

1. Faculdade de Medicina da USP.

Sex differences in brain metabolism of an Alzheimer's disease animal model: a PET imaging study

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Introduction: Neurodegenerative diseases are multifactorial conditions in which sex has been considered a crucial variable for the etiology and pathophysiological alterations that are known to start 10 to 20 years before the first symptoms appear. By ignoring sex as a variable, studies might have not only a bias but also negatively impact the management of disease onset, progression and treatment. **Objective:** Investigate sex differences in brain metabolic activity and neuroinflammation, and its consequences into memory in a mouse model of Alzheimer Disease. **Methods:** Twenty 3xTg-AD mice, four-months-old, equally divided into males and females were used. PET images were acquired in a small-animal PET scanner with the animals properly anesthetized (isoflurane in oxygen) and injected intravenously with [18F] FDG or [11C] PK11195 (8–30 MBq). Static images were acquired, 45 and 30 min after the tracer injection, respectively. PET images were co-registered to a T2-MRI template and the standardized uptake value (SUV) was calculated to quantify whole brain metabolic activity and neuroinflammation. Short and long-term memory were assessed through the novel object recognition test, performed in an open field apparatus containing two objects for a ten-minute exploration. In the exposure phase, animals were exposed to two identical objects. After 1 hour, one of the objects were exchanged for a new one (short-term memory); and after 24 hours, animals were again exposed to the already-known object and a new object (long-term memory). The recognition index (RI) was calculated for quantification of each memory step. All data was analyzed by unpaired “t” test. **Results:** Male 3xTg-AD mice had a 27.4% higher whole brain glucose metabolism than female mice (1.86 ± 0.30 vs 1.46 ± 0.17 , $p=0.0014$), but there was no significant difference in neuroinflammation (0.72 ± 0.14 vs 0.61 ± 0.12 , $p=0.09$). The metabolic differences did not reflex in statistical sex differences neither in short-term (54.10 ± 10.54 vs 60.28 ± 12.91 , $p=0.26$) nor in long-term memory (63.43 ± 8.72 vs 64.04 ± 6.50 , $p=0.86$). **Conclusion:** Our data support the existence of brain metabolic differences between sex in the 3xTg-AD model of Alzheimer's disease that are not associated with neuroinflammation and that precedes cognitive changes. Studies like this highlight the importance of studying sex as a variable in preclinical research in neurodegenerative diseases.

1. Faculdade de Medicina da USP.

Cognitive impairments in Long-COVID

Livia S. S. Valentin

INTRODUCTION: According to the World Health Organization – WHO, COVID-19 has slaughtered more than 600,000 people in Brazil, affecting millions of people to varying degrees of SARS-CoV2. There are more than 200 new strains of this virus in Brazil, and the action on the immune system is more severe than the initial coronavirus. Previously, three of these strains most aggravated the patient's recovery and often led the person affected by COVID-19 to death or severe sequelae after the acute phase. Using Personal Protective Equipment (PPE), social distancing, and energetic measures such as “Lockdown” reduce contagion and dissemination of COVID-19. The study already approved and in progress at the Heart Institute of the Faculty of Medicine, University of São Paulo, under CAAE nº 30430720.0.0000.0068 obtained significant and worrying results on cognitive dysfunction after the acute phase of the disease. These results were made possible through the MentalPlus® digital game and the SF8® Quality of Life scale. Comorbidity for cardiovascular disease, diabetes, and advanced age are aggravating factors for post-COVID-19 cognitive dysfunction. MentalPlus® is a digital game that assess and rehabilitated the cognitive function in 30th minutes, under Identifier NCT04632719 on the National Institute Health (NIH) website www.clinicaltrials.gov under request from the World Health Organization (WHO) to collaborate with the treatment of cognitive sequelae left by COVID-19. The initial study conducted by INCOR-FMUSP showed that many volunteers, after evaluation and rehabilitation by the digital game, benefited from the stimuli proposed by the training with MentalPlus®; however, they did not show full recovery of their cognitive, physical, or affective functions. **OBJECTIVE:** The aim of this current study is the rehabilitation of cognitive and physical functions and the balance of affections by the digital instrument MentalPlus® concomitant with other therapeutic techniques for the research volunteers participating in the initial study who did not show full recovery after the stimulation protocol by the same neuropsychological instrument. **METHODS** The volunteers will be submitted again to the application of MentalPlus® in conjunction with other therapeutic methods to intensify cognitive stimulation, balance emotions, and restore quality of life.

Effect of maternal supplementation with retinoic acid on viral infections in newborn mice

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Due to the low exposure of antigens in the intrauterine period, newborns have a developing immune system, characterized by the absence of memory and cellular immaturity, making them susceptible to infections. Among the viral infections that occur most in the first years of life, we can highlight the gastrointestinal infection caused by rotavirus and infection by Herpes Simplex Virus (HSV). We also have the infection by the ZIKA virus (ZIKV), which despite being more serious during the gestational period, can also cause damage, mainly due to the tropism for cells of the central nervous system. As the immune system of neonates does not provide adequate protection, maternal immune components present in milk are essential to ensure immunity. Through breastfeeding, several components of the diet are also passed on to the offspring, such as vitamin A, which has a wide role in the immune system. In the viral infections context, retinoic acid (RA), an active metabolite of vitamin A, can act by increasing the expression of RIG-I and the production of type I interferon, which inhibits viral replication. Thus, the aim of the project is to evaluate the effect of maternal supplementation with RA during viral infections in newborn mice. Preliminary results showed that the offspring of mothers supplemented with RA responded better to the RIG-I agonist, with increased IFN- β gene expression in splenocytes stimulated for 12 hours. We also noticed a lower production of pro-inflammatory cytokines such as IL-6 and TNF after stimulation with a RIG-I agonist and CL097 (TLR7/8 agonist). This shows that the offspring of mothers supplemented with RA have a more activated antiviral profile and less inflammation capacity, something interesting, since there is a worsening of the clinical condition in these infections, as pro-inflammatory cytokines are produced, causing tissue damage. Regarding analysis during infections, we started preliminary groups with ZIKV infection and, despite not decreasing the viral load, we saw that the offspring of mothers supplemented with RA showed symptoms later and the resolution was also faster. In addition, clinical symptoms were also present in a smaller number of animals and with less intensity. These data suggest that RA supplementation was able to attenuate the clinical status of offspring infected with ZIKV. Other tissue evaluations and other viruses need to be performed to determine the real role of RA in the viral infections of the offspring.

1. Instituto de Ciências Biomédicas da USP.

2. Faculdade de Medicina da USP.

Inhibition deficit as a marker of neuroplasticity in rehabilitation

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According to the WHO, more than one billion people in the world have a disability, which is not only a public health issue, but also a human rights issue. In 2015, the Global Burden of Diseases presented worldwide epidemiological evidence that 74% of the total years lived with disability are related to health conditions that can benefit from rehabilitation. For this reason, the development of new therapies and rehabilitation research is one of the main objectives of the WHO Global Plan of Action 2014–2021. However, little knowledge about the biological mechanisms involved in the rehabilitation process is one of the main limitations faced in building solid knowledge. There is evidence that brain plasticity is the central mechanism involved in the functional recovery process of patients with deficits of different etiologies. Although much progress has already been made in the understanding of brain plasticity, little has been incorporated into the practice of rehabilitation, mainly due to the scarcity of study designs that favor the translation of knowledge. Thus, the present postdoctoral research, in a longitudinal cohort with five groups of subjects (500 patients with stroke, spinal cord injury, amputations, osteoarthritis of the knee and control subjects), with funding from SPEC FAPESP, sought to understand the neuroplasticity mechanisms involved in the motor rehabilitation process, using a battery of neurophysiological assessments, Transcranial Magnetic Stimulation (TMS), High Density Electroencephalography (HD-EEG), Functional Near Infrared Spectroscopy (fNIRS) and Magnetic Resonance Imaging (MRI), before and after the rehabilitation. Through this project, to date, it has been possible to obtain a better understanding of the neuroplasticity mechanisms involved in rehabilitation, with “transdiagnostic” neurophysiological biomarkers, especially inhibition markers, which will have great relevance in the scientific and therapeutic improvement of rehabilitation. By evaluating the reliability of the techniques studied as possible biomarkers for neurological rehabilitation in different neurological disorders, this study will help in understanding the mechanisms of brain plasticity in rehabilitation, allowing for more effective approaches and screening methods.

1. Hospital das Clínicas.

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Vaccination coverage survey in Cubatão – São Paulo

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Despite the advance and international recognition, the National Immunization Program (NIP) has been facing a reduction in the achievement of targeted vaccination coverage rates for vaccines included in the national schedule since 2016. Several hypotheses are raised in the literature, such as the complexity of the NIP with partial shortage of some products, lack of training and capacity-building for healthcare professionals, spread of fake news, the COVID-19 pandemic, and changes in the information system. There has also been a resurgence of vaccine-preventable diseases. In the city of Cubatão, vaccination coverage has decreased by 50%. Objective: to estimate the vaccination coverage at 12 months and 18 months of age for residents of Cubatão, São Paulo, and identify factors related to the reduction in coverage using a mixed methodology that involves quantitative and qualitative approaches. Method: The sequential explanatory method will be used. The quantitative phase will be conducted based on birth records of children born between July 2020 and June 2021 and residing in Cubatão. A sample of 434 children will be selected. The caregivers of the children will be interviewed in their homes to assess the vaccination status, social stratum, and difficulties in adhering to their child's vaccination schedule. The qualitative phase will be built upon the results obtained in the quantitative phase through semi-structured questionnaires with audio-recorded and fully transcribed interviews. Families who participate in the quantitative phase and express their availability for the second phase will be contacted.

1. Faculdade de Medicina da USP.

2. Hospital das Clínicas.

Circulating biomarkers in liquid biopsy for differential diagnosis between diabetes mellitus secondary to pancreatic ductal adenocarcinoma and type 2 diabetes mellitus

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Pancreatic ductal adenocarcinoma (PDCA) is a highly aggressive cancer often detected at advanced stages, rendering surgery ineffective. However, new-onset diabetes mellitus (DM) can serve as an early warning sign for PDCA, as it typically appears 2–3 years before tumor diagnosis in 80% of patients. Differentiating between PDCA-related DM and type 2 DM (T2D) is crucial, as it enables early detection and potentially curative treatment. In a previous study, we validated three serum microRNAs (miRs-19a, -24 and -29a) that effectively distinguished PDCA-related DM from T2D and identified two upregulated mRNAs (HBB and TMSB4X) in circulating extracellular vesicles (EVs) isolated from PDCA-related DM patients. To further enhance diagnostic accuracy, we aim to identify new potential circulating biomarkers of PDCA-related DM using plasma concentrations of trefoil factor 2 (TFF2), mass spectrometry and miRs expression in EVs isolated from serum and from saliva. Therefore, plasma samples from participants of the previous study (n=42 PDCA, n=33 T2D, n=30 controls), as well as samples from new, pre-chemo/radiotherapy participants will be evaluated. Machine learning models will be employed to establish an accurate diagnostic strategy for clinical application.

1. Hospital das Clínicas.

2. Faculdade de Medicina da USP.

3. Hospital Sírio-Libanês.

4. Universidade Federal de São Paulo.

5. Instituto de Ciências Biomédicas da USP.

Effects of the COVID-19 pandemic on trends in stillbirths, under-5 and maternal mortality in Brazil

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Background: Despite the proliferation of studies on the impact of the COVID-19 pandemic, there are lesser evidence on the death toll compared to the health service provision disruptions. We assessed the impact of the COVID-19 pandemic on national and regional trends in stillbirths, under-5 and maternal deaths in Brazil. **Methods:** We used the nationwide routine health information system data from January 2017 to December 2021, to which we applied descriptive and advanced mixed effects ordinary least squared regression models to measure the percentage change in mortality levels during the COVID-19 pandemic. We carried out counterfactual analyses comparing the observed and expected mortality levels for each type of mortality at national and regional levels. Trends in maternal mortality ratio (MMR) and under-5 mortality rate (U5MR) were also analyzed. **Results:** Compared to the expected number of stillbirths, maternal and under-5 deaths based on the pre-pandemic period (January-2017 to February-2020), stillbirths increased by 5%, maternal deaths increased by 99%, and under-5 deaths decreased by 8% during the pandemic period (March-2020 to December-2021). Higher percentage increases in stillbirth were found in the Central-West region, while maternal deaths increased more in the South region, followed by Central-West and North regions. The MMR almost doubled concerning the expected based on the previous years, while the U5MR showed values very close to or even lower than expected. **Conclusions:** In Brazil, the COVID-19 outbreak and resulting restrictions negatively affected stillbirths and maternal deaths. We found differences according to the regions of the country, highlighting existing health inequalities.

1. Faculdade de Medicina da USP.

2. Johns Hopkins University.

3. Universidad Peruana Cayetano Heredia.

Development of DNA aptamers against pathogenic multidrug resistant bacteria

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Infections caused by multidrug-resistant agents are a global health problem and one of the leading causes of human diseases with high mortality rates. The rapid identification of these infections is crucial as they can be highly contagious, difficult to treat, and result in high hospitalization costs. In this context, the development of rapid and economically viable detection methodologies, as well as the development of new therapeutic alternatives, poses challenges. One promising solution may be the development of nucleic acid aptamers capable of interacting with bacteria. These aptamers can be used for specific recognition of infectious agents and for blocking their functions. Currently, Cell-SELEX technology allows for the selection and identification of aptamers and is extensive enough to target any protein of interest or any target present in a whole bacterial cell without prior knowledge. However, aptamer technologies still face several setbacks, including the difficulty of the selection process. Here, we describe an in-house methodology based on Cell-SELEX for the identification of aptamers with fast execution and low cost. Furthermore, this protocol enabled the identification of the first aptamer, A01, which has already been published. The newly categorized aptamer (A01) exhibited significant binding affinity to MDR *A. baumannii* when compared to the negative control. Additionally, new aptamers with even more promising results are currently being tested and their specificity and sensitivity are being confirmed. These data indicate that aptamer-based technology may soon become a tangible alternative to traditional approaches in the diagnosis and therapy of infectious diseases.

1. Universidade de São Paulo.

Circulating biomarkers for predicting cognitive decline in individuals with type 2 diabetes mellitus

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The inadequate metabolic control in diabetes mellitus (DM), a high prevalence disease, lead to chronic macro and microvascular complications in long term, with impact in the morbidity and mortality of this population. Retinopathy, nephropathy, cardiovascular disautonomic neuropathy, distal neuropathy and diabetic encephalopathy (DE) are among the DM clinical complications, and DE may lead to cognitive impairment. The aim of the present study is to identify potential markers in peripheral blood and urine that allow the selection of DM patients with higher risk to develop cognitive decline. Approximately 1,000 individuals with type 2 DM (T2D) will be included in the study and will be follow up at least for 12 months. The microvascular diabetic complications including renal disease, distal symmetric neuropathy, cardiovascular dysautonomy and retinopathy will be evaluated. The miR profile by NGS and proteomic profile by MALDI-TOF-MS of peripheral blood, urine and extracellular vesicles isolated from these fluids will be determined. The distribution of APOE polymorphisms will be analyzed in the groups stratified by clinical complications. The generated results will be analyzed by machine learning approach for the identification of markers associated with DE. The selected targets will be followed longitudinally to analyze their association with the progression of cognitive decline. A patent will be required if a target or a combination of targets present high accuracy to predict the cognitive decline in T2D.

1. Faculdade de Medicina da USP.

Immunomodulatory role of syncytin in HIV-exposed newborns

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Innate immunity in the maternal–fetal interface is one of the protective mechanisms essential in the antiviral response, especially in HIV-1 infection. In this project, we will evaluate the immunomodulatory role of syncytin (HERV-W) in HIV-exposed newborns. Previously, we demonstrated an increase in syncytin expression in placentas from HIV-infected mothers. In addition, we also observed a decrease in serum cytokines inflammation in newborns exposed to the virus. It has already been described that placental explants, cultured in vitro, are able to release exosomes containing syncytin, and yet, that this retroviruses have an immunosuppressive role in blood cells, reducing the expression of pro-inflammatory cytokines. Our hypothesis is that the syncytin present in the placenta – and in higher levels in HIV-infected mothers – could be being released in the placenta, within exosomes, and sent to the fetal blood circulation, thus, could collaborate with the serum decrease of these factors in the newborns (NB) serum (NB). Suppression of the inflammatory environment can collaborate to decrease viral replication and protection against HIV-1. Therefore, we will analyze the role of Syncytin in a model of human placental explants, as well as their receptors and signaling pathway in newborn mononuclear cells. The maintenance of regulatory mechanisms is fundamental to inhibit viral replication and, consequently, the infection of the NB. It's possible that HERVs, especially type W, can contribute to this balance.

1. Faculdade de Medicina da USP.

Rural-urban disparities in the consumption of fruits and vegetables and cognitive performance in Brazil

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Background. Adherence to a healthy diet has been associated with lower risk of dementia and cognitive decline. Furthermore, low consumption of fruits and vegetables has been associated with lower cognitive performance. Rural Brazilians have several factors related to poor diet quality, such as low education and income. However, differences in the association of fruit and vegetable consumption with cognitive performance in urban and rural areas have not been explored. The aim of this study was to investigate the association of fruit and vegetable consumption with cognitive performance in urban and rural areas in a nationally representative sample of Brazilian older adults. **Methods.** The sample included 9,412 adults 50 years or older from the Brazilian Longitudinal Study of Aging. Consumption of fruits and vegetables was measured using a food frequency questionnaire. Cognitive performance was evaluated using the immediate recall, late recall, semantic verbal fluency, prospective memory, semantic memory, and temporal orientation. A global composite z-score was derived from these tests. Association of consumption of fruits and vegetables with cognitive performance was evaluated using linear regression. **Results.** In 6,743 participants (mean age 61.3 ± 8.9 y, 53% women, 43% White, and 15% from rural areas), the mean intake of fruits and vegetables was 2.0 ± 1.3 portions a day. Higher consumption of fruits and vegetables was associated with better memory, verbal fluency, and global cognition performances. There was a modifying effect of urban/rural area of residency (p for interaction < 0.001). Stratified analysis showed that consumption of fruits and vegetables was associated with better episodic and semantic memory, verbal fluency, and global cognition performances in participants who resided in urban, but not rural areas. **Conclusion.** Consumption of fruits and vegetables was associated with cognitive performance in urban, but not in rural areas in Brazil, possibly due to socioeconomic disadvantages and lower access to healthcare.

1. Faculdade de Medicina da USP.

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Bacterial community analysis and antibiotic resistance profile from an urban stream in São Paulo, Brazil

Nazareno Scaccia¹

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Antibiotic resistance (AR) is a major human health threat worldwide, and its environmental dissemination still deserves more investigation. This study aims to explore the presence of antibiotic-resistant bacteria (ARB), resistance genes (ARGs), antibiotics and chlorhexidine and define the bacterial community structure of a São Paulo urban stream. We analysed water samples from “Riacho doce”, an urban stream crossing “São Remo” Community. Samples were collected between June–September 2021 and examined by culture-dependent and molecular methods. Bacterial isolates were characterized and, genomic and total community DNA was screened for ARGs and used for bacterial community analysis based on the 16S rRNA gene. From a total of 67 isolates, a group of 33 strains have resulted positive for the presence of ARGs blaKPC (19.4%), blaVIM (25.3%) and identified as belonging to the genera *Aeromonas*, *Chryseobacterium*, *Elizabethkingia*, *Comamonas*, *Citrobacter*, *Escherichia*, *Klebsiella*, *Serratia*. The bacterial species under these genera have shown predominantly resistance to cefotaxime (CTX, 73%), amoxicillin (AML, 70%), aztreonam (ATM, 54.5%) and ertapenem (ERT, 51.5%). The Minimum Inhibitory Concentration (MIC) values of chlorhexidine ranged between 0,5 to 128 mg/L and, *Klebsiella pneumoniae* strain resistant to chlorhexidine was found. The microbiome was dominated by members of the phyla Firmicutes (25–33%), Bacteroidota (25–32%), Proteobacteria (22–31%), Campylobacterota (4–10%), Actinobacteria (2–4%) and Patescibacteria (0,8–1,5%). Among the chemical groups analysed, ceftriaxone, azithromycin and chlorhexidine were commonly found. The main conclusion of this research is that ARB&ARGs were found in the urban streams “Riacho doce” which may pose a human health risk. The presence of antibiotic and chlorhexidine residues in water can increase the spreading of AR in the river ecosystem.

1. Faculdade de Medicina da USP.

2. Hospital das Clínicas.

3. Faculdade de Saúde Pública da USP.

Influence of solution (or drink?) colour on perception of sweetness and brain electrical activity in healthy individuals and cyclists

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Purpose: Solution colour of sports drinks and ergogenic supplements could modify performance via placebo effects. this study aimed to investigate interactions between colour and taste perception of coloured solutions, and subsequently characterize electrical brain activity in healthy, non-cyclist individuals and cyclists. **Methods:** Study 1. Seventy-two participants (42 non-cyclists and 30 cyclists) rated their visual perception of sweetness of 7 identically artificially sweetened solutions with distinct pigmentations (red, purple, blue, yellow, green, brown, and pink). Participants ranked them from first (sweetest; congruent) to seventh (least sweet; incongruent) according to their subjective visual impression of the colour's congruency with sweetness. Study 2. Thirty-one participants (15 healthy individuals and 15 cyclists) determined whether artificially sweetened drinks with colours perceived as sweetest (congruent) and least sweet (incongruent) from Study 1 modified their perception of taste using a visual analogue scale, and rated their acceptability and intention-to-purchase. Study 3. Electrical brain activity of two participants (1 healthy individual and 1 cyclist) was measured using electroencephalography during mouth rinsing with congruent (red), incongruent (green) and colourless artificially sweetened solutions. The absolute spectral power was calculated using the Welch estimate for frequency bands. **Results:** Study 1. The median ranking for the red solution was the highest (6 ± 2), while green was the lowest (2 ± 1). Ordinal regression models showed red and green were most likely to receive sweetest and least sweet scores, respectively, and thus were classified as the congruent and incongruent colours for the subsequent studies. Study 2. The median of perception of sweetness (5.1 ± 1.9 vs. 3.9 ± 3.3), acceptability (3 ± 1 vs. 2 ± 1) and intention to purchase (3 ± 0 vs. 3 ± 1) were greater with the congruent compared to the incongruent solution. Study 3. Slow waves were predominant between 6–8 Hz (2–4 s) in the congruent condition, but not in the incongruent or non-coloured conditions, suggesting that a congruent colour may induce changes in slow frontal frequency brain activity. **Conclusions:** Colour affected perception (Study 1) and taste (Study 2) of artificially sweetened drinks, while a mouth rinse solution congruent with sweetness affected slow frontal brain frequency (Study 3). Solution colour may be an important factor to consider for researchers and athletes, since it could modify performance via placebo effects. The mechanisms by which this occurs need to be explored in future studies.

1. Faculdade de Medicina da USP.

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Public policies in prenatal care and childbirth and fetal deaths

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Background: Prenatal care programs are one of the most traditional and consolidated forms of Public Health action. The evaluations of prenatal programs have not obtained conclusive results of their impact on outcomes such as fetal and neonatal death. Studies that analyze in greater detail the impact of prenatal care on fetal death are still rare. **Objectives:** To build a national and international frame of reference on prenatal and obstetric care public policies and fetal mortality and instruments for the development of proposals for categorizing the quality of care and impact on the conditions of pre-term birth and delivery of fetal deaths. **Method:** Prospective case-control study with estimated 415 cases (stillbirths) and 415 controls (live births) carried out in 14 public hospitals in São Paulo City, Brazil. Data is being collected from mothers' interviews, hospital records, antenatal cards, interviews with municipal and hospital managers, genetic and serological analyses of maternal and umbilical cord blood and the placenta, and traditional and non-invasive autopsies of the stillbirths. As data collection is still in progress, we will only present preliminary analysis of completeness of prenatal cards, the difference in the completeness for cases and controls, and the agreement between the prenatal card records and the information obtained from the parturients. We used information from the 366 antenatal cards and mother's interviews. **Results:** The section with the best completeness was the exams with excellent or good completeness in 10 of the 13 indicators, whereas the uterine height curve and nutrition tracking graphs section showed the lowest levels of completeness (1,9% and 7,5%, respectively). Completion was very poor or poor for most data from the first prenatal visit in 10 of the 20 indicators. The other sessions had a low percentage of completion: ultrasound data was very poor in 77% (7 for 9 indicators), labor and birth date was very poor or poor in 88.9%, and vaccine data was below 40% for all fields. In most sessions, there was no significant difference between the case and control groups. The proportion of agreement between the prenatal cards and mothers' interviews ranged from 27.2% to 91.0%. **Conclusions:** Missing prenatal information limits the flow of information between health services and the systematization of care and may result in inappropriate medical care and limits the usefulness of these records for research.

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Systematic review of melatonin receptors and its action on breast cancer

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Melatonin is a hormone produced by the pineal gland, mainly during the night, and plays a crucial role in regulating the body's circadian rhythms. It also has antioxidant, immunomodulatory, and anticancer properties, and its action has been analyzed in various forms of cancer, including breast cancer. In breast cancer, melatonin has been shown to inhibit tumor growth, promote apoptosis (programmed cell death) of cancer cells, and inhibit the formation of new blood vessels that feed the tumor (angiogenesis). In addition, melatonin has been shown to reduce breast cancer metastases, making it a promising molecule for the prevention and treatment of this disease. In the context of breast cancer and the role of melatonin, proteomics has been used to investigate melatonin-induced changes in protein expression in breast cancer cells. This allows the identification of melatonin target proteins such as melatonin receptor 1 (MT1); melatonin receptor 2 (MT2); Cyclin-dependent protein kinase 2 (CDK2); Cyclin-dependent protein kinase 4 (CDK4), and Bcl-2 family proteins; and to understand the molecular mechanisms underlying the anticancer effects of this hormone. Proteomic analysis can also help identify biomarkers that can be used in the early diagnosis and monitoring of breast cancer. We can see that melatonin also influences breast cancer metabolomics by changing metabolite profiles in cancer cells. These metabolomic changes may affect important biological processes such as cell proliferation, differentiation, and immune response, thus influencing breast cancer development and progression. Metabolomic analysis can provide valuable insights into the molecular mechanisms by which melatonin acts in breast cancer and aid in the development of new therapeutic approaches. In summary, melatonin plays a significant role in regulating breast cancer by inhibiting tumor growth, angiogenesis and metastasis. approaches provide a solid foundation for further research and development of more effective therapeutic strategies against breast cancer.

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Detecting and monitoring symptoms of depression using everyday sensors and machine learning algorithms

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Depression is a psychiatric syndrome affecting over 264 million people around the world and is the second cause of years lived with disability. However, many cases go undiagnosed, and treatment reaches less than half of those affected. Untreated depression can exacerbate symptoms, become chronic, and increase the risk of other psychiatric and physical health issues. Diagnosis is challenging, relying on self-reported data or extensive clinical evaluation, both prone to limitations. Clinical evaluation often requires specialized professionals in the public health system, which are scarce. To address these challenges and achieve scalability, innovative approaches utilizing smartphone sensors and machine learning algorithms can be leveraged. Smartphones possess embedded sensors that capture diverse data, including activity logs and user-generated content. These sensor-generated data contain patterns that can serve as proxies for behaviors, symptoms, and physiological parameters. Machine learning algorithms can effectively analyze this data to detect and monitor depression symptoms. Our project aims to develop automated, intensive monitoring methods using smartphone sensors and machine learning algorithms to detect and monitor depression symptoms. We are collecting smartphone sensor data from participants in two randomized clinical trials (RCTs) evaluating remote interventions for adolescents (RCT1) and young mothers (RCT2). Our specific objectives are: 1) assess the usability and acceptability of digital phenotyping methods; 2) explore associations between self-report scales measuring depression and anxiety symptoms and data derived from smartphone sensors; 3) examine changes in associations between sensor data and symptoms over time and across intervention groups; 4) investigate whether identified digital phenotypes can predict treatment response.

1. Faculdade de Medicina da USP.

An engineered N-glycosylation motif reveals Golgi-independent routes of PDI secretion

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Protein Disulfide Isomerase (PDI) is a multifunctional enzyme required for efficient oxidative protein folding. It localizes in the Endoplasmic Reticulum (ER) owing to its N-terminal signal sequence and C-terminal KDEL motif. Yet, part of PDI is detected extracellularly, where it controls thrombosis and virus entry. The mechanisms that determine PDI externalization are not fully understood. Its secretion is selective, in that other intracellular molecules as abundant as PDI are not found extracellularly. To investigate how PDI can reach the extracellular milieu, we added a canonical consensus motif for N-glycosylation to a human PDI, the rationale being that the extent of glycan processing reveals whether and how far our 'Glyco-PDI' has traveled along the exocytic pathway. When expressed in HeLa cells, Glyco-PDI is fully glycosylated. Most remains equally sensitive to Endo-H and PNGase-F, consistent with its prominent ER localization. Brefeldin-A (BFA), a drug that causes retrograde transport of Golgi enzymes to the ER, induced Endo-H resistance, pointing to Glyco-PDI as a powerful tool to monitor Golgi passage. Accordingly, Endo-H resistant molecules were abundantly secreted upon downregulation of the three KDEL Receptors (KRKD) or deletion of the KDEL motif (Glyco-PDI Δ KDEL). However, Glyco-PDI molecules that were actively secreted by live cells carried Endo-H sensitive glycans, suggesting that they were not flowing through the Golgi. BFA prevented the secretion of Glyco-PDI Δ KDEL but not of Glyco-PDI, whose release was slightly exaggerated. Moreover, not all Glyco-PDI secreted upon KRKD were Endo-H resistant, indicating that part of the ER pool continued to avoid the Golgi in their way out. Taken together, these findings suggest that basal PDI secretion does not entail defective KRs' surveillance. Rather, some PDI molecules bypass the Golgi and reach the extracellular space. Retrotranslocation to the cytosol is unlikely in that the sugar moieties of Glyco-PDI are not removed by cytosolic N-glycanases. We propose that the mobile pool of PDI that normally cycles between ER-Golgi be the one that becomes Endo-H resistant upon KRKD, while most PDI molecules are kept in the ER matrix and can be selectively secreted bypassing the Golgi. Studies exploiting our reporter in cells involved in pathophysiological PDI secretion will shed more light on the Golgi independent routes revealed herein.

1. Instituto do Coração (InCor).

2. Università Vita-Salute San Raffaele.

Effects of home-based exercise training on quality of life, functional capacity, and symptoms in survivors of severe/critical COVID-19: a randomised controlled trial

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We investigated the effects of a home-based exercise training (HBET) programme on health-related quality of life (HRQoL), and secondary outcomes, in survivors of COVID-19 through a single-blinded, randomised controlled trial. Fifty survivors were randomly allocated (1:1) to either a 3-times-a-week (~80minutes/session), semi-supervised, individualised, HBET programme or standard of care (CONTROL). HRQoL was evaluated through 36-Item Short-Form Health Survey, and secondary outcomes included cardiorespiratory fitness, pulmonary function, functional capacity, body composition, and persistent symptoms, all evaluated at pre- and post-16-weeks of intervention. HRQoL improved in HBET compared to CONTROL in the physical component summary (effect size, ES:0.74), physical functioning (ES:0.83), general health (ES:0.73), and vitality (ES:0.49). 30s sit-to-stand (ES:0.86), and muscle weakness and myalgia were also improved in HBET compared to CONTROL ($P<0.05$). No significant differences were seen in the remaining variables. HBET effectively improved HRQoL and other health-related outcomes in survivors of severe/critical COVID-19.

1. Escola de Educação Física e Esporte da USP.

2. Faculdade de Medicina da USP.

Air pollution and stillbirth in São Paulo metropolitan region, Brazil – FetRisks study preliminary findings

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Fetal mortality is a central public health problem in lower and higher-income countries with unestimated social and economic burdens. About 1.9 million babies are stillborn at 28 weeks of gestation or more every year globally (5,000 per day) (UNICEF, 2023). It is also a major problem in São Paulo, the biggest city in Latin America, where there is intense social disparity. Even so, stillbirth's risk factors and impacts are not fully understood and are poorly studied in Brazil. A core issue in the study of fetal mortality has been the difficulty in determining the causes of death and their contributing factors (Flenady et al., 2011; Cockerill et al., 2012). Diverse factors may influence its occurrence, such as maternal health conditions, socioeconomic, environmental, and cultural aspects, and access to health services and public policies (Frøen et al., 2016; Flenady et al., 2016). Moreover, air pollution exposure has been associated with adverse pregnancy outcomes, including stillbirth (Nyadanu et al., 2022; UNICEF, 2023). These effects have been reported in air pollution levels frequently observed in most urban centers, including in São Paulo, where air pollution is a recognized problem. Therefore, understanding the effects of air pollution on fetal death, and its relation with other possible biological and sociodemographic conditions may support the proposition of novel public health policies capable of reducing exposure to pollutants and fetal death rates. This project aims to explore the effects of air pollution on fetal deaths in São Paulo, Brazil.

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1. Faculdade de Medicina da USP.

The voice of trans and transvestite women PrEP users during the pandemic of COVID 19. Struggles, resistance and diverse care

Ramiro A. F. Unsain

The Pandemic of COVID-19 has impacted the general population in a variety of ways. However, the impact of COVID-19 may be even more severe in marginalized populations such as women who adhere to the trans, transvestite, non-binary and fluid (MT and TR+) collectives. Thus, our goal is to contribute to the reduction of HIV incidence among adolescent and adult MT and TR+ women, as well as to evaluate the effectiveness of PrEP use among these groups in the city of São Paulo. In turn, listening and thinking about MT and TR+ populations through an intersectional perspective will allow us to contribute with innovative perspectives, in the sense of native perspectives, to implement public health care policies for vulnerable groups. Finally, the valorization of these groups not as “objects” of study but as co-constructors of knowledge can and should contribute to the achievement of original results to be applied in the prevention of HIV/AIDS.

Post-Covid syndrome: immunological sequels after Covid-19 infection

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COVID-19 is an infectious disease primarily of the respiratory tract that resulted in more than 4 million documented deaths through the first half of 2021. About 5% of those infected progress to severe or life-threatening COVID-19, presenting with lung damage severe or even multiple organ dysfunction. Sepsis and COVID-19 share many pathophysiological and clinical features such as consumptive thrombocytopenia, hemolytic anemia, vascular microthrombosis, multiple organ dysfunction syndrome, coagulopathy, septic shock, respiratory failure, fever, leukopenia, hypotension, leukocytosis, and high cytokine production. One in six patients recovered from sepsis develops post-sepsis syndrome, which is characterized by impaired immune function, a state of chronic inflammation, similar to elderly and immunosuppressed patients with an inadequate response to infections, impaired cognitive, psychiatric, cardiovascular, renal and decrease in quality of life. Due to the great similarity between the pathophysiology of sepsis and COVID-19, it is believed that patients who developed COVID-19 and who present sequelae may also develop Post-covid Syndrome. Based on this possibility, the objective of this study is to identify and characterize the Post-Covid Syndrome, as well as the prognostic markers of quality of life and survival of patients after hospital discharge, based on markers that have already been studied by the group in patients. septic. The metabolic, immunological and psychological status of patients after COVID-19 will be evaluated. Metabolic status through analysis of medical records and laboratory tests. The immune status through the study of the expression of genes NLRP3, TLR2, TLR4, NF- κ B, IL-1², IL-1 $\pm$, IL-10, TNF- $\pm$, IL-18, caspase 1, caspase 11, caspase 12, HSP70, HSP40 and HMGB1 of monocytes and pro and anti-inflammatory cytokines in the culture supernatant also of monocytes. And the psychological state through the evaluation of the patients' quality of life using the short-form health survey SF-36 questionnaire.

1. Faculdade de Medicina da USP.

Tendência à hesitação vacinal: perspectiva médica

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Introdução: A vacinação é uma das maiores contribuições para a redução da morbimortalidade de doenças imunopreveníveis, representando uma técnica preventiva eficaz no combate às doenças infectocontagiosas. A despeito de todas as benesses e do viés coercitivo da vacinação no Brasil e em outros países, a vacinação enfrenta desafios, uma vez que há um crescente questionamento sobre a sua importância por parcelas da sociedade, além de um movimento crescente de hesitação à vacinação. Esse estudo visa a um melhor entendimento sobre esse fenômeno, pela perspectiva de médicos(as) pediatras. **Objetivos:** A pesquisa teve por objetivo elencar e compreender, a partir da ótica de médicos(as) pediatras, os motivos pelos quais os pais optam por não vacinar os seus filhos de acordo com o calendário preconizado pelo Programa Nacional de Imunização (PNI), ou ainda selecionar as vacinas quais vacinas serão aplicadas. **Metodologia:** A pesquisa assumiu base qualitativa e a coleta de dados foi realizada por revisão da literatura acadêmica, análise documental, além de entrevistas em profundidade com médicos(as). **Discussão e Resultados:** As entrevistas realizadas endossaram a existência de um movimento de hesitação vacinal. As principais justificativas para que os pais não vacinem, ou selecionem as vacinas que serão aplicadas, segundo os(as) médicos(as) entrevistados são: os eventos adversos das vacinas, a precariedade da imunidade gerada pela vacina em comparação à imunização natural, a liberdade individual envolvida no processo de vacinação, a ineficácia das vacinas propostas e risco de doenças associadas, como o autismo, pelo processo da vacinação. **Considerações finais:** Espera-se que, a partir dos subsídios e análises geradas pelas entrevistas, a pesquisa contribua para desmistificação de temas sem validade científica acerca da vacinação, para o combate da disseminação de notícias falsas e para a promoção de ações de educação em saúde, como treinamentos e campanhas de sensibilização sobre a importância da vacinação, não apenas na esfera individual mas em um viés coletivo.

1. Faculdade de Medicina da USP; Faculdade de Saúde Pública da USP.

2. Faculdade de Medicina da USP.

Investigation of peri/epicellular protein disulphide isomerase as a novel regulator of the platelet-endothelium interaction in normoglycaemia and diabetes

Renato S. Gaspar

Diabetes is a chronic and epidemic disease with high socio-economical cost worldwide, being characterized by increased risk of cardiovascular disease (CVD) and thromboembolic event. Upon endothelial dysfunction, platelets bind to endothelial cells to precipitate thrombus formation in a process that is not fully understood. Specifically, it is still unclear which surface proteins regulate platelet-endothelium interaction. In this regard, our lab has shown that peri/epicellular (pec) protein disulphide isomerase A1 (pecPDI) influences adhesion and migration of vascular cells. Therefore we hypothesized that pecPDI may regulate adhesion molecules on the surface of endothelial cells and platelets that influence the binding of these cells in physiological and pathological settings. This hypothesis was tested *in vitro* using human vein endothelial cells (HUVECs) exposed to normoglycaemic (5.5 mM) or hyperglycaemia (25 mM) media for 48 hours. First, we have uncovered that platelets of healthy donors adhere more onto hyperglycaemic HUVECs and that endothelial, but not platelet, pecPDI is able to regulate this effect. Given the previously reported modulation of integrin activation by pecPDI, we assessed the adhesiveness of HUVECs onto different matrices. Indeed, hyperglycaemic HUVECs were more adhesive onto fibrinogen and collagen surfaces; a process that was reversed when pecPDI was inhibited. As integrins regulate cytoskeletal reorganization and protein secretion, we decided to investigate these components. First, we showed cytoskeletal reorganization and increased production of reactive oxygen species in hyperglycaemic cells and that pecPDI inhibition reversed these phenomena. Afterwards, a proteomic analysis of secreted proteins (secretomics) points out that only hyperglycaemic HUVECs secrete adhesion proteins (namely ECM1, JAG1, LAMC1 and SLC3A2) potentially implicated in the effects described above. Our goal now is to understand the role of each of the identified proteins of interest to understand how pecPDI modulates platelet-endothelial cell adhesion in hyperglycaemia. Altogether, we have consistently shown that pecPDI regulates platelet-endothelial cell adhesion in hyperglycaemia, likely contributing to the pathophysiology of diabetes-associated thrombosis.

Comparative study of fat grafting in the treatment of progressive hemifacial atrophy: 3D volumetric evaluation by photogrammetry of the fat graft obtained by liposuction conventional versus laser-extracted fat grafting 1210 nm

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Introduction: The treatment of hemifacial atrophy Parry's disease – Romberg, with autologous tissue represents to be the safest and the fat graft has shown to have the lowest morbidity. Laser-assisted liposuction, more specifically with Diode laser with 1210 nm length the wave, has shown promise in the preservation of aspirated cells, reaching 98% conservation of adipocytes, due to fat rich tissue being the chromophore. **Objective:** A evaluate the results of the treatment of facial asymmetry triggered by Progressive Hemicraniofacial Atrophy with fat grafting structured compared with fat grafting with autologous fat obtained with the use of 1210 nm Laser, based on the three-dimensional virtual volumetric evaluation facial. **Method:** twenty patients will undergo to the surgical treatment of fat grafting to correct hemifacial atrophy. Ten with fat use liposuctioned and ten with liposuctioned fat and predicted being stimulated with 1210 laser nm. A comparative study of the evolution of maintenance volumetric d the grafted tissue will be performed using technology three-dimensional. **Results:** The prior stimulation of the fat to be used as a graft with use of 1210 nm Laser, enhances The integration and volume maintenance grafted.

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Inhibitory deficit as a marker of neuroplasticity in rehabilitation – Proposal for a functional assessment protocol to stroke

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Functional disabilities are increasing once one we are having more people surviving to diseases such as Stroke although stroke keeping as leader of cause of death globally. With that been said studies that are dedicated to evaluating the rehabilitation and viable neuronal pathways in disabling conditions are of paramount importance so that we can start towards the use of the advances obtained in the research for the day-to-day clinical practice. However, little knowledge about the biological mechanisms involved in the rehabilitation process is one of the main limitations faced in building solid knowledge. There is evidence that brain plasticity is the central mechanism involved in the functional recovery process of patients with deficits from stroke and from different etiologies. Much progress has already been made in the understanding of brain plasticity, little has been incorporated into the practice of rehabilitation, mainly due to the scarcity of study designs that favor the translation of knowledge. Thus, we propose a study in four groups of subjects aiming to understand the neuroplasticity mechanisms involved in the motor rehabilitation process, before and after the rehabilitation period. The present study aims to construction of a protocol first to Stroke patients based on four types of assessments that are already well known in the medical literature in the area and by the group that coordinates this project: TMS, fNIRS, EEG and functional assessments. TMS, fNIRS and EEG technologies already have their role in rehabilitation research and, although they have a promising use in clinical practice, there is not clearly designed and viable protocol for IMRea. This time, the objective is to propose and publish an evaluation protocol to be used in clinical practice for patients undergoing rehabilitation with stroke aiming to be faster, more accurate, objective model of care and with a view to presenting better cost-effectiveness. The development of evaluation protocols for routine rehabilitation will facilitate the planning and execution of care, in addition to allowing the standardization of data, a necessary item for comparing the functional gains resulting from different rehabilitation programs and for publications and scientific growth in the field of rehabilitation.

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Synthesis, characterization of graphenes and enrichment of both instruments, implants and orthopedic materials, with potential application in areas of surgical medicine

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In this project, it is intended to prepare graphenes, from adequate sources of C, capable of conferring properties of interest, such as increased biocompatibility of prostheses and surgical cements, the effect of reducing the incidence of infections in general, such as periprosthetic joint infection, increasing the durability of prostheses, including the acetabular and glenohumeral components and other high-density polyethylene parts, with the use of graphene and its derivatives as part of these artifacts, instruments and implants. The aim is to increase the durability of implants and reduce the number of surgical revisions. The project also includes the verification and identification of changes in the tissues formed during bone repair and the monitoring of inflammatory products, using various spectroscopic, chromatographic and biochemical techniques. The insertion, deposition and reactivity of these carbon compounds in joint regions of prostheses will also be objects of study, both in cobalt and chromium-titanium and in ceramics such as alumina, zirconia and the alumina-zirconia combination. A final comparative analysis, based on stability, kinetic wear parameters, costs and applications of each type of material should also be carried out, aiming at possible orthopedic and surgical use.

1. Faculdade de Medicina da USP.

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Muscular health predicts health outcomes and health care costs in COVID-19 patients

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We conducted two prospective observational studies between March 2020 and August 2021 in the HCFMUSP aimed to verify whether muscle mass and strength predicts health outcomes and health care costs in COVID-19 patients. Firstly, to investigate whether muscle strength and muscle mass assessed at hospital admission are predictive of length of stay (LOS) in patients with COVID-19, we evaluated prospectively 196 patients in the point-of-care within less than 48 hours upon hospital admission for handgrip strength and vastus lateralis cross-sectional area, by means of ultrasound imaging, and were followed until medical discharge. The primary outcome was LOS, defined as time (days) from hospital admission to discharge. We found muscle strength and muscle mass are predictive of LOS in hospitalized patients with. Then, in a cohort of COVID-19 survivors, we investigated the influence of skeletal muscle loss during hospitalization on COVID-19-related health care costs following discharge, persistent symptoms, hospital readmission rate, and self-perception of health. Handgrip strength and vastus lateralis muscle cross-sectional area (CSAVL) were evaluated at hospital admission, discharge, and 6 months after discharge. PASC were evaluated 6 months after discharge (main outcome). Also, health care costs, hospital readmission rate, and self-perception of health were evaluated 2 and 6 months after discharge. To examine whether the magnitude of muscle mass loss impacts the outcomes, we ranked patients according to relative CSAVL reduction during hospital stay into either “high muscle loss” ($-18 \pm 11\%$) or “low muscle loss” ($-4 \pm 2\%$) group, based on median values. COVID-19 survivors experiencing high muscle mass loss during hospital stay fail to fully recover muscle health. In addition, greater muscle loss was associated with a higher frequency of post-acute sequelae of SARS-CoV-2 and greater total COVID-19-related health care costs 2 and 6 months after discharge.

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Effect of myofascial release, manipulation and joint mobilization of the lumbar spine on pain and joint range of individuals with non-specific low back pain

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Background: Low back pain is one of the main complaints of worldwide adult population. Manual therapy is usually used to treat back pain, however, there's a lack on the literature comparing these techniques. **Objective:** Compare the effect of mobilization, joint manipulation and myofascial release on the pain, mobility and functionality at the nonspecific low back pain. **Methods:** This study consist in a Randomized Clinical Trial with blind evaluation. The population was composed by individuals between 18 and 55 years old, that were submit in 5 sessions of therapy, randomized in three groups: joint manipulation, myofascial release and joint mobilization. The outcomes assessed were pain, measured by VAS and algometry of pressure; mobility, measured by goniometry and Schober test; and functionality, measured by Oswestry index 2.0. **Results:** The sample consisted of 48 volunteers. After the intervention, the three techniques achieve an improvement on the pain, increase the mobility and improve the incapacity, showing statistical difference at the outcomes pain, measured by VAS and algometry pressure, mobility, measured by Schober test, and functionality, measured by Oswestry index 2.0, but without statistical difference between the applied techniques. There was no statistical difference at the mobility measured by goniometry. **Conclusion:** The manipulation technique is more effective concerning the outcome pain, mobility and functionality, followed by myofascial release and lastly joint mobilization.

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Through vulnerabilities, needs and potentialities for the comprehensive healthcare: learning and shared inventions in pandemic times from a human psychosocial intervention and Multicultural Human Rights (MDH)

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Adolescents and Youth (A&Y) are affected in Brazil by the epidemics of Sexually Transmitted Infections (STIs), HIV/AIDS and syphilis, integrating a key population for the control of such diseases, adding to this context Covid-19 and the psychosocial suffering in a syndemic way. In this perspective, a Thematic research/extension project on the health of A&J is under development of 8 high schools in 3 cities in the state of São Paulo. Based on the framework of Vulnerability and Care, in the Multicultural Human Rights (MHR), it is proposed to conduct integrated activities for prevention and health promotion in schools in articulation with actions in the basic health unit (BHU) of reference in the school territory addressed. In the Thematic, the Health Axis aims to identify facilitators and obstacles in building partnerships between schools and health services with the construction and interpretation of empirical material guided by the Theory of the Work Process in Health and by the axis that qualifies integrality (needs; purposes; articulation; interactions). The Post Doctorate, which has just begun, is linked to the Health Axis and objective to identify and understand, based on interviews with health professionals and A&Y and observation of the service, how the reading of A&Y needs is developed, focusing on sexual and reproductive health and the intersections of A&Y daily life identified by the thematic project and the syndemic experience lived by this group. In this perspective, I seek to contribute to the consolidation of discussions of the problematic field of health in A&Y, considering that the promotion, guarantee and sustainability of health, require renewal of concepts, understanding of what favors the continuity and effectiveness of actions and evaluation process, it's essential to problematize the strategies and arrangements to be produced for the qualification and support of comprehensive A&Y care in an intersectoral network in daily practices within the scope of primary care and in which the participation of these subjects is essential.

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Three-dimensional model of nerve cells in cellular communication in healthy and pathological aging in Alzheimer's disease

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Aging is not, in itself, a disease. However, aging is the main risk factor for the development of many major chronic diseases. Furthermore, many diseases appear to accelerate the aging process. Alzheimer's disease (AD) is a complex, neurodegenerative disorder of multifactorial etiology, related to brain aging, significantly affecting public health systems worldwide. In AD, senile plaques result from the toxic accumulation of amyloid-beta peptide (Ab) in brain tissues, as a consequence of abnormal cleavage of amyloid precursor protein (APP). Parallel to this process, paired helical filaments (FHP) are formed, aggregates of the Tau protein in a hyperphosphorylated state, which causes the disruption of the microtubular cytoskeleton. Individuals with Down Syndrome (DS) are known to develop dementia in middle age, and the underlying degenerative process presents pathological characteristics similar to AD. This process has been attributed to the increased expression of APP due to trisomy 21 in the brains of adult DS patients, aged between 35–45 years. In this project, we intend to investigate some markers that precede the pathogenic processes of AD in DS in neurons derived from human induced pluripotency cells (tri-dimensional culture of human neurons, astrocytes and microglia). Extracellular vesicles will be collected from isolated cultures and tricultures to determine vesicular markers related to cell communication in healthy elderly, individuals with AD and individuals with Down syndrome with and without AD. Bioinformatics analysis will be carried out to identify the ontological pathways, describing the Biological Processes, Cellular Function and the cellular Components involved in the cellular communication pathway. We intend to describe the different cellular communication pathways in healthy and pathological aging.

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Effect of inhibition of inflammasome NLRP3 and via TLR4/NF- κ B in clinical and experimental conditions of heavy proteinuria

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The study was divided into 2 experimental protocols. In the first, using the model of adriamycin-induced nephropathy, we evaluated the effect of inhibition in of the NLRP3 inflammasome by allopurinol (ALLO) on the development of interstitial and glomerular lesions. As expected, ADR promoted massive albuminuria, intense infiltration of M Φ , lymphocytes, COLL deposition and α -actin, hyperuricemia, activation of CASP1, NLRP3, TLR4 and NF- κ B, as well as evidence of oxidative stress. Administration of ALLO normalized acid uric acid and attenuated renal inflammation/fibrosis despite persistence of albuminuria massive. Likewise, ALLO prevented the upregulation of NLRP3, CASP1 and IL1 β 4 weeks after ADR, without interfering with the TLR4/NF- κ B pathway. Those findings were associated with reduced renal abundance of Heme oxygenase-1, together with an increase in renal SOD-2, suggesting an action Allopurinol antioxidant. In addition, treatment with ALLO promoted the M Φ change from M1 to M2 phenotype. In tubular cell cultures primary cells, excess albumin increased the abundance of NLRP3, Caspase-1, IL1- β , MCP-1, α -SMA and COLL-1. The silencing of NLRP3 with siRNA, as well such as treatment with ALLO, attenuated this pro-inflammatory/pro-fibrotic. NLRP3/Casp-1/IL1 β upregulation may be a mechanism by which intense protein filtration promotes interstitial fibrosis. Treatment with ALLO prevented the activation of this innate immune pathway and attenuated renal injury, even without decreasing proteinuria. The acid reduction systemic uric acid and oxidative stress may also contribute to this effect. beneficial. The use of ALLO may help prevent or limit the progression of CKD.

Application of clustered regularly interspaced short palindromic repeats-associated protein 9 (CRISPR/CAS9) in samples from individuals with HIV-1 associated neurocognitive disorders (HAND)

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Despite the care and availability of efficient antiretroviral treatment, some people living with HIV (PLHIV) have neurocognitive disorders associated with the human immunodeficiency virus (HAND), with important disturbance in their quality of life. HAND can be further grouped into asymptomatic neurocognitive impairment (ANI), minor neurocognitive disorder (MND) and the more severe HIV-associated dementia (HAD). Although the mechanism of HAND remains to be elucidated, it is generally accepted that HAND is closely correlated with HIV infection of astrocytes, microglial cells and macrophages in the human brain. It is known that a reservoir of HIV is established in the early stages of infection represented by proviruses that lie dormant and inserted into the genetic material of cells, such as resting CD4+ T lymphocytes, as well as into sanctuary tissues, such as the brain. This is one of the great difficulties in curing HIV. In recent years, a new toolkit has emerged, gene editing based on the CRISPR/Cas9 system, which can edit genomic segments by performing insertions, deletions, and substitutions, with great therapeutic potential. This technology has been used for research in the treatment of HIV and appears to be a hope for a possible cure of HIV infection and perhaps a prevention of HAND. This approach has the potential to directly impact the quality of life of PLHIV, being a very important subject to be known and discussed.

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Post-GWAS of the 2q22 region and its impact in renal cell carcinoma development

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Genome-wide association studies (GWAS) have identified 13 genomic regions associated with the risk of developing renal cell carcinoma (RCC). This study focuses on the 2q22 region, which remains poorly understood in terms of its biological mechanisms of susceptibility. The objective was to identify the functional role of single nucleotide polymorphism (SNP) within the 2q22 region, using a comprehensive approach including MPRA, ATAC-Seq, ChIP-Seq, Capture-HiC, eQTL, LDlink data, and validation through electrophoretic mobility shift assays (EMSA). Among the 14 SNPs evaluated, we prioritized SNP rs72858496 due to its high linkage disequilibrium ($R^2 = 0.93$; $D' = 1$) with the tag SNP rs12105918 ($p = 2.9 \times 10^{-9}$). Notably, on Capture-HiC, rs72858496 exhibited a chromosomal loop allowing physical interaction with the promoter region of the ZEB2 gene. EMSA analysis confirmed specific binding of the C-probe with nuclear extracts from renal cancer cell lines. To assess the functional role of rs72858496 in renal cancer and understand its impact on the target gene ZEB2, we employed CRISPRi as a gene expression interference technique. Specifically, a catalytically inactive Cas9 (dCas9) fused to a KRAB-ZIM3 repressive domain was utilized. CRISPRi was applied to target the SNP region and the ZEB2 gene in UO-31, Caki-1, 786-O, and ACHN cell lines. Our initial results point to rs72858496 as a potential functional SNP in the 2q22 region, decreasing ZEB2 gene expression when the SNP region is blocked by the dCas9-KRAB-ZIM3 domain targeted by 3 out of 4 different gRNAs targeting rs72858496 in the UO-31 cell line. In conjunction with data obtained by EMSA, we note that this SNP has a role associated with the gene modulation of ZEB2. Furthermore, CRISPRi targeting ZEB2 in renal cancer cell lines resulted in approximately 10–20% repression of gene expression and a decrease in cellular growth, without significant alterations in cellular migration across the different cell lines. These findings contribute to a better understanding of the molecular mechanisms associated with the 2q22 region and its implications in renal cancer susceptibility. Further functional studies are underway to gain a comprehensive understanding of the molecular mechanisms associated with ZEB2 in the 2q22 region and their relevance to renal cancer.

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DNA methylation pattern after combined physical training in women with obesity

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The study's objective was to evaluate the DNA methylation pattern in women with obesity submitted to physical training. Thus, 13 women with a BMI of 33 ± 2 kg/m², aged 34 ± 5 years, underwent evaluation of body composition, resting energy expenditure (REE), physical performance (VO₂max), and peripheral blood collection for DNA methylation analysis (EPIC Beadchip), before and after eight weeks of combined physical training intervention (3 times/week, 55 minutes/session, 70–90% of max HR). The data are presented as a percentage of change, and the methylation analysis was performed using the Champ package for R ($p < 0.05$). After physical training, there was no change in body weight, but a 4% reduction in body fat percentage was observed. Meanwhile, there was an increase of 4% in lean mass, 25% in REE, and 20% in VO₂max ($p < 0.05$). In DNA methylation, 103 CpG sites were found in 13 differentially methylated regions (DMRs). Genes involved included: energy metabolism (GATA5), thermogenic enzymes and brown adipose tissue enrichment (PM20D1), regulation of body weight and adiposity (KRTCAP3), autophagy process, signaling modulation, and apoptosis (PTRH2 and TMEM49), transcription and gene expression (BDP1), and association with heart diseases (LRRC20), among others. Therefore, combined physical training can promote modifications in the DNA methylation profile at CpG sites involved in energy metabolism pathways, in addition to increasing REE, physical performance, lean mass, and reducing body fat.

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Use of an ACE2 receptor mimetic peptide in reducing infection and pathophysiology caused by the SARS-CoV-2 virus

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To infect human cells, SARS-CoV-2 depends on the interaction of the RBD domain found in the viral spike S structural glycoprotein and its binding receptor expressed on the surface of human cells, the angiotensin-converting enzyme 2 (ACE2). This interaction occurs through the formation of a hydrophilic network of amino acids (a.a) specific to the RBD domain of SARS-CoV-2 and specific a.a residues of ACE2. Identification of the interaction site between SARS-CoV-2/ACE2 is essential for the development of strategies for tracking or blocking human ACE2, without interfering with its physiological function in the body. Based on this, this study aimed to investigate whether the use of a synthetic ACE2 mimetic peptide that contains a.a residues present in the interaction interface with the RBD domain of the virus could act as a competitor through the interaction site of SARS-CoV-2, decreasing the infectious process and consequently the pathology of COVID-19. For this, we used 45 µg of mimetic peptide that represents the N-terminal alpha-helix portion of human ACE2 for the treatment of K18-hACE2 mice infected with 1x10³ PFU of SARS-CoV-2. Interestingly, our findings indicate that mice treated with the peptide don't show clinical signs of COVID-19. Furthermore, the RT-qPCR results revealed a reduction corresponding to 50% of viral load in the lungs of treated mice when compared to untreated infected mice. In addition, the histopathological evaluation showed a reduction in cellular infiltration and lung lesions in mice treated with the peptide, which was also associated with a significant reduction in pro-inflammatory cytokines/chemokines (CCL2, CCL3, CCL4, IL-6, CXCL1, C5aR1) levels, as demonstrated by the ELISA assay. Our data indicate that the use of the ACE2 mimetic peptide is a promising strategy for controlling SARS-CoV-2 virus infection and also has therapeutic potential for COVID-19.

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Social stress induces behavioral and autonomic alterations related with depressive disorders, possible role of oxytocin

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Social stress is a risk factor for mental health problems such as depression and anxiety. Social support can buffer the negative effects of stress and protect mental health. Oxytocin, a hormone that regulates social bonding and stress responses, may mediate the beneficial effects of social support on mental health in stressful situations. In the sense, we conducted a study to analyze if social stress can induce autonomic and behavioral alterations related to depression using a resident-intruder model in rats. For this, Sprague Dawley rats were used as resident/aggressors and Wistar rats as intruders/defeated presented for 7 days 10 minutes per day followed by social isolation of intruders. Intruders were treated with saline or oxytocin antagonist (L-368,899 3µg/kg ip) 30 minutes before RI-protocol. After, animals were tested in splash test, forced swimming test, open field, novelty object recognition and cardiovascular recording in two stages (homecage and into resident cage). During all RI-protocol, animals were weighted, and stressed group showed a decrease in body weight and weight gain compared to control group at day 7 of stress. Stress had a negative impact on body weight and weight gain, as stressed animals weighed less and gained less weight than control animals after seven days of stress. Stress also affected grooming behavior and latency time in the splash test, as stressed animals took longer to start grooming and spent less time grooming themselves than control animals. In the forced swimming test, stress reduced the immobility time of the animals, indicating a higher level of despair, while control animals showed a learning behavior of increasing immobility. Stress also altered the autonomic responses of the animals, as stressed animals had a higher basal heart rate in their home cage than control animals, but no difference in mean arterial pressure. Blocking oxytocin neurotransmission with L-368,899 during stress exacerbated these effects, except for the memory impairment in the novelty object test. Stress also diminished the heart rate and blood pressure responses to the exposure to an aggressor in the resident cage. These results suggest that short-term social stress has significant effects on behavior and heart rate in rodents. Pharmacological manipulation of the oxytocin central system seems to induce the worst heart rate and anhedonic-like behavior, which can be involved with learning/memory impairment.

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Investigation of the therapeutic profile of cannabigerol in animal models for the study of psychiatric disorders

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Cannabigerol (CBG) is a phytocannabinoid found in the plant *Cannabis sativa*, which, like cannabidiol (CBD), is not psychotomimetic and is devoid of intoxicating effects. CBG, in its acid form, is a precursor to other phytocannabinoids. Currently, there are few clinical and preclinical approaches with CBG that have aroused great interest due to its pharmacological profile. This study investigated whether this drug has a therapeutic profile in animal models related to schizophrenia symptoms and obsessive-compulsive disorder. 8-week-old male Swiss mice were used, which independently underwent different experimental protocols. The tests were: prepulse inhibition test (PPI), open field, social interaction, object recognition, marble burying. Treatments were administered acutely via the intraperitoneal route. In the experimental protocols, four different doses of CBG were generally used (1, 3, 10, and 30mg/kg). All experiments were conducted under CONCEA guidelines. CBG in all trials related to schizophrenia symptoms robustly prevented amphetamine- or MK-801-induced impairments. In addition, it showed an anti-compulsive-like effect in the marble burying test. The results of this work are unprecedented and suggest that CBG exhibits antipsychotic and anti-compulsive-like effects in preclinical trials. Furthermore, CBG showed low-dose therapeutic effects, indicating that it may be more potent than CBD and a promising compound for clinical use.

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A short noncoding RNA affects nutritional stress response and metacyclogenesis in *Leishmania braziliensis*

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Under a restricted nutritional environment inside the sand fly, the pathogenic parasites from *Leishmania braziliensis* are crucially dependent on metacyclogenesis to their survival, before reaching the blood stream of the mammalian host. Even with some genes associated to the parasite differentiation, the mechanism of such cellular process is still not fully understood. However, the nutritional stress and metacyclogenesis are processes well correlated in these parasites. Here we show the first identification, molecular and functional characterization of a short noncoding RNA (sncRNA) in *Leishmania braziliensis*. So far, ncRNA97 is found as independent transcript in these parasites, as presented by circular RNA assay. Additionally, under nutritional stress condition, this transcript is at higher levels in living cells, 10 times enriched in pre-polysome fractions. Mutant parasites (Δ) lacking the ncRNA97 were more sensitive to nutritional stress, presenting decrease in the metacyclogenesis rate of 50%. Polysome profile analysis of mutant parasites proved that the lack of ncRNA97 also promoted an alteration in the polysome profile, with higher levels of free-ribosomal subunits. Moreover, a ribosome constituent protein S29 was identified specifically binding to ncRNA by in vitro pull-down, endorsing the role of this ncRNA during the nutritional stress response in *Leishmania braziliensis*. In knockout parasites, RNA-seq revealed a group of genes up and down regulated, highlighting genes encoding for Amastin, an important protein for the establishment of amastigote morphology. Additional bioinformatics analysis will be performed in order to generate some in silico and substantial information about motifs of interaction between these genes at modified levels in the Δ parasites and the ncRNA97 sequence. Lastly, RNA fractionation between nuclear and cytoplasmic followed by northern blotting will prove the main location of this transcript inside the cell, corroborant to the phenotypical results and interacting protein.

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Adamantinomatous craniopharyngiomas are characterized by two distinct epigenomic profiles

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Introduction: Abnormal methylation is frequent in neoplasias. To date, there are no studies addressing the methylation pattern in adamantinomatous craniopharyngioma (aCP) and its relationship with clinical behavior and outcome. **Objective:** To identify differential methylation signatures in aCP and their association with clinical presentation and outcome. **Materials and Methods:** We analyzed 35 aCP patients (54% male; 23 years [7–74]). Clinical, biochemical and pathology data were retrospectively collected. CTNNB1/b-catenin mutations and methylation (MethylationEPIC Array–Illumina) were analyzed in tumor DNA. Unsupervised Hierarchical Cluster Analysis (UHCA) using Euclidean distance as metric, Ward D2 as grouping, and Bootstrap as robustness check was applied to Quantile normalized data. Fisher’s and Mann–Whitney–Wilcoxon’s tests were applied to interpret and cross correlate clusters with external clinical information. **Results:** CTNNB1 mutations were found in 77% aCP. UHCA revealed two clusters, aCP1 and aCP2, with distinct methylation signatures and 100% bootstrap support. aCP2 cluster (n=17) was enriched with CTNNB1 mutated aCPs. We found 1,033 differentially methylated probes ($|\log_2\text{foldChange}| > 1$ and FDR p-values $< 10^{-7}$). Of these probes, 7% are located in the regulatory region of 65 genes, none of them previously known to be associated with aCP. **Conclusion:** aCPs present two distinct methylation signatures clusters revealed by UHCA. One of these clusters is significantly enriched by CTNNB1 mutated aCPs. In CTNNB1 mutated aCPs were found hypermethylation of genes associated with cell migration and tumor invasion. These new findings expand the knowledge on the pathogenesis of aCP and may offer new insights into this process.

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A functional variant of AP-1 complex composed by $\gamma 2$ is a novel cellular factor required for Endosome-to-Golgi retrograde trafficking of CI-MPR and copper transporter ATP7B

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The adaptor proteins (APs) comprise a family of five heterotetrameric complexes in mammals, which mediate intracellular membrane trafficking along endocytic and secretory pathways. AP-1 is one of the best-studied AP complexes and may be formed by one of two isoforms of its γ - adaptin subunit: either $\gamma 1$ or $\gamma 2$, giving rise to two AP-1 variants. So far, the knowledge that we have for AP-1 function is by studying $\gamma 1$, but not $\gamma 2$. One of the best characterized roles of $\gamma 1$ is in the transport of transmembrane proteins from endosomes to the trans-Golgi network (TGN). This route compensates the biosynthetic secretory flow and is vital for cellular homeostasis. Two important transmembrane proteins subjected to this pathway are the Cation-Independent Mannose-6-Phosphate Receptor (CI-MPR) and the ATP7B copper transporter. CI-MPR is responsible for delivering acid hydrolases to lysosomes and is involved in various cellular responses, while ATP7B facilitates the transport cytosolic copper ions into organelles or the extracellular space. We previously demonstrated that $\gamma 2$ is part of functional AP-1 complex (hereafter termed AP-1 $\gamma 2$) required for efficient HIV-1 Nef-mediated targeting of CD4 and MHC-I to lysosomal degradation. However, a physiological role of AP-1 $\gamma 2$ has not been reported yet. In this study, we have discovered that both CI-MPR and ATP7B interact with AP-1 $\gamma 2$ in co-immunoprecipitation assay. Moreover, by using siRNA and CRISPr-Cas9 approaches to deplete AP-1 $\gamma 2$ expression, we performed synchronized anterograde trafficking and cell-surface uptake assays and we found that AP-1 $\gamma 2$ is dispensable for ATP7B and CI-MPR exit from the TGN, but is critically required for their retrieval from endosomes back to the TGN. This underscores the indispensable involvement of AP-1 $\gamma 2$ as a key component in the sorting and trafficking machinery of CI-MPR and ATP7B, highlighting its essential role in the Endosome-to-Golgi trafficking.

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CBD attenuates trauma-induced behavioral deficits in rats by modulating inflammatory and cell death pathways in the prefrontal cortex through the disruption of PSD95/NOS1AP/nNOS complex

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In PTSD patients, fear memories become long-lasting and repeatedly activated. Excitatory neurotransmission mediates fear consolidation/extinction in parts through activation of NMDA receptors and consequently nNOS enzyme, functionally coupled to PSD95-NMDAR. On the other hand, nNOS/PSD95 inhibition has been shown attenuate anxiety and the overgeneralization of fear, behaviors that are also improved after treatment with cannabidiol (CBD). In this study, we show that CBD rather than being able to inhibit the NOS1 catalytic core, has affinity to the PDZ domain on the NOS1AP binding site, an adaptor of nNOS/PSD95/NMDA. NOS1AP is associated with severity and other neuropsychiatric comorbidities in PTSD patients. Therefore, to investigate this pathway on trauma neurobiology, adult male Wistar rats were submitted to single prolonged stress (SPS; 2hs-restraint, 20-min forced swimming, and ether exposure). After 7-day period, animals were submitted to a forced swimming session as a direct reminder of the trauma, and then started to be treated with CBD (5mg/kg i.p.) or vehicle for 7 days. CBD treatment attenuated anxious and anhedonic behavior as well, as the deficits in the extinction of fear memories induced by SPS. The trauma effects on emotionality were directly correlated with nNOS levels and co-immunoprecipitated PSD95 and NOS1AP isoforms in the prefrontal cortex (PFC). Positive correlations were also found on inflammatory and apoptotic pathways, including the NF κ B/Siah-1 translocation to the nucleus, and increased protein levels pP38, pIKB α , and caspase-3. Given the interesting findings obtained related to NMDA/PSD95/TrkB, we are investigating the hypothesis that by inhibiting the PSD95/nNOS complex in the hippocampus, CBD might favor the interaction of PSD95/TrkB, promoting synaptic plasticity, which is essential for fear extinction (IC project under postdoc supervision). As perspectives, we will assess the direct action of CBD on nNOS/PSD95 in neuronal cells and the effects of NOS1AP overexpression in vmPFC/IL on stress and aversive memory processing.

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Aprendizado de máquina e regressão logística na predição de prognóstico em traumatismo cranioencefálico

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O traumatismo cranioencefálico (TCE) é um problema de saúde pública no Brasil e no Mundo, com alta morbimortalidade associada. Novos algoritmos de aprendizado de máquina (AM), como o Extreme Gradient Boosting (XGBoost), têm mostrado melhor desempenho na classificação do desfecho funcional de pacientes com TCE em comparação aos modelos de regressão logística. O objetivo deste estudo foi comparar a acurácia do modelo de regressão logística com o modelo XGBoost em pacientes com TCE e identificar os fatores associados a desfechos desfavoráveis. O estudo foi conduzido em um centro de referência em trauma, incluindo pacientes adultos com TCE. A escala de desfecho de Glasgow (EDG) foi usada para avaliar o desfecho funcional. O modelo XGBoost foi treinado com 70% da amostra e testado com os 30% restantes. A acurácia e a área sob a curva ROC (AUROC) dos modelos foram comparadas. Foram incluídos 5056 indivíduos no estudo, com média de idade de 43,2 anos. O modelo de regressão logística foi estatisticamente significativo para classificar desfechos desfavoráveis, com uma taxa de previsão adequada de 75,6%. As variáveis significativas no modelo foram idade, nível educacional, sexo, tipo de acidente, gravidade da lesão, escala de Glasgow na admissão, frequência respiratória, pressão arterial sistólica, dias de internação no CTI e cirurgia do sistema nervoso. A análise da curva ROC mostrou uma AUROC significativa de 0,825. O algoritmo XGBoost alcançou uma acurácia de 0,79 e AUROC de 0,77, com as variáveis mais importantes sendo idade, pressão arterial sistólica, dias de internação, escore de Glasgow e gravidade da lesão craniana. Concluiu-se que o algoritmo XGBoost foi superior na classificação de desfechos desfavoráveis, apresentando excelente acurácia e capacidade de processamento de dados. Estudos futuros devem focar na otimização dos hiperparâmetros do algoritmo para aprimorar os resultados.

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Cost-effectiveness threshold prediction model for rare diseases in Brazil

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Redefining a cost-effectiveness threshold (CET) for rare and ultra-rare diseases is very important for the incorporation of Health Technologies in Brazil. Rare diseases affect 5 to 80 individuals in 100,000, who are fatally commended to death because there are no treatment options and when do them, they are very expensive, excluding part of the population from the public health system. The aim of this study was to delimit parameters for cost-effectiveness thresholds for the incorporation of health technologies in cases of rare diseases in Brazil. This is a pharmacoeconomic study of policy based on healthcare management for the evaluation of health technologies in the application of CET definitions for rare diseases by a model for cancers. This study provides for retrospective data collection over ten years, a whole database from the CONITEC of the Ministry of Health, Brazil. This study will have the following steps: cost assessment from the perspective of the Unified Health System (SUS) in a time horizon of one year; data collection of Technologies incorporated by CONITEC; Systematic review for assessment of Quality-Adjusted Life Years and Years of Life Save; Description of data related to common and rare cancers in Brazil and; Description of thresholds adopted by Latin American countries. Sequentially, the results of the indicators will be applied to a predictive model of expected value and statistically analyzed regarding its robustness and sensitivity. Out of the 813 records, 249 (51.0%) were demands of the Ministry of Health and 123 (37.3%) by external demands. Comparatively, the request for use expansion was 47 (9.7%) and 6 (1.8%) for internal and external demands, respectively. Among drugs, procedures, and products, drugs appeared in 617 (75.9%) of the requests. Rare diseases accounted for 266 (32.7%) of the demands, of which 214 (80.5%) were related to drugs. Requests for incorporation and expansion of use summed 60.1% in rare diseases. Out of the 22 medical areas identified in the demands of rare diseases, oncology was present in 62 (23.3%) of the requests, followed by Infectiology in 50 (18.8%) and Hematology in 38 (14.3%). It is concluded by these preliminary results that rare diseases are important for the improvement of access to health, which tends to cause a representative budgeted impact in Brazil, especially when the medical area of oncology is considered.

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Urocortin 2 improves skeletal muscle mass associated with insulin/IGF-1 signaling pathway stimulation in obese and denervated mice

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Introduction: Urocortin 2 (Ucn2) modulates skeletal muscle (SM) mass of rodents, however, the intracellular mechanisms responsible for these findings remained unclear. We have recently demonstrated that the hypertrophic effect promoted by Ucn2 in vivo was associated with a crosstalk, probably mediated by Epac, between urocortineric canonic signaling pathway (cAMP/PKA/CREB) and insulin pathway (Akt/mTOR/S6; Akt/Foxo) in SM of normal mice. The objective of this work is to investigate the effects of Ucn2 in SM in a model of insulin resistance induced by diet and also in an atrophic model induced by motor denervation. **Methods:** C57Bl/6J male mice (8 weeks) received hyperlipidic diet (HL; 35% of lipids) for 3 months and to induce muscle atrophy, male mice (8 weeks) were surgically denervated (DEN). Using electroporation technique, empty vector (pcDNA3.1+) or Ucn2 plasmid was transfected in vivo into tibialis anterior (TA) muscles of obese (14 days before euthanasia) and 14-days-DEN mice (the transfection occurred in the same day of the denervation surgery). Then, TA were excised and processed to determine the expression of genes and proteins of interest. Student's t-test was used to analyze data. Ethic committee approval: 063/2014. **Results:** HL diet induces body gain mass, hyperglycemia, hyperinsulinemia and a tendency in decrease muscle mass indirectly measured by total protein content. HL diet reduces the phosphorylation levels of Akt (Ser473; Thr308), S6 (Ser235/236; Ser240/244) and FoxO1 (Ser256) and these effects were completely reverted by Ucn2 overexpression in TA of obese mice. Ucn2 in vivo reduced the protein expression of E3-ligases (atrogin and MuRF-1) in TA muscles of obese mice. In addition, HL diet decreases the protein content of LC3-II, an autophagy marker, and this effect were completely reverted by Ucn2 overexpression suggesting inhibition of lysosomal-autophagic proteolytic system. Ucn2 partially reverted the atrophy induced by denervation measured by TA weight in DEN mice. **Conclusions:** Ucn2 exerts its effects in SM of insulin resistant and atrophic models probably through insulin/IGF-1 signaling pathway stimulation. This research rises up new perspectives for the development of therapeutic strategies to protect muscle mass and also to cope with insulin resistance induced by HL diet.

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Ex vivo monkeypox virus infection of lymphoid tissue: viral fitness and inflammatory responses

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Human monkeypox virus (MPOX) is a neglected zoonotic orthopoxvirus closely related to the smallpox virus. Following the increase in human-to-human transmission in May 2022, MPOX has become a global concern. MPOX infects various mammalian species through close contact, leading to symptoms such as fever, headaches, skin rashes, pustules, scabs, and lymph node swellings. In this study, we investigated the ex vivo infection of human tonsillar explants by MPOX to evaluate viral production, cellular tropism, cytokine profile, and activation of inflammatory pathways. Hypertrophic tonsil explants were cultured in Transwell inserts with an air-liquid interface, and MPOX (5x10⁵ TCID₅₀/ml) was carefully inoculated on the epithelial side. After 2 hours, the tissue was washed, and fresh medium was added. Explants were harvested at 72 hours and 7 days post-infection for molecular assays, in situ labeling, and lipidomics analyses. MPOX infection resulted in a significant increase in viral loads, with strong viral protein signals observed in the lymphoid parenchyma. Tissue destruction, necrosis, and necroptosis were evident at 7 days post-infection, as shown by intense architectural loss, eosinophilia, and detection of the necroptosis marker MLKL. The upregulation of IL-6 and IL-1B mRNA, along with positive labeling of AIM2, NLRP3, and N-term GSDM, indicated the activation of inflammasome pathways and pyroptosis in MPOX-infected explants. Furthermore, lipidomics analysis revealed alterations in phosphatidylethanolamine and phosphatidylcholine species, impacting cellular membrane fluidity. These findings highlight the susceptibility of tonsillar explants to MPOX infection and the involvement of inflammasomes AIM-2 and NLRP-3 in MPOX lymphoid pathogenesis and inflammation. This model shows potential for further studies and pre-clinical antiviral investigations.

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Akkermansia muciniphila elicits tolerogenic type-2 dendritic and Treg cells and limits type 1 diabetes onset

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Reduction in *Akkermansia muciniphila* abundance has been related in the development of type 1 diabetes (T1D). However, its supplementation effect and action mechanism in this autoimmune disease has not been elucidated. In this context, we investigated whether *A. muciniphila* administration is able to ameliorate streptozotocin (STZ)-induced T1D. For this propose, the T1D was induced in vivo by inoculating 1 daily dose of STZ 40mg/kg for 5 consecutive days, and the viable *A. muciniphila* was administered every other day from the one day before the first dose of STZ until day 15 in C57BL/6 male mice (CEUA 169/2020). Euthanasia was performed 15 days after the first dose of STZ. We also evaluated the effect of *A. muciniphila* on the differentiation of bone marrow-derived dendritic cells (BMDC) in vitro. Our data showed that In vivo administration of the *A. muciniphila* was able to control glycemia levels, reduced the incidence of T1D and degree of insulinitis in mice with STZ-induced T1D. The modulation of T1D, in mice that ingested the probiotic, was related to the accumulating of CD11b+CD103+ dendritic cells (cDC2) in the pancreatic lymph nodes (PLN). We also detected an increased gene expression of *Sirpα* and *Aldh1a2*, markers of tolerogenic cDC2, in the colon and pancreas from STZ-Akk group. This group also showed an increase in Treg cells in the PLN and in regulatory cytokines, like IL10 and TGFβ, in the pancreas, when compared those diabetic and non-supplemented mice. Then, we confirmed in vitro that *A. muciniphila* is efficient in inducing the differentiation of BMDC with a tolerogenic profile (CD103+CD11b+PDL-1+). In addition, BMDC differentiated in the presence of *A. muciniphila* promoted the Treg differentiation in vitro. Thus, the *A. muciniphila* confers immunomodulatory properties able of attenuating T1D in mice, making this probiotic a promising target as new therapeutic tools against this disease.

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Correlation between different methods of gait functional evaluation in rats with ischiatic nerve crushing injuries

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A study of the correlation between different methods of functional evaluation of the sciatic nerve of rats after a crushing injury was carried out. Twenty five Wistar rats weighing 250g in average were submitted to a controlled crushing injury of the nerve and evaluated by two conventional methods for obtaining the sciatic functional index (SFI), based on manual and computer-based measurement of parameters on animals' footprints, and by a new method developed by the authors, based on walking track movie recording and the measurement of the same parameters, on the 1st, 7th, 14th and 21st postoperative days, a comparison being established with the values obtained preoperatively and between the different methods in all periods. The results showed that the method of recording the walking track allows for a better visualization of the injured paw and that this method positively correlates with the conventional methods, as early as the first postoperative week on, provided that the same SFI formula is used.

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Exploring small molecule modulators of PKM2 tetramer formation

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Psoriasis is characterized by persistent skin inflammation and has evident clinical manifestations as an autoimmune disease. In contrast to those from other regions of the world, who are just 2% at risk, people of Northern European and Caucasian ancestry are 11%. Reversal of the psoriasis imiquimod-induced model is shown in animals lacking the glycolytic protein pyruvate kinase isoform II (hPKM2), notably in keratinocytes, or when this enzyme is pharmacologically controlled. Non-canonical events, such as increased production of pro-inflammatory cytokines, are exclusively carried out by the dimeric form of hPKM2. PKM2 dissociation to lower oligomeric states stimulates the IL-17 pathway, which is critical in the progression of psoriasis and can be modulated by allosteric modulators.¹ Finding molecules that stop the breakdown of the hPKM2 tetrameric oligomer into dimers/monomers is critical for impeding the progression of the disease. In this regard, the goal is to discover and develop new therapeutic modulators for psoriasis treatment. Differential scanning fluorimetry (DSF) is a technique for detecting how a protein reacts to temperature changes. As a result, greater oligomeric states of hPKM2 account for the improved thermal stability seen in the presence of ligands (tetramer). In this work, we provide the results of our extensive study of tetramerization modulators, which included the screening of 8000 compounds by hPKM2 thermal stability, from which 127 positive hits were chosen. Numerous biochemical and biophysical investigations have been performed to determine how the wild-type protein responds to the presence of these ligands. Currently, the tetramerization and cellular activity of the 26 most promising hits are being assessed. Furthermore, x-ray crystallography has been used to probe the ligand-binding mechanism. Appropriately, the most potent psoriasis cellular hits will be evaluated in imiquimod-induced animal models.

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Behavioral effects of neonatal lipopolysaccharide injection in rats: implications for panic disorder

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Panic disorder (PD) is a chronic, disabling pathology, characterized by the recurrence of unexpected panic attacks, whose pathophysiology is still not fully understood. Recent studies show that neonatal stressors can promote behavioral changes in the offspring throughout life and, among these, is the increase in vulnerability to stimuli that induce panic attacks. In this context, the present study aimed to evaluate the behavioral effects associated with PD caused by neonatal injection with lipopolysaccharide (LPS) in Sprague Dawley rats. Litters were standardized with one dam and eight pups (4 males and 4 females) on the third postnatal day (DPN3). In DPN14, half of the animals of each litter (2 males and 2 females) received LPS (i.p. dose: 0.05 mg/kg) and the other half received saline. After weaning (DPN21), the pups from the same litter (LPS and saline) were separated into boxes, according to sex, under standard conditions and submitted in adult life (DPN60) to inhalation of a low concentration of O₂ (7 %), a known panicogenic stimulus. The results of this experiment showed that neonatal immune activation with LPS induced a panicogenic response in the offspring of both sexes during the respiratory challenge, evaluated through increased jumping towards the edge of the chamber. In the continuation of this study, we will evaluate the behavioral responses in another experimental model that associates the escape response with PD, the elevated T-maze, as well as expanding the investigations through neuroimmune analyses.

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Identification of immune evasion mechanisms in myeloid leukemias by mapping Natural Killer cells by single-cell transcriptomics

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Advances in immunotherapy have already been achieved with checkpoint inhibitors to enhance T cell responses such as inhibition of PD-1/PDL-1 in solid tumors and lymphoproliferative diseases, with promising results, and more scarce data from clinical trials in myeloid leukemias, as well as with genetic engineering of T lymphocytes (CAR-T cell therapy). However, for myeloid diseases, this therapy still faces great limitations due to the difficulty of targeting specific leukemic antigens that are not present in normal cells. Leukemic Initiating Cells are resistant to the immune system, either by deficiency of ligands at the level of the tumor cell, or by deficiency of receptors or molecules essential for the performance of effector cells. In this context, a deep characterization of Innate Lymphoid Cells, in particular Natural Killer (NK) cells, deserves investigation, and can be the scientific base for developing strategies to reestablish the antitumoral immunity, especially for myeloid malignancies, yet unfortunately rarely curable. Aims and Methods: To identify molecular mechanisms reducing ILCs cytotoxicity. To describe the transcriptional profile of NK and T cells from patients with myeloid neoplasms by CITE-directed sc-RNA-seq. We plan to include 60 patients with confirmed diagnosis of myeloid neoplasia (10 with CML; 20 with JAK2V617F MPN; 30 with AML) from the Ribeirao Preto Medical School Clinical Hospital, not previously submitted to therapy. Peripheral blood (PB) and bone marrow (BM) will be obtained for the cytotoxic transcriptional and immunophenotypic mapping after mononuclear cells enrichment. We hope the robust characterization of innate immune cells contribute to the development of strategies capable of restore the antitumor immune effect in myeloid neoplasms, which until now currently have low cure rates.

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Biological and environmental mechanisms underpinning the association between weight gain and antipsychotic treatment of psychosis patients

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Antipsychotic treatment may induce weight gain, a risk factor for metabolic disturbances. Childhood trauma and tobacco smoking are also risk factors for both metabolic and psychiatric pathology. However, data on long-term metabolic effects associated with antipsychotics (AP) are scarce. We aimed to evaluate up to one-year changes in body mass index (BMI) and related metabolic abnormalities in psychotic patients receiving AP, and determine if childhood trauma or tobacco smoking are associated with these changes. We included 82 early stages of psychosis patients aged 16–64 years treated with AP at baseline and followed up for 12 months in the Ribeirão Preto Early Intervention in Psychosis Programme. Data were analysed by ANOVA with follow-up group as a cofactor, followed by post-hoc Bonferroni tests. Forty-nine patients were men (59.8%), 47 were white (57.3%), and the average age was 32.5±14.4 years. Patients exhibited a significant increase in BMI (baseline: 25.2±6.4 kg/m²; follow-up: 27.4±7.1 kg/m², $p<0.001$). The percentage of obese (BMI ≥ 30 kg/m²) subjects among patients rose from 15.9 to 29.3% after follow up. The percentage of those meeting criteria for overweight (BMI ≥ 25, <30kg/m²) also increased from 31.7% to 32.9%. At baseline, 64.6% received haloperidol and 35.4% second-generation AP. After follow-up, 26.8% received haloperidol, and 73.2% of patients second-generation AP, grouped based on the AP propensity for weight gain (low: haloperidol; high: quetiapine, risperidone, olanzapine and clozapine). Glucose ($p=0.007$), cholesterol ($p=0.002$), triglycerides ($p=0.008$) and LDL-c ($p<0.001$) significantly increased at follow-up. History of emotional or physical abuse was significantly associated with elevated glucose ($p=0.037$; $p=0.012$, respectively). The current smoking frequency was 37.8%. High blood pressure was associated with tobacco smoking ($p=0.032$). Psychotic patients with physical childhood abuse had a higher smoking rate than non-smokers patients ($p=0.042$). The first year of AP treatment has significant effects on BMI and metabolic markers, and experience of childhood maltreatment may contribute as a risk factor for increased metabolic profile in psychosis. We will investigate if changes in DNA methylation in target genes may reveal a relationship between weight gain, environmental factors and antipsychotic treatment in psychosis.

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Nrf2 is important for the reabsorptive activity of osteoclasts through oxidative mitochondrial regulation

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Introduction. Bone remodeling is a vital process involving osteoclasts and osteoblasts, maintaining bone integrity throughout life. Imbalances in their activities lead to bone loss. Reactive oxygen species (ROS) and oxidative stress play a role in bone diseases, affecting osteoblasts and osteoclasts, and disrupting bone homeostasis. Nrf2, a key transcription factor, controls oxidative stress and acts as a negative regulator of osteoclast differentiation, protecting against bone destruction caused by reactive oxygen species (ROS). However, the excessive production of ROS species could impair osteoclast function. Thus, we tested whether specific deletion of Nrf2 in osteoclast precursors could affect osteoclast's function. **Methods.** To study the effects of Nrf2 deletion during osteoclast differentiation and function, we generated mice carrying Nrf2 floxed alleles and crossed them with LysmCre and CtskCre animals. Bone marrow macrophages (BMMs) from Nrf2^{fl}/fLysmCre animals were isolated and treated with the cytokines M-CSF (30 ng/mL) and RANKL (10 ng/mL). Differentiated osteoclasts were analysed by molecular and functional assays. This work was approved by ethics committee of the FCFRP (21.1.597.60.3). **Results.** Firstly, we re-analyzed a public database of microarray analysis of differentiated osteoclasts (Kim et al., 2021), focusing on reactive oxygen pathways. We observed that treatment with RANKL inhibits the primary antioxidative responses of the cells during osteoclast differentiation. RANKL decreases the expression of antioxidant and antiapoptotic genes such as *Mgst1*, *GPX3*, which are directly regulated by Nrf2. Subsequently, we differentiated Nrf2-deficient BMMs into osteoclasts and observed a significant increase in osteoclast differentiation validated by TRAP staining. However, despite the increase in osteoclast number and fusion, these osteoclasts showed a decrease in cathepsin K production, a vital protease for bone degradation. Upon analyzing the oxidative state of these cells, we found evidence of oxidative metabolic reprogramming, where the cells exhibited a decrease in the production of cytoplasmic ROS and an increase in the production of mitochondrial and lipid ROS, resulting in more damaged mitochondria. These results indicate that Nrf2 is vital for controlling the stability of mitochondrial function during osteoclast differentiation. **Conclusion.** The production of reactive oxygen species (ROS) during osteoclast differentiation is an important step in this process. However, Nrf2 is indispensable for preventing the exacerbation of oxidative responses and potential mitochondrial and cellular damage.

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Structural characterization of HLA-G polymorphisms in the hypoxia-inducible factor-1 binding and its regulatory element in the coding region of the gene

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The Human Leukocyte Antigen-G (HLA-G) gene encodes a non-classical class I major histocompatibility complex molecule responsible for immune system regulation. Under physiological conditions, its tissue expression is restricted; however, the gene can be induced under hypoxic conditions by the action of the Hypoxia Inducible Factor-1 (HIF1), which mainly binds to hypoxia-responsive regulatory elements (HREs) located in the promoter region and exon 2 of the HLA-G gene. These HREs act synergistically in regulating gene expression under low cellular oxygen tensions, and previous studies have shown that polymorphisms in the HLA-G promoter region modulate the magnitude of the HRE response in exon 2. Furthermore, using computational chemistry and molecular dynamics simulations, another study demonstrated that such polymorphisms also affect the stability and binding specificity of the HIF1-HRE molecular complex. Exon 2 also has polymorphisms within its HRE, but no structural or experimental studies have been done to evaluate how these polymorphic sites can impact on the transcription factor binding with its regulatory element. Therefore, this study aims to analyze the interaction between HIF1 and its regulatory element present in exon 2 of HLA-G, considering the population variability of the gene. Physical interaction between the TF and the polymorphism in the regulatory element through protein-DNA docking and molecular dynamics simulations will allow us to better understand the transcriptional regulation mechanisms of the gene under hypoxic conditions.

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The effects of multi-mode monophasic stimulation with capacitive discharge on the facial nerve stimulation reduction in young children with cochlear implants: intraoperative recordings

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Introduction: Facial nerve stimulation (FNS) is a potential complication which may affect the auditory performance of children with cochlear implants (CIs). We carried out an exploratory prospective observational study to investigate the effects of the electrical stimulation pattern on FNS reduction in young children with CI. **Methods:** Ten ears of seven prelingually deafened children with ages up to 6 years old who undergone a unilateral or bilateral CI surgery were included in this study. Electromyographic (EMG) action potentials from orbicularis oculi muscle were recorded using monopolar biphasic stimulation (ST1) and multi-mode monophasic stimulation with capacitive discharge (ST2). Presence of EMG responses, facial nerve stimulation thresholds (T-FNS) and EMG amplitudes were compared between ST1 and ST2. Intra-cochlear electrodes placement, cochlear-nerve and electrode-nerve distances were also estimated to investigate their effects on EMG responses. **Results:** The use of ST2 significantly reduced the presence of intraoperative EMG responses compared to ST1. Higher stimulation levels were required to elicit FNS with ST2, with smaller amplitudes, compared to ST1. No and weak correlation was observed between cochlea-nerve and electrode-nerve distances and EMG responses, respectively. **Conclusion:** ST2 may reduce FNS in young children with CI. Differently from the electrical stimulation pattern, the cochlea-nerve and electrode-nerve distances seem to have limited effects on FNS in this population.

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Machine learning applied to predict major adverse cardiovascular events

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Cardiovascular diseases are the leading cause of death worldwide. Underlying atherosclerosis and subsequent conditions such as myocardial infarction, ischemic heart disease, and stroke cause significant morbidity, mortality, and economic losses. Early identification of high-risk patients for these clinical events is essential for implementing preventive measures. In this context, the use of machine learning techniques to predict risks can offer advantages over traditional risk scoring methods. The objective of this project is to investigate, through a retrospective study, the ability of ML models to measure the risk of major adverse cardiovascular events (MACE) occurrence, using predictors extracted from electronic health records (EHRs). This work is a preliminary result of the project “Federated Learning for validation of machine learning models trained on different hospital networks”.

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Interprofessional Education and the development of an innovative technological model for health education in Brazil

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In recent years, the World Health Organization (WHO) has formulated guidelines, plans and technical documents in order to contribute with the formulation of human resources for health (HRH) policies. One of the themes that WHO has invested to contribute to the implementation of the HRH Strategy in the Region of the Americas is Interprofessional Education (IPE). Conceptualized as occasions in which two or more health professions learn together, interacting each other, to improve health care and develop collaborative skills, IPE is a priority for the strengthening of national HRH policies, and which has gained notoriety. The Ministry of Health of Brazil, motivated by the so-called WHO, prioritized the inclusion of the IPE agenda based on an action plan for its implementation in the country. As part of the plan's activities, the call for projects for the Education through Work Program for Health PET-health/Interprofessionality edition was launched. The University of São Paulo (USP), Ribeirão Preto (RP) campus, had its project approved. The objective of this research is to develop an innovative educational model in IPE based on the project PET-health/Interprofessionality USP/RP. This is exploratory research with design and qualitative approach method, developed at USP/RP with PET participants, in order to ensure the adoption of the IPE precepts in its curricular components, thus contributing to the advancement in the areas of innovation, knowledge and institutional development. The development of an innovative model to integrate IPE in the USP-RP undergraduate health curricula is essential and necessary. One aspect that facilitates achieving this goal is the university's PET-health/Interprofessionality project. The CIHC National Framework for Interprofessional Competencies is the Canadian conceptual framework being considered as potential model in the USP-RP undergraduate health curricula. Six domains of competencies highlight the knowledge, skills, attitudes and values that together shape the essential requirements for interprofessional collaborative practice and which, according to the research participants, is the most appropriate to be adopted at USP. The PET-health/Interprofessionality program offers an example of how to transform health education as well as practice scenarios, including micro, meso and macro levels, encouraging us to reflect on the scope and sustainability of its influence.

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The susceptibility of seizures and depressive-like symptoms can be modulated by NR1 receptor dysfunction in parvalbumin-interneurons

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Introduction. The progression of mesial temporal lobe epilepsy (MTLE) seizures affects populations of GABAergic interneurons (IN) and the functional/morphological connectivity between the hippocampus (HPC) and prefrontal cortex (PFC), which could explain the high prevalence of psychiatric disorders in MTLE patients. Moreover, the role of parvalbumin interneurons (PV-INs) in epileptogenesis could explain the pathophysiology of MTLE's psychiatric comorbidities. Thus, this study investigates the role of PV-IN malfunction in the HPC-PFC microcircuitry in the process of epileptogenesis and associated comorbidities such as depression-like symptoms, anxiety-like symptoms, and psychosis-like symptoms. **Material and methods.** Adult male C57BL6 mice and PV-Cre/NR1f/f mice (with selective ablation of NMDA receptor NR1 subunit) were used in this study. Bipolar electrodes were implanted in the basolateral amygdala (BLA), and the mice underwent rapid kindling (BLA-RK). Monopolar electrodes were implanted in the HPC and PFC to record local field potentials (LFPs). The BLA-RK protocol involved ten daily stimulations, 20 minutes apart, using biphasic pulse trains of 0.1ms and a frequency of 50 Hz for 10 seconds over three days. The behavior of the mice was assessed using the open field (OF), elevated plus maze (EPM), sucrose preference (SPT), tail suspension (TST), and prepulse inhibition (PPI) tests. This study was approved by the Ribeirão Preto Medical School Animal Use Ethics Committee (CEUA-FMRP-USP) under number 33/2019. **Results.** Our analysis revealed no significant differences between groups in the OF, SPT, and PPI tests. However, PV-Cre/NR1f/f mice spent less time exploring the open arms of the EPM and exhibited increased immobility time in the TST compared to C57BL6 mice. PV-Cre/NR1f/f mice also showed a lower threshold for after-discharge (AD) onset and secondary ADs in the HPC, suggesting the spread of epileptiform activity beyond the stimulated region. Additionally, PSD analysis showed an increase in gamma power in the PFC on the third day of BLA-RK. Following BLA-RK, PV-Cre/NR1f/f mice exhibited increased consumption of sucrose solution and immobility in the TST. However, significant impairments were not observed in the other behavioral tests assessed. **Conclusions.** Our findings highlight the role of PV-INs in the susceptibility of AD onset and duration, providing further evidence of their role in depression-like symptoms in the RK model of epileptogenesis.

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Galectin-3 inhibitor prevents non-alcoholic steatohepatitis and insulin resistance

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Non-alcoholic steatohepatitis (NASH) is characterized by hepatic steatosis, inflammation, and hepatocellular ballooning, and it can present fibrosis and Mallory's bodies. The aim of this study is to evaluate the protective potential of the Gal-3 inhibitor (MCP – modified citrus pectin) on NASH and insulin resistance. ApoE KO mice were divided into the following groups: standard diet fed (SD), western diet fed (WD) and western diet + fructose fed and MCP treated (WD+MCP). MCP was administered orally in drinking water (1%). The animals were fed with WD for 7 weeks, after the 3rd week of diet, the treatment with MCP was started, and lasted 4 weeks. WD promoted an increase in the area under the curve (AUC) of glucose tolerance test (339.5 ± 19.7 mg/dL-min), glycemia, plasma insulin and HOMA-IR, when compared to the SD group. While MCP treatment inhibited the increase of all these parameters. WD increased liver TAG accumulation by 22% and it increased plasma TAG, cholesterol, fatty acids and VLDL. However, MCP treatment was able to inhibit this increase of TAG in the tissue by 9% and plasma TG and VLDL, however had no significant difference for cholesterol and fatty acids in relation to WD group. We analyzed the expression of genes involved in the lipogenesis pathway in the liver, such as SREBP1, ACC, SCD1 and FASN. Only ACC gene expression was increased by 10x and SREBP1 protein expression by 183% in the WD group compared to the SD group. And the MCP treatment inhibited the increase of both. The animals of WD group showed a greater deposition of collagen in the liver (18%), as well as the increase of genes expression related to collagen production (TGF- β , Col1 α , MMP2), compared to SD group. While MCP treatment inhibited the increase in collagen deposition by 8.2% and only MMP2 gene expression. In addition, the galectin-3 protein expression was analyzed, and it was increased by 500% in the WD group compared to the SD group, and this increase was inhibited by 200% with MCP treatment. The inflammatory profile of the liver was also shown, obtaining an increase of the F4/80 expression in the liver, gene expression of pro-inflammatory cytokines (TNF α and IL-1 β) and pro-inflammatory protein activity (pJNK) in the WD group compared to the SD group. Meanwhile, MCP treatment inhibited the increase of all these parameters. Given these results, it is concluded that the MCP protects the liver from the progression of steatohepatitis in animals fed western diet and fructose.

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Identification of immunomodulatory drugs that inhibit multiple inflammasomes and impair SARS-CoV-2 infection

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Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) caused the COVID-19, an infectious and inflammatory pandemic disease that has affected more than 360 million people worldwide, leading to more than 5.6 million deaths. Although the disease is mild or asymptomatic in most cases, some patients develop severe inflammation mediated by inflammasomes. As the NLRP3 inflammasome and additional inflammasomes are implicated in disease aggravation, drug repositioning to target inflammasomes emerges as an important strategy to treat COVID-19. The aim of this research was to perform a screening to identify inflammasome inhibitors. We developed a high throughput screening using pore formation as a read-out to evaluate the inflammasome inhibition. In this screening we identified 3 FDA-approved drugs that function as pan-inflammasome inhibitors. After some validation assays, we identified our best hit, niclosamide, which effectively inhibits both inflammasome activation and SARS-CoV-2 replication. Niclosamide potently inhibited inflammasome activation in human monocytes infected in vitro and PBMCs from COVID-19 patients. Moreover, the administration of this drug for 3 days to animals infected with SARS-CoV-2 resulted in a reduction of the inflammation in the animals' lungs. This study provides relevant information regarding the immunomodulatory mechanisms of function of this highly promising drug for the treatment of inflammatory viral diseases including COVID-19.

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Probing Cannabidiol rapid and sustained antidepressant effects in preclinical experimental models of depression

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Although effective, the clinically available antidepressant drugs have two major limitations: latency for symptoms' improvement and lack of response in about 40% of patients. We hypothesized that similarly to Ketamine, CBD will show antidepressant effects in ACTH and Social Defeat Stress protocols. To test that, animals were randomly assigned to saline or 30ug ACTH treatment (21 days) or control and Social Defeat. They were treated with either vehicle, Ketamine (20mg/kg), Fluoxetine, Imipramine (30mg/kg) or CBD (20mg/kg) (1 or 7 days). In ACTH, on the 21th day, 1 hour after the drug treatment, all animals were tested in the open field (OF), splash (ST) and forced swim (FST) tests. Our data indicated that none of the treatments interfered with the distance traveled in the OF ($F(9, 95)=0.73$, $p=0.6$). In the FST, imipramine reduced the immobility time in vehicle and ACTH treated mice (2way-ANOVA $F(1,46)=19.54$; $p=0.001$). Due to high variability in the data, we considered 20% decrease in the immobility (compared to vehicle-stressed) as a response and divided animals in responders and non-responders. Imipramine had a higher number of responders (Fischer exact test, $p=0.02$), as did CBD (not significant). Moreover, there was also no significant effect of treatment in the last session of ST ($F(6, 43)=0.4916$, $p=0.8$). In Social Defeat protocol, CBD had significant effect in Von Frey ($p<0.05$) in stressed animals and some animals responded to the treatment in Sucrose preference Test (not significant). In conclusion, in ACTH, CBD was not effective at the dose of 20 mg/kg, either with single or repeated injection, unless combined with imipramine. In Social Defeat CBD reduced mechanical allodynia induced by the stress. New doses will be tested and compared to baseline parameters.

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PGC1 α at the interface between mitochondrial activity and regulatory T cell biology

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Regulatory T (Treg) cells play important role in the maintenance of immunologic tolerance and control of immune responses. The transcription factor Foxp3 is essential for the development, stability and suppressive function of Treg cells. In the last few years, it has been evidenced different metabolic pathways driving the phenotype of Treg cells, which require mitochondrial integrity and metabolism for exerting their functions. Mitochondria are sites of biochemical processes including lipid oxidation, tricarboxylic acid cycle and oxidative phosphorylation, that culminate in generation of energy. Peroxisome proliferator-activated receptor gamma coactivator 1- α (PGC1 α) acts as an important regulator of oxidative metabolism, biogenesis and mitochondrial dynamics through the activation of different transcription factors, being widely described in tissues with high energy demand. Although a low expression of PGC1 α has been related to the exacerbation of inflammatory responses, little is known about its intrinsic role in immune cells, especially in immunoregulatory functions. This project aims to investigate how PGC1 α connects the regulation of cellular metabolism to the generation and function of Treg cells. Our preliminary results demonstrated that higher mitochondrial content is closely related with the differentiation of Treg cells *in vitro*. Also, these cells showed a substantial increase in the expression of PGC1 α . Furthermore, the activation of PGC1 α promoted an increase in the expression of Foxp3, which was reduced by its inhibition, suggesting a contribution of PGC1 α in the development of Treg cells. Indeed, activation of PGC1 α accompanied increased mitochondrial mass in Treg cell cultures. These preliminary findings shed light on the PGC1 α potential as a pharmacological target when manipulating Treg cells as a therapeutic strategy.

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Intracranial pressure evaluation in swine during full-endoscopic lumbar spine surgery

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Headaches, visual loss and seizures might be attributed to intracranial pressure (ICP) increase due to continuous saline infusion (CSI) during Full-Endoscopic Spine Surgery (FESS). Although irrigation pump safe parameters are unknown, it is widely used with different recommendations. Understanding the correlation between CSI and ICP profile might modify irrigation pumps usage, turning FESS even safer. The objective was to evaluate invasive ICP profile during interlaminar FESS in swine with different irrigation pressures and flow rates; during drainage occlusion tests simulating situations the outflow is manually obstructed to control bleeding; and after durotomy, simulating accidental dural laceration. Experimental study with 5 *S. domesticus* (fem., 4mo, 55kg). Swine were monitored, submitted to intravenous anesthesia, positioned ventrally. A frontal skull burr was performed to install a parenchymal catheter for invasive ICP monitoring. Incision and dilator insertion directed to L4L5 interlaminar space was performed. Introduction of an interlaminar endoscope followed exposure of neural structures. CSI with irrigation pump in progressively higher parameters was maintained throughout the procedure and ICP was documented (Config. A: 60mmHg–350ml/min; B: 90–350; C: 120–700, D:150–700). During the use of each configuration, situations were divided into groups: intact dura mater and open drainage channels (A1–D1), intact dura and occlusion test (A2–D2), dural laceration and open drainage channels (Ax1–Dx1), dural laceration and occlusion test (Ax2–Dx2). Safety was established as $ICP < 20\text{mmHg}$. The animals required adjustments in anesthetics doses or suspension of some tests due to severe ICP increase or animal discomfort. Avg ICP = 8.1mmHg. It was safe to work with the irrigation pump in A1–D1. It was possible to work safely in all configurations with opened drainage channels even with dural laceration (Ax1–Dx1). Temporary occlusions tests (A2–D2, Ax2–Dx2), even of short duration caused ICP increase except for few situations related to anesthetic state and hemodynamics. During FESS, CSI might raise ICP to critical levels. Keeping the drainage channels open, with ideal anesthetic state, the ICP remains at safe levels even with high irrigation pump parameters. Drainage occlusions can quickly raise the ICP to critical levels, being even more severe with higher irrigation pump parameters. It was safe to use CSI, despite dural laceration, if the system was kept open.

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Genetic mapping of type I cortical dysplasms in patients with refractory epilepsy undergoing surgical treatment

Marcelo V. Santos

Epilepsy, characterized as a state of recurrent seizures, is a common pathological condition in the pediatric age group. About one third of children with epilepsy maintain seizures and their associated clinical consequences, despite optimized drug therapy, constituting the subgroup of so-called refractory epilepsy, and becoming candidates for surgical treatment. Among the multiple causes of refractory epilepsy in childhood, focal cortical dysplasia (FCD) assumes particular importance, due to its frequency and relationship with refractoriness to clinical treatment. However, many pathophysiological mechanisms, mainly at the cellular and molecular level, and from the point of view of brain development, are still not be clarified and/or fully understood, especially in the case of type I cortical dysplasia. Our goal is to identify specific genetic defects of type I cortical dysplasia by analyzing the genes of mTOR signaling pathways and also other parallel pathways. We selected 23 patients diagnosed with this pathology, aged between 0 to 18 years old and submitted to surgical treatment. Biological samples (blood and brain tissue) from these patients were collected and submitted to genomic analysis (total exome sequencing). The results of this work have allowed for the identification of the genetic background responsible for the emergence and progression of epilepsy related to type I FCD, and also contributed to a better understanding of the mechanisms associated with the evolution of the pathology, as well as for the development of new therapeutic strategies.

The rostral ventromedial medulla (RVM) modulates pain and depression-related behaviors caused by social stress

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The rostral ventromedial medulla (RVM) is a crucial structure for the descending pain modulatory system, playing a key role as a relay for both the facilitation and inhibition of pain. One of the mostly used mouse model to mimic chronic pain and depression is the chronic social defeat stress (CSDS). In this study, we aimed to investigate the involvement of the RVM on CSDS-induced behavioral impairments, including those associated with chronic pain and depression. For this, we applied the chemogenetic approach to activate or inhibit the RVM during the defeat sessions. The results indicated that the RVM is a crucial hub influencing stress outcomes. The RVM activation during the CSDS ameliorates all the stress outcomes, including social avoidance, hyperalgesia, anhedonia, and behavioral despair. In addition, the RVM inhibition in animals exposed to a subthreshold social defeat stress protocol induces a susceptible phenotype, facilitating all stress outcomes. Also, solely chronic RVM inhibition – with no social stress stimulus – induces CP but not depressive-like behaviors. Finally, preliminary data suggests that the projection from the periaqueductal gray (PAG) to the RVM mediates the stress-induced chronic pain but not the depressive-related behaviors. Our findings advance in understanding the comorbidity between CP and depression by indicating the involvement of the RVM in establishing social stress-induced behavioral responses associated with both CP and depression.

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Cannabidiol potentiates the Escitalopram's anti-stress effects via a NAPE-PLD-dependent mechanism in mice

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Selective serotonin reuptake inhibitors (SSRIs) are the first line of treatment for stress-related psychiatric disorders. However, one of the limitations of SSRIs is that they require between 4–8 weeks of treatment to induce significant improvement in symptoms. In previous data, we demonstrated that the combination with CBD could be a strategy to optimize the antistress action of SSRI escitalopram (ESC), reducing from 21 to 7 days the behavioral effects of this SSRI in models of chronic stress in rodents. Data from the literature suggest that deletion of the enzyme NAPE-PLD (N-acyl-phosphatidylethanolamine-hydrolyzing phospholipase D), the enzyme responsible for the production of the endocannabinoid anandamide and other bioactive lipids, in neurons activated by stress induces anxiety-like behavior. In addition, in studies in animals K.O for NAPE-PLD, there are changes in the cerebral lipid pattern induced by CBD in mice, which would indicate the possible participation of this enzyme in the mechanisms of CBD. In the present study, we test the hypothesis that the combination of ESC+CBD induces antistress effects dependent on NAPE-PLD expression. In our study, mice of the C57Bl6 (Wild Type-WT) and NAPE-PLD knock-out (K.O.) were submitted to a ten days protocol of unpredictable chronic stress and seven days of treatment with ESC (10mg/kg) and CBD (7, 5mg/kg). In WT and NAPE-PLD KO animals, stress generated an anxiogenic-like phenotype in the novelty-suppressed feeding test. Treatment with ESC+CBD caused an anxiolytic-like effect in W.T. animals but not in NAPE-PLD KO animals. The results indicate that the combination of ESC and CBD induces an antistress effect in a NAPE-PLD enzyme-dependent manner.

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Obstructive sleep apnea treatment in stroke patients: a randomized clinical trial

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Obstructive sleep apnea (OSA) is present in more than 70% of acute stroke patients and has been related to poor short- and long-term outcomes. Therefore, studies to assess the benefit of early treatment of OSA become essential in this setting. The treatment of choice for OSA is the use of CPAP (continuous positive airway pressure). Results regarding the feasibility and safety of CPAP in post-stroke patients are encouraging. However, studies of effectiveness are scarce and controversial, which justifies the proposal of this project. Evidence of the benefit of OSA treatment in stroke patients will dramatically change daily clinical practice. Therefore, our primary objective is to evaluate whether early treatment of OSA with CPAP in ischemic stroke patients has a favorable effect on functional evolution. We will perform a prospective, multicenter, randomized study, including 170 patients diagnosed with ischemic stroke and severe OSA. They will be randomized in a ratio of 1:1 (CPAP+ vs. CPAP-) and followed for 6 months. This project aims to create a new research group in the Institution with a multi-professional team (physician, physiotherapist, speech therapist, nurses, psychologist). The proposal is to form an Interdisciplinary Research Center on Sleep and Stroke (IRCSS), which will contribute to the development of projects that involve sleep disorders in the context of cerebrovascular diseases. Besides having a multidisciplinary team, this Center will allow interaction with other national and international researchers, expanding the research on this field not yet widely exploited in Brazil.

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Human organotypic skin ex-vivo culture (hOSEC) in the Hansen's Disease treatment surveillance

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Hansen's Disease, a chronic dermato-neurological infectious disease caused by *M. leprae*, since the late 1980s, the treatment has been carried out with multidrug therapy (MDT), which, despite being a long-term treatment (12 months), is effective in most cases, especially when diagnosed and treated early. *M. leprae* has peculiarities that make to study and diagnose the disease difficult, the disease itself has a clinical and laboratory spectrum that make diagnose a challenge, as well as follow the evolution of patients. Some patients reach the end of the conventional treatment presenting positive bacilloscopy, and others during the treatment start reactional process, these situations leave to the confused patient's case by mixing manifestations of the microbiological disease and of the immunology disease, raising discussions about persistence or not of viable bacilli, and about the need to continue MDT. Some *M. leprae* peculiarities are that it has not been possible to cultivate it artificially in vitro, and its doubling time is very slow (~14 days). However, our previous studies showed that is possible maintenance the viable bacilli in human skin ex vivo culture (hOSEC) for up to 60 days, this model consists of culturing human skin remnants from abdominoplasty. Thus, the aim of this study is to inoculate clinical samples from patients undergoing treatment into hOSEC and evaluate its use for surveillance of treatment efficacy. Skin smears samples before the start of treatment (T₀), after 6 months (T₆) and at the end after 12 months (T₁₂) were inoculate into hOSEC and the persistence of bacillary viability during culture (until 30 days) was evaluate by 16SrRNA RT-PCR and associate with active microbiological disease. In addition, in the same times, we collected sample to bacilloscopy and nasal swab to DNA extraction. Twelve patients were enrolled, for now six have finished the treatment and we have the results from samples in hOSEC by 30 days. Five of them at T₀ showed 16SrRNA RT-PCR positive after 30 days in culture, three remained positives at T₆, and two remained positives at T₁₂. Our results so far, demonstrated that it is possible to use the hOSEC to maintain viable *M. leprae* and be use to surveillance.

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Segurança e eficácia da ayahuasca e ibogaína nos transtornos mentais

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Contexto: O Transtorno Depressivo Maior (TDM), o Transtorno por Uso de Álcool (TUA), o Transtorno de Estresse Pós-Traumático (TEPT), e o Transtorno de Adaptação (TA) estão entre os transtornos psiquiátricos de maior prevalência na sociedade. São transtornos crônicos e de difícil tratamento, e uma parcela significativa dos pacientes não respondem aos fármacos tradicionais, mesmo após diversas tentativas de tratamento farmacológico. Portanto, novas ferramentas farmacológicas com efeitos terapêuticos mais rápidos (porém duradouros) poderiam oferecer uma melhor qualidade de vida para estes pacientes. Justificativa: Estudos preliminares em pacientes descreveram efeitos antidepressivos, ansiolíticos, e redução de uso de drogas de abuso após a administração de uma ou poucas doses de substâncias psicodélicas como a ayahuasca, ibogaína e cetamina. Embora os dados preliminares sobre os efeitos dessas drogas sejam promissores, poucos desses estudos foram randomizados ou controlados com placebo, e no caso do TEPT, ainda não foram avaliados. Objetivos: O objetivo do presente projeto é o de avaliar a segurança, tolerabilidade e eficácia da ayahuasca, ibogaína e cetamina no TDM, TUA, TEPT e TA. São propostos cinco estudos clínicos: 1) efeitos da ayahuasca no consumo de álcool em universitários com TUA; 2) efeitos da ibogaína no consumo de álcool em adultos com TUA; 3) efeitos da ayahuasca ou cetamina nos sintomas de depressão em adultos com TDM; 4) efeitos da ayahuasca ou cetamina nos sintomas relacionados ao trauma em adultos com TEPT; e 5) efeitos de ayahuasca ou cetamina nos sintomas de depressão e ansiedade em adultos com TA associado ao diagnóstico de câncer. Métodos: Todos os estudos de ayahuasca e cetamina possuem um desenho randomizado, duplo-cego e de grupos paralelos. O estudo de ibogaína possui um desenho inicialmente aberto e posteriormente randomizado, duplo-cego e controlado com placebo. Todos os estudos já foram aprovados pelo Comitê de Ética e Pesquisa (CEP) do Hospital das Clínicas da Faculdade de Medicina de Ribeirão Preto da Universidade de São Paulo (HCFMRP-USP) e encontram-se em andamento. Todos os estudos estão sendo realizados no Laboratório de Psicofarmacologia do Departamento de Neurociências e Ciências do Comportamento da FMRP-USP.

Experimental periodontitis in genetically modified mice (VACHT and SUPER VACHT): cardiovascular and inflammatory aspects¹

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The interaction between the autonomic nervous system (ANS) and the immune system has been demonstrated, although the mechanisms involved lack better documentation. The existence of an inflammatory reflex mediated mainly by the vagus nerve has been proposed. Vagal afferences would be activated by mediators of the inflammatory process leading to the activation of brainstem nuclei, which would control an anti-inflammatory vagal efferent response, characterized by the reduction of pro-inflammatory cytokines. Goal: To examine the role of the parasympathetic activity in cardiocirculatory and inflammatory responses in the model of periodontitis induced by *Porphyromonas Gingivalis* in genetically modified mice, which present attenuation of the vesicular acetylcholine transporter (VACHT), named VACHT knockdown (VACHT KD), or overexpression of cholinergic neurotransmission, which was named Super VACHT mice. Scientific challenges: To verify whether impairment of parasympathetic function would have an undesirable effect, exacerbating inflammatory responses and compromising cardiocirculatory responses in the model of periodontitis. And verify if the enhancement of parasympathetic function in Super VACHT animals would play a “protective” role against the effects of periodontitis. Methods: Submit VACHT KD and Super VACHT animals to Periodontitis induced by *Porphyromonas Gingivalis* and carry out the following approaches: 1) Hemodynamic study (blood pressure, heart rate, and variability of blood pressure and heart rate) and baroreflex function through blood pressure telemetry records; 2) Study of cardiac function through echocardiography; 3) Study of cardiac remodeling through echocardiography and histology; 4) Study of bone loss through histological analysis with hematoxylin-eosin, photomicrography of the sagittal section of the molars, and 3D computed microtomography; 5) Study of inflammatory responses by measuring inflammatory cytokines [TNF- α , IL-6, IL-10 and interferon (IFN)- γ] and anti-inflammatory (IL-10).

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Proteomic evaluation of renal cancer patients treated with immunotherapy

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Renal cell carcinoma represents 2 to 3% of cancers worldwide and is one of the most commonly diagnosed cancers. Clear cell renal carcinoma (ccRCC) represents 85% of these cases. Immune checkpoint inhibitors (ICIs) have emerged as a first-line therapy for treatment of ccRCC, resulting in improved clinical outcomes. ICIs such as ipilimumab and nivolumab, monoclonal antibodies targeting CTLA-4 and PD-1, respectively, have shown overall survival and quality of life improvement compared to previous treatment (tyrosine kinase inhibitors). However, despite their significant impact, about half of the patients do not respond to the therapy. Together with high cost and toxicity, the better understanding of the underlying mechanisms and the identification of molecular targets for patient stratification could be very important to precision medicine and for overcoming therapy resistance. The CLARA trail, which aims to investigate germline-somatic interaction mechanisms. is currently recruiting and collecting samples from 100 ccRCC prospectively patients receiving immunotherapy. In this way, we propose an integrated proteomic analysis to evaluate mechanisms of response and resistance for immunotherapy in renal cell carcinoma. We are collecting genomic material for exome sequencing, transcriptome analysis, methylome profiling, microbiome evaluation, and cellular assessment. For proteomic data, biopsy tissues from patients will be subjected to mass spectrometry. The protein extraction was conducted on 26 tumor tissues obtained from patients with ccRCC, derived from FFPE, for initial analysis of proteomic profiling using LC-MS/MS. This data collection represents a significant step towards gaining valuable insights into the molecular characteristics and potential therapeutic associated with CCRcc. We believe that detailed data from tissues of different patients treated with immunotherapy will provide a better understanding of the mechanisms related to the response to immunotherapy and the identification of candidate biomarkers for prognosis in tissue samples from patients with kidney cancer.

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Pulmonary and hepatic vascular lesions in Golden Syrian hamsters (*Mesocricetus auratus*) experimentally infected with SARS-CoV-2

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The vascular lesions associated with SARS-CoV-2 infection are still not completely understood and may represent therapeutic targets in COVID-19 or post-COVID-19 syndrome. The study aimed to characterize pulmonary and hepatic vascular lesions in Golden Syrian hamsters experimentally infected with SARS-CoV-2. Thirty-eight (n=38) hamsters were divided into infected group (IG, n=24) that were intranasally inoculated with 10⁵ 50% TCID₅₀ of SARS-CoV-2 (strain B.1.1.28); and mock-infected group (MG, n=14) that were intranasally inoculated with the vehicle. IG hamsters were euthanized at 2-(n=3), 3-(n=3), 4-(n=3), 5-(n=3), 7-(n=6), 14-(n=6) days post-inoculation (dpi), and MG animals at 2-(n=3), 4-(n=2), 7-(n=3), 14-(n=2), and 15-(n=4) dpi. Samples of lungs were collected for viral isolation and RT-qPCR which confirmed virus replication in the IG. Lung and liver samples were collected in 10% buffered formalin for semiquantitative histopathological evaluation and immunohistochemical detection of SARS-CoV-2 spike S2 antigens. Clinically, the IG animals showed a moderate, self-limiting respiratory disease, progressing to recovery within a period of 14 dpi. Microscopically, the lungs of the IG animals showed bronchiolitis/peribronchiolitis with progression to broncointerstitial pneumonia associated with the detection of spike S2 antigens in the bronchial/bronchiolar epithelium and type I pneumocytes between 2–5 dpi. Hyperplasia of dysplastic type II pneumocytes and resolution of acute disease occurred between 7–14 dpi. Lesions in the lung were accompanied by hemorrhage, endothelial swelling, endotheliitis, vasculitis and perivasculitis without detection of spike S2 antigens in vascular endothelium and/or inflammatory cells in pulmonary blood vessel wall. SARS-CoV-2 antigens were not detected in the liver and hamsters from both groups presented mild and multifocal portal and interface hepatitis as basal lesions. There was a higher frequency of portal vein endotheliitis, lobular activity, hepatocellular degeneration, and lobular vascular changes in IG. The data indicate that hamster model is effective for reproducing vascular lesions observed in COVID-19. The hepatic vascular lesions may point to a potential application of the model in studies to evaluate extrapulmonary lesions associated with SARS-CoV-2 and it still needs further evaluation.

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Hospitalization causes a transient adverse impact on horse resting pattern

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Introduction: The influence of the environment on resting patterns is not completely understood in horses. This study aimed to identify differences in resting patterns of athletic horses subjected to the hospital environment. **Materials and Methods:** Eight Quarter Horses from the Equestrian Team of Texas A&M University were recorded by cameras for 3 days in their stalls to determine the normal resting pattern, for 5 days in the Teaching Hospital of the University, more 3 days following their return. Despite hospitalization, the horses did not undergo any procedures at the hospital. **Results:** The mean times of sternal and lateral recumbency, and the number of times the horses were in sternal and lateral recumbency decreased by up to 90% on days when the horses were hospitalized ($p < 0.05$), but the average time spent in each recumbency position did not differ between the days in the hospital. Baseline values were reached on the first night of returning to their stalls. **Discussion/Conclusion:** Hospitalization for 5 days can adversely affect resting patterns in horses. All parameters returned to baseline values on the first night of their return to the normal environment. The factors that may have contributed to this negative impact were the smaller stall size, the presence of light, less physical activity of the animal, and factors that were found during hospitalization in our experiment. Although not statistically significant, an 18% increase in lateral recumbency time was observed on the first day of return to the horse's normal environment. This increase in lateral recumbency could characterize a "rebound effect", to compensate for the restricted rest in the previous 5 days. In conclusion, the hospital environment decreases the resting times of performance horses transiently and the return to normality was only observed with the return to their environment.

1. Faculdade de Medicina Veterinária e Zootecnia da USP.

Maternal separation model for induction of postpartum depression cause disturbance on maternal care in lactating rats

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Postpartum depression is a complex disease with multifactorial etiology that affects women worldwide. Despite the high prevalence, this disease is still poorly studied and underdiagnosed. One of its main characteristics is the poor maternal care that these women express towards the child. It is well documented in the literature that lack of maternal care can lead to severe consequences on child behavioral and cognitive development. Thus, the aim of the present study is to evaluate the maternal care sphere of dams induced to postpartum depression through the maternal separation model. Sixteen lactating rats were subdivided into 2 groups, control and MS (n=8 animals/group). MS dams were separated from their litter for 3h daily from lactating day (LD) 2 to 12, while the control dams were handled only for the behavioral tests. The behavioral evaluation was performed on LD5 and 6 through the maternal behavior and the maternal aggressive behavior tests. On LD21, right after weaning, all dams were euthanized by decapitation for collection of hippocampus and prefrontal cortex for dopaminergic system analysis and blood for prolactin and oxytocin dosage. The results showed dysfunction on the maternal care sphere of the MS dams evidenced by alterations in several behavioral parameters [1st pup retrieval (t=0.0422); 2nd pup retrieval (t=0.0366); 3rd pup retrieval (t=0.0375); 4th pup retrieval (t=0.0429), self-grooming (t=0.0331); latency for nursing (t=0.0290); total time of nursing (t=0.0389); latency to start the 1st fight (t<0.0001); number of fights (t=0.0406); and number of boxing (t=0.0024)] and in the dopaminergic system analysis [HVA (t=0.0440) and HVA/DA rate (t=0.0341) in the hippocampus; and DA (t=0.0311), DOPAC (t=0.0045) and DOPAC/DA rate (t=0.0339) in the prefrontal cortex]. These results indicate that the maternal separation model mimics the maternal care dysfunction expressed by woman with postpartum depression, suggesting that this model can be used to induced postpartum depression in female rats.

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Evaluation of the nutritional contents and molecular weight of the protein sources used in hypoallergenic foods for dogs and cats

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In Brazil, there is a population growth of dogs and cats giving rise to multispecies families. Consequently, we have more attentive owners who seek veterinary assistance to contribute to the medical health and longevity of their animals. With the increase in the clinical routine, complaints related to changes in the skin are very frequent. Among the various causes of dermatopathies is food hypersensitivity. The gold standard diagnostic method for food hypersensitivity is the exclusion diet, until complete remission of clinical signs, followed by a provocation diet. Major hurdles in diagnosis include timing and choice of food. It is common to carry out this food with homemade food, which requires a lot of responsibility on the part of the guardian through the use of protein foods that the animal has never been exposed to. Nowadays it is increasingly difficult to find something that the animal has never had contact with. The use of hypoallergenic foods can also be used in the diagnosis. As not all hypoallergenic foods are created equal, those with hydrolyzed protein sources should be prioritized for both diagnostic and treatment use. Providing food with hydrolyzed protein is an effective way to control clinical signs in dogs and cats with food hypersensitivity and the improvement in line with this type of food is increasing. The hydrolysis process allows the breakdown of the protein macromolecule into peptides and amino acids, composing a food with protein sources of low molecular weight. This project aims to evaluate the nutritional composition and molecular weight of six hypoallergenic foods with hydrolyzed protein sources for dogs and two foods for cats. This sample size refers to the number of commercially available commercial foods recommended for the management of food hypersensitivity in dogs and cats, respectively. Will be carried out determinations of dry matter, mineral matter, ether extract after acid hydrolysis, crude protein, crude fiber, calcium and phosphorus. In addition to nutrient composition, the molecular weight of the protein source present in each food will be measured. The results of the analyzes will be compared with the declared values on the labels, as well as with the EU recommendations (2020). Information related to the size and molecular weight of proteins will be processed descriptively.

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Study of the impact of Roflumilast treatment on the metabolism of obese mice

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Obesity is related to systemic inflammation, which in turn leads to increased peripheral insulin resistance, changes in glucose metabolism and diabetes, through activation of cell receptors (IL-1, TLR3 and TLR4), and decreased levels of circulation adiponectin, increasing the chance of metabolic syndrome. Roflumilast, an anti-inflammatory inhibitor of phosphodiesterase-4, induces an increase in glucose metabolism and energy expenditure, may result in weight loss. Our aim was to study the influence of Roflumilast on obese mice (ob/ob) from the metabolic and inflammatory point of view. Animals (n=6) were weighed daily and treated by gavage with Roflumilast 1 mg/kg/day for 12 weeks (PSI) and the control received water (NT). In the initial and final time, they were submitted to positron emission tomography using the 2-deoxy-2-[18F] fluoro-D-glucose tracer (PET-18F-FDG) for metabolic evaluation. Statistical analyzes were performed using the R software with a significance level of 5% ($p < 0.05$). Our study demonstrated the *in vivo* anti-inflammatory effect of roflumilast after 12 weeks, by preventing the increase in uptake tracer in target brain regions at PSI: hippocampus (NT=1.46±0.19 and PSI=1.06±0.15; $p=0.0026$); cerebellum (NT=1.78±0.38 and PSI=0.96±0.13; $p=0.0006$) and cortex (NT=1.45±0.23 and PSI=1.01±0.19; $p=0.0048$). Roflumilast prevents weight gain in the PSI group (AF-NT 21,8% vs. AF-PSI 2,18%, $p=0,000026$), this effect being unrelated to the inhibitory influence of the treatment on leptin secretion or action, as the animals are leptin knockouts. The maintenance of body weight of PSI animals over time, may be directly related to activity in brown adipose tissue, coupled to the basal metabolism. It is possible that Roflumilast has been a promising drug. Studies on mechanisms of action may investigate the activation of cAMP, PKA and UCP1, allowing clinical studies of the probable anti-inflammatory effect of Roflumilast in weight control and neurological degeneration triggered by aging.

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Histological and stereological characterization of hepatic steatosis in Zucker rats

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INTRODUCTION: Obesity and metabolic syndrome are among the leading causes of global mortality, yet their pathogenic mechanisms are not fully understood. Developing new investigative methods to promote prophylaxis, control, or cure of these conditions becomes a priority. Worldwide, physical activity has decreased while the consumption of high-fat and high-sugar foods has increased. Choosing this model for the study of obesity aims to achieve maximum similarity with what occurs in human patients due to obesity, which involves an imbalance between energy intake and expenditure. **OBJECTIVES:** To compare macroscopic and microscopic morphological findings between Zucker and Lean rats and quantify possible structural alterations, such as those reported in hepatic inflammation. Therefore, the results will be clinically relevant for a better understanding of obesity and future therapeutic targets. **METHODS:** Twelve adult male Zucker rats will be used in this study. The rats will be divided into two groups: Group I (Zucker Lean) and Group II (Zucker Fat). Blood for biochemical profile analysis will be collected prior to euthanasia. After euthanasia, the livers will be removed from the animals and weighed before being immersed in a fixative solution and stored at a temperature of 4°C. The liver will be embedded in paraffin and serially sectioned using a microtome. Morphological characterization of the liver, histopathological classification of NAFLD, stereological studies of the liver, and measurements of gene expression by real-time PCR will be performed. **RESULTS:** The body weights of Zucker Lean rats were 279.59 grams, and Zucker Fat rats weighed 452.12 grams. The liver weights of Zucker Lean rats were 15.04 grams, and Zucker Fat rats weighed 23.39 grams. Serum total cholesterol (mg/dL) ($p=0.0022$) in the groups of Zucker Lean and Fat rats. Serum triglycerides (mg/dL) ($p=0.0022$) in the groups of Zucker Lean and Fat rats. Histologically, the hepatic lobule exhibits a hexagonal shape, with a central vein and portal triads at the ends of this imaginary hexagon. The distribution of hepatocytes has not been modified in the evaluated groups thus far. **PARTIAL CONCLUSION:** The liver of obese Zucker rats is steatotic, leading us to hypothesize that obese rats may exhibit more inflammation and fibrosis in the hepatic parenchyma compared to control animals.

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Serum metabolomics analysis reveals that weight loss in obese dogs results in similar metabolic profile to dogs in ideal body condition

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In recent decades the incidence of obesity in companion animals has increased significantly and has become a serious concern in veterinary medicine. To date, there are few published studies that evaluated and compared the metabolome of obese dogs with that of dogs in ideal body condition score. However, there is not any study evaluating the weight loss effect on the metabolic profile. Therefore, in the present study the metabolic profile of blood serum of obese dogs, control dogs, and dogs that were subjected to a weight loss program was analyzed. All procedures were previously approved Animal Use Ethics Committee (AUEC) from the School of Veterinary Medicine and Animal Science of the University of São Paulo (protocol number 4668091214). Approximately 20 metabolites were identified on the high-resolution ¹H Nuclear Magnetic Resonance (NMR) spectra of the animals' blood serum. The metabolomic assessment differs between obese dogs and animals in optimal body condition. Moreover, weight loss results in metabolomic profiles similar to those observed in lean animals. The metabolites that contributed to the separation of the groups were: glucose, lactate, glutamine, acetone, arginine, alanine, and citrate for the grouping of healthy animals (control and after weight loss); and lipids, cholesterol, and BCAA for the obese animals. The present study is a pioneer in this type of evaluation in dogs and these results highlighting the importance of maintaining or achieving an ideal body condition score for reducing deleterious effects of overweight on pets.

1. Faculdade de Medicina Veterinária e Zootecnia da USP.

2. Embrapa.

3. Grandfood Indústria e Comércio.

Oral health and PCATool: evaluation in different care and management scenarios

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It is necessary to investigate the quality of oral health services with an evaluation culture capable of inducing the necessary changes. The objective was to evaluate the presence and extent of PHC attributes in different models of oral health care and management. This is a cross-sectional study carried out in the city of São Paulo/SP, from 2022 to 2023. The dependent variable was the scenario, categorized into scenario 1 (ESF + Term Agreement) and scenario 2 (Traditional + direct management) and PHC attributes were the independent variables. Mann Whitney and binary logistic regression analyzes were performed, with $p < 0.05$ and 95% CI. Scenario 1 was better evaluated in terms of essential and general scores ($M=5.1$ and $p < 0.001$), the attributes access – use, comprehensiveness and community orientation predicted a departure from scenario 2, while comprehensiveness and coordination – information system predicted an approximation with scenario 2. The evaluation of the two scenarios showed that the FHS model of care and management by term of agreement was better evaluated than the “traditional” model of care and direct management and that it is necessary to strengthen PHC in health services oral health through the presence and extension of its attributes in any adopted care and management scenario.

1. Faculdade de Odontologia da USP.

Caries indicators in twins: comparison between monozygotics and dizygotics children

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Monozygotic twins (MZ) share 100% of the genetic composition, while dizygotic twins (DZ) have an average of 50%. Therefore, studies in populations of twins are an excellent alternative to investigate the contribution of genetic and environmental factors in the development of physical characteristics of individuals, as well as in the etiology of diseases. We aimed to assess the agreement of caries indicators in twin children and the influence of zygosity on the occurrence of dental caries. Twins born between 2007–2017 at a University Hospital (São Paulo, Brazil) were contacted and invited to participate in this cohort study. Information about twins was collected and an oral clinical examination was performed to calculate the decayed, missed, and filled primary and permanent teeth index, considering all lesions (dmft–D1/DMFT–D1) and cavitated lesions (dmft–D3/DMFT–D3). Comparisons of caries indicators between MZ and DZ twins were conducted with multilevel negative binomial regression adjusted by the child's age. Agreement in the caries parameters in MZ and DZ twins was calculated through Intraclass Correlation Coefficient (ICC) and 95% Confidence intervals (95%CI). Heritability (h^2) was calculated with Falconer's method. We included 144 twins being 68 MZ and 76 DZ. No significant differences were observed between MZ and DZ for all caries indicators ($p>0.05$). The agreement between the pairs was consistently higher for MZ, with the ICC (95%CI) varying from 0.601 (0.336 to 0.778) to 0.842 (0.707 to 0.918), for dmft–D3 and dmft–D1, respectively. For DZ twins, the higher ICC value was for DMFT–D1 (0.695; 0.484 to 0.829). The h^2 values in most cases were higher than 0.700, except for DMFT–D1, with an h^2 value of 0.090. The highest h^2 values were 0.908 for dmft–D1 and 0.944 for dmft–D1+DMFT–D1. In conclusion, the higher agreement in MZ twins shows a genetic influence on the occurrence of dental caries.

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Action of HDACIs on stem-tumor phenotype of cell lines derived from mucoepidermoid carcinoma of the salivary gland: a proteomic and functional analysis

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The low response of the mucoepidermoid carcinoma (MEC) of salivary glands to radio/chemotherapy has been associated to the presence of tumor stem cells (CSCs). Histone deacetylase inhibitors (HDACIs) induce histone hyperacetylation and have important antitumor effects, including action on CSCs. This study evaluated the action of two HDACIs (Panobinostat – PAN and Romidepsin – ROM), alone and associated with Cisplatin (CIS), on MEC cell lines (UM-HMC1 e UM-HMC3A). The action of the HDACIs was investigated regarding to cell migration and invasion; clonogenicity and self-renewal; stem phenotype markers, and proteome of the cells, 48 hours after treatment with IC50 doses of the drugs (previous treatment), alone and associated with CIS. The properties of self-renewal and clonogenicity (formation of colonies and tumorspheres) were also analyzed with the maintenance of the drugs in the culture medium for a longer period (prolonged treatment). Previous treatment with HDACIs reduced the migration, invasion, and self-renewal capacity (tumorspheres) in both cell lines, although it did not significantly reduce ($p \leq 0.05$) the clonogenicity (colonies formation) or the ALDH+/CD44+ population (CSCs) in the UM-HMC3A lineage. The associations with cisplatin (PAN+CIS and ROM+CIS) significantly reduced the number of tumorspheres and potentiated the inhibitory effect of the HDACIs on the cell migration and invasion, besides of decreasing the “resistance” of the cells to CIS, in the prolonged treatment. Analysis of 84 genes revealed the differential expression of several genes related to CSCs such as PROM1, EPCAM, ALDH1A1, NANOG, THY-1 and BMP7 in the MEC strains, when compared the treated groups with the controls (without treatment). Proteomic analyses showed alterations in several proteins, some related to the epithelial-mesenchymal transition (STAT3, SMAD2 and β -Catenin), CSCs (CD44, CD166, EPCAM and THY-1) and important signaling pathways (mTOR and MAPK). Thus, the data prove the in vitro antitumor effects of Panobinostat and Romidepsin, although also emphasize the need to identify therapeutic combinations more effective than the association HDACI + CIS to eradication of CSCs of the mucoepidermoid carcinoma from Salivary gland. Nevertheless, the HDACIs analyzed showed potential that could be explored in other studies, especially if associated with drugs with mechanisms of action different those presented by Cisplatin.

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Fractal dimension analysis of mandibular bone trabeculae on Cone Beam Computed Tomography images

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Fractal dimension is the measurement of the complexity or irregularity of a geometric pattern, being able to provide valuable information regarding trabecular architecture for the assessment of bone quality and strength. The aim of this study was to evaluate possible bone alterations in the mandible of groups with different ages and sexes, through fractal dimension (FD) analysis, using Cone Beam Computed Tomography (CBCT) images. Sixty-five CBCT scans were retrieved from the LAPI-FOUSP database. In the first stage, cross-sectional and axial slices of each patient were selected, where it was possible to evaluate mandibular bone trabeculae in the mental foramen region. In the ImageJ® software, two plugins, BoneJ and FracLac were used to calculate bone trabeculae FD. For these evaluations, different regions of interest (circular ROIs) were used: 30x30 in axial slices(A) and 35x35 in cross-sectional (CS) slices. The results were submitted to statistical analysis with a significance level of 95% ($p < 0.05$). The sample consisted of 260 ROIs, the mean value of FD was 1.40 ± 0.15 (A) and 1.45 ± 0.13 (CS) in BoneJ and 1.07 ± 0.24 (A) and 1.08 ± 0.18 (CS) in FRACLAC, showing statistically significant differences ($p < 0.05$). There was moderate positive correlation (0.575) between FD values measured in the two tomographic slices studied. The mean values of FD were superior on BoneJ plugin. The sample was divided by different age groups; however, no significant statistical differences were found. By analyzing the FD in different regions of the mandible using CBCT images, clinicians and researchers can gain insights into the microstructural properties of the bone trabeculae. Both plugins can be used to evaluate FD, and the superior values found on Bone J can be justified by the variation of the organized pixel values within the region of interest. Studies with larger samples might be beneficial in the search of a standard mandibular FD value regarding different age groups.

1. Faculdade de Odontologia da USP.

Influence of the use of mobile technology on access to MOOCs courses for dentists on chronic non-communicable diseases

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The objective of this research is to evaluate the effectiveness of the mobile technology of distance courses, in the MOOC (Massive Open Online Course) modality, offered to dentists throughout the Brazilian territory, in the project called “Dentistry for Patients with chronic noncommunicable diseases (O-DCNT)”. The MOOCs produced are intended to qualify care for patients with NCDs. In Brazil, 73% of deaths were attributed to NCDs. Among the goals for sustainable development (SDG) is the reduction by one third of deaths caused by NCDs by 2030. Oral diseases present the same risk factors as many NCDs. In this regard, a common approach to risk factors in broader health strategies that fully integrates oral health care constitutes a key factor in the global confrontation of NCDs. In the first phase of the project (2016–2018) a prospective longitudinal study was carried out, showing a rate of graduates of 30%, well above that reported in the literature (5 to 10%). In this second phase of the project, a prospective descriptive and analytical longitudinal study is being carried out to evaluate the effectiveness of the use of mobile technology in the engagement, completion, and certification of MOOC courses, compared to the use of other devices, taking into account the distribution of dentists across the Brazilian territory and the indicators of the Municipal Human Development Index (HDIM).

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External root temperature and its relationship with dentin thickness during gutta-percha removal procedures with ultrasound. An ex vivo study

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When endodontic treatment fails, in some clinical situations, retreatment is indicated. For this, it has been proposed the use of ultrasonic tips (CROZETA et al. 2022) for the removal of gutta-percha. Recently, the company Helse Ultrasonic (Brazil) developed ultrasonic tip called Clearsonic (RIVERA-PEÑA, et al. 2018) and Clearsonic Black, which have an arrow-shaped tip (SANTOS-JUNIOR et al. 2020), which are made of stainless steel or with diamondlike carbon treatment. When activating the ultrasound, it generates heat at its tip (BUDD et al. 2005), a fact necessary to plasticize the gutta-percha, facilitating its removal. Heat transfer and the damage it can cause to periradicular tissues in different operative procedures have been a concern of researchers (KWON et al, 2013; SAUNDERS, 1990), however, the literature surveyed does not mention temperature variations on the external root surface in retreatment procedures. The main objective of this study is to test the hypothesis that there is no temperature change in the external root dentin at 0, 5 and 10 mm from the cemento-enamel junction using two types of ultrasonic tips. The second objective is to test the hypothesis that there is no relationship between external temperature and dentin thickness. To carry out the experiment, a total of 56 single-rooted teeth will be used, which will be divided into 4 experimental groups. The external temperature will be measured with a K-type thermocouple (chromel-alumel – NiCr-NiAl) with a thickness of 127 micrometers, and the readings will be performed using the software LabVIEW 2010 version 10.0 (National Instruments, USA). Dentin thicknesses will be measured in the e-VOL software using DICOM images of all samples.

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Development of a database for registration of families affected by huntington's disease in Brazil

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Huntington's disease (HD) is a fatal neurodegenerative genetic disorder, without curative treatment³. In Brazil, it is estimated that it affects approximately 3.416 families and that there are between 73,500 and 105,000 descendants of the carriers of the gene that cause the disease⁴; however, there are no national epidemiological data on the prevalence of HD⁵, except for the identification of certain clusters, cities in which HD has a high incidence among its residents^{6,7}. It is known that there is a trend towards an increase in the incidence of HD in world populations, with a significant increase in late-onset HD cases^{8,9,10}. However, there is no data on the growth trend of this incidence in Brazil. Thus, this project aims to develop a new and more robust system than the current ABH Database, allowing the registration of patients with HD, family members and caregivers, using a system that guarantees the security and confidentiality of the data, respecting the General Data Protection Law (LGPD)¹¹, carrying out diverse data collection, with primary emphasis on the incidence, prevalence and distribution of HD in Brazil. Obtaining this data also has the purpose of tracking families at risk, facilitating the planning of educational and assistance actions, guidance in public policies, and scientific dissemination. The methodology envisages the development of cloud-hosted software that allows

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for easy registration of individuals and that can incorporate artificial intelligence tools for data processing. It will contain basic questions about personal data and other questions associated with the disease, written by members of the scientific committee. The registration will have 3 phases: initially, using the old registration as a basis. Next, expansion of registration through social networks and national volunteer network, and finally, face-to-face registration in remote regions. The registration will remain active to incorporate additional research for an indefinite period. It is expected that the collection of real data on HD in Brazil will facilitate the incorporation of assistance measures for the patient, in the SUS, in social security, social assistance, in addition to scientific dissemination, favoring the execution of research in Brazil.

Evidence synthesis for oral health policy: use of fluorides to control dental caries in high-risk patients

Mariana Gabriel

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Despite the large volume of applied research in oral health, a significant gap is observed between this scientific production and its use. Proper science communication, carried out through the translation of knowledge, aims at transforming evidence into attractive and understandable information for its target audience, being fundamental for the sharing of knowledge, favouring its use in decision-making and, consequently, improving health policies and the clinical practice of professionals. The objective of this research is to identify, evaluate, synthesize and communicate, through the translation of knowledge, the best scientific evidence, aimed at the use of professionally applied fluorides in the control of caries in high-risk patients (with the presence of caries lesions active), in a language aimed at policy makers in order to strengthen the National Oral Health Policy (Brasil Sorridente) and the inclusion of oral health in the Unified Health System. As a methodology, the steps proposed by the SUPPORT tool (Supporting Policy Relevant Reviews and Trials) for evidence-informed policies will be carried out. This process values the exchange between different actors, for which some strategies will be used: i) involvement of decision makers in the project, ii) production of evidence synthesis for policy formulation, iii) deliberative dialogue, and iv) implementing a knowledge translation plan using the “guide to knowledge translation”. It is expected, with the result of this research, to inform the formulation and implementation of policies with the best available scientific evidence, thus increasing the chance of success of public health actions related to the use of fluorides in the control of dental caries in patients with high risk, once the translation of knowledge is a powerful tool to bring scientific evidence closer to decision makers, and collaborate in transforming science into social impact.

Mechanical characterization of biological materials of dental interest for numerical simulations

Mariana M. Monteiro

INTRODUCTION: The protection of athletes in the oral and facial context requires an integrated approach to the different areas of dentistry, aiming at their health and, consequently, their performance, in addition to developing features to protect the hard and soft tissues of the face. Several studies show the importance of using mouth and face shields by athletes and, within studies with impacts, the finite element method (FEM) – mathematical simulation of a real structure – is widely used. Among accessible studies, the periodontium is the least characterized region, with parameters such as Poisson's coefficient and modulus of elasticity, used from very old references, which makes new researchers feel insecure in using them. **OBJECTIVE:** Therefore, this project aims to mechanically characterize the periodontium (gingiva, bone, periodontal ligament and tooth). **MATERIALS AND METHODS:** The tissues will be extracted from the safety margin of the excision of malignant neoplasms (maxillectomy). These fabrics will be separated by category and mechanical tests will be performed to calculate the Poisson coefficient and modulus of elasticity of the structures, which, in the future, will be used in the construction of experimental models by MEF.

Determination of the ideal force in the intrusive mechanics of an extruded upper molar using a mini-implant: finite element analysis

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The present study evaluated, through finite element analysis, the ideal force for the orthodontic intrusion of an extruded maxillary molar with different levels of reduction of periodontal support. A 3D anatomical model was constructed representing a first molar inserted in a maxillary bone segment along with adjacent teeth, a first premolar and a second molar. Based on the control model, three conditions of horizontal bone resorption were simulated, with alveolar bone height loss of 2 mm, 4 mm and 6 mm (R2, R4 and R6, respectively). An intrusive force of 50 cN was used for the two simulated mechanics: with a bilateral mini-implant (buccal and palatal) and with a single mini-implant in the palate. The root resorption risk index (iRRR) was calculated by dividing the maximum compressive hydrostatic stress in the periodontal ligament by the hydrostatic stress of the capillaries (4.7 kPa). To determine the ideal strength of the control models, the increment number was gradually decreased from the last one (increment 100) until the maximum compressive hydrostatic stress was between 5.6 and 6.6 kPa, which corresponds to an iRRR between 1.2 and 1.4, interval considered effective enough to promote orthodontic movement and satisfactorily safe to avoid root resorption. The ideal force in cases with bone loss was achieved when the pattern was similar to the control models of the corresponding mechanics and the compressive hydrostatic stress distribution in the capillaries was similar to the pattern found in the control models of the corresponding mechanics. Optimal force values estimated by finite element analysis were compared with those obtained by the analytical formula ($\text{Force} = \text{stress} \times \text{area}$).

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Environmental sustainability related to dental materials and procedures in prosthodontics: a critical review

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This article aims to review the status, challenges, and directions of environmentally sustainable oral healthcare by focusing on the dental materials and procedures used in prosthodontics. Sustainable development is a global priority and requires a systemic, integrative approach from all sectors of society. The oral healthcare sector is responsible for substantial greenhouse emissions throughout its value chain, including raw material extraction, industrial production, supply distribution, clinical practice, and management of waste. Of all dental specialties, prosthodontics has been one of the main generators of carbon emissions by fabricating a single product such as dentures or crowns in multiple steps. Dental prosthetic procedures involve chemicals and materials such as polymers, ceramics, metals, gypsum, and wax, which are often used in large quantities and for a single use. Thus, environmental risks and socioeconomic burdens can result from residuals and improper disposal, as well as waste and the embedded costs of unused materials retained by manufacturers, retail suppliers, dental laboratories, and dental clinics. To mitigate the environmental impact generated by conventional prosthodontics, we urge awareness and the adoption of sustainable good practices in the daily routine of dental clinics and laboratories. Capacity building and investment in a circular economy and digital technology can reduce the carbon footprint of prosthetic dentistry and improve the quality of life for present and future generations. *(The complete article has been accepted for publication in the Journal of Prosthetic Dentistry).*

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Three-dimensional dentoskeletal comparison of maxillary protraction with miniscrews versus miniplates

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This study aimed to compare the three-dimensional (3D) outcomes of the novel miniscrew-anchored maxillary protraction (MAMP) therapy and the bone-anchored maxillary protraction (BAMP) therapy. The sample comprised growing patients with skeletal Class III malocclusion. The MAMP group was composed of 22 patients (9 female, 13 male; 10.9 ± 0.9 y at baseline) treated with Class III elastics anchored on a hybrid hyrax expander in the maxilla and two mandibular miniscrews distally to the permanent canines. The BAMP group was composed of 24 patients (14 female, 10 male; 11.6 ± 1.1 y at baseline) treated with Class III elastic anchored in two titanium miniplates in the infra-zygomatic crest and two miniplates in the mesial of the mandibular permanent canines. Three-dimensional displacements were assessed using cone-beam computed tomography cranial base superimposition of the pre- and post-treatment scans on the 3D Slicer software. The Slicer Automated Dental Tools module was used to perform artificial intelligence-based automatic segmentation of craniofacial structures, automatic landmark location and automatic quantification of the 3D displacements. Mean differences (MD) were obtained. Interphase changes were compared using the T-test, Mann-Whitney test, and Analysis of Covariance ($p < 0.05$). Both groups showed improvements after treatment. The MAMP group showed smaller anterior (MD: 1.08mm; $P = 0.002$) and 3D (MD: 1.27mm; $P = < 0.001$) displacements of the maxilla after treatment when compared to BAMP. Both groups showed negligible and similar anteroposterior changes in the mandible (MD: 0.33mm; $P = 0.362$). A greater increase in the nasal cavity width (MD of 2.36mm; $P = < 0.001$) was observed in the MAMP group when compared to BAMP. In conclusion, BAMP and MAMP therapy showed adequate 3D outcomes after treatment. BAMP therapy showed greater maxillary advancement with treatment, while MAMP therapy showed greater transversal increases.

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Effect of calcination on microstructural and mechanical characterization of recycled zirconia for dental restorations

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Aim: The present study aimed to develop a recycling route of milled dental 3Y-TZP remains and to evaluate the effect of powder calcination on microstructural and mechanical properties of recycled zirconia. **Methods:** Zirconia powder was obtained from puck remains of milling equipment exclusively used for 3Y-TZP, and half of the powder was calcined at 900 °C for 1 hour. 50 discs of recycled 3Y-TZP with 12 mm-diameter and 1 mm-thick were uniaxially pressed and sintered at 1550 °C for 2 hours (n=25/group). Microstructural and crystalline evaluations were performed through scanning electron microscope (SEM) and X-Ray diffraction (XRD), respectively. Mechanical properties were assessed through biaxial flexural strength test with subsequent SEM fractographic analysis. Weibull statistics were used to calculate characteristic strength and Weibull modulus. Vickers hardness was assessed using a hardness tester under a 10 N load. **Results:** SEM micrographs showed similar microstructural features among experimental groups, however the calcined group exhibited a homogeneous substrate without any residues and impurities compared to the non-calcined group. XRD spectra demonstrated a predominance of tetragonal zirconia. The calcined 3Y-TZP exhibited higher hardness (1.22 GPa) and characteristic strength (806.64 MPa) compared to the non-calcined group (0.56 GPa and 646.89 MPa, respectively), with no significant differences in Weibull modulus. Fractographic marks suggested that fractures originated from flaws at the tensile side and propagated towards the compression side of the discs. **Conclusion:** The calcination process improved the microstructure and mechanical properties of the recycled 3Y-TZP with no modifications in the crystalline structure of recycled zirconia.

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Effect of saliva enrichment with CaneCPI-5, Stn15pSpS or hemoglobin, isolated or combined, associated or not with EGCG, in thickness and viscoelastic properties of the acquired enamel pellicle

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The prevalence of dental caries and erosive tooth wear (ETW) has increased worldwide, consuming many public health resources for its treatment and sequelae. Acquired enamel pellicle (AEP) is one of the protective factors against dental caries and ETW. Among the AEP proteins with the potential to bind to enamel and acid-resistant properties, we identified cystatin, hemoglobin and statherin. Thus, inserted in the “acquired pellicle engineering”, this study aims to assess the effect of saliva enrichment with sugar cane-derived cystatin (0.1 mg/mL; CaneCPI-5), statherin-derived peptide (1.88×10^{-5} ; Stn15pSpS) or hemoglobin (1.0 mg/mL; Hb), isolated or combined, associated or not with epigallocatechin-gallate (1.25 mM; EGCG) in the thickness and viscoelastic properties of the AEP. For this, the real-time analysis of the interaction between the proteins, associated or not with EGCG, on hydroxyapatite (HA) sensors was performed using a quartz crystal microbalance with dissipation monitoring (QCM-D). Remarkable differences were observed in the frequencies and dissipations in the films adsorbed to the HA compared to the baseline. Our results demonstrated the great affinity of the saliva enrichment with all proteins associated with polyphenol to the HA. Also, saliva enriched with Stn15pSpS+EGCG and CaneCPI-5+EGCG were the films most strongly bound to HA when the difference between frequencies was compared between the adsorbed formed film and after washing. Furthermore, saliva enrichment with proteins associated with EGCG drastically decreases the AEP thickness formed on the surface of the HA. Finally, our results show, for the first time, that saliva enrichment with CaneCPI-5 demonstrated a greater thickness and viscosity of the film compared to the other groups. These discoveries open a way to understand the mechanisms involved in AEP protection when enriched with proteins/peptides and polyphenol, in addition, it provides a new preventive approach for erosive demineralization, using AEP engineering procedures that may, in the future, be incorporated into dental products.

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Effects of chronic fluoride exposure on the duodenum of diabetic mice

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Diabetes mellitus is currently considered a disease of great impact, with type 2 diabetes (T2D) having the highest prevalence. Some studies have indicated that excessive fluoride (F) intake causes insulin resistance, an initial effect in the development of T2D. Gastrointestinal symptoms are the first signs of toxicity by F. In this work, diabetic mice chronically exposed to F had the duodenum evaluated by proteomics analysis. 18 male C57BL/6J mice were divided into 3 groups (n=6/group) according to the F dosage administered in drinking water (0, 10 or 50 mgF/L). They received hyperlipidic diet until they weighed 30g. Control animals received normocaloric diet and water containing 0 mgF/L for the same period. After reaching the established weight, the animals received daily intraperitoneal injections of streptozotocin (SZT), for 3 days. The animals had their blood glucose measured weekly and were considered diabetic when it reached 200 mg/dL. After the experimental period, the animals were euthanized and the duodenum was collected for proteomic analysis. Control animals showed a significant decrease in blood glucose when compared to the groups that received hyperlipidic diet. After 3 weeks of application of SZT and installation of T2D, the groups received treatments with or without F. As a result, a significant reduction in blood glucose was observed in animals that consumed F-containing water (10 and 50 mgF/L) in comparison to those receiving 0 mgF/L and controls. The proteomic analysis of the duodenum showed changes in the abundance of several proteins correlated with important biological processes, such as protein synthesis, glucose homeostasis and energy metabolism. These data indicate that the administration of F during the second week significantly reduced the glycemia of the animals after the installation of T2D and provide new insights into the mechanisms involved in the F toxicity in the gut.

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Effect of a solution containing *Malva sylvestris* on cariogenic microcosm biofilm and on human gingival fibroblasts

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This study evaluated the cytotoxicity on fibroblasts, and the antimicrobial and anti-caries effects of *Malva sylvestris* on microcosm biofilm produced on tooth. Human gingival fibroblasts were treated with: 1) *Malva sylvestris* extract (0.78% to 50%); 2) 0.12% chlorhexidine - PerioGard® (0.39% to 12.5%); 3) commercial *Malva sylvestris* - Malvatricin Plus® (1.56% to 25%, commercial control); 4) Fluoride - 225 ppm F⁻, NaF (50% and 100%); 5) 5% Xylitol (50% and 100%); 6) Positive control (n 16/group), for 1 minute, and incubated in DMEM for 24 hours. Cell viability was determined by 3-(4,5-dimethylthiazol-2-yl)-2,5 diphenyltetrazolium bromide to evaluate mitochondrial activity by MTT reduction. Bovine enamel and dentin samples were submitted to the formation of cariogenic microcosm biofilm for 5 days. From the second day, the experimental solutions were applied (1 mL/1 min/day): 1) 12.5% *Malva sylvestris*; 2) Sodium Fluoride (225 ppm F); 3) 5% Xylitol; 4) *Malva sylvestris* + F; 5) *Malva sylvestris* + Xylitol; 6) *Malva sylvestris* + F + Xylitol; 7) *Malva sylvestris* (Malvatricin Plus® - positive control); 8) 0.12% chlorhexidine (PerioGard®, positive control) and 9) PBS (negative control-NC) (n 12/group). The colony forming units (CFU) were counted for *Lactobacillus* spp. and *Streptococcus mutans*/S. *sobrinus*. Demineralization was quantified by transverse microradiography. Data were analyzed by one-way ANOVA/Dunnett's or Tukey or Kruskal-Wallis/Dunn ($p < 0.05$). The extract of *Malva sylvestris* has no cytotoxicity below 6.25%. None of the treatments was able to reduce *Lactobacillus* spp. and S. *mutans*/S. *sobrinus* CFU. The average enamel mineral loss was reduced by chlorhexidine (42%), F (30%) and *Malva sylvestris* + F (42%) compared to NC. Integrated dentin mineral loss and lesion depth were reduced by chlorhexidine (32%) and Malvatricin Plus® (29%) compared to NC. The experimental solution containing *Malva sylvestris* + F showed low cytotoxic effect and anti-caries action only on enamel.

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Characterization of sound and eroded dentin: implications for mechanical properties of functional resin monomers

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The minimally invasive protocols currently advocate for the use of resin-based materials on the treatment of altered dentin substrates. As the interaction of these materials to dentin strongly depends on the quality of the formation of the hybrid layer, modifications caused by erosive tooth wear can impair this relation. Thus, the aim of this study was to characterize sound and artificially eroded dentin and their effect on the degree of conversion (DC) and wettability (W) of dentin bonding systems (DBSs), using Fourier-Transform Infrared Spectroscopy (FTIR) and a goniometer, respectively. This study involved 2 factors: dentin substrate at 2 levels (sound dentin and artificially eroded dentin) and DBSs at 3 levels according to the mode/category (Scotchbond Multipurpose [MP], Clearfil SE Bond [SE], and Adper Single Bond Universal [SU]). For substrate characterization, the dentin samples were evaluated individually, and the ratio between the reference band areas was calculated. Subsequently, the DBSs were applied to the substrates following the manufacturers' recommendations, and the DC was assessed. For wettability, the analysis was performed using the water sessile drop method before and after applying each DBS to the substrates. The data were subjected to a two-way ANOVA, followed by Tukey's test for individual comparisons, with a significance level of 5%. In the substrate characterization, the results showed that eroded dentin exhibited a decrease in the carbonate-phosphate ratio, indicating increased tissue dissolution. Regarding DC, only SU showed a decrease in values when applied to the eroded substrate. In terms of W, the eroded substrate negatively affected the performance of the DBSs. Therefore, it can be concluded that the alteration of eroded dentin jeopardized DBSs performance, especially when associated with a universal system, highlighting the need for new approaches to improve the adhesive interface in altered dentin.

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Role of different functional monomers of self-etching adhesives in dentin submitted to radiotherapy and/or carious challenges

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Radiotherapy induces chemical and structural alterations in dentin that must be considered in the adhesive process, in particular when followed by carious disease condition. Different dentin bonding systems (DBSs) with distinct functional monomers combined or not with bioactive compound can play interesting roles to reinforce these altered substrates. The aim of this study was to evaluate the interaction between different DBSs in irradiated dentin, associated or not with cariogenic challenge by microtensile bond strength test (μ TBS) at initial (24h), 6 and 12-month aging time. 144 (n=12) sound human molars were randomly distributed into 4 groups based on dentin condition: S (sound), C (caries-induced through 6hDE-18hRE simulation), I (irradiated, total dose of 70Gy) and IC (irradiated followed by the DE/RE protocol). After that, the specimens were redistributed according to DBSs: SE-ClearFil SE Bond, SU-Adper Single Bond Universal and FL- FL Bond II and restored following the manufacturers' instructions. After 24h, 0.64mm² sticks were submitted to μ TBS test (500N/0.5mm/min). Data were analyzed by 3-way ANOVA and Tukey test ($p<0.05$). Results indicate that dentin condition; DBS and time were statistically significant factors as well as the interaction between dentin condition and DBS ($p<0.001$). The adhesive and mixed failures were predominant in all groups. SE and SU showed the higher values for S. For I, SU and FL yielded the higher performance while in C and IC there were no difference between these DBSs. 12-month aging impaired μ TBS regardless the DBSs and dentin conditions. Altered dentin substrate, in particular C and IC impaired the bonding interaction with any of the functional monomer-based DBS. 10-MDP DBS were more promissory for sound dentin and for initial time, while FL Bond II was stable and can offer bioactive benefits to recover the dentin.

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Protective ability of a cystatin to control dentin erosion and abrasion: in situ study

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The objective of this study was to evaluate the protective effect of a new protein (cystatin derived from sugarcane: CaneCPI-5) in different vehicles for application in Dentistry (solution and chitosan gel) against erosion and erosion+abrasion on dentin surface in situ. For the first vehicle, fifteen volunteers participated in a protocol containing three phases (solutions): Water; ElmexTM and CaneCPI-5. They used a palatal appliance containing four dentin samples for 5 days. These samples were treated with a drop of the solutions for 1min (4X/d). Then, the acquired pellicle (AP) was formed and the samples were submitted to erosive challenges (Erosion: citric acid, for 90s, 4X/day). In addition, twice a day, half of the samples were also subjected to an abrasive condition, using an electric brush for 15s (Abrasion). For the gel study, sixteen volunteers also participated in a crossover protocol (gel): No gel, Chitosan gel, Chitosan gel+NaF and Chitosan gel+CaneCPI-5. The volunteers also wore a device (similar to the first study). Samples were treated once/day with the gel for 4min (except for the no-gel group). Then the AP was formed and the samples were subjected to erosive and abrasive challenges, as reported in the first study. Dentin wear was measured by profilometry. Data were analyzed by two-way RM-ANOVA and Sidak tests ($p<0.05$). Results: For the solution study, ElmexTM and CaneCPI-5 significantly reduced dentin loss compared to Water for Erosion and Abrasion conditions ($p<0.05$). For the gel study, all treated groups significantly reduced dentin loss compared to the No gel group. The greatest reduction was found for the gel+CaneCPI-5 group for Erosion and Abrasion ($p<0.05$). Conclusion: Chitosan solution and gel containing CaneCPI-5 protected against erosive wear of dentin in situ.

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Effect of two protocols on denture stomatitis, microbial load, blood pressure, C-reactive protein, and quality of life: a randomized clinical trial

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Background: Edentulous patients can have an increased risk of cardiovascular diseases, particularly hypertension and stroke, and wearers complete dentures positives to Denture Stomatitis (DS) can be associated with deleterious cardiovascular effects, mainly hypertension. **Objective:** To evaluate the effects of two protocols on Denture Stomatitis (DS), microbial load, blood pressure, C-reactive protein (CRP), and Oral Health-Related Quality of Life (OHRQoL). The body mass index (BMI) and lipid profiles outcomes was evaluated for characterized of participants. **Methods:** This randomized, double-blind, controlled clinical trial allocated DS-positive participants in two parallel groups: nystatin 100,000 IU (control - C) or sodium hypochlorite solution (SH0.25%). All participants brushed their palate and dentures and applied one of the solutions to the oral mucosa (C) or denture (SH0.25%). The data were measured at baseline, after 15 and 45 days of treatment. The degree of DS was diagnosed based the modified Newton classification. The microbial load of *Candida* spp. and *Staphylococcus* spp. on denture and palate was evaluated by colony-forming units. Three measurements were performed the systolic and diastolic blood pressure (mmHg). The ELISA assessed the CRP (mg/L) of blood samples. OHRQoL was evaluated by the Brazilian version. The data were evaluated for Mann-Whitney (groups) and Friedman (times) tests. ANOVA and Tukey's post-test was applied for CRP using the software SPSS 25.0 ($p < 0.05$). **Results:** Forty-seven participants were included (C: 25; SH0.25%: 22) with a mean age of 68 ± 6.2 years. DS grade decreased after both protocols and times ($p < 0.001$). The two protocols reduced the CFU/mL on the denture and palate compared with the baseline for *Candida* spp. ($p < 0.001$). SH0.25% was the most effective on the denture for *Staphylococcus* spp. at 15 days ($p = 0.024$). Systolic blood pressure decreases after two protocols at 15 days ($p = 0.002$) and after 45 days ($p = 0.013$), while diastolic blood pressure was similar over time for both treatments ($p = 0.654$). The treatments did not affect the CRP ($p = 0.824$). A significant improvement of OHRQoL in 3 of 4 domains evaluated ($p < 0.001$). The participants of both groups presented similar BMI and lipid profile all the times. **Conclusion:** The two treatments of DS reduced the participants' DS degree, microbial load, and systolic arterial pressure; and improved quality of life of participants.

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Long-term doxycycline (SDD) improves osteopenic bones in rats submitted to tibial implants

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The present study aimed to compare the use of doxycycline in subantimicrobial doses (SDD-Subantimicrobial dose) with risedronate sodium in Wistar rats, a gold standard drug used for the treatment of osteoporosis. Forty-two (n=42) female Wistar rats were divided into 6 groups (n=7), the groups were defined as follows: C – Control; C-DOX – Control exposed to doxycycline 30 mg/kg/day; C-RIS – Control exposed to risedronate sodium 30 mg/kg/month; OVX – Ovariectomized Control; OVX-DOX – Ovariectomized subject exposed to doxycycline 30 mg/kg/day; OVX-RIS – Ovariectomized subject exposed to risedronate sodium 30 mg/kg/month. The rats, around 80 days old, underwent the ovariectomy procedure which aims to induce osteopenia for 90 days. After this period, the rats were submitted to treatment with doxycycline at a dose of 30 mg/kg/day or risedronate sodium at a dose of 30 mg/kg/month, both for 60 days. Thirty days after starting drug treatment, all animals underwent implant placement in the right tibial bones. After the other 30 days of the drug expose, the death induction was performed and samples of blood, tibial and femoral bones were collected. The data were submitted to the multivariate linear model statistical test ($p \leq 0.05$). The results of the present study demonstrated an improvement in the bone quality of osteopenic rats treated with doxycycline SDD and risedronate sodium, with better results for rats treated with doxycycline SDD. Our study concluded that doxycycline was a safe drug at subantimicrobial doses with great potential for the treatment of osteopenia according to the experimental model of tibial implants.

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Effect of osteoblasts on osteoclasts grown on a nanostructured titanium surface

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Bone remodeling involves osteoblast and osteoclast activities and is of relevance for titanium (Ti) osseointegration. As a nanostructured Ti surface (Ti Nano) obtained by H₂SO₄/H₂O₂ treatment attenuates the osteoclast-induced disruption of osteoblast differentiation, we hypothesized that osteoblasts regulate osteoclast differentiation and activity of cells grown on Ti Nano. Thus, the aim of this study was to evaluate the effect of osteoblasts on osteoclasts cultured on Ti Nano compared with Ti Control. RAW 264.7 cells were cultured on Ti Control and Ti Nano discs and MC3T3-E1 cells in inserts and kept under osteoclastogenic and osteogenic conditions for 5 days to induce osteoclast and osteoblast differentiation, followed by 2 days in co-culture. Additionally, conditioned media of osteoblasts grown on Ti Control and Ti Nano were used in osteoclasts cultured on polystyrene and calcium phosphate plates. Protein expression of the osteoclast markers TRAP and CTSK (n=3), TRAP staining and resorption assay (n=4) were performed on day 7 and the data were compared by ANOVA ($p \leq 0.05$). The results showed that Ti Nano inhibited osteoclast differentiation and activity and the presence of osteoblasts enhanced this effect, as well as the conditioned medium of osteoblasts cultured on Ti Nano reduced osteoclast differentiation and activity. In conclusion, osteoblasts exacerbated the inhibitory effect of nanotopography on osteoclast differentiation and activity and may regulate the bone remodeling process, favoring the osseointegration of Ti implants.

Detecting early tooth wear in children

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Bruxism, characterized by teeth grinding and involuntary clenching, is a common condition in children and a risk factor for masticatory dysfunction. Its etiology, involving physical, psychological, and genetic factors, remains complex and not fully understood. Bruxism can lead to sensitivity, tooth destruction, failed restorative procedures, temporomandibular joint (TMJ) pain, craniofacial muscle pain, limited jaw mobility, headaches, and compromised quality of life. Diagnosis relies on subjective observations, medical history, and clinical examination. Technology plays a crucial role in dental procedures, including planning and impressions. Digital dentistry has shown promise in preventing, controlling, and monitoring tooth wear. In this pilot study, three children (aged 8–12) were scanned at different intervals (T₀ = initial, T₁ = 6 months, T₂ = 12 months) using an intraoral scanner CS 3600 (Carestream Dental). Three-dimensional (3D) models were aligned with a reference model using CloudCompare software. Differences in surface profile between the reference and obtained models represented tooth substance loss. Among participants, two children exhibited normal wear on first molar cusps, with approximately 26 µm of structure loss. However, one child with diagnosed bruxism displayed around 100 µm of structure loss on lower first molar cusps. The use of intraoral systems aided by specific software demonstrates effective early detection and monitoring of tooth wear in vivo. Early diagnosis and monitoring in children can be facilitated by existing tools in digital dentistry, enabling timely and individualized treatment by dentists. Furthermore, it is characterized as non-invasive and easily accepted by children.

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Evaluation of the stomatognathic system in athletes practicing physical activity in individual and collective modalities

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The regular practice of physical activity contributes to the improvement of quality of life. However, the practice of physical activity aims at performance, makes athletes train more exhaustively in the search for the best physical training, with this, extreme physical stimuli, restricted diet, emotional stress, demands for results, can cause deleterious effects related to other factors inherent to high performance. A system that can change with all this overload suffered by athletes is the stomatognathic system. To understand this whole scenario related to performance, sports dentistry proves to be effective as a tool in the prevention of possible musculoskeletal injuries, thus minimizing the deleterious effects of performance. The objective of this study will be an evaluation of the stomatognathic system in athletes who practice physical activity in individual and collective modalities. Therefore, to trace the functional profile of the masticatory muscles, the occlusion and the respiratory capacity of individuals who practice individual and collective sports professionally, as well as to establish comparisons with sports performance, the athletes will be evaluated by means of electromyography, the muscles will be rewarded: the masseter and temporalis in conditions of mandibular rest, right and left lateralities, protrusion, dental clenching in maximum intentional contraction. The masticatory performance will be evaluated by the efficiency of the masticatory cycles. Tongue and lip pressure will be measured by the Iowa Oral Pressure Instrument. Thermography images will be captured by the FLIR One Plus® camera. The muscle thickness will be measured by the treated ultrasound image, in the clinical conditions of rest and dental tightening in intentionally maximum contraction. The Kratos digital dynamometer will be used to analyze the maximum bilateral molar bite force. The T-Scan® III system will be used to analyze the contact of occlusal forces (%) between the upper and lower hemiarches (bilateral) and the first permanent molars (upper and lower). In capturing images for 3D facial analysis, the Vectra® M3 equipment will be used. The consolidation of this research project will have the potential to generate knowledge for the scientific community of Sports Dentistry, confident in the evaluation of the stomatognathic system of athletes.

1. Faculdade de Odontologia de Ribeirão Preto (USP).

Hypoxia-primed mesenchymal stem cells overexpressing BMP-9 for bone regeneration

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Bone morphogenetic protein (BMP)-9 and hypoxia-inducible factor-1 alfa (HIF-1 α) are among the signaling molecules with major roles in bone regeneration. Mesenchymal stem cells (MSCs) overexpressing BMP-9 (MSCs+BMP-9) can enhance bone formation in calvarial defects, showing potential for cell-based therapies. Then, to further investigate the role of BMP-9, this study aimed to evaluate the effect of hypoxia on the components and targets of the BMP signaling pathway and the effect of hypoxia-primed MSCs+BMP-9 on osteogenesis and bone repair. Cobalt chloride was used to mimic a hypoxic condition in MSCs+BMP-9 and the expression of BMP components and targets was evaluated. Conditioned medium from hypoxia-primed MSCs+BMP-9 was used to assess the effect of their secretome on viability, migration, and osteogenic differentiation of MSCs and osteoblasts because these cells participate in bone formation. Additionally, cell therapy was performed by directly injecting hypoxia-primed MSCs+BMP-9 into rat calvarial defects, and bone formation was assessed. Results demonstrated the regulation of BMP components and targets by hypoxia without changing BMP-9 protein expression. An enhancement in migration and osteogenic differentiation of MSCs and osteoblasts was promoted by the conditioned medium generated under hypoxia; however, there was no effect in bone formation by hypoxic-primed MSCs+BMP-9 compared with control MSCs+BMP-9. Despite the lack of in vivo effect, the potential of hypoxic-primed MSCs+BMP-9 evidenced by the improvement in cell migration and osteoblast differentiation, provides new insights for future investigations on the modulation of the BMP-9-HIF-1 α axis for bone regeneration.

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Restorative procedures in endodontically treated teeth: a retrospective clinical study

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The aim of this study was to evaluate, during 14 years (2008 to 2021), data regarding intraradicular retainers in endodontically treated teeth, in order to identify their prevalence. A survey of medical records was performed in the Romeu (FORP-USP) computerized medical record system database, searching for permanent teeth with endodontic treatment, exporting them to a spreadsheet containing the dental group and the year for the following procedures: cast metal cores, glass fiber posts and prefabricated metal posts, allowing descriptive data analysis. Of 176,277 data from the original spreadsheet, 1,188 rows were distributed into 895 (75%) cast metal cores, 250 (21%) fiberglass pins and 43 (4%) prefabricated metal pins. The largest number of procedures was performed in patients aged 30 to 60 years (63%) and on upper incisors (31.7%). There was a gradual decrease of cast metal cores over the years and an increase of glass fiber and prefabricated metal pins. It was possible to observe a higher prevalence of cast metal cores, as well as their decrease over the years compared to the other retainers.

Implementation of an interactive dashboard for analysis of food insecurity data among university students within the scope of Bazuca-Covid

Carolina R. Xavier¹

and Dirce Marchioni¹

Data from the World Food Programme reveals that food insecurity doubled between 2019 and 2020 due to the economic effects of the pandemic. Brazil was also affected, with food security rates decreasing from 44.8% in 2020 to 41.3% in 2022. Food insecurity has negative consequences on physical, psychological, social, and emotional development. Furthermore, hunger and social inequalities lead to problems such as malnutrition, nutrient deficiencies, and obesity. Changes in eating behavior, limited culinary skills, and sedentary lifestyles contribute to alterations in nutritional status and increase the risk of cardiovascular diseases. Studies have shown increased sedentary behavior, tobacco, alcohol, and ultra-processed food consumption during the pandemic. A study conducted with students from USP revealed decreased income, food insecurity, worsened self-rated health, weight gain, abusive alcohol consumption, sleep disturbances, and elevated stress levels. University students are vulnerable to the impacts of the pandemic, especially due to the closure of university restaurants and the lack of stable employment. This population is essential to the country, and investigations on the impact of COVID-19 can provide data to understand the disease's sequelae and develop actions and public policies to mitigate long-term effects. The objective of this project is to build an interactive dashboard, using computational tools and methods of artificial intelligence and data science, to facilitate the exploration and investigation of the pandemic's impact on food security, social conditions, health, and nutritional aspects related to cardiovascular risk in university students through intelligent and interactive graphs and maps for end-users. Data from other sources will be added and correlated with the data provided by the respondents.

1. Faculdade de Saúde Pública da USP.

Maternal factors related to the current and previous gestational history associated with fetal mortality: preliminary results from the FetRisks project

Lays J. P. Marques¹

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Objective: This is a case-control study to identify maternal factors in the current pregnancy and obstetric history associated with stillbirths and is part of the Fetrisks thematic project being conducted in 14 SUS hospitals in the municipality of São Paulo (MSP). **Methods:** This is a hospital-based based on a population case-control study, where cases are stillbirths and controls are live births. Information on 307 cases and 311 controls were obtained through interviews with parturients during their hospitalization for delivery. Preliminary data representing 74% of the initial sample and referring to March/2023 are presented, as the project is still in the data collection phase. The crude odds ratios (OR) estimated using logistic regression with 95% confidence intervals (95%CI) were obtained. **Results:** Data collection was severely impacted by the covid-19 pandemic. Fetal deaths were predominantly antepartum (84%). Concerning obstetric history, it was found that primiparous (OR=1.2; 0.8-1.6) or high multiparous (OR=1.7; 0.8-3.8) mothers were associated with a greater chance of stillbirths. As well as mothers who had negative outcomes in previous pregnancies (OR=1.63; 1.1-2.4), having a previous child born prematurely (OR=2.2; 1.4-3.7), having a child previous stillbirth (OR=1.3; 0.8-2.3), having a previous child born with low birth weight (OR=1.8; 1.1-2.9) and having a previous child born with a congenital malformation (OR=1.4; 0.5-3.9) were associated with stillbirths. Mothers who did not undergo prenatal care (OR=8.0; 2.2-5.1), having been referred to be transferred to another prenatal service due to a health problem (OR=1.7; 1.2-2.3), and mothers who received an indication but were not transferred to another reference prenatal service (OR=2.5; 1.2-5.7) also showed greater chances of stillbirths. Very preterm pregnancies (<32 weeks) were at risk for stillbirths (OR=48.1; 24.9-102.9), as well as very low birth weight (<1500g) (OR=68.5; 35.0-151.2). **Conclusions:** The preliminary findings of this study indicate that stillbirths in the MSP have a profile similar to that found in high-income countries, where premature stillbirths and low birth weight predominate. Primiparous and high multiparous women had a

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greater chance of stillbirths, but this result was not statistically significant. The negative outcome of previous pregnancies was associated with a higher occurrence of stillbirths, with emphasis on previous low birth weight and premature births. The absence of prenatal care and the indication for care services for high-risk pregnant women were also associated with stillbirths, noting that not all pregnant women who had this indication received prenatal care for high-risk pregnancies.

Spatial-time modeling of Zika, chikungunya and co-occurrence in Brazil considering three different geographic scales and environmental-socioeconomic factors: preliminary results

Raquel G. S. Palasio¹

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Chikungunya and Zika are neglected tropical and emerging diseases caused by arbovirus transmitted by *Aedes aegypti* in the Americas. They are subjected to climate change, as temperature and precipitation variations can affect the survival, reproduction and distribution of virus and vector. This study aims to investigate, model and predict the space-time patterns of Zika and chikungunya occurrence and co-occurrence considering different geographical scales: Brazilian municipalities, weighting areas in the São Paulo state, and census tracts in Campinas and Baixada Santista municipalities. The first results we obtained were ran considering the Brazilian scale from 2015–2021. Spatial, space-time, temporal, seasonal and spatial variation in temporal trend clusters were identified based on univariate scan analysis for chikungunya and Zika. We used symptom onset of the confirmed cases, sex and age indirectly standardized data, municipality of residence, and the Poisson probability. We used the mean t-test to compare temperature, precipitation, vegetation and socioeconomic variables between the municipality included in the high-risk spatial clusters in relation to the not included. The highest incidence of these diseases occurred in 2015–2016, followed by a decline between 2018–2021. However, this decrease was not heterogeneous throughout Brazil, with a resurgence in the northeast between 2019–2021. Dispersion and an upward trend were observed for chikungunya in Baixada Santista in 2021. The t-test showed that municipalities included in high-risk clusters for both diseases had higher temperatures, lower percentage of households with a sewage system or septic tank, lower Normalized Difference Vegetation Index than those not included. However, precipitation levels were lower for chikungunya and higher for Zika. Chikungunya occurrence was more related to lower socioeconomic level than Zika. We will conduct a multivariate scan analysis to identify Zika and chikungunya co-occurrence clusters. We will use these first results as hypotheses to be tested in Bayesian spatiotemporal models, doing future predictions considering possible climate change scenarios, conducting them in the three geographical scales. We will contribute to identify priority areas for the implementation of entomological and epidemiological surveillance and control activities, aiming to avoid or minimize the Zika and chikungunya occurrence.

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Connections between knowledge in scenarios of uncertainty: a study of perception and decision-making about physical activity in Covid Longa patients

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Decision-making in health involves scientific evidence, resources available in services, sociocultural contexts and subject autonomy. In the Covid-19 pandemic, the need for mappings that show the possible connections between these apparently different areas has become not only relevant, but urgent. This research aims to identify and analyze elements that can compose the subject of decision-making in physical activity of patients with long-term Covid, based on an international experience in the United Kingdom. A scope review will be carried out for dialogues with the scientific literature with national and international partners, in addition to group observations of physical activity care for patients with this condition. The analysis will be done in conjunction with other data from broader research on the health decision-making of individuals with long-term Covid, to which this project connects Dialogues will be made with areas such as health literacy, health promotion, and popular education.

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Evaluation of the mammographic screening sensitivity in Brazil and factors influencing the mammography quality

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Objectives: The objective of this study is to evaluate the quality of mammograms conducted within the breast cancer screening program in Brazil. We will assess the mammograms results obtained from the information systems used for payment purposes. Additionally, our aim is to investigate potential associations between mammogram quality and various factors, including the time of diagnosis, the education level of women, lesion size, family history of cancer, the use of hormone therapy, and radiotherapy. **Methods:** To achieve these objectives, we will perform a sensitivity analysis to compare the screening mammograms results with breast cancer diagnoses. This analysis will provide a comprehensive evaluation of the overall quality of mammography and identify the factors that may impact its effectiveness. To ensure standardized data collection, we will utilize the national health information. Specifically, we will access and interconnect the Breast Cancer Information System (SISMAMA) and Cancer Information System (SISCAN) databases to gather data on mammograms and biopsies results. The screening (mammography) and diagnosis (biopsy) criteria will adhere to the national guidelines set by the National Cancer Institute (INCA). Additionally, we will consult the National Register of Health Establishments (CNES) database to determine the type of mammography device used. Patient information, including age, ethnicity, education, family history of cancer, hormonal therapy, radiotherapy, and geographic region will be obtained from the SISMAMA database. The study will include all women aged 40 to 79 years who underwent mammographic screening in either 2013 or 2022 and subsequently underwent a biopsy procedure for breast cancer diagnosis. Bivariate and multivariate statistical analyses will be conducted using SPSS v.29 software. The sensitivity of mammography, which indicates the level of agreement between mammography and biopsy results for breast cancer, will be assessed by calculating the proportion of true results. To compare the different strata of demographic, biological, and technological variables in terms of sensitivity, we will utilize the non-parametric Mann-Whitney test. Furthermore, we will use Spearman's coefficient to evaluate correlations between diagnostic time and the proportion of false results and inconclusive results. **Expected results:** We anticipate that the study will reveal varying levels of sensitivity in mammographic screening based on population characteristics, such as age and ethnicity. We also expect to observe associations between the proportion of false negative,

false positive, and inconclusive results and the risk factors for breast cancer. Furthermore, we will evaluate the sensitivity of mammographic screening in the five different regions of Brazil in both 2013 and 2022 to assess potential regional and temporal differences in mammography quality. This analysis will provide insights into any disparities or improvements in screening effectiveness across different regions and over time. The expected results will contribute valuable information regarding the quality of breast cancer screening. By highlighting the relevance of specific factors, these findings can inform the planning and development of more effective breast cancer screening programs, ultimately improving early detection and patient outcomes.

The role of Health Regulation in the process of regionalization and organization of care networks: a comparative case study between Brazil and Portugal

Ana Lúcia Passos Meira¹

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Since the Federal Constitution of 1988, Brazil has established a dynamic and complex health system – the Unified Health System (SUS), based on the principles of health as a citizen's right and a duty of the State, with the objective of providing comprehensive and universal, preventive and curative care, through management and delivery in the three spheres of government. The Portuguese National Health System (SNS) was created in 1979, under the principles of centralized control and decentralized management and since 2008 it has been working strongly with the theme of decentralization of health actions and services. The establishment of these health systems and their proper implementation face considerable challenges, in particular, the expansion and adequacy of the offer of health programs and services, with regionalization and conformation of health networks, aiming to expand access, effectiveness and efficiency. of your actions. It is therefore necessary to identify the conditions that favor or hinder the regionalization and conformation of these networks, linked to the fundamental role that regulation can play in the structuring of access to health in the system, prioritizing the period currently lived, in times of Covid-19 pandemic. This study aims to understand the role of health regulation in the process of regionalization and organization of health networks in the fight against Covid-19, based on comparative case studies. The methodological procedures will use quantitative and qualitative approaches: interviews with managers and health professionals, document analysis and secondary database created with indicators from the countries studied. By identifying and studying the conditions that favor or hinder health regulation in the regions and the conformation of regionalized health networks, we will be able to understand the possible obstacles to the reduction of inequalities in the universalization of health in both countries. From the knowledge of these obstacles and contributing factors of regulation in health regions, the urgency and emergency network will be studied as a way of evaluating access to health services and because it is a network of services that was widely used at this time of facing the crisis. Covid-19, can offer us subsidies to understand the care process, where we will try to understand users' access to health services and the technologies and actions present in the regions of the study.

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Recent changes in trends of mortality from cervical cancer in Southeastern, Brazil

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Objective: To analyze the trends of cervical cancer mortality in Brazilian Southeastern states, and to compare them to Brazil and other regions between 1980 and 2020. **Methods:** Time series study based on data from the Brazilian Mortality Information System. Death data were corrected by proportional redistribution of deaths from ill-defined causes and cervical cancer of unspecified portion. Age-standardized and age-specific rates were calculated by screening target (25–39 years; 40–64 years) and non-target (65 years or older) age groups. Annual percentage changes (APC) were estimated by linear regression model with breakpoints. The coverage of Pap Smear exam in the Unified Health System (SUS) was evaluated between 2009 and 2020 according to age group and locality. **Results:** There were increases in corrected mortality rates both in 1980 and in 2020 in all regions, with most evident increments at the beginning of the series. There was a decrease in mortality nationwide between 1980–2020; however, the state of São Paulo showed a discrete upward trend in 2014–2020 (APC=1.237; 95%CI 0.046–2.443). Noteworthy is the trend increment in the 25–39 year-old group in all study localities, being sharper in the Southeast region in 2013–2020 (APC=5.072; 95%CI 3.971–6.185). Screening coverage rates were highest in São Paulo and lowest in Rio de Janeiro, with a consistent decline from 2012 onwards at all ages. **Conclusions:** São Paulo is the first Brazilian state to show a reversal trend in mortality from cervical cancer. The changes in mortality patterns identified in this study point to the need for reorganization of the current opportunistic screening program and for investments in more efficient evidence-based strategies. Only with a broad approach to ensure high coverage, quality, and adequate follow-up of all women with altered test results, reductions not only in mortality, but also in incidence will be achieved. This will ensure Brazil's alignment with the global strategy of eliminating cervical cancer as a public health issue.

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Association between diet and mental health of a nationally representative sample of Brazilian adolescent students: Pense 2012 and 2015

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The aim of this study was to analyze the association between consumption of healthy and unhealthy foods and mental health symptoms in a nationally representative sample of Brazilian adolescent students. Cross-sectional analyzes of data from the National School Health Survey (PeNSE 2012 and 2015) were used to verify the association between the frequency of mental health symptoms in the last month (loneliness and worried sleep) and weekly consumption of foods considered as markers of healthy eating and unhealthy eating. Analyzes were performed using a logistic regression model and significance of 5% in survey mode. Around 16% (17457) of the adolescents declared that they felt alone most of the time or always in the 12 months preceding the survey in 2012 and 2015. 9.7% and 11.3% of teens reported losing sleep due to worry most of the time or always in the 12 months preceding the survey in 2012 and 2015, respectively. The consumption of vegetables and fruits at least once a week was associated with a lower chance of feeling lonely (7% and 13%, respectively) and sleeping worriedly (12% and 13%, respectively). Beans also had a protective effect on the mental health of adolescents since weekly consumption of beans three or five times a week was related to an 11% and 36% reduction in the chance of feeling lonely. The consumption of beans at least once a week or five days or more a week was associated with a 15% and 39% lower chance of feeling worried. Regarding unhealthy foods, between 2012 and 2015, an increase in the consumption of sausages five times or more per week was observed among adolescents (14.7% in 2012 and 31.3% in 2015) and when the consumption increased to five times a week, the chances of feeling lonely doubled (22%) and the chances of feeling worried tripled (27%). CONCLUSION: The higher the consumption of vegetables, fruits and beans, the lower the chances of feeling lonely and worried during sleep in Brazilian adolescent students.

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Quality of data information of pregnant women registered in the Sistema Integrado de Gestão da Assistência à Saúde (SIGA), São Paulo, 2012 to 2020

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Introduction: The health care of the population generates a large volume of data on the health services provided, which, when treated properly, allow the extraction of information for better knowledge, to guide managers in decision-making related to the planning of health actions, for health surveillance; assessment of the quality of hospital care and/or primary care and analysis of the performance of the health system as a whole to support public policies. Among the administrative health data Sistema Integrado de Gestão da Assistência à Saúde (SIGA) of the Municipal Health Department of São Paulo (SMS-SP), which records prenatal data, among others. **Objective:** to evaluate the quality of SIGA information on pregnant women monitored by the SUS. **Methods:** Descriptive study using data from SIGA and the variables: maternal height (cm), weight (kg) measured during pregnancy, gestational age at prenatal consultation, blood pressure in mmHg systolic (SBP) and diastolic (DBP), and body mass index (BMI) in early pregnancy (up to 8 weeks). **Quality analysis** was carried out by calculating the indicators: percentage of incompleteness and zero values for all variables studied, percentage of implausible values for height, weight, BMI and preference for terminal digits of weight and height. **Results:** Database of pregnant women made available for analysis included 8,046,608 records and 1,174,115 women. The percentage of incompleteness and zero values was low (< 1%) in all original system variables. There are more records at the end of pregnancy. For the four original variables of interest in the database (weight, height, SBP, DBP), there is a clear preference for the terminal digit. **Conclusion:** The quality analysis showed the need for improvement in the standardization of data collection and recording, rounding of measures and the need to encourage pregnant women to start prenatal care as soon as possible.

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Additive effect of common obesity-related SNP variants in admixed Brazilian population: 2015 ISA-Nutrition study

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Background and objective: Genome-wide association studies (GWAS) identified loci associated with obesity, mainly in populations of European or Asian ancestry. Considering the importance of diversity and the participation of multi-ethnic groups in GWAS, we aimed to identify loci associated with obesity in admixed Brazilian population from São Paulo city. **Methods:** The analyses included 680 non-related free-living individuals aged 12 years or more of the cross-sectional population-based Health Survey of São Paulo with Focus on Nutrition (2015 ISA-Nutrition). Obesity was defined according to BMI cutoffs. Genotyping was obtained from blood using Axiom PMR Array, resulting in 731,392 high-performing markers, after quality control pruning. Markers with minor allele frequency (MAF) < 0,05 and with extreme deviation from Hardy-Weinberg equilibrium ($P < 10^{-5}$) were excluded. Population structure and global ancestry were accessed through principal component (PC) analysis. The models for obesity were adjusted by sex, age, age², and the two first PCs of global ancestry, assuming an additive effect of the markers. **Results:** The population included 53.7% of men, 29.4% adolescents, 32.8% adults and 37.8% older adults (mean age=44.7y; min.=12y; max=93y) with 23.2% prevalence of obesity. Considering a significance threshold of 10^{-5} , the SNP rs41282114 (C>T; MAF=0.136) was associated with obesity (OR= 2.67, $p = 9.33E-06$), which was not previously observed in studies with Europeans or Asians. The rs41282114 is located in CDS2 gene, with function in mitochondrial activity. In mouse models, overexpression of CDS2 protected against high-fat-diet-induced obesity and fatty liver. **Conclusions:** The findings provide an entry point to reveal new susceptibility loci and etiological factors of common obesity that may be ancestry-specific in Brazilian population.

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Seasonal and regional differences in eating times in a representative sample of the Brazilian population

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Human food intake and its timing is a complex behavior that can be influenced by a variety of factors, some of which may vary from season to season or from region to region. In this study, our aim was to investigate the seasonal variation in food intake times, with a particular focus on how these may vary across different regions of the country. We conducted an analysis of data from 20,622 adults from the National Household Budget Survey (POF-IBGE), encompassing complete food records collected from individuals residing in Brazil, thereby ensuring representation across different latitudes. Each participant's daily food intake was recorded for two non-consecutive days at different times of the year using a food diary. An ANOVA revealed a later food intake time in the evening in high-latitude regions compared to low-latitude regions. The Sidak post-hoc test showed a significant interaction effect between region and season demonstrating a pattern of early first intake time and eating midpoint in the northeast region during spring/summer. Additionally, we observed an independent effect of the region revealing early food intake times in low-latitude regions. These findings have implications for interventions and policies aimed at promoting healthy eating times in the population.

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Association between food consumption and symptoms of anxiety and depression in a Brazilian adult population

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Evidences relate the quality of the diet with mental disorders, among them anxiety, and depression. In this sense, certain studies have investigated the association between the consumption of foods rich in sugars and fats and anxiety and depression. Other studies have investigated the association between fruit and vegetable consumption with anxiety and depression. Other studies have associated nutritional status with these psychiatric disorders. The results are questionable, with research pointing to a positive relationship and others a negative relationship between being overweight and mood disorders. The high prevalence of mental disorders in the population and their relationship with food consumption, nutritional status and weight variation, associated with a high prevalence of consumption of foods high in sugar and fat, overweight and obesity in the Brazilian population, explain the importance from evaluating the relationship between symptoms of mental disorders, food consumption and excess weight, to the future establishment of more appropriate therapeutic proposals. A cross-sectional study was carried out, where anxiety and depression were assessed according to the Beck questionnaire. Food consumption was analyzed according to a food consumption frequency questionnaire, and the portions of food groups classified according to the 2005 Food Guide for the Brazilian Population. A direct association was found between the consumption of sweets and sugary drinks and symptoms of depression, as well as an inverse association between the consumption of fruits and vegetables and the presence of anxiety symptoms. An inverse association was identified between the higher level of physical exercise and the presence of depression symptoms. This reinforces the assertion that increasing levels of physical exercise, decreasing consumption of sweets and sugary drinks, and increasing consumption of fruits and vegetables can be a convenient target for the prevention and control of symptoms of mental disorders in the Brazilian population. The existence or not of a linear association between anthropometric variables, food consumption and diagnosis of anxiety and depression was studied.

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A genetic and epigenetic approach in the placenta of pregnant women, and its relationship with fetal body composition: the Araraquara Cohort Study

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Introduction: DNA methylation (DNAm) is an epigenetic mechanism by which adverse effects of the intrauterine environment can be transferred to the offspring. **Objective:** To evaluate the relationship between maternal environmental factors and changes in placental DNAm on fetal body composition. **Methods:** One hundred pregnant women in the prospective epidemiological study – The Araraquara Cohort were followed up during the first, second, and third trimesters of pregnancy, up to delivery. Fetal body composition was assessed with the Siemens ACUSON X300TM ultrasound (Siemens®, Mountain View, USA). Maternal diet was investigated using 24-hour dietary recalls and will be analyzed using the Nutrition Data System for Research (NDSR; Minnesota, USA). Placental tissues from the decidua and villi regions were collected from the central cotyledon, and DNA was extracted using proteinase K by the salting-out method. The hypo- and hypermethylated regions of genes related to nutrient transport and maternal metabolism (such as SNAT1, FFAR4, MYD88, ADIPOR2, and others) will be analyzed using the Methylation-Sensitive Enzymatic Digestion technique associated with quantitative PCR (qPCR), and their polymorphisms by Fragment Restriction Length Polymorphism associated with PCR (PCR-FRLP) and Sanger sequencing. Polymorphic genes will also be analyzed using the pyrosequencing technique in a subgroup. Linear regression models will be used to explore the associations between DNAm, gene polymorphisms, and fetal body composition. **Results:** We hope to explain the following: 1) whether environmental factors modulate DNAm in different tissues of the placenta, which may present different polymorphisms between the mother (decidua) and fetus (villi); 2) whether DNAm would be altered due to genetic polymorphisms; and 3) whether these events affect fetal body composition. **Keywords:** fetal programming, placenta, DNA methylation, polymorphism, body composition.

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Diversity and ecology of mosquitoes (Diptera: Culicidae) in the Hydro mining area in Paragominas, Pará, Brazil

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The Culicidae family is represented by true mosquitoes, whose notoriety is due to their ability to transmit disease-causing agents to vertebrate animals, such as malaria, filariasis, in addition to several arboviruses. Activities such as those related to agribusiness and livestock development, hydroelectric projects, mineral exploration, can lead to sudden and catastrophic changes to the environment. In this context, what would be the changes/impacts on the ecology of mosquito populations in areas that have undergone major changes due to human economic activities and their surroundings? And what are the risks of disease transmission between organisms in impacted areas and preservation areas? The project aims to evaluate the diversity, population dynamics and vector activity of insects of the Culicidae family in the area of the bauxite mining company HYDRO, located in the Amazon Forest. Mosquitoes have been collected at six strategic points arranged from the highly modified area, which comprises the company's facilities, through the ore dam to the central area of the forest reserve. Mosquitoes have been captured using CDC-type traps and manual collectors. In the laboratory they have been sorted and identified. The engorged females have been sent for evaluation and identification of the feeding source using the DNA barcoding methodology. Mosquitoes not engorged have been grouped and sent for analysis of viral diversity in each species. As a result, so far, six hundred and twenty-five pools of mosquitoes have been set up, according to species, collection point and date. As for the total number of individuals, 2,541 mosquitoes were collected. The genus that was most abundant in the collection results was *Culex*, followed by *Aedes* and *Psorophora*. Some species of great medical importance were also observed in this campaign, such as *Ae. albopictus* and *Hg. janthinomys*. As for the composition of the pools, most captured insects were female.

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Intersectional equity in Brazil's remote rural municipalities: The road to efficiency and effectiveness in health

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Remote rural localities (RRL) are different from rural areas, with even smaller and more cohesive populations, but with reduced power and facing greater distances and social and geographical barriers. Despite the growing production of knowledge in these localities, most health strategies are still developed with the urban space in mind, ignoring specific populations, who end up having to adapt them in a solitary manner, without the corresponding resources. We aim to understand how RRL are positioned in relation to efficiency and effectiveness in health, compared to other types of Brazilian localities, focusing on Primary Health Care (PHC) and its organizational models. We evaluated the efficiency and effectiveness of different organizational models, using the model of health production. We analyzed the dimensions of human, material and financial resources, with emphasis on teams, the results of PHC actions and health levels (life expectancy at birth and infant mortality rates). We used the fixed effects model and data envelopment analysis, cross-sectioned by intersectional inequities. The models denote the importance of riverine and fluvial health teams, the proportion of diagnostic and treatment units, in addition to the proportion of illiteracy and adolescent mothers, along with the inequity of reaching high levels of schooling between gender and race (greater inequities in the Midwest Vector). The best results of the efficiency analysis were observed in the Amazon region and Northern Minas Gerais. Hopefully, these elements shall contribute to gains in efficiency and effectiveness in these spaces, prioritizing financial resources and the establishment of human resources, family health teams configured for the necessary displacements, availability of local diagnosis and treatment, and greater attention to basic sanitation and intersectional inequities in education. Finally, one should aim for equity of gender and ethnicity in income and education and, above all, of place, perceived in its entirety.

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Do agricultor à escola: abordagens para melhorar os canais de distribuição de frutas e vegetais e promover educação nutricional para crianças em situação de insegurança alimentar

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Descrição: Apesar dos benefícios da ingestão de frutas e vegetais (FV) para a saúde, este consumo é insuficiente na maioria das populações. A pandemia da COVID-19 está apresentando desafios e efeitos econômicos drásticos que afetam, desproporcionalmente, as populações mais vulneráveis. Com o aumento das desigualdades e da desnutrição, são necessárias pesquisas sobre intervenções práticas e econômicas, e que abordem os fatores ambientais, sociais e estruturais relacionados ao abastecimento e determinantes da ingestão de FV em populações socioeconomicamente vulneráveis. **Objetivo:** Avaliar o consumo de FV por crianças antes e após uma intervenção multicomponente. **Métodos:** Será um estudo piloto com delineamento quase experimental, antes e após a intervenção, que inclui estratégias de distribuição de FV e educação nutricional para crianças em situação de insegurança alimentar, matriculadas numa escola pública de São Paulo, Brasil. Mapearemos a cadeia de suprimentos de FV para propor estratégias para aumentar a acessibilidade de FV e reduzir o seu desperdício, e realizaremos atividades de educação nutricional com os professores, merendeiros, escolares, pais e alunos. Um questionário de frequência de consumo alimentar e um de escolhas alimentares serão aplicados com os pais/responsáveis (via entrevistas telefônicas), antes e após a educação nutricional (via vídeos). Espera-se analisar se investimentos para fornecer acesso a FV e informação de como cozinhá-los e aproveitá-los de maneira integral, aumentará a sua ingestão por crianças em situação de vulnerabilidade social. Assim, criar um ecossistema alimentar de ganha-ganha, tanto para o meio-ambiente como para a saúde, que possa ser replicado em outras regiões. Além disso, fortalecer a colaboração entre parceiros com experiências em áreas diferentes, porém complementares, desde a cadeia de suprimentos de alimentos até a nutrição.

Criação de dispositivos microfluídicos com geometrias diferentes para fertilização in vitro

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As tecnologias para o estudo de reprodução assistida (ART), embora sejam capazes de alcançar resultados bem-sucedidos, ainda enfrenta desafios como erros técnicos, eficiência, custo e monitoramento/avaliação. Nesse sentido, a microfluídica surge como uma ferramenta poderosa, que por meio de microdispositivos que pode mimetizar condições fisiológicas muito próximas aos sistemas in vivo. Assim, esta proposta tem como objetivo principal o desenvolvimento e construção de dispositivos microfluídicos com geometrias diferentes, para avaliar a qualidade de embriões bovinos. O intuito é avaliar se as diferentes geometrias impactam na qualidade dos embriões. Os embriões serão avaliados qualitativamente (morfologia) e quantitativamente (análise das vesículas extracelulares – EVs). Para isso, primeiramente os microdispositivos serão validados operacionalmente e biologicamente (biocompatibilidade), concomitantemente ocorrerá a extração e seleção dos ovócitos para posteriormente ocorrer o processo de fecundação in vitro (microdispositivos e em placas). As vesículas serão coletadas do meio de cultivo por 7 dias, onde serão caracterizadas (tamanho, a concentração de vesículas e quantidade de material genético). Esses parâmetros auxiliarão a estimar a qualidade dos embriões em cultivo tradicional (placas) e nos microdispositivos. Os resultados obtidos em microdispositivos serão analisados estatisticamente e comparado ao sistema convencional (macroescala).

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Generation and preliminary characterization of induced pluripotent stem cells generated from fibroblasts derived from non-human primates (*Sapajus apella*)

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Studies involving stem cells, cell therapy and regenerative medicine represent a growing area of research, providing the generation of various animal models. Of these, non-human primates (NH-primates) share great genetic, immunological and morphophysiological similarity with humans, being widely used as disease models, in the development of drugs and new therapies and the production of so-called induced pluripotency stem cells (iPSCs) to from these species becomes interesting and desired. Here, we aim to produce and characterize iPSCs from neotropical NH-primates of the species *Sapajus apella*, considered primates of great cognitive capacity, in addition to the differentiation of cells generated into lineages of interest. So far, it was possible to isolate fibroblasts from vitrified skin biopsies from a female of the target species. These cells were reprogrammed using an integrative lentiviral system containing human Oct4, Sox2, KLF4 and c-Myc reprogramming factors. The isolated lineages were initially maintained in a monolayer of mitotically inactivated murine fibroblasts and were subsequently transferred to a matrix culture system where they were characterized. The characterized clonal lineages were considered positive for the detection of alkaline phosphatase, Oct4 and Sox2 by immunostaining, in addition to demonstrating the ability to generate embryoid bodies. Further morphological and molecular characterizations and the differentiation into lineages of interest are in progress. We anticipate that the data generated in this proposal will collaborate with the understanding of the mechanisms of reprogramming and cellular differentiation in a highly relevant study model.

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A SARS-CoV-2 Vaccine Candidate Using Reverse Genetics and the Newcastle Disease Virus

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The COVID-19 pandemic was a global outbreak and, to stop the spread of the virus, several vaccines were developed, most of which use the Spike (S) protein as the main antigen. Although the rapid development and effectiveness of these vaccines has been crucial in controlling the pandemic, the new variants of concern, such as Omicron, has posed challenges by evading the neutralizing antibodies generated by S vaccines. Thus, our aim was to generate an alternative vaccine using the nucleocapsid protein (N) of SARS-CoV-2 as the main antigen, which is more conserved among the wild type and the current variants. Briefly, a codon-optimized nucleotide sequence of the N gene was synthesized. The transgene was inserted in an antigenome NDV plasmid and the recombinant products were transformed in TOP10 competent cells to generate the NDV-N plasmid. The rescue of the NDV-N virus was performed in BHK-T7/9 cells using Lipofectamine and including the principal and accessory plasmids. After 48h, virus particles were rescued from cells and propagated in embryonated 10-day-old chicken eggs for 96h. Hemagglutination assay (HA) was performed to determine the presence of the virus in the allantoic fluid and monoclonal viruses were selected by limiting dilution assay. The fidelity of the NDV-N was evaluated by the amplification of the NDV F gene and the SARS-CoV-2 N gene using PCR. The expression of the N gene and protein in the NDV virus was determined by real-time PCR and western blot. Viral titration was performed in canine mammary cancer cells (CMCs), which are very susceptible to NDV infection and propagation. Also, we infected CMCs with NDV-N to observe the expression of N protein using immunofluorescence. Concentration, size and polydispersion of the viral particles were determined by Nanoparticle Tracking Analysis and Dynamic Light Scattering. Thus, we generated a promise vaccine candidate for COVID-19 and the next steps will determine if the NDV-N is able to generate a robust humoral and cellular immune response against the wild-type and variants of the SARS-CoV-2 virus.

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Unveiling hidden risks: environmental challenges for humans in early life

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From the prenatal period onward, humans are confronted with inherent environmental challenges that can have significant consequences later in life. In these challenges, fungal presence and resulting mycotoxins, along with agricultural formulations (e.g., herbicides and fungicides) have become remarkable hidden threats. These toxic substances can disseminate in various sources relevant to human use, including crops, foods, water, soil, and others. In a wide array of over 400 mycotoxins, aflatoxin B1 (AFB1) is highly toxic and classified as a Group 1 carcinogen, if compared with fumonisin B1 (FB1 – Group 2B), zearalenone – ZEA and deoxynivalenol – DON (Group 3). Another group of chemicals of concern are agrochemicals, extensively used in agricultural practices. One example is the herbicide glyphosate, currently under scientific debate, commonly found in these formulations and labeled a “probable carcinogen.” Regarding mycotoxins, preliminary results from our study in Ribeirao Preto indicate 88% occurrence of FB1 and ZEA, 75% DON, and 63% FB2 in diet consumed by preschoolers (aged ≥ 2 to < 6). Similarly, 56% incidence of FBs, while 44% of ZEA and DON, and 11% AFB1 in diet consumed by schoolchildren (aged ≥ 6 to < 10), while 58% FB1 and ZEA, and 42% FB2 and DON in the diet taken by adolescents (aged ≥ 10 to < 19). Moreover, in regions with significant agricultural production, the new generation may be at high risk of contamination and health complications due to these hidden chemicals of concern. The presence of agrochemical residues through high throughput analysis can provide insights into the factors contributing to early life damages. It is because, exposure to toxicants, whether of fungal origin or from agrochemicals, can have adverse effects, including organ malformation, preterm birth, and even mortality in humans at early life stages. Therefore, it is crucial to address and alleviate all risks associated with hidden threats in a timely manner to ensure the well-being and healthy development of individuals from early life and beyond.

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Mycotoxins in infant foods: bioaccessible and bioavailable fraction evaluation through Caco-2 cells system

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Mycotoxins are secondary metabolites produced by fungi that occur naturally in foodstuffs, which can cause a large variety of toxic effects on vertebrates, including humans. The fact that some mycotoxins are carcinogenic (e.g., aflatoxins) and could be detected in breast milk, food and feedstuffs constitutes a serious human and animal health threat, mainly to children and young animals due to their high physiological vulnerability. In addition, bioavailability data are important items included in modern exposure assessment modelling approaches for mycotoxin mixtures in infant foods. In this Post-Doctoral research project, a set of in vitro methodologies using digestion model and caco-2 cells that simulates the transport across the intestinal membrane, from apical to basolateral sides of intestinal membrane, will allow to elucidate the bioavailable portion in infant foods that arrives to the intestinal causing toxic effects on cells. Bioaccessibility studies will be performed according to an in vitro digestion model for infant foods that includes three sequential steps: oral, gastric and intestinal phases, whilst the intestinal membrane integrity of caco-2 cells will be assessed by measuring the transepithelial electrical resistance (TEER). This task represents a potential challenge of the project, considering the diversity of the worldwide regulated mycotoxins found in contaminated foods, alone or in combinations. The outcomes of the project are expected to greatly contribute for a more accurate determination of the in vitro bioavailability of regulated mycotoxins in Brazil and the risk assessment of mycotoxins in foods generally consumed by young children.

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Bats and coronaviruses: tracking the coronaviruses diversity in Brazilian bats

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Bats have been the main target for viral surveillance mainly after their association with coronaviruses (CoV), especially Betacoronaviruses (SARS, MERS and SARS-CoV-2), and our recent data showed a high genetic diversity of Alphacoronaviruses genus circulating in bats from the Brazilian Atlantic Forest, subdivided into four subgenera. Here, we aimed to continue the molecular analysis of the CoV diversity circulating in Brazilian bats from mist-net captured bats in the Brazilian Cerrado (GO), and Atlantic Forest (SC, PE), within the PREVIR-MCTI network (National Network for Virus Surveillance in Wild Animals). Swab samples were screened by a nested-PCR test targeting the RdRp gene of the Orthocoronavirinae subfamily, and positive samples were sequenced by the Sanger method. CoV were detected in 43 (8.4%) out of 509 analyzed samples from seven bat species, with 27% (5 out of 18) and 7.7% (38 out of 491) positives in Brazilian Cerrado and Atlantic Forest, respectively. A virus identified in a phyllostomid bat from Atlantic Forest (SC) was grouped into the Betacoronavirus genus, while most detected viruses (n=42) were classified into the Alphacoronavirus genus with sequences grouped into three recently proposed subgenera (Groups 1 to 3) and Amalacovirus. CoV were detected in a hematophagous species (*Desmodus rotundus*) from the same bat colony in the Brazilian Cerrado, which belonged to two Alphacoronavirus subgenera. Also, our group is developing continuous cell lines from neotropical bat cells for virus isolation and improving the genome sequencing to better characterize these viruses. More information is needed to understand the ecology and evolution of CoV in neotropical bats, as gene recombination can be observed, and bats present a highly gregarious social behavior that could facilitate the spread of pathogens.

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8. Universidade do Vale do Itajaí.

9. Fundação Educacional de Brusque.

10. Universidade Estadual de Campinas.

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Pharmagenetic study and PK/PD after application of infiltrative lidocaine associated or not with epinephrine in saliva samples by LC MS/MS

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The individualization of drug prescription has increasingly become the focus of current research in pharmacology so that the adverse effects of drugs are minimized whenever possible. Some studies in the current literature show the relationship that cytochrome P450 polymorphisms, more specifically CYP3A4 and CYP1A2, exert on the metabolism of lidocaine into its main metabolite, monoethyl-glycinexylidide (MEGX). Lidocaine is the most used local anesthetic in dentistry worldwide, being one of the oldest sodium channel blockers on the market and considered the safest amide local anesthetic. Even so, it can cause some side effects on the cardiovascular system and the central nervous system, especially when accidental administration occurs directly into a blood vessel, and the association with vasoconstrictors, especially epinephrine, is a strategy to minimize these effects. In this research, clinical data will be collected from the largest possible number of volunteers in the first 18 months of the project, who will attend two different dental appointments, according to the protocol, for scaling and crown-radicular polishing, sulcular infiltrative injection in the region of maxillary molars of a cartridge of lidocaine associated or not with 1:100,000 epinephrine. For the pharmacokinetic (PK) study, saliva samples will be collected at a predetermined time: before and 30 min; 1; 1.5; two; 3; 4; 5; 6; 8 and 11 h after local anesthetic infiltration. For the pharmacodynamic parameters (PD), variations in blood pressure, oximetry, and heart rate will be evaluated during the procedure, in addition to the beginning and duration of local anesthesia in soft tissues. Altogether, data will be analyzed for CYP3A4 and CYP1A2 polymorphisms and their relationship with individual patient responses. In the future, based on the data obtained, we will perform the same procedures in a sample of patients with cleft lip and palate.

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Music training in children's global development milestones and rehabilitation of cochlear implants users: systematic review, meta-analysis and single-blind randomized controlled trial

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Music training in children with severe and profound sensorineural hearing loss who use cochlear implants (CI) can be an effective strategy to accelerate the response of the central auditory nervous system to auditory stimulation and, consequently, promote their overall development. In this context, this research was divided into two studies. Study one: a systematic review and meta-analysis that followed the PRISMA guidelines and was registered in PROSPERO (CRD42020205581). The literature search was conducted until April 2023 in the following databases: CENTRAL, PubMed, EMBASE, CINAHL, Web of Science, Science Direct, LILACS, Scopus, ClinicalTrials.gov, WHO-ICTRP and grey literature, without date and language limits, with the aim to answer the clinical question: "what kinds of music training contribute to the rehabilitation of children using CI?". Six studies that met the inclusion criteria were included. Four using formal musical teaching methodologies and two focusing on musical appreciation and discrimination. The results showed that the music training structured in the musical learning process contribute to the rehabilitation of children using CI. Despite the studies demonstrating the potential benefits of music training, it was not possible to isolate the effect of music on the rehabilitation of children using CI. Study two: a single-blind randomized controlled trial, approved by the research ethics committee (5.780.706), registered in ReBEC (RBR-7jt6zny), supported by FAPESP (2022/15553-4) and CAPES (88887.838057/2023-00). The aim is to investigate the effects of music training, in early childhood, focusing on overall developmental milestones and the maturation of the auditory cortex. The justification for a second study, involving children in early childhood with typical development, is the need to analyze objective measures and control variables such as auditory acuity and the quality of information reaching the auditory cortex, in order to isolate the effect of music on overall child development and subsequently replicate in studies with children using CI.

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Escaneamento intrabucal em bebês edêntulos: protocolo clínico

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INTRODUÇÃO: O escaneamento intrabucal é um procedimento não invasivo que utiliza a tecnologia de escaneamento tridimensional para criar uma imagem digital da cavidade bucal. Este procedimento pode ser útil em diferentes situações, como nos aspectos relacionados ao crescimento craniofacial. Entretanto, a captura de imagens intraorais com scanner digital ainda é um desafio em regiões com ausência de dentes, devido aos achados anatômicos limitados, compostos pelo rebordo, superfícies lisas e saliva, além de apresentar baixa precisão nas regiões periféricas. Assim, o objetivo deste estudo foi estabelecer um protocolo de escaneamento intrabucal para bebês edêntulos não fissurados e com fissuras labiopalatais. **MATERIAL E MÉTODOS:** Uma técnica mista, digital-analógica, foi desenvolvida. No arco superior, o protocolo completamente digital é preconizado, dispensando moldagens convencionais. Com o bebê em posição supina e o operador ao seu lado, a estratégia de escaneamento da maxila inicia-se no rebordo alveolar, pela região do tuber do lado esquerdo até o tuber do lado direito, prossegue-se pela face palatina do lado direito em direção ao lado esquerdo e pela face vestibular esquerda passando para a direita, complementa-se então, o palato. No arco inferior, com o bebê no colo do responsável e o operador atrás de ambos, realiza-se a moldagem com silicona de adição e moldeira personalizada em resina acrílica para moldagem em crianças, este modelo é vazado em gesso pedra e escaneado. **RESULTADOS:** Os arcos de bebês edêntulos podem ser digitalizados de forma confiável e rápida desenvolvendo a estratégia de escaneamento digital-analógica, pelo menos ou tanto quanto nos procedimentos de moldagem convencionais. **CONCLUSÃO:** Os escaneamentos intraorais de bebês edêntulos são viáveis e precisos para estabelecer parâmetros relacionados ao crescimento craniofacial da população infantil brasileira e protocolos de reabilitação.

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Correlation between religiosity and alcohol use in adolescents with closed lip and/or palate

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Introduction: among the most common malformations that affect the face, cleft lip and/or palate stand out. **Objective:** to evaluate the correlation between religiosity and alcohol use in adolescents with cleft lip and/or palate. **Method:** analytical, observational, cross-sectional study, developed in a Brazilian public and tertiary hospital. Three instruments were used for data collection: Sociodemographic Questionnaire, Durel's Religiosity Scale and the Alcohol Use Disorders Identification Test-AUDIT. For the statistical analysis, the following tests were used: Chi-square, Fisher's Exact, Mann-Whitney and Spearman's Correlation, in addition to the analysis of corrected adjusted residuals and linear correlation forces, with a significance level of 5%. **Results:** 370 adolescents participated, with a mean age of 15.2 years (SD=2). Among them, 23 (5.4%) used alcohol, being significantly higher among male adolescents ($p=0.001$), brown ($p=0.046$), with high school education ($p=0.011$), without religion ($p<0.001$) or who did not practice it ($p<0.001$). Organizational, non-organizational and intrinsic religiosity were significantly lower among adolescents who used alcohol ($p=0.005$; $p<0.001$ and $p=0.002$ respectively). There was a moderate correlation between alcohol use and non-organizational ($r=0.31$; $p=0.002$) and intrinsic ($r=0.36$; $p<0.001$) religiosity. **Conclusion:** religiosity, in most of its dimensions, acted as a protective factor against alcohol use.

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Covid-19 in craniofacial anomalies: airflow analysis by means of computational fluid dynamics

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Background: The coronavirus is responsible for human respiratory tract infections ranging from a mild cold to acute respiratory distress syndrome. The SARS-CoV-2 virus spread worldwide in 2019 and originated the COVID-19 pandemic (Corona Virus Disease – 2019), a public health emergency. Cleft lip and palate (CLP) is the most prevalent congenital malformation in humans. Individuals with CLP are susceptible to recurrent respiratory infections due to morphology and functional changes in the airways (Trindade-Suedam, et al. 2019). **Objectives:** Considering the vulnerability of the individual with CLP to be contaminated with SARS-CoV-2 and the severity of the COVID-19. This study aims to evaluate the morphometric tomographic changes in the upper airways of individuals with CLP affected by COVID-19 using 3D reconstruction and computational fluid dynamic simulation. **Methodology:** Four groups will compose the study: (1) without CLP and without COVID-19; (2) without CLP and with COVID-19; (3) with CLP and without COVID-19; (3) with CLP and with COVID-19. The images will be provide by IMAGEM clinic (groups 1 and 2) and HRAC (groups 3 and 4). The study will be performed after the approval by the institutional review board and with the consent of the individuals. The images of the airways will be tridimensional segmented and volumes and minimal cross-sectional areas will be quantified using the Mimics Research 25.0 Materialise software. Parameters related to respiratory flow such as pressure, flow and resistance of the airways will be simulated by computational fluid dynamics (ANSYS Fluent – ESSS). **Expected results:** The study expects to find a significant reduction in the dimensions, volume, and patency of the upper airways in the group with CLP and with COVID-19, considering the inflammatory condition of the disease associated with the malformation.

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Three-dimensional analysis of rare facial clefts on soft and bone tissue

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The Hospital for Rehabilitation of Craniofacial Anomalies, University of São Paulo (HRCA/USP) is recognized by the World Health Organization as a “world References” in craniofacial anomalies care. During 55 years of existence, it has been dedicated to the multidisciplinary care of individuals with orofacial clefts and other complex craniofacial anomalies. Rare facial clefts also named Tessier clefts may either be isolated or associated with other craniofacial anomalies, skeletal anomalies, or systemic abnormalities. It is not uncommon to observe a combination of multiple rare facial clefts in the same individual, which can be classified as complex cases of rare facial clefts. Most cases require a long and costly rehabilitation process, which impacts on social, neuropsychological, and academic development. Aiming to contribute to different specialties involved in rare facial cleft care, this work presents a 3-dimensional representation of craniofacial clefts 0 to 14 and 30 in the Tessier classification evaluated clinical cases of 30 individuals followed up at HRCA/USP. The methodology was performed with reconstruction and segmentation of the Computed Tomography images (helical or cone beam) and the morphological description of anatomical variations. The image reconstructions allowed a better understanding of the craniofacial structures involved in each type of cleft, as well as their phenotypic variations and associations with other facial clefts and to visualize a relationship between soft tissue changes and bone changes. We authors hope that a better knowledge of the morphology of rare facial clefts will allow the establishment of personalized and individualized therapeutic practices in cases of high complexity. In this sense, the recognition of repetition patterns can assist in more accurate syndromic diagnosis and contribute to the rehabilitation interdisciplinary team in predicting the risks and benefits of therapeutic procedures.

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Clinical Profile and Genetic Factors in Non-Syndromic Isolated Cleft Palate: A Preliminary Investigation

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Among non-syndromic craniofacial anomalies, cleft palate only (CPO) represents is one of the possible phenotypes of oral cleft. Interestingly, CPO has consistently higher occurrence rates in females compared to males. The etiology of non-syndromic CPO (NSCPO) is multifactorial, involving both genetic and environmental risk factors. However, the precise associations between these factors remain unclear. Therefore, our objective was to investigate the clinical profile of non-syndromic CPO phenotypes with respect to parental age at conception, consanguineous relationships, previous miscarriages, and oral cleft recurrence within families. We randomly selected 165 non-syndromic patients with NSCPO, classified according to the model proposed by Spina et al. (1973) and modified by Silva-Filho (1992), upon their admission to the Hospital for Rehabilitation of Craniofacial Anomalies, University of São Paulo (HRAC-USP). All available clinical data were collected from medical records, and this study received approval from the Committee for Ethics in Research of HRAC/USP (#1.009.764). Our preliminary results revealed that the non-syndromic incomplete CPO phenotype was the most common among the cases (n=146, 88.48%). Among these, partial hard palate CPO was the most prevalent subtype (n=73, 44.24%). As anticipated, females constituted the majority of individuals with CPO (n=106, 64.24%). The average age of conception for mothers and fathers was approximately 26 and 31 years old, respectively. Information regarding previous miscarriages and consanguineous relationships were available for only 92 cases (55.75%), and among them, 11 cases (11.95%) reported a positive history of miscarriage, and consanguineous relationships. Furthermore, positive family recurrence of oral clefts was reported in 28.47% of cases (n=41) where this data was provided (n=144, 87.27%). Importantly, oral clefts with positive family recurrence were predominantly observed within the immediate family (n=14, 43.75%), followed by cousins (n=8, 25%), and distant relatives (n=6, 18.75%). Although we conducted separate analyses for general CPO clinical features, these initial findings underscore the predominance of the incomplete ICP phenotype, with a higher prevalence among females and positive familial recurrence. These observations suggest a significant genetic contribution to the development of NSCPO CPO.

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The potential of viruses as etiological agents of orofacial clefts

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Viruses are acellular parasitic organisms that infect all branches of the Tree of Life. Mainly associated with human diseases, they are also agents of congenital infections, with their pathogenic potential concerning anomalies uncertain and far from fully explored. Orofacial clefts are congenital malformations caused by the non-fusion of tissue during the embryonic period. Its complex, multifactorial etiology (non-syndromic cleft lip and palate CL/P) and rare when related to viruses. Therefore, our objective was to analyze the potential of the viruses that infect the *Homo sapiens* species as an environmental etiology of CL/P in a co-evolutionary way. A score was developed and adapted for the qualitative assessment of the viral potential to cause CL/P, considering aspects of the literature, nucleotide similarity, amino acid similarity, and presence of Endogenous Viral Elements (EVEs). The various algorithm packages of the Basic Local Alignment Search Tool (BLAST) software and the databases of the National Center for Biotechnology Information (NCBI) and the International Committee on Taxonomy of Viruses (ICTV) were used. The study presented a higher potential in the Baltimore viral classes I, III, and V related to the classes II and IV (viral classes according to their biosynthesis processes, divided from I to VII). Regardless of the biosynthesis strategy, twenty viral species presented significance. The study infers an indirect co-evolutionary history associating viruses and CL/P (presence of EVEs) with herpesviruses, papillomaviruses, and poxviruses that may predate periods up to sixteen million years. We emphasize that the viral etiological potential in CL/P is evident. Nevertheless, more studies in this new line of research are relevant and can bring new possibilities for prevention.

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Thyroid peroxidase antibodies are associated with incidence, but not progression, of subclinical atherosclerosis: ELSA-Brasil study

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Introduction: CAC is an established risk factor for cardiovascular diseases and early mortality. Recent studies have shown the thyroid peroxidase antibodies (TPOAb) as a marker of chronic low-grade inflammation. Still, little is known regarding the impact of TPOAb levels on CAC incidence and progression. We aimed to explore the association of TPOAb levels with CAC incidence and progression in an ethnically diverse cohort. **Methods:** We included individuals with no prior cardiovascular disease and two CAC measurements in ELSA-Brasil. Fasting plasma TPOAb levels were used as continuous data (log-transformed), categorized in quartiles and as positive TPOAb. We defined incident CAC as a baseline CAC of 0 followed by CAC > 0 on the second visit. CAC progression was defined according to Berry and Hokanson methods. We performed Cox and logistic regression models to investigate the association of TPOAb levels with CAC incidence and progression, respectively. **Results:** We included 3015 individuals (57.2% women, 49.3 ± 8.1 years, 55.2% white). The mean interscan period was 5.0 ± 1.0 years. CAC incidence occurred in 333 (14.5%) of 2292 individuals with baseline CAC of 0. Among the 723 participants with CAC > 0 at baseline, 328 (45.4%) and 434 (60%) had progression of CAC according to Berry and Hokanson criteria, respectively. The highest quartile of TPOAb was associated with a higher risk of CAC incidence when compared to the lowest quartile, even after multiple adjustment (HR, 1.53 [95%CI, 1.11–2.11]). Similar result was observed for euthyroid participants (HR, 1.62 [95%CI, 1.11–2.37]); which also showed that higher levels of TPOAb, as a continuous variable, were associated with a higher risk of CAC incidence (HR, 1.23 [95%CI, 1.05–1.44]). There was no significant association between TPOAb titers and CAC progression (p=NS). **Conclusions:** We found that higher levels of TPOAb were associated with higher risk of CAC incidence, but do not affect CAC progression.

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Association of psoriasis with subclinical atherosclerosis in the Longitudinal Study of Adult Health (ELSA-Brasil)

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Introduction: Psoriasis is a chronic inflammatory disease which has been associated with a cardiovascular risk burden, whereas coronary artery calcium (CAC) score has been considered as a marker of subclinical atherosclerosis. **Objective:** To analyze the association of psoriasis with the prevalence and incidence of CAC in the Longitudinal Study of Adult Health (ELSA-Brasil). **Methods:** Data from 3824 ELSA-Brasil participants without cardiovascular disease at enrollment and with CAC exams at baseline and after a 5-year follow-up were analyzed (51.0±8.9 years, 53.8% women). The CAC score, in Agatston units, was analyzed by computed tomography and the psoriasis cases were identified by medical diagnosis reported by the participant. Poisson regression models analyzed the association of psoriasis with CAC prevalence and CAC incidence in different cutoff points (CAC>0 and CAC>100), adjusted by sociodemographic factors (age, sex, race and education attainment) and by traditional cardiovascular risk factors (alcohol consumption, smoking, physical inactivity, body mass index, hypertension, diabetes, total cholesterol, fasting glucose, C-reactive protein and statin use). **Results:** The prevalence of psoriasis was 2.9% (n=113). There were no differences in sociodemographic and traditional cardiovascular risk factors according to having or not having psoriasis (p>0.05). A total of 28.3% of sample had CAC>0 and 9.4% CAC>100 at baseline. The 5-year CAC incidence was 7.8% for CAC>0 and 5.8% for CAC>100. Multivariate model showed that participants with psoriasis were more likely to have CAC>100 prevalence at baseline (OR: 1.62 [1.14; 2.30] p=0.007) and CAC>100 incidence at follow-up (OR: 2.42 [1.34; 4.38] p=0.003). **Conclusion:** Psoriasis was associated with prevalence and incidence of elevated CAC levels in the ELSA-Brasil cohort, indicating a higher risk of atherosclerosis in this population even when considering traditional risk factors.

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Duplication and subfunctionalization of the male fertility gene *kl-2* in drosophilids show evolutionary convergence

Eduardo G. Dupim

Subfunctionalization is considered one of the most frequent models for maintaining gene duplications, remaining an essential source of evolutionary novelties. In this model, each copy specializes in part of the original gene's functions. Here, we investigated the subfunctionalization of the *kl-2* gene: a male fertility factor associated with sperm flagellar movement in *Drosophila*. This gene was originally located on an autosome, as seen in the mosquito *Aedes aegypti* and other outgroups, but it was transposed to the Y chromosome in the ancestor of the subfamily *Drosophilinae*, leaving an autosomal copy of the gene, called CG9068, which is smaller and only encoded the first domain of the original protein. In contrast to *kl-2*, which is preferentially expressed in the testes, differential gene expression analyses using public RNA-Seq libraries for *Drosophila melanogaster* reveal that CG9068 is specifically expressed in the 2nd antennal segment, in which the auditory sensory cells with ciliary motility are located. As expected, in mosquitoes the nonduplicated gene is expressed in both tissues, with alternative splicing in the antenna codifying only the first protein's domain, similar to *Drosophila*'s CG9068. These results strongly suggest that *kl-2* has originally been expressed in both auditory cells and spermatogenesis. Following the duplicative transposition in *Drosophila*, each copy's function became specialized in one tissue. Moreover, genomic analyses with outgroups also reveal that this same gene has undergone duplicative transposition in another branch of drosophilids, in the species *Phortica variegata*, where the autosomal copy also had a comparable size decrease pointing to a convergent subfunctionalization.

Candidate genes for natural resistance to COVID-19 in Brazilian admixed population

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Prêmio Pós-Doc USP

The influence of genetics in determining susceptibility or resistance to COVID-19 is one of the major challenges in the current scientific scenario. To date, some genes related to innate immunity that favour SARS-CoV-2 infection have been identified, but little is known about protective genes against COVID-19. Since natural resistance against infectious pathogens has already been described for some human diseases, the same could happen for COVID-19. In this context, this study aimed to identify genetic mechanisms of resistance to COVID-19 and the great clinical variability ranging from asymptomatic cases to severe and lethal outcomes, to understand why some “more susceptible” individuals end up developing mild symptoms or are asymptomatic, while others “less susceptible” end up succumbing to COVID-19. For that, we investigated long-lived individuals (>90 years) who recovered from COVID-19 as opposed to young adults (<50 years) who died from COVID-19. In addition, we also investigated the genetic resistance mechanisms related to immunity in individuals who had close contact with infected people and did not become infected (serum-discordant couples). Peripheral blood samples from these cohorts were collected prior to the initiation of vaccination in Brazil and the circulation of SARS-CoV-2 variants. Serological tests confirmed COVID-19. Whole-exome sequencing (n=450) and immunoassays were performed. We identified some candidate genes associated with the host immune response involved with resistance to infection

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by SARS-CoV-2, including the MICB and MUC22 genes, responsible for natural killer (NK) cell activation and mucin production (glycoproteins responsible for mucus viscosity), respectively. Interestingly, our immunological assays showed a higher frequency of memory-like NK cells and a higher cytotoxic activity of T and NK cells in exposed non-infected individuals. We hope that these genomic findings will contribute to the clinical practice guideline for the treatment and management of COVID-19.

Unveiling endothelial dysfunction in Marfan Syndrome: Insights from a iPSC-Derived model revealing defective vascular cell phenotype

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Marfan Syndrome (MFS) is an autosomal dominant disease associated with the development of aortic aneurysms, leading to significant morbidity and mortality. It is caused by mutations in the fibrillin-1 gene (FBN1), and the relationship between genotype and phenotype remains unclear due to the clinical variability observed. One potential factor contributing to this variability is the classification of mutations as Haploinsufficient (HI) or Dominant-negative (DN), which has been shown to correlate with the severity of MFS. Emerging evidence suggests that endothelial dysfunction may play a role in aneurysm development in MFS, although it is not yet clear whether it is a cause or a consequence of aortic dilation. To investigate these mechanisms further, we have utilized an isogenic model in which we genetically modified human induced pluripotent stem cells (hiPSCs) derived from a healthy patient using the CRISPR/Cas9 gene editing system. This allowed us to generate distinct hiPSC lineages carrying HI or DN mutations in the FBN1 gene. Subsequently, we differentiated and characterized these hiPSC lineages into endothelial cells (iECs) and smooth muscle cells (iSMCs). We evaluated protein and mRNA expression using Western blotting and quantitative PCR (qPCR), assessed morphology through immunofluorescence and tube formation assays, and performed shear stress analyses to examine the profile of nitric oxide (NO) production. Validation of our model revealed the expression of fibrillin-1 in both iECs and iSMCs, with iSMCs showing a higher expression compared to iECs. Furthermore, the DN and HI models exhibited distinct expression patterns. Additionally, preliminary data indicated significant phenotype changes in MFS-iECs, including decreased gene expression of key phenotypic markers and impaired tube formation, as well as reduced NO production. These findings suggest that MFS is associated with significant deregulation of both iEC and iSMC phenotypes, potentially leading to the development of endothelial dysfunction and exacerbating aneurysm formation in the aorta.

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Bioprospecção de bactérias marinhas: avaliação da produção e isolamento de compostos com potencial bioatividade

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Os oceanos são fontes inestimáveis de produtos naturais bioativos. Dentre os organismos que neles habitam, as bactérias apresentam grande capacidade de produzir metabólitos secundários com ampla gama de atividades biológicas, incluindo antitumoral, antimicrobiana, inseticida, entre outras. Como a busca por novas opções terapêuticas no combate a infecções microbianas e câncer é de grande relevância, o objetivo desse projeto é avaliar a composição química de cepas da coleção denominada MicroMarin (mantida no ICB-USP), selecionadas previamente por triagem de atividade citotóxica. Os extratos que apresentarem composição química de interesse serão direcionados para isolamento e identificação estrutural de compostos e, posterior determinação de atividade citotóxica e antimicrobiana. Quatorze cepas, provenientes do litoral brasileiro e Antártida, foram incubadas em doze meios de cultivo sólido diferentes que variaram fontes de carbono, nitrogênio e micronutrientes, além de pH e presença ou não de sal marinho. Os perfis químicos de seus extratos acetato de etila foram analisados por CLAE-DAD. Para a cepa BR-626 (proveniente do litoral de São Paulo) observou-se a presença de três picos de interesse, tR 8,55; 10,42 e 13,84 min, ocorrendo nos cultivos de oito meios distintos, com percentual relativo variando entre 2-68; 2-14 e 14-21%, respectivamente. Os meios SCB e A1m, usando amido como uma das fontes de carbono, cloreto de sódio e algumas variações de macro e micronutrientes, mostraram maior percentual relativo desses picos e foram selecionados para crescimento em larga escala. Após escalonamento dos cultivos, os extratos obtidos foram direcionados para isolamento de metabólitos por CLAE-semipreparativa.

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Na, K-ATPase as a receptor that modulates neuroplasticity

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Statement of the problem: The Na, K-ATPase (NKA) is a heterodimeric integral plasma membrane protein, ubiquitously expressed in mammalian cells, that differ from other ion transporters. The difference is not only due to its capacity to maintain an electrochemical gradient across plasma membrane, but also because it acts as a receptor for Ouabain (OUA). Studies from the last two decades, have demonstrated that OUA, can activate a network of signaling molecules through NKA. The purpose of this study was to verify whether OUA can modulate neural plasticity as well as adult neurogenesis. **Methodology & theoretical orientation:** In vivo and in vitro assays were performed using Wistar rats. All the protocols were in accordance to ARRIVE guidelines and following Ethical Committee for Animal Use from University of São Paulo. Male adult rats received an intrahippocampal injection of OUA 10 nM and then animals were submitted to Morris Water Maze test, to verify the effects of OUA in spatial long-term memory. Furthermore, neural precursor cell cultures obtained from rat neonatal hippocampus were treated with OUA 10 nM to verify its effect in hippocampal neurogenesis. **Microscopy, flow cytometry and biochemical assays were performed. Findings:** Indeed, intrahippocampal injection of OUA, in male adult rats, activated the Wnt/ β -Catenin signaling pathway and increased CREB/BDNF and NF κ B levels, in CA1 neurons. These effects contributed to important changes in the cellular microenvironment, resulting in enhanced levels of dendritic branching in hippocampal neurons, in association with an improvement in spatial reference memory and the inhibition of long-term memory extinction. Furthermore, in vitro assays suggest that OUA can enhance hippocampal neurogenesis.

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Assessment of vulnerability dimensions considering Family History and Environmental interplay in Autism Spectrum Disorder

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Background: Despite previous studies have recently shown Autism Spectrum Disorders (ASD) as having a strong genetics background, over a minimum environmental background, no study up to date has investigated the interplay between genetics and environment. **Methods:** We have collected data regarding Family History (FH) and Environmental Factors (EF) from 2,141 individuals with ASD and their caretakers throughout Brazil, based on an online questionnaire. Most of the ASD individuals were males (81%) and the average age was 02 years minimum for males and females, and the maximum age was 41 years for males and 54 for females. People from all states in Brazil have answered the questionnaire. Genetic inheritance was obtained based on the declared FH of Psychiatric and Neurological diagnosis. As for EF, exposure to risk factors during pregnancy was considered, like infections, diabetes, drugs/chemicals exposure, socio economic and psychological factors. Respondents were invited to answer the questionnaire in lectures given throughout Brazil, and by the social networks of NGO “The Tooth Fairy Project”. A Multiple Correspondence Analysis (MCA) was conducted to search vulnerability dimensions, and a Cluster Analysis was conducted to classify and identify the subgroups. **Results:** Regarding EF, social and psychological exposures contributed to the first two dimensions. Concerning FH, the first dimension represented psychiatric FH, while the second represented neurological FH. When analyzed together, EF and FH contributed to two new dimensions: 1. psychiatric FH, and 2. a psychosocial component. Using Cluster Analysis, it was not possible to isolate subgroups by genetic vulnerability or environmental exposure. Instead, a gradient of psychiatric FH with similar contributions of EF was observed. **Conclusion:** In this study, it was not possible to isolate groups of patients that correspond to only one component, but rather a continuum with different compositions of genetic and environmental interplay.

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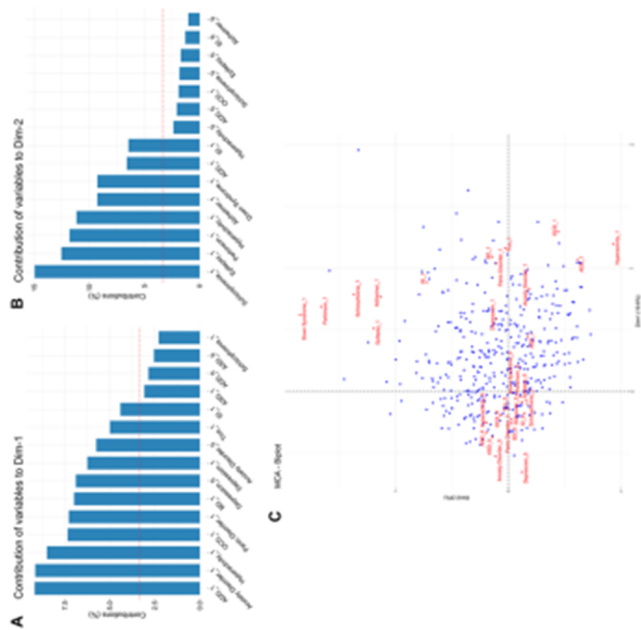


Fig. 2 MCA with 15 variables (1500 individuals and 15 variables). **A** Barplot of contribution of variables to first dimension. **B** Barplot of contribution of variables to second dimension. **C** MCA biplot visualization of response levels. Autism Spectrum Disorder (ASD), Bipolar Disorder (BD), Attention Deficit Disorder (ADD), Obsessive Compulsive Disorder (OCD), Intellectual Disability (ID)

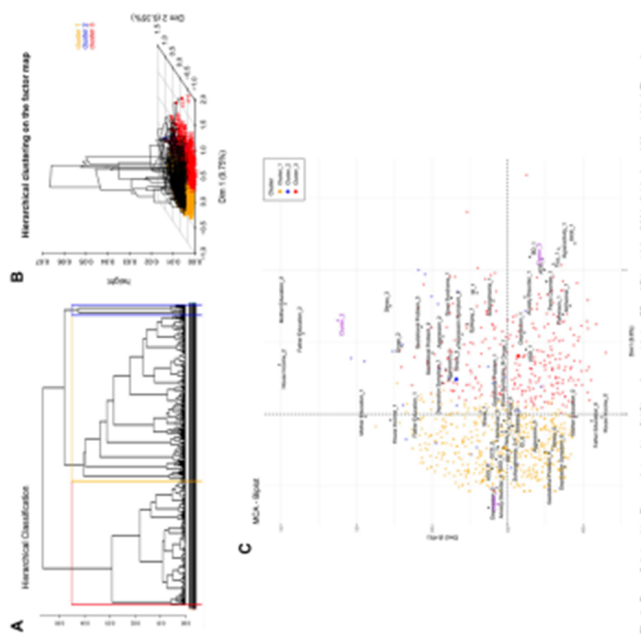


Fig. 3 Cluster Relationship. Cluster relationship of MCA results considering 23 and 23 variables (8250 individuals and 23 variables). These outliers are represented in orange, blue and red. **A** Hierarchical classification. **B** Three-dimensional representation of hierarchical clustering on the factor map. **C** MCA biplot of individuals by cluster color on the polygenic (Dim 1) and environmental (Dim 2) axes

Evaluating polygenic liability for common psychiatric comorbidities of Attention-Deficit/Hyperactivity Disorder on treatment outcomes

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Psychiatric comorbidities of Attention Deficit/Hyperactivity Disorder (ADHD) have been associated with poor treatment outcomes. Considering the great variability in the ADHD treatment response, it is crucial to investigate the biological mechanisms related to such variability to improve symptom management quality. In this context, polygenic scores (PGS) analysis is a promising approach to disentangling the genetic architecture underlying differences in treatment outcomes. This study aims to test the association between PGS for ADHD and genetically correlated comorbidities (i.e. Major Depressive Disorder (MDD) and Neuroticism (NEU)) with treatment response outcomes. Summary statistics from the latest genome-wide association studies for MDD and NEU were used to calculate the PGS in a sample of Brazilian adults with ADHD under treatment with methylphenidate. The treatment outcomes evaluated were: 1) symptom response, comparing groups of responders and non-responders, and 2) treatment persistence, comparing individuals who completed at least 30 days of treatment and those who discontinued medication earlier. Genotyping was performed using the Infinum PsychArray (Illumina®). PGS were calculated with PRSice-2 considering six association p-thresholds to extract those that best fit the model. The first five principal components, severity at baseline and concomitant use of psychiatric medications were used as covariates. Empirical p-value was calculated using 10,000 permutations to account for overfitting. PGS for ADHD were not associated with symptom response or treatment persistence. PGS for MDD and NEU were associated with treatment persistence, where higher PGS for both phenotypes predicted worse persistence, that is, higher dropout rates to treatment. These findings suggest a possible biological relation between the polygenic liability for MDD and NEU with poor ADHD treatment persistence. As a perspective, a second wave of genotyping will be integrated into this dataset, and a metanalysis with two additional independent samples from Norway and Spain will be performed.

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Clinical and neurobiological aspects of Attention-Deficit/Hyperactivity Disorder courses through midlife

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Most follow-up studies have characterized the course of ADHD from childhood to young adulthood. However, there is a dearth of studies evaluating ADHD trajectories in adults and their predisposing factors. Our aim was to evaluate possible clinical, genetic and neuroimaging predictors of ADHD trajectories in midlife. A total of 323 subjects diagnosed with ADHD in adulthood were evaluated seven and thirteen years after the first assessment. Based on ADHD status at the reassessments, midlife trajectories were characterized as: (i) stable if subjects fulfilled ADHD diagnostic criteria in all the assessments; (ii) remission if subjects presented three or less symptoms of ADHD and lacked impairment criterion after baseline; and (iii) unstable in the remaining possibilities. Polygenic scores (PGS) were calculated for ADHD and psychiatric phenotypes genetically correlated with ADHD (depression, schizophrenia and bipolar disorder). Neuroimaging liability scores were calculated for structural brain measures (cortical thickness, surface area, and subcortical volume). These scores represent the similarity to an ADHD brain and have the advantage of increasing statistical power by joining regional effects in the same way as PGS. Finally, functional connectivity between Default Mode Network (DMN) regions were acquired through resting-state fMRI. In the last assessment (13 years after baseline evaluation), mean age was 47 years and retention rate was 62%. Among the patients evaluated three times, 68.8% coursed a stable, 25.5% an unstable, and 5.7% a remission trajectory of ADHD. Women, individuals with more severe ADHD, with higher frequency of comorbidities and/or with higher genetic liability to depression presented a higher probability of a stable trajectory. ADHD, schizophrenia and bipolar disorder PGSs did not differ between stable and unstable trajectories. Stable and unstable trajectories did not differ regarding neuroimaging scores or functional connectivity within DMN. This is the first study evaluating neurobiological aspects in midlife ADHD trajectories. We were able to detect demographic, clinical and genetic differences (for depression PGS) between trajectories. Structural and functional brain aspects might be related to the clinical manifestation of ADHD (trait), while clinical and genetic aspects could be more associated with subtle differences such as fluctuation along lifespan (state).

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Role of epithelial sodium channels (ENaC) and endothelial nitric oxide synthase (eNOS) in perivascular adipose tissue dysfunction in renovascular hypertension

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Perivascular adipose tissue (PVAT) modulates vascular tone, but its role in renovascular hypertension (RVH) remains unknown. RVH is marked by obstruction of the renal artery and activation of the renin-angiotensin-aldosterone system. As aldosterone regulates epithelial sodium channels (ENaC) expression, which is linked to nitric oxide (NO) availability, we sought to investigate the role of ENaC channels and NO synthase (NOS) in the vasoactive profile of PVAT in RVH. For this, male C57BL/6 mice (CEUA 6455090821) were divided into normotensive (sham operated – SO) and hypertensive 2 kidneys/1 clip (2K1C) groups. Blood pressure (BP) was assessed by tail plethysmography over 6 weeks. Mesenteric resistance arteries (MRA) with (+) or without (–) PVAT were placed on a wire myograph, and noradrenaline (NOR) concentration– response curves were performed. Protein expression of α and γ subunits of ENaC, endothelial NOS (eNOS) and p-eNOS Ser1177 was evaluated in mesenteric PVAT. Statistical analysis: 2-way ANOVA; $p < 0.05^*$ vs. SO. As expected, BP was higher in 2K1C mice compared to SO. NOR-induced vasoconstriction did not differ between groups in MRA PVAT–. The presence of PVAT reduced the potency (pD₂) of vasoconstriction in the SO (–23%), and to a lesser extent in the 2K1C (–14%). Also, PVAT increased the maximal effect (E_{max}) of vasoconstriction only in 2K1C mice (SO: 1.78 ± 0.15 vs. 2K1C: $2.51 \pm 0.09^*$ mN/mm). Amiloride, an ENaC blocker, did not modify vasoconstriction in MRA with or without PVAT in the SO, while a significant reduction in the E_{max} and pD₂ values was found in MRA PVAT+ in 2K1C mice. The non-selective inhibition of NOS with L-NAME potentiated the vasoconstriction in MRA PVAT– (+10%) and PVAT+ (+10%) in SO mice, as well as increased the E_{max} only in MRA PVAT+ (SO: 2.14 ± 0.09 vs. 2K1C: $2.77 \pm 0.12^*$ mN/mm). However, L-NAME did not alter NOR-induced vasoconstriction in MRA with or without PVAT in 2K1C mice. α ENaC expression in PVAT was similar between groups, while a higher expression of γ ENaC (SO: 3.08 ± 0.65 vs. 2K1C: $5.28 \pm 0.32^*$) was found in PVAT of 2K1C. Although eNOS expression did not differ between groups, the PVAT of 2K1C exhibit a lower expression of p-eNOS Ser1177 (SO: 1.99 ± 0.47 vs. 2K1C: $0.80 \pm 0.11^*$). Together, our results demonstrate that ENaC channels, along with reduced eNOS phosphorylation, seem to play a crucial role in mesenteric PVAT dysfunction in RVH mice.

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Mechanisms of Glioblastoma resistance to antitumoral temozolomide in 3D tumor spheroids in vitro: the role of Translesion Synthesis polymerases

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Temozolomide (TMZ) is the most used antitumoral drug in Glioblastoma Multiforme (GBM) chemotherapy. However, chemotherapy-resistant cells are recurrent in GBM patients due to many factors, and one of them is the Translesion Synthesis (TLS) mechanism, which allows tumor cells to tolerate genomic damage by bypassing DNA lesions. Specifically, TLS DNA polymerases (TLS pols) Kappa (Pol κ), Iota (Pol ι), and Rev1 are associated with chemotherapy resistance, but little is known in GBM. To understand this mechanism, this work analyzed the cytotoxic, antiproliferative, antimetastatic, and genotoxic effects of TMZ on GBM U251MG WTE (wild type) and for TLS Pol κ , Pol ι , and Rev1 KO (CRISPR/Cas9) cells cultured as 3D tumor spheroids in vitro. The results showed that TMZ (10–200 μ M) reduced the 3D spheroids diameter, especially in Pol κ and Pol ι KO cells after 5 and 10 days. Similarly, Pol κ and Pol ι KO spheroids had the most significant cytotoxicity compared to WTE after TMZ treatment (25–200 μ M). Rev1 KO spheroids showed sensitivity to TMZ only at irrelevant concentrations for GBM patients. Next, TMZ (25 μ M) reveals higher antiproliferative effects (clonogenicity) in TLS Pols KO (Pol κ and Pol ι) cells compared to WTE after 5 days. Next, U251MG Pol κ KO spheroids showed higher Caspase 3/7 levels after TMZ treatments (25–200 μ M) than WTE spheroids. Concerning genotoxicity, Pol κ KO spheroids demonstrated a higher 53BP1 fluorescence than WTE spheroids after 24 and 72 hours of treatments with TMZ ($\geq$ 50 μ M). TMZ $\geq$ 50 μ M also reduced the 3D cell migration and decreased 3D invadopodia mainly in TLS KO (Pol κ /Pol ι) spheroids compared to WTE spheroids. In conclusion, the results indicate that TLS Pols (Pol κ /Pol ι) are involved in proliferation, cytotoxicity, survival maintenance, cell death, genotoxicity, and metastasis (migration/invasion) of GBM spheroids in vitro after TMZ chemotherapy. These TLS pols appear as candidates for therapy targets in GBM.

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Autoregulation of blood flow overrides pressure regulation in the early stage of endotoxic shock

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Objective: Although vascular and cardiac malfunctions are known to play roles in the late stages of septic and endotoxic shock, the factors accounting for the earliest stages of such conditions are still debatable. Here, we sought to clarify the relative contributions of cardiovascular abnormalities vs. physiological adjustments to the earliest phase of endotoxic shock. **Methods:** Endotoxic shock was induced by bacterial LPS (1 mg/kg;i.v.). Hemodynamic parameters were recorded continuously from freely moving, unanesthetized male Wistar rats. Sympathetic nerve output was recorded under anesthesia. Vascular reactivity was assessed ex-vivo in isolated mesenteric arterioles. Vasoactive substances and blood transfusion were employed as experimental tools. **Results:** The earliest fall in arterial pressure (AP) was associated not with a reduction in cardiac output (CO), but with a decrease in systemic vascular resistance (SVR). This response was not associated with altered reactivity of resistance arterioles ex-vivo. The early fall in SVR occurs in the setting of increased sympathetic output and plasma angiotensin II concentration was not changed. We then hypothesized that competing demands between the tissue autoregulation of blood flow and the neuroendocrine control of arterial pressure might be involved. Consistent with this hypothesis, we observed that lowering of SVR was associated with recovery of flow (CO) to a normal level. In this phase, two proxies of tissue autoregulation (coherence of spontaneous fluctuations in SBF and AP; and autoregulatory escape to PHE-induced vasoconstriction) suggest that autoregulation is heightened at the onset of LPS-induced hypotension. Importantly, as autoregulation was heightened, the vasculature became less responsive to sympathetically-driven vasoconstriction in vivo, which explains how SVR could fall in the absence of sympathetic shutdown. Lastly, we found that maintenance of circulating volume with blood transfusion prevented heightening of tissue autoregulation, as well as the associated changes in vascular function. **Conclusion:** Hypotension in the early stage of endotoxic shock does not seem to reflect cardiovascular malfunction, but rather the ability of tissue autoregulation to override AP regulation. In this setting, blood flow is maintained at the expense of a lowered arterial pressure. The competitive demand behind this phenomenon seems to be edema-associated hypovolemia.

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Platform for bioprospecting the mechanism of action of antimicrobial molecules

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Multidrug-resistant bacteria, also known as superbacteria, are simultaneously resistant to several antibiotics, and currently represent one of the main threats to public health worldwide. There is a global crisis in the development and identification of new antimicrobials. It is thus imperative to discover and/or develop new antibiotics, with a focus on ESKAPE pathogens (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter* species). The identification and validation of the molecular target of an antimicrobial molecule represents a major bottleneck and one of the longest steps (~5 years) in the process of discovering new antibiotics. This platform consists of a functional assay that uses a chemical-genetic strategy to identify antimicrobial molecules (by growth inhibition) and it simultaneously determines their mechanism of action (DNA damage, ribosome inhibition, or cell wall/membrane damage). As a model, we use the bacterium *P. aeruginosa* containing the fusion (pSensor: lux) of *recA*, *parS*, *pmrB* and *ampC* promoters (pSensor) with the luciferase reporter gene (*lux*). These promoters are induced by molecules that cause DNA damage, inhibition of ribosomal activity or cell wall damage, resulting in the expression of the specific reporter genes and identification of the molecular target of the antimicrobial molecule. Preliminary tests showed that molecules secreted by fungi inhibit ribosome function and cause damage to bacterial DNA, thus demonstrating the feasibility of the proposal for bioprospecting and identification of new antibiotics against *P. aeruginosa*. This platform (Patent application by the University of São Paulo – INPI BR:1020200260979), could decrease the time needed during the preclinical phase of discovering an antibiotic, in a relatively simple and low-cost way with potential application for therapeutic treatment in human and/or animal health.

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eGFP mRNA transfection optimization in human fibroblasts

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Messenger RNA (mRNA) transfection represents a valuable alternative to gene therapy, since the translation of the transfected mRNA is highly efficient and only the protein of interest is generated, in contrast with other vectors. Good examples of the potential of this technic are mRNA vaccines against SARS-Cov2, that have been successfully and safely used during the COVID-19 pandemic. We aimed to implement in the lab a strategy of transfection in human fibroblasts using mRNA molecules. The protocol was standardized using plasmid containing the enhanced green fluorescent protein (eGFP) sequence, that was linearized, purified, in vitro transcribed, purified of double-stranded (ds)RNA products, capped and transfected into fibroblasts. In order to improve transfection efficiency, several conditions were tested: a) commercial plasmid versus an in house amplified plasmid; b) in vitro transcription using uridine or pseudouridine; c) removal or not of dsRNA; d) presence or absence of capping; e) different concentrations of mRNA; f) different concentrations of lipofectamine; g) different time points after transfection; h) 6 transfection kits; and i) medium replacement, or not, 2–4 h after transfection. Transfection efficiency (percentage of eGFP positive cells) was evaluated by flow cytometry. In summary, the best combination for eGFP mRNA expression in human fibroblasts was using fresh mRNA synthesized from commercial plasmid, using pseudouridine, purified for dsRNA, and capped. Moreover, for the transfection itself, 500 ng of mRNA in combination with intermediate concentration of lipofectamine was the most efficient condition, presenting a peak of cells expressing eGFP at 24 h post-transfection: 81,7%. Additionally, using these conditions with 6 different transfection kits and without medium replacement after transfection, we could increase the percentage of eGFP positive cells up to 95–96 % for 3 of the kits. Thus, using this very efficient mRNA transfection protocol, we expect to develop several studies, especially on DNA repair, which are our particular interests.

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Dissecting the neural circuitry regulating anxiety-like behaviors and aversive memory reconsolidation in mice

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The NIH's RDoC matrix, anxiety is characterized by enhanced vigilance in situations in which harm may potentially occur but is uncertain in probability. When exposed to a potential danger, rodents will display vigilance or risk assessment (RA) behavior. In parallel, animals need to recall an area where a threat occurred so that the possibility of re-encountering the threat can be avoided. In the present study, we first used shock-based fear conditioning and probed contextual anxiety-like responses in mice. After conditioning, animals presented increase RA responses and avoided the shock chamber and presented increased FOS expression in several brain areas, including the dorsal premammillary nucleus (PMd) of the hypothalamus. By recording PMd activity by in vivo calcium imaging, we observed a significant increase in PMd activation when mice approached the shock cage, as well as during RA behavior. Thus, we applied chemogenetic silencing of the PMd during contextual testing (context 1, 24h after shock), re-exposing the animals to the context 24h after testing (context 2) to investigate whether PMd silencing would influence fear memory. Inhibition of the PMd during context 1 impaired RA and shock cage avoidance and contextual fear memory for animals tested in context 2, suggesting that PMd inhibition influenced behavioral expression and aversive memory reconsolidation. Since the PMd projects to the dorsal periaqueductal gray (dPAG), a site related to anxiety-like responses, as well as to the ventral anteromedial thalamic nucleus (AMv), crucial for memory formation, we tested their influence over behavior and memory reconsolidation by optogenetically inhibiting each pathway. The silencing of both pathways impaired the contextual fear responses on context 1 and influenced reconsolidation of fear memory by decreasing anxiety-like responses during context 2. However, the effects PMd > AMv pathway silencing were larger in the context 2 suggesting a greater influence in memory reconsolidation, whereas the PMd > dPAG effects were stronger in context 1, suggesting greater relevance to anxiety-like behavioral expression. We found that elements of a neural circuitry that influences both anxiety-like responses and memory update processes to accommodate changes in the threatening conditions. Overall, our results could provide insight into the neural pathways involved in human pathological states such as anxiety disorders and PTSD.

Correlation between circulating microRNAs and biomarkers in obese and diabetic patients supplemented with açai juice

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Type 2 diabetes (DM2) is a chronic and inflammatory disease, characterized by hyperglycemia, caused by resistance to the action of insulin, impairing the function of various organs and triggering complications such as cardiovascular diseases, retinopathy and nephropathy. Açai is a fruit, originally from the Amazon, rich in nutrients such as lipids, proteins, fibers, vitamins, minerals and non-nutrients (phenolic and non-phenolic compounds) with antioxidant action. A recent study showed that açai reduced inflammatory markers such as iNOS, NF- κ B and TNF- α in mesangial cells cultured in a medium with high glucose, suggesting inflammatory modulation via the antioxidant system. MicroRNAs (miRNAs) are small non-coding RNAs, important in the regulation and gene expression of proteins, which can modulate the inflammatory response and thus contribute to the pathogenesis of diabetes. The objective is to correlate the circulating miRNAs of obese and diabetic patients with biomarkers pre and post supplementation with acai juice. Patients with DM2 were recruited from the Clinical Gastroenterology outpatient clinic at UNIFESP. Clinical information, anthropometric data, blood samples were collected for analysis of glycated hemoglobin, nitric oxide, triglycerides, urea, creatinine, acid uric acid and expression of circulating miRNAs in plasma (34a-5p, 92a-3p, 93-5p, 122-5p, 125b-5p, 143-3p, 144-3p, 146b-5p, 221-3p and 378a-3p), supplemented for 30 days. For statistical significance, $p < 0.05$ will be considered.

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The role of miR-200 in anaplastic thyroid cancer aggressiveness

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Anaplastic Thyroid Cancer (ATC) is the most aggressive and lethal of all thyroid cancer histotypes, characterized by undifferentiated, highly proliferative and invasive cells, which are intrinsically resistant to conventional treatment. Deregulation of microRNAs (miRNAs), a group of small non-coding RNAs that post-transcriptionally regulates protein expression, has been linked with cancer development. Specifically, the miR-200 family has been postulated to control the balance between epithelial and mesenchymal cell states through Epithelial-Mesenchymal Transition (EMT), a critical process for tumor metastasis. Previous results showed that miR-200c, a member of miR-200 family, is downregulated in ATC, but the biological effect of its deregulation remains unclear. Therefore, this study aims to evaluate the antitumor effect of miR-200c on ATC cell aggressiveness. Using plasmid overexpression, we induced miR-200c upregulation in KTC2 (KTC2-200c) and SW1736 (SW-200c) cells to analyze its role in cell differentiation, proliferation, migration, and EMT markers expression. Light microscope images showed that KTC-200c and SW-200c cells presented an epithelial morphology in contrast with the control group which displayed mesenchymal morphology. Analysis by qPCR and western blot of KTC-200c and SW-200c cells showed that upregulation of miR-200c expression enhanced mRNA and protein expressions of the epithelial marker E-cadherin, while diminished the mRNAs and protein levels of the mesenchymal markers N-cadherin and ZEB1/2. Additionally, KTC2-200c and SW-200c presented reduced cell colony formation and cell proliferation, and reduced cell migration visualized by wound healing assay and transwell assay. In conclusion, this study evidences the tumor suppressor role of miR-200c in controlling ATC cell aggressiveness.

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Disrupting ubiquinone biosynthesis in malaria parasites: a new strategy to amplify the effects of atovaquone

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One of the most promising targets for malaria therapy development is the biosynthesis of isoprenoids. There are several metabolites that are important for *P. falciparum* and that are isoprenoids, but this study concentrates on the metabolism of only one of them: ubiquinone (or coenzyme Q; UQ). One of the most recently discovered antimalarials, atovaquone (ATO), is an inhibitor of mitochondrial complex III by competing with the reduced form of UQ, ubiquinol (UQH₂). This process shows that the availability of UQ/UQH₂ is critical for parasite respiration, which unlike in the human host, is precisely essential for pyrimidine biosynthesis. Therefore, this work aimed to evaluate the importance of the UQ biosynthesis pathway in the parasite by using inhibitors and creating an inducible knockdown line of PfCOQ2, predicted to codify a 4-hydroxybenzoate polyprenyl transferase (4-HPT), the first step of the UQ biosynthesis pathway. The reduced gene expression was found to affect the parasites' long-term viability and trigger increased susceptibility to ATO. Analogues of 4-hydroxybenzoate (4-HB) demonstrated UQ biosynthesis inhibitory action, specifically affecting the recombinant 4-HPT activity and potentiating the ATO antiplasmodial effect. Finally, it was possible to propose that alterations in the radicals linked to the C4 atom of the 4-hydroxybenzoate phenyl ring are more efficient than those linked to the carboxylic group in promoting the potentiating effects of ATO. These results open the way for the development of an antimalarial pharmaceutical formulation containing ATO that is more efficient than the one currently used.

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Miscommunication of the muscle-liver axis: lessons from a mouse model of mitochondrial myopathy

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Skeletal muscle (SK) and liver are the two major players in glucose and lipid homeostasis. Therefore, it is expected a distinctive communication between this two tissues to fine-tune energy distribution during lifetime. Here, we set out a model to better understand the (patho)physiology mechanisms involved in muscle-liver (mis)communication and inter-dependence to redefine integrated physiology towards a more holistic and less organocentric vision. We used a mouse model of SK mitochondriopathy which display accumulation of abnormal/dysfunctional mitochondria in SK to understand its impact on muscle-liver (mis)communication. SK mitochondriopathy was triggered by deletion of mitofusins 1 and 2 (MFN1/2) in the SK of MFN1/2Flox/ACTA1Cre mice. Biochemical, morphological and functional measurements were taken over a period of 5 months after the onset of SK mitochondriopathy. All transgenic mice displaying SK mitochondriopathy (but none WT) died at 5mo of age with signs of liver failure including impaired bioenergetics and depleted glycogen storage. Notably, at 3mo of age, these mice already presented sarcopenia, characterized by body weight loss, muscle wasting and impaired muscle contractile properties. Noteworthy, the establishment of sarcopenia was paralleled by a metabolic syndrome signature including increased whole body fat mass, elevated circulating levels of cholesterol and triglycerides, dysglycemia and insulin resistance in mice with SK mitochondriopathy. Strikingly, these animals displayed impaired lactate clearance, a known contributor to liver failure in humans. To address whether elevated lactate levels is sufficient to induce liver failure in SK mitochondriopathy mice, we recapitulated this condition in culture by challenging hepatocytes with sodium-lactate and/or BSA-palmitate conjugate. Our findings demonstrated that lactate maximizes palmitate toxicity in hepatocytes in culture; therefore, supporting our in vivo findings. Our data suggest that SK mitochondriopathy is sufficient to impair muscle-liver communication and cause liver failure followed by a substantial reduction of lifespan in mice. Finally, considering the increasing prevalence of sarcopenia in elderly, a better understanding of the molecular mechanisms regulating muscle-liver axis is critical for the development of better interventions capable of extending both healthspan and lifespan.

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Identification of predictive biomarkers of placental dysfunction in malaria

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Menção Honrosa

Introduction: Placental malaria is one of the serious consequences of gestational malaria, occurring in about 20% to 50% of cases. It is usually asymptomatic and is one of the main causes of adverse pregnancy outcomes, such as miscarriage, premature birth, intrauterine growth restriction and low birth weight. The gold standard diagnosis for malaria (microscopy) does not detect cases of placental malaria, which currently can only be diagnosed after delivery. Due to the lack of methods for early diagnosis and because it is a disease of great magnitude, this study aims to identify potential predictive biomarkers of placental dysfunction in malaria early in pregnancy. **Methods:** We conducted an observational cohort study in the Brazilian Amazon from 2013 to 2015. Of the 600 pregnant women who were followed up until delivery, after applying the exclusion criteria, 304 pregnant women with malaria and 170 uninfected pregnant women remained for analysis. Biomarkers were measured in peripheral plasma in the first months of pregnancy. **Results:** To date, nine markers have been measured and analyzed, including: angiogenic factors, hormones, and apolipoproteins. We observed that most markers were altered in pregnant women who had malaria compared to uninfected pregnant women. To assess the sensitivity and specificity of these molecules as biomarkers for placental malaria, the analysis of the area under the ROC curve (AUC) was used; evaluating the markers in their groups, only angiogenic factors and apolipoproteins showed $AUC > 0.7$ ($AUC = 0.76$ and $AUC = 0.74$, respectively). Of the nine markers, five showed better diagnostic performance: endoglin, leptin, VEGF, APO-A1 and APO-B, because when analyzed together, they increased the AUC value to 0.79, considered an acceptable diagnostic discrimination. **Conclusion:** Knowledge of the mechanisms involved in the pathogenesis of infection during pregnancy will make an important contribution not only to understanding the immunobiology of the disease but also to predicting the efficacy of new diagnostic, intervention, and treatment methodologies.

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Differences in the extracellular matrix protein signature of the outermost zone of the rat adrenal gland

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Changes in the composition of the extracellular matrix (ECM) induce different cell signaling in normal tissues and in pathological conditions. ECM alteration in the adrenal microenvironment may contribute to both the development and function of adrenal gland. The adrenal gland consists of a cortex, with three concentric zones, glomerulosa (ZG), fasciculate (ZF) and reticulate (ZR), and the medulla (M), surrounded by a capsule. Here, we describe the differences among the ECM signatures of fractions obtained from rat adrenal glands, the outer fraction (OF), the inner fraction (IF) and the medulla (M). Sprague-Dawley rats (250±30g, n=6) were euthanized by decapitation and adrenal glands were removed and decapsulated to separate the capsule/zona glomerulosa (OF) from the zona fasciculata/reticularis (IF) followed by removal of medulla (M). The samples were frozen in liquid nitrogen and stored at -80 °C. ECM enrichment through decellularization was achieved through incubation in 1% Triton-X for 2h30 min at room temperature following incubation in 4.0% deoxycholate until complete decellularization. The absence of remaining intact cells was certified by DNA quantification and microscopy analysis of decellularized tissues stained with DAPI. Pellets containing ECM proteins were treated as described in Trombetta-Lima et al. (J. Proteome Res. 2021, 20, 4693-4707). We compared the proteomic profiles of OF, IF and M fractions samples (n = 6). Raw files of LC-MS/MS were processed into MaxQuant software version 2.1.4 using Andromeda search engine against SwissProt Ratus norvegicus and Mus musculus combined databases (54,778 and 17,121 entries, respectively, downloaded from Uniprot.org November 2022). The total identified and regulated proteins were compared with MatrisomeDB 2.0. Our analysis revealed that 69, 144 and 121 total proteins were detected in OF, IF and M decellularized fractions, respectively. Ninety-two proteins were identified as common to the OF, IF and M fractions, 25 of which are ECM proteins, of these, 89 were regulated proteins, 22 of which are ECM proteins. Four proteins were differentially expressed in the OF, 22 in the IF and 8 in the M. Only the OF showed 3 differentially expressed ECM proteins, which are Fibrillin 1 (Fbn2), CollagenXIV alfa1 (Col14a1) and CollagenIV alfa3 (Col4a3) which will be validated by immunoblotting and immunohistochemistry. Therefore, we report differences in ECM composition of the outermost zone of rat adrenal that may influence adrenal pathophysiology.

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XPC is required to control DNA damage and genome instability caused by mitochondrial ROS during Th17 differentiation

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Background. The differentiation and function of CD4⁺ T cells is influenced by intrinsic and extrinsic factors, some of which lead to increased protein and DNA damage which can culminate in compromised differentiation and function. DNA damage may be caused in part by reactive oxygen species (ROS) produced as a result of TCR activation. Thus, the imbalance between ROS production and protective mechanisms against damage caused by ROS can affect T cell activation. Associated with this, previous studies have shown that oxidative stress and increased levels of mitochondrial ROS are associated with increased on DNA damage in Th17 and Treg cells as well as impaired differentiation and function of these cells. Thus, the hypothesis of this project is that increased mitochondrial ROS caused during the activation of CD4⁺ T cells and the absence of stimuli inducing the NER pathway of DNA repair culminates in increased DNA damage and consequent reduction in cell viability. On the other hand, during the differentiation of Th17 cells, the oxidative stress and consequent DNA damage caused by TCR activation would be prevented by the induction of the NER pathway of DNA repair through the cytokines involved in the polarization of Th17 cells (TGF- β and IL -6). **Aims.** We aimed to evaluated the role of the NER DNA repair molecule XPC in the control of DNA damage and genome instability caused by mitochondrial ROS during Th17 cells differentiation. **Methods.** To understand if XPC plays a role in Th17 cells differentiation, we isolated naïve CD4 T cells from spleen and lymph nodes of WT and XPC/- mice, and culture these cells under Th0 and Th17 cells differentiation conditions, and 96 hours later, we evaluated the IL-17A production by flow cytometry and ELISA. In addition, WT and XPCKO Th17 cells was analyzed by qPCR, WB, confocal microscopy, to identify a possible mechanism of XPC in Th17 cells. **Results.** Our results demonstrated that activated CD4 T cells (Th0) have increased levels of DNA damage. However, Th17 cells show reduced levels of DNA damage when compared to Th0 cells. In line with this, the deficiency of the XPC a protein involved in DNA repair pathway, significantly affected the differentiation of Th17 cells, a fact associated with increased DNA damage in the absence of XPC. Moreover, the of XPC-deficient Th17 cells accumulates increased mitochondrial ROS levels when compared to WT

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Th17 cells. Interestingly, in silico analysis demonstrated that the chromatin in the Xpc promoter region is open and accessible for transcription factor binding in Th17 cells, however, in Th0 cells, the chromatin is closed and unavailable for transcription factor binding. Furthermore, we observed that the transcription factors BATF, RORgt and IRF4 are bounded in the promoter region of Xpc and seems to regulate its expression in Th17 cells. Conclusions. Overall, our results suggest that Th17 cells have mechanisms that protect against DNA damage, probably through XPC activation and consequent DNA repair NER pathway.

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Chemogenetic inhibition of the ventral and intermediary subiculum differently affect contextual fear responses elicited by cat exposure or footshocks: evidence for distinct hippocampal-hypothalamic neural pathways

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The hippocampus (Hp) is involved in spatial and cognitive processes. Within the Hp, the Subiculum (SUB) contains vector-border cells crucial to assess the spatial limits of the environment. The SUB receives heavy amygdalar input, while sending projections to the medial hypothalamic defense system. Both the Juxtadorsomedial region of the lateral hypothalamus (LHAjd), and the anterior hypothalamic nucleus (AHN), receive significant inputs from the SUB. Here we aim to investigate the contribution of the different regions of the subiculum on behavioral responses in two different contextual fear paradigms. We further dissected the projections from the subiculum to the LHAjd and to the AHN. Stereotaxic surgery was performed in male C57Bl/6 mice (7w, 20g, CEUA/ICB, Nº 8930240322) for bilateral injections of an inhibitory DREADD expressing (n=25) or control viral vector (n=25) in the SUBv or SUBi regions. Animals were then submitted to a passive avoidance paradigm. 24h after conditioning with footshocks (n=12) or cat exposure (n=12), animals from all groups were administered with the DREADD ligand Clozapine-N-oxide (CNO; 1 mg/kg; i.p) prior to re-exposure to the paradigm. After the experimental procedure, mice were euthanized, and their brains were processed for fluorescent microscopy analysis to confirm the injection site. Another 8 mice received iontophoretic deposits of retrograde tracer fluorogold, either over the LHAjd or AHN. After 7 days of tracer transport, animals were euthanized. Brains were processed to map the projections from the subiculum. Behavioral data was analyzed by factorial GzLM. Inhibition of both SUBv and SUBi significantly decreased contextual avoidance to the conditioning cage related to footshock. Chemogenetic inhibition of the SUBv, but not the SUBi, decreased contextual avoidance to the predator-related context. We have further shown that the AHN receives projections from SUBv, while the LHAjd receives projections from both SUBv and SUBi. Our evidence suggests that both SUBv and SUBi projections to the LHAjd are related to contextual responses to the physical aversive stimulus related environment, whereas the SUBv projections to the AHN is likely to be related particularly with the contextual responses to the predator-related environment. This circuit is of especial importance to understand the neural basis of fear generalization present in anxiety as well as post-traumatic stress disorders.

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From nuclear to mitochondrial genome: coupled assembly of cytochrome oxidase and ATP synthase in *Saccharomyces cerevisiae* expressing allotopic mitochondrial COX6

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Cytochrome oxidase (COX) and ATP Synthase of the yeast *Saccharomyces cerevisiae* mitochondria are genetic hybrids with some of their polypeptides encoded in mitochondrial and others in nuclear DNA. Cox6 is a nuclearly encoded subunit of COX and Atp9, a mitochondrially encoded subunit of the ATP synthase. Despite being components of distinct complexes of the respiratory chain, these two protein interact with each other to form high molecular weight Atco complexes. We have previously showed that Atco is the source of Atp9 for the ATP synthase assembly. In the present study we developed a strategy to further study the role of Cox6 in Atco complexes by allotopically expressing it from the mitochondrial genome. The recoded gene Cox6m introduced into the 3'-UTR region of VAR1 in the mitochondrial DNA was able to partially restore respiration of the cox6 null mutant. This strain presented low levels of COX, which may be explained by the presence of most Cox6m as a free subunit and only a small fraction associated with Atp9 in Atco. We also show that atp9 null mutant lacks COX, confirming our hypothesis that Atco couples the biogenesis of COX to that of ATP synthase thereby determining stoichiometric amounts of these two respiratory complexes.

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Investigating COVID-19 transmission and vulnerability: insights from three studies in Brazil

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We conducted three impactful studies in our state, resulting in publications that are relevant to the current COVID-19 situation in Brazil. Study A, titled “Is it possible to contain COVID-19 in a female prison in Brazil? A pilot study”, aimed to assess the feasibility of controlling COVID-19 within a female prison. We evaluated the preventive measures implemented to prevent virus transmission among inmates. Unfortunately, despite these measures, a high rate of infection was observed among the inmates. This highlights the necessity of enhancing prevention and control strategies within correctional facilities to mitigate the spread of the virus. Study B, entitled “Cross-sectional analysis of students and school workers reveals a high number of asymptomatic SARS-CoV-2 infections during school reopening in Brazilian cities”, focused on the prevalence of asymptomatic infections among students and school workers during the reopening of schools in Brazilian cities. Our findings indicated a substantial number of asymptomatic infections, suggesting the potential for silent virus transmission within educational settings. These results underscore the importance of implementing rigorous preventive measures, including widespread testing, maintaining physical distance, and proper mask usage, to effectively control the spread of the virus within schools. In study C, “A higher number of SARS-CoV-2 infections in quilombola communities than in the local population in Brazil”, we investigated the prevalence of SARS-CoV-2 infections in quilombola communities compared to the local population. Our findings revealed a higher number of infections in these communities, indicating their increased vulnerability to acquiring the virus. This emphasizes the necessity of implementing specific prevention measures and ensuring equitable access to healthcare resources to protect quilombola communities and address the COVID-19-related disparities they face. In conclusion, our studies shed light on different aspects of COVID-19 transmission and vulnerability in Brazil. They emphasize the urgent need for enhanced prevention and control strategies in correctional facilities, schools, and marginalized communities to effectively contain the spread of the virus and reduce the health disparities associated with COVID-19.

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Unlocking the fosmidomycin enigma in malaria: discovery of a novel kinase mediating drug efficacy in *Plasmodium falciparum*

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Malaria, primarily caused by the *Plasmodium falciparum* pathogen, is a major health concern in tropical and subtropical regions. The increasing development of drug resistance signals a crucial need for new antimalarial compounds. Our research focuses on Fosmidomycin (FOS), a drug that targets a key metabolic pathway, the methylerythritol 4-phosphate (MEP) pathway, in *P. falciparum*. Despite its effectiveness, there have been recurrent cases of relapses, prompting us to investigate the biological mechanisms of FOS recovery. We discovered that specific substances, such as isoprenoid alcohols (including farnesol, geranylgeraniol, and phytol) and lipid extracts from foods, can restore the activity of FOS in *P. falciparum*. These compounds undergo processes like phosphorylation and elongation before they are integrated into proteins. Further proteomic and radiolabeling studies revealed that if externally supplied, these prenylated proteins can bind to several isoprenoids. This led to the identification of a gene, Δ PfPolk, which encodes a prenyl kinase; when expressed in yeast, it demonstrated kinase activities for farnesol and geranylgeraniol. To explore the biological relevance of the farnesol/geranylgeraniol salvage pathway, we created knockout parasites using CRISPR-Cas9 and DiCre strategies. These engineered parasites were more susceptible to MEP inhibitors and could not utilize isoprenoid alcohols for protein prenylation. Our findings suggest that this salvage pathway is an alternate isoprenoid source for malaria parasites, and blocking it could increase the effectiveness of drugs that target isoprenoid metabolism. We also identified a compound that reduces the recovery effect of geranylgeraniol on FOS, indicating its potential use in combination with FOS in future trials. Collectively, these results shed light on how antimalarial drugs targeting the apicoplast work and reveal a novel protein modification in *P. falciparum*. This knowledge provides valuable insights that could guide the development of more effective antimalarial drugs.

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The action of growth hormone signaling in the lateral hypothalamic area regulates eating-motivated behavior

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Introduction: Motivated behaviors depend on an individual's internal state and several neural mechanisms. Under negative energy balance, mammals increase wakefulness and locomotor activity to favor food seeking. Several neurons within the hypothalamus respond to changes in the energy balance, but neurons of the lateral hypothalamic area (LHA) are able to mediate key adaptative responses to fasting, such as the increase in arousal and exploratory behaviors. However, the underlying neuronal mechanisms that LHA neurons use to sense the internal state in order to alter these behaviors are poorly understood. Growth hormone (GH) regulates cell division and growth in many tissues, but also exerts a powerful influence on energy metabolism via the activation of GH receptor (GHR) in several metabolically-relevant tissues. Recent data highlight that GH's action in the central nervous system mediates important metabolic effects since GHR is expressed in several hypothalamic areas. GHR is also expressed in the LHA. However, the effects of GH signaling in this area have not yet been identified and deserves to be more explored. **Objective:** The objective of this work is to investigate the potential role of GHR signaling in LHA neurons. **Methodology:** All procedures were approved and performed in accordance with the Ethics in Animal Use Committee (CEUA) of the Institute of Biomedical Sciences of the University of São Paulo (Protocol: 72/2017). GHRflox/flox male mice (10 – 14 weeks of life) were submitted to stereotaxic surgery of adeno-associated viruses (AAV) to induce Cre expression in the LHA (AP: -1,20mm; L: ±1,00mm; D: -5,20mm), and therefore causing ablation of GHR in the LHA neurons. We used 14 mice that received Cre-expressing AAV (LHAΔGHR) and other 14 mice that received control AAV, without Cre expression. After recovery and genetic recombination period, mice were submitted to food restriction (FR) for 5 days (40% of their usual food intake). Several metabolic and locomotor parameters were measured. **Results:** Under FR, LHAΔGHR mice did not show alterations in the metabolic parameters, such as oxygen consumption, carbon dioxide production, and respiratory exchange ratio (RER). Control mice exhibited an increase in the locomotor activity and ambulatory activity. This effect was attenuated in the LHAΔGHR mice. Under FR, LHAΔGHR mice did not present an increase in the locomotor activity and ambulatory activity. **Conclusions:** The lack of GHR in the LHA neurons blunts the increase in locomotor activity typically observed during starvation. Therefore, GHR signaling seems to be important in the LHA neurons to control motivated behavior induced by energy balance challenges.

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Naturally acquired anti-RBP2b antibodies are associated with reduced risk of *Plasmodium vivax* clinical malaria in a treatment-recurrence cohort in Brazil

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In Brazil, malaria remains endemic in the Amazon region, where *Plasmodium vivax* is the predominant species. The individual risk of infection and disease vary markedly in the region and some people appear to develop clinical immunity after repeated exposure to the parasite. Reticulocyte binding proteins (RBPs) are likely targets of protective antibodies – especially antibodies that target PvRBP2b, preventing this parasite ligand from binding the transferrin receptor 1 expressed on the surface of reticulocytes and reducing the ability of *P. vivax* blood stages to invade immature red blood cells (RBC) that serve as their host cells. Importantly, murine monoclonal antibodies raised against PvRBP2b can block *P. vivax* entry into reticulocytes. Here we focus on naturally acquired antibodies to RBPs, their fine specificity, and association with clinical immunity. We first tested whether IgG antibodies to six RBP family proteins were associated with reduced risk of recurrence over the next six months in 172 individuals with acute vivax malaria, enrolled in the main transmission hotspot of Brazil, and showed that high levels of antibodies to RBP2b were significantly associated with reduced risk of recurrence, after adjusting for age, sex, antimalarial treatment, and CYP2D6 genotype. We next tested whether naturally acquired antibodies and the invasion-blocking murine monoclonals targeted the same or nearby epitopes on PvRBP. We showed that the ability of antibodies from acute-phase plasma samples to compete with invasion-blocking murine monoclonals for PvRBP2b binding predicted a significantly reduced risk of clinical vivax malaria recurrences over the following months, after adjusting for the same confounders as above. These results suggest that human antibodies to *P. vivax* RBP2b elicited by natural infection target similar epitopes as protective monoclonals raised by immunization of mice and modulate the risk of clinical malaria. Our next step will be testing whether these naturally acquired antibodies to RBP2b are able of partially blocking *P. vivax* invasion ex-vivo, as murine monoclonals do, as a step toward the development of blood-stage vaccines.

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Effect of clock genes over the immunometabolism and monocyte/macrophage differentiation in immunosenescence. The role of exercise training throughout life

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Aging is enhanced by a gradual decline in numerous physiological processes, including changes in the immune system, which are collectively called immunosenescence, and circadian rhythms, which show age-related changes. The relationships between clock genes, aging and immunosenescence are not well understood. Monocytes and macrophages show high rhythmicity with a high amplitude of expression of clock genes. Consequently, different functions of macrophages and monocytes exhibit circadian rhythms, such as the pattern recognition receptors (PRRs) response, an expression of cytokines in response to an endotoxin challenge, tissue recruitment and phagocytosis. The elucidation of the process by which immunosenescence impairs the activity of innate immunity, favoring the installation of low-grade chronic inflammation, in addition to decreasing the response against invaders, especially viruses, in addition to the greater susceptibility to septic shock, can help in the development of new ways to delay and decrease the amplitude of immunosenescence. Regular physical exercise throughout life slows down the aging processes, providing better quality and prolongation of life. Given the anti-inflammatory nature of aerobic exercise training, the hypothesis of the present study is that the systems differentiation of monocytes may be related to genes that control the circadian rhythm in immunosenescence, which are positively regulated by physical training. Thus, the aim of the study will be to evaluate the role of exercise training during life in immunosenescence and the relationship of this protective effect with the modulation of clock genes.

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Glucocorticoids modulate oxidative and thermogenic function of brown adipose tissue in rats and in human brown adipocytes

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Chronic and excessive glucocorticoids (GC) exposure can cause Cushing's syndrome due to disruption of hypothalamic–pituitary–adrenal axis, a condition clinically characterized by body fat redistribution and metabolic syndrome. It has been proposed that GC excess negatively regulates thermogenesis through UCP1 inhibited expression and mitochondrial dysfunction in the brown adipose tissue (BAT) contributing to increased abdominal fat observed in patients. Because miRNAs regulate multiple biological processes that impact directly adipose tissue function and the crosstalk between metabolic organs, we hypothesized that the negative action of GC in BAT are mediated by dysregulation of microRNAs. Four-month-old male Wistar rats were divided into 2 groups: 1) Control sham and 2) GC group that was administered dexamethasone 16.67mg/200µl via osmotic pump implantation over 4 weeks. After this period, the animals were euthanized and BAT tissue was properly stored (Ethic Committee n. 5386170518 and 89/2016). GC-treated rats showed an effective block in HPA axis associated with clinical features of metabolic syndrome such as glucose intolerance, dyslipidemia and adrenal atrophy. These rats also showed a lower VO₂ consumption and VCO₂ production at room temperature but not during cold exposure (10°C). In BAT of GC-treated rats, whitening and large lipid dropped diameter were associated with a severely impaired thermogenic activation and less glucose uptake visualized by 18F-FDG PET/CT during beta adrenergic stimulation. GC treatment induced an up-regulation of mitochondrial fusion and fission genes in parallel to a reduction in mitochondrial OXPHOS system and oxygen consumption. Microarray global analysis of miRNAs revealed the modulation of 5 miRNAs in BAT. Among the modulated miRNAs, qPCR validation indicated that miR-21-5p was up-regulated in parallel to miR-146a-5p reduction after dexamethasone treatment.

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In order to translate these results to the clinic, human brown adipocytes were treated with dexamethasone. In human cells, GC treatment induced miR-21-5p levels and promoted glucose uptake while decreased maximal respiration. Inhibition of miR-21-5p prevented GC-mediated effects on mitochondrial respiration and glucose uptake observed. In conclusion, in human cells, GC modulates microRNAs expression that might be associated with dysfunction in glucose metabolism, impacting brown functions.

Potential application of the association of T3 with insulin as a therapeutic target for glycemic control, inflammatory cytokines and maintenance of muscle mass in the treatment of Diabetes Mellitus (DM)

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Glucose homeostasis is achieved by a set of physiological processes, balancing the release and uptake/utilization of glucose by the cells. Its regulation depends mainly on the interaction between insulin and peripheral organs (liver, muscle, and adipose tissue), since the impairment of this interaction observed in Diabetes Mellitus (DM), and in inflammatory diseases contributes to glucose intolerance. The skeletal muscle plays a primordial role in glucose metabolism and energy consumption, pathologies such as DM and hypothyroidism lead to insulin resistance, increased inflammatory cytokines, reduced glucose uptake, and loss of muscle mass. DM and autoimmune thyroid disease share susceptibility genes, however, studies from our laboratory have shown that rats induced to type 1 Diabetes mellitus (DM1) by alloxan show hypothyroidism, insulin resistance and increased pro-inflammatory cytokines in skeletal muscle, being reduced with treatment with triiodothyronine (T3). Thus, objective to identify changes in DM, and repercussions of T3 treatment associated or not with insulin on the improvement of glycemic control, TSH levels, insulin resistance, inflammatory status (TNF- α , IL-1 β , IL-6, NF-Kbp65 and IL-10), key proteins of glucose uptake and utilization (GLUT4, hexokinase and glycokinase), mechanics and their mass control in skeletal muscle tissue, and TREM2, a protein that changes the phenotype of M1 to M2 macrophage, by western blotting. By in vitro studies, we will use L6 muscle cell culture evaluating genes encoding TNF α and IL6 and possible direct and negative regulation by T3 (reporterluciferase gene). In the in vivo study we will use Wistar rats induced to DM1 by alloxan (150 mg/kgde PC), ip), subdivided into groups treated with different doses of insulin (3 and 6U) associated, or not, to T3 (1.5 μ g/100 g of PC), for 28 days. Preliminary results demonstrate that diabetic rats showed changes in fasting glucose parameters, insulin resistance, TSH levels, expression of inflammatory and anti-inflammatory cytokines, and key proteins of glucose uptake and utilization (GLUT4, hexokinase, and glycokinase). Treatment with T3 and/or insulin showed improvement in all parameters evaluated, and the treatment with T3 associated with 3U insulin was the closest to the control group and the diabetic group that received the replacement dose of insulin (6U).

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The cellular prion protein as a key player of primary cilia dynamics and signaling pathways in glioblastoma progression

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Glioblastoma (GBM) is an aggressive, invasive, and therapy-resistant brain tumor. Our research group has been investigating the role of the cellular prion protein (PrPC) in GBM biology. PrPC acts as a scaffold protein, interacting with numerous partners and playing a crucial role in the proliferation and maintenance of glioblastoma stem-like cells (GSCs). GSCs exhibit abnormal activation of various signaling pathways, including the Notch, Hedgehog (Hh), and Wnt pathways. Furthermore, PrPC has been discovered at the base of primary cilia, which are non-motile structures that act as “antennae” to detect and transmit signals from the surrounding environment to the cell. Interestingly, GSCs have been shown to suppress ciliogenesis, and restoring ciliogenesis induces differentiation of GSCs and prevents their invasion into the brain. Considering these findings, our objective is to evaluate the role of PrPC in cilia formation and its impact on the Hh and Wnt signaling pathways in GSCs. To achieve this, we generated U87 and U251 PrPC knockout cells (PrPC-KO) using CRISPR-Cas9. We observed reduced proliferation and self-renewal of GSCs in the PrPC-KO cells. Furthermore, we analyzed several GSC markers in the PrPC-KO cells and found several to be downregulated. To gain insights into the molecular changes associated with PrPC knockout, we performed RNA sequencing analysis to identify differentially expressed genes (DEGs) associated with ciliogenesis, as well as the Notch, Hh, and Wnt signaling pathways. The expression profiles of the two cell lines differed significantly. Additionally, we observed an increase in the number of ciliated cells in both U87 and U251 PrPC-KO cells. Our findings highlight the involvement of PrPC in primary cilia components and critical signaling pathways in GSCs. These insights position PrPC as a promising target for the development of novel therapeutic strategies against GBM.

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The regulatory loop between miR-200/Gata5-Foxa2 and PRC2/EZH2 in lung cancer metastasis

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Introduction: Lung cancer is the most lethal type of cancer. Part of this lethality is due to late diagnosis when more than 60% of cases are diagnosed with distant metastases at bones, brain and liver, leading to an overall survival of less than 5%. Thus, investigating the biology of this aggressive cancer is mandatory as a public health policy. One molecular mechanism involved in the progression of lung cancer is the repression of miR-200 family of miRNAs that regulate the process of epithelial-to-mesenchymal transition. Our previous study showed that miR-200 deletion accelerated the formation of lung adenocarcinoma and progression in KP transgenic mice model. **Objective:** Investigate the transcriptional regulation of miR-200 cluster and its impact in lung cancer metastasis. **Methods:** For in silico analysis of promoter region, we used the FANTOM 5, genome browser and transcription factor (TF) prediction tools. Experimentally, we cloned several fragments of miR-200c/141 and miR-200b/miR-200a/miR-429 into the luciferase reporter plasmid pGL4-20, and transfected into a panel of murine lung cancer cell lines (metastatic-889PF and 404M1 and non-metastatic-368T1 and 394T4). Gene expression analysis of TFs and miR-200s was performed for comparisons among lung cancer cell lines. For overexpression experiments, we cloned the coding sequence of TFs into pMSCV-puro plasmid, and transfected into metastatic. **Results:** we defined the minimal promoter region of miR-200c/141 and miR-200b/miR-200a/miR-429 as the fragments -1246 to obp and -4363 to -4027bp from transcription start site, respectively. Next, the in-silico search for TFs revealed a list of several TFs related to lung biology, such as Nkx2-1, Gata5 and Foxa2. Gene expression analysis showed that reduced levels of miR-200s expression in metastatic lines (889PF and 404M1) inversely correlated with TFs Gata5 and Foxa2 levels. The reactivation of Gata5 and Foxa2 in the metastatic lines reverted the mesenchymal phenotype to an epithelial phenotype while restored miR-200s expression and blocked EMT factors. Further investigation of Gata5 and Foxa2 genes promoter region revealed a common signature for polycomb gene Ezh2/PRC2. Overexpression of Ezh2 in non-metastatic cancer lines reduced TFs and miR-200 expression. **Conclusion:** lung cancer metastatic phenotype is controlled by Ezh2-PRC2 inhibitory effect over TFs Gata5- Foxa2/ miR-200s.

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Development of alginate nanoparticles as miltefosine carriers for oral treatment of cryptococcal meningitis

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Cryptococcosis is an opportunistic disease that causes meningitis, occurring ~223,100 cases/year. The therapeutic arsenal for fungal diseases is limited by problems of selectivity, toxicity, pharmacokinetics, and resistance profiles of fungi to available antifungals. Previous studies indicate that miltefosine (MFS) may be an alternative as an antifungal agent however, it has high toxicity and pharmacokinetic disadvantages. The use of nanoparticles to enhance drug efficacy, improve pharmacokinetic profiles, and reduce toxicity is increasingly used to develop new options for treating disease. In this context, was develop alginate nanoparticles functionalized with polysorbate 80 (P80) as MFS carriers for brain targeting in the oral treatment of cryptococcal meningitis. MFS- loaded alginate nanoparticles functionalized or not with P80 were produced by an emulsification/external gelation method and the physicochemical characteristics were determined. The hemolytic activity, and cytotoxic and antifungal effect were assessed in a BBB model. The oral treatment with nanoparticles was evaluated in a murine model of systemic cryptococcosis, as well serum biomarkers were measured, and the biodistribution of nanoparticles was analyzed. The P80-nanoparticles had a mean size of ~300 nm, a polydispersity index of ~0.4, and zeta potential around -50 mV. Both nanoparticles reduced drug cytotoxicity and hemolysis, and decreased the infection process across the BBB model. The oral treatment with P80 nanoparticles reduced the fungal burden in the brain and lungs, while the non-functionalized nanoparticles reduced fungal only in the lungs, and the free MFS was ineffective in murine cryptococcosis. Besides, treatment with nanoparticles did not cause any toxicity in animals. Finally, the P80-functionalization improved the nanoparticle distribution in several organs, especially in the brain. These results support the potential use of P80-functionalized alginate nanoparticles as miltefosine carriers for non-toxic and effective alternative oral treatment, enabling BBB translocation and reduction of fungal infection in the brain.

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Effects of PMCH silencing in the lateral hypothalamic area of female long-evans rats

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Introduction: The melanin-concentrating hormone (MCH) has its synthesis increased according to the progression of lactation days in rodents. The expression of Pmch reaches the peak around the lactation day 19th, and then neither the peptide nor the mRNA is found in the ventromedial part of the medial preoptic area (vmMPOA). **Objective:** The role of MCH synthesis only during lactation has not been fully elucidated in this period. We aim to investigate the effects of Pmch mRNA inactivation through the RNA interference technique (shRNA) in female rats. **Methodology:** Thirty young-adult female Long-Evans rats [virgin (n=24) and lactating dams (n=6)] were submitted to bilateral intracerebral injection of Pmch shRNA or scrambled lentivirus in the lateral hypothalamic area. Then, brain areas were dissected by micropunch and submitted to RT-qPCR or collected to immunohistochemistry. **Results:** Female virgin rats submitted to stereotaxic surgeries using lentiviruses presented a significant decrease in Pmch expression ($p=0.0269$) compared to the scrambled group. In addition, this pattern was confirmed in lactating dams on postpartum day 14, with a significant reduction in Pmch expression compared to the scrambled group ($p=0.05$) after 4 days Pmch shRNA transfection. **Conclusion:** In conclusion, our data suggest that Pmch expression may be modulated by lentiviral intracerebral injections into lateral hypothalamic area, and it could have an impact on the lactation control in rats.

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Bioprospecting microorganisms associated with ascidia *Herdmanina pallida* with biotechnological potential

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Marine organisms have shown to be promising sources of new compounds with therapeutic potential. Currently about 30,000 marine natural products are known, of which seven are marketed for cancer therapy. Ascidians are organisms rich in alkaloids with pharmacological properties. However, it is estimated that microorganisms in symbiosis with these organisms are mainly responsible for the production of these substances. Therefore, the present study focused on evaluating the cytotoxic potential of organic extracts obtained from *H. pallida* and recovered cultivable microorganisms. Specimens were collected in Secret beach, São Paulo Coast (São Sebastião – Brazil). The material was dissected in a laminar flow hood, separating the internal organs (C) and túnica (T). Part of this material was extracted with metanol and another portion heated at 55°C for 10 min. and seeded in Petri dishes with the following media: SWA (seawater agar), TMA (trace metal agar) and SCA (casein starch agar). The isolation of colonies of microorganisms was based on phenotypic characteristics and named with the BRB code followed by a three-digit number. The isolated strains were inoculated in 100 mL of A1 culture medium (soluble starch, yeast extract and peptone) for 7 days at 28°C, under 200 rpm agitation, and after this period, the culture broth was extracted with ethyl acetate. The antiproliferative activity of the obtained extracts was validated by the MTT assay against the human colon carcinoma cell line HCT-116. The extracts were tested at 50 µg/mL for an initial qualitative evaluation, and in a concentration curve (0.032 – 50 µg/mL), for quantitative analysis of the selected ones. A total of 102 strains were recovered from the SCA medium. 71.5% of the strains were recovered from the tunica and 28.5% from the internal organs. 39 of them were deposited in the marine microorganisms (MicroMarin) from the University of São Paulo cataloged with the respective codes registered as BRB-710 to BRB-751.

Reactive microglia and black carbon particles in the olfactory bulb: a preliminary evaluation in autopsies conducted in São Paulo

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Air pollution is a public health concern associated with increased risks for neuroinflammatory and neurodegenerative diseases. The concentration of black carbon (BC), a marker of traffic-related air pollution, in pleural tissues could be used as an indicator of lifetime exposure to urban air pollution (Env.Res 173, 23–32, 2019). BC has been associated with decreased cognitive function in the elderly (Envir. Heal Pers. 119(5)682–7,2011) and the mechanisms driving BC-induced CNS pathology are still unclear, but new evidence suggests that microglial activation is a crucial component. The olfactory bulb (OB) might be a key regulator and portal for BC entry since inhaled nanoparticles could translocate along the olfactory nerve into the brain (Trends Neur. 32(9):506–16,2009). The study aims to investigate the presence of BC particles and their correlation to microglia reactive morphology in OB from autopsies conducted in Sao Paulo. OB was obtained from 6 deceased individuals by the DVSSP. Immunohistochemistry was performed to detect reactive microglia. Qualitative reactive microglia (RM) morphology analysis was done according to the following score: 0– no RM; 1– RM in 1 quadrant; 2– RM in 2 quadrants; 3– RM in 3 or more quadrants. Then, slides were analyzed for concomitant detection of particles and reactive microglia by 2– photon confocal fluorescence microscope spectral analysis. BC particles present an emission spectra that allows the detection. The presence of BC particles in OB slides from 4 autopsies (BC+) and its absence in the remaining 2 (BC–) was detected. The frequency of microglial morphological reactivity score analysis suggested an increase in microglial reactivity in BC+ compared to BC– OB slides (score 1, BC– = 50±10 % vs. BC+ = 14,3±5,2%, p=0.08; score 3, BC– = 5±5 % vs. BC+ = 44,5±7,5%, p=0.04, 2–way ANOVA, Tukey's post hoc test). Our preliminary results identify the presence of BC particles in OB, and suggest a positive correlation with increased microglial reactivity, indicating a local response near particles.

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Extracellular vesicles derived from neural precursors as modulators of the tumor microenvironment: glioblastoma organoids as a study model

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The glioblastoma (GBM) is a lethal brain tumor with a low life expectancy after diagnosis. It comprises several cell types that communicate through extracellular vesicles (EVs). Through miRNAs, proteins, lipids, and DNA, EVs can mediate cell-to-cell communication. Stem cells/neural precursors (NSCs) are responsible for brain neurogenesis and may be involved in the processes of emergence, recurrence and progression of GBM. Previous laboratory data characterized a repertoire of miRNAs obtained from NSC-derived EVs. Subsequent analyzes showed that some of these miRNAs are related to several types of cancer and have several long non-coding RNAs (lncRNAs) as targets, suggesting that these miRNAs may act in tumorigenesis-related pathways and in the regulation of gene expression in other cells. Therefore, the objective of this project is to evaluate the effect of EVs recovered from NSCs, obtained from the differentiation of hiPSCs (human induced pluripotency stem cells), on the biology of GBM organoids obtained from clinical samples. For this, NSC vesicles will be isolated, characterized, co-cultured with GBM organoids and later a proteomic analysis of treated and untreated GBM cells with NSC VEs will be performed. The evaluation of GBM protein expression may show functional evidence to identify biological processes related to the impact of neural precursor cells on tumor biology. Therefore, it will be possible to detect molecules for possible therapy candidates or biomarkers that are involved in the communication between these cell types.

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Modeling Autism Spectrum Disorders using induced pluripotent stem cells (iPSC)

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Autism Spectrum Disorders (ASD) comprises a complex neurodevelopmental disorder characterized by communication and social interaction impairment, with restricted and repetitive patterns of behavior. ASD affects more than 2% of children in the United States, with a concerning ratio of 1 in every 36 newborns. Induced pluripotent stem cells (iPSC) have been generated to model human neurological disorders. However, studies involving complex neurological disorders, such as ASD, remain a major challenge in this field. The main goal of this work was to investigate neuronal connectivity and the interplay between neurons and astrocytes from ASD individuals using iPSCs. Our iPSCs were derived from a clinically well-characterized cohort of three idiopathic ASD individuals, sharing common behaviors, and three controls. We have obtained our cohort from the Tooth Fairy Project, in Brazil, in which donated teeth were used to isolate dental pulp stem cells for cellular reprogramming. We generated mixed neural cultures analyzing synaptogenesis and neuronal activity using a multielectrode array platform. Furthermore, using an enriched astrocytes population we investigated their role in neuronal maintenance. Our results revealed that ASD-derived neurons had a significant decrease in synaptic gene expression and protein levels, glutamate neurotransmitter release and, consequently, reduced spontaneous firing rate. Based on co-culture experiments, we observed that ASD-derived astrocytes interfered with proper neuronal development. In contrast, control-derived astrocytes rescued the morphological neuronal phenotype and synaptogenesis defects from ASD neuronal co-cultures. We also investigated IL-6 levels, since this interleukin has been previously associated with autism and its severity. Furthermore, after identifying IL-6 secretion from astrocytes in our ASD individuals as a possible culprit for neural defects, we were able to increase synaptogenesis by blocking IL-6 levels in our cultures. This work highlights the influence of glial cells on neurons in ASD. In addition, our results reinforce the benefit of iPSC technology for model idiopathic autism, generating novel insights on autism pathophysiology and providing a platform to test drugs for future potential therapies.

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Development of *Histoplasma capsulatum* mutant strains: editing virulence and survival-related genes using CRISPR-Cas9

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Histoplasmosis is one of the most important systemic and endemic mycoses in the Americas and the world. The infection is acquired by inhalation of *Histoplasma capsulatum* propagules, such as microconidia and small mycelial fragments, mostly found in soil contaminated with droppings of certain bird species or bat guano. After inhalation, these propagules convert into yeasts in the lung. The disease may also develop through the reactivation of a quiescent focus of a past infection. *Histoplasma* spp. is an intracellular pathogen and yeasts are highly adapted to the host, using macrophages as a proliferative niche while avoiding the microbicidal mechanisms inside these cells. As a result, innate immune cells are unable to control *H. capsulatum* on their own. Within the intracellular compartment, yeast replication requires the acquisition of several essential nutrients, including metal ions. Studies show that, although iron and zinc are sufficiently abundant in resting macrophages, once these phagocytic cells are activated by pro-inflammatory cytokines causes restriction of these metals to yeast within macrophages as a form of nutritional immunity. Thus, the objective of this study is to elucidate and characterize genes and proteins involved in the acquisition of zinc and iron metals for a better understanding of the mechanisms of virulence, survival, and intracellular replication of the fungal pathogen *H. capsulatum*. Expression analyzes of genes related to the acquisition of iron and zinc were performed. After analyzing the genes, previously reported in the databases of sequences and genomes of *H. capsulatum* and other related fungi, the genes *ZRT2* and *SRE1*, associated with the acquisition of zinc and iron, respectively, were selected to obtain mutants of *H. capsulatum* using the CRISPR-Cas9 methodology. The design of guide RNAs for the *ZRT2* gene was performed using CRISPOR software and inserted into the plasmid. *E. coli* were used for plasmid expansion and concentration. Then, *Agrobacterium tumefaciens* were electroporated to receive the plasmids and co-cultivation with *H. capsulatum* was performed. In addition to co-cultivation, new methodological studies have been carried out to obtain mutant strains.

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Effects of fatty acids in resistant and not-resistant glioblastoma cell line

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Background. Current therapeutic strategies for glioblastoma are surgery, chemotherapy and radiotherapy. However, such treatments fail due to the tumor's acquired resistance mechanisms, such as increased activity of multidrug resistance proteins (MRPs). Eicosapentaenoic acid (EPA), Gamma-linolenic acid and Docosahexaenoic acid (DHA) are described as modulators of these mechanisms. **Aims.** Evaluate the role of fatty acids in drug resistance of human GBM cells, verifying the effects upon tumor growth, motility and chemotherapeutic action of Temozolomide (TMZ). **Methods.** Drug resistant U87MG cell lines were produced with TMZ (25 μ M, respectively). Cell growth assays were performed using DHA and EPA [100 μ M] in U87MG, TMZ-resistant (TMZ-R) U87MG- derived cells. Lipid droplets (LD) were stained with Nile Red at 72h after treatments. GCMS to evaluate the lipid composition, Rhodamine 123 efflux MRP activity assay and gene expression through qRT-PCR, were performed in the cell lines after DHA and EPA treatment [100 μ M; 72h]. For statistical analysis ANOVA with Bonferrini post-test were used to evaluate the statistical relevance. For qRT-PCR were used t test. **Results.** In U87MG, EPA [100 μ M and 150 μ M] and DHA [150 μ M] decreased the cell number compared with BSA. The Nile Red staining showed LD accumulation after treatments with EPA, GLA and DHA. The efflux activity of MRPs appears to be decreased after fatty acids treatments + TMZ in TMZ-R more than U87MG after 100 min. The gene expression of ABCB1, ABCC1, ABCC3 and ABCC4 in U87MG decreased in presence of TMZ + DHA and TMZ + EPA [100 μ M]. **Conclusions.** The association between resistance phenotype and treatment's response raises questions about the association between MRPs, fatty acid metabolism and resistance. Since we have established our resistance model, new tests are already under way. There is not conflict of interests.

1. Instituto de Ciências Biomédicas da USP.

Evidence for the involvement of insulin-like growth factor in the modulation of kisspeptin neurons

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Introduction: The insulin-like growth factor-1 (IGF-1) plays an important role in the onset of puberty and fertility. However, it is unknown whether IGF-1 can modulate kisspeptin neuron activity. Kisspeptin is the main known modulator of gonadotropin-releasing hormone (GnRH), essential for puberty onset and fertility. Hypothalamic kisspeptin neurons are located at the arcuate nucleus of the hypothalamus (ARH), the anteroventral periventricular nucleus, and the rostral periventricular nucleus. The dynamics and modulation of kisspeptin neurons activity, through internal and external signals are important questions that have not yet been fully elucidated. **Objective:** Our goal is to determine whether IGF-1 modulates intracellular calcium concentration ($[Ca^{2+}]_i$) of the ARH kisspeptin neurons, and therefore their activity. **Methodology:** Mice expressing the green fluorescent protein “humanized renilla” by transcriptional control of the Kiss1 gene (male, 8–10 weeks old) were used (protocol number CEUA 4831271021). The animals’ brains were sliced on a vibratome (200 μ m), and the ARH was divided into rostral and caudal. We used Fura-2 fluorescent probe to evaluate the state coupled or uncoupled to calcium in the face of stimulation with IGF-1 (0.5 μ g/ml), or with L-glutamate (100 μ M) to determine cell viability. Cells considered viable that showed delta variation in $[Ca^{2+}]_i$ equal to or greater than 40% were considered responsive to the drug. **Results:** Of the total kisspeptin cells located in the rostral ARH $[Ca^{2+}]_i$ (n=10 of 218 cells analyzed from 14 animals) 20% of these (2 cells out of a total of 10) was modulated by IGF-1 (IGF-1=172 $\pm$ 23nM vs baseline=89 $\pm$ 14nM; p=0.09) and 80% of these (8 cells out of a total of 10) were not responsive to IGF-1 (IGF-1=53 $\pm$ 12nM vs baseline=57 $\pm$ 9nM; p>0.05). Of the total number of kisspeptin cells located in the caudal ARH $[Ca^{2+}]_i$ (n=50 of 235 cells analyzed from 24 animals) 52% of these (26 cells out of a total of 50) were responsive to IGF-1 (mean $[Ca^{2+}]_i$: IGF-1=164 $\pm$ 18nM vs baseline=61 $\pm$ 10nM; p=0.0001) and 48% of these (24 cells out of a total of 50) were not responsive to IGF-1 (IGF-1=40.5 $\pm$ 5.5nM vs baseline=47 $\pm$ 6nM; p>0.05). **Conclusion:** The data indicated that IGF-1 may be one of the modulators of kisspeptin neurons. As these cells are directly involved with reproductive control, this raises the possibility that IGF-1 could be evaluated as a possible drug to be administered in fertility disorders. More studies are necessary.

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Study of the efficacy the drug buparvaquone with a ubiquinone biosynthesis inhibitor using in vitro model of Cutaneous Leishmaniasis

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Leishmaniasis is a parasitic disease caused by protozoa of the genus *Leishmania* that represents an important problem in public health. The treatment is considered a major challenge due to the limited therapeutic arsenal and serious adverse effects. These diseases are considered a neglected disease due to the need to prioritize the development of new drugs. Based on this problem, there is an urgent need to research new therapies. *Leishmania* is distinguished from mammalian cells by having a unique and essential mitochondrion and this makes it an important therapeutic target. Ubiquinone is an isoprenoid found in the inner membrane of mitochondria and plays an important role in the electron transport chain. The drug buparvaquone showed activity both in promastigotes forms and in intracellular amastigotes forms of *Leishmania amazonensis* and produces variations in ATP levels by inhibiting the complex III of electron transport chain. Based on this information, the drug buparvaquone was chosen to be studied combined with a ubiquinone biosynthesis inhibitor, 4-nitrobenzoate (4-NB) that showed activity only in promastigotes. The results of therapeutic association showed an additive effect on promastigotes. In the most relevant form of the disease in humans, in intracellular amastigotes, the results showed that when testing buparvaquone with fixed, non-toxic concentrations of 4-NB, the effect of buparvaquone was potentiated 2 to 3 times. The obtained results of potentiation in intracellular amastigotes forms encourage continuing studies with the coadministration of buparvaquone and 4-NB in the murine model and elucidating the mechanism of action.

1. Instituto de Ciências Biomédicas da USP.

The role of the cuneiform nucleus in defensive response

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Introduction. The cuneiform nucleus (CUN) is a midbrain structure located lateral to the caudal part of the periaqueductal gray matter. A Parkinson's disease (PD) study has shown in a murine model that optogenetic stimulation increase locomotor activity, suggesting that this nucleus is a potential clinical target for PD. However, these results must be interpreted with caution since CUN has been related to defensive responses. Defensive behaviors (DB) are a group of evolved responses to threats, including flight, freezing, defensive attack, and risk assessment. The type of DB elicited depends on the threats and the situation's features. In some disorders, such as anxiety and depression, these behaviors can be exacerbated. Then, this study can help elucidate the role of CUN in DB, allowing the development of therapeutic strategies for those disorders. **Aims.** This study aims to determine the role of excitatory (glutamatergic) and inhibitory (GABAergic) neurons of CUN in defensive behaviors. **Methods.** VGAT-CRE and Vglut2-CRE mice 6 months old were used to evaluate inhibitory and excitatory neurons respectively, and they were used for all experiments. Surgeries were performed to deliver specific vector viruses in CUN. After three weeks, the animals were ready for the tracing (TR), optogenetic (OP) or fiber photometry (FP) experiments. For TR the brains were collected to histology analysis. For the OP experiments, the behavior analysis was performed in an open field, the real-time place preference test (RTPP), to evaluate aversiveness, and the conditioning place preference test (CPP), to evaluate the aversive context memory formation, during the stimulation of excitatory or inhibitory neurons. Lastly, for the FP, the excitatory or inhibitory neurons were recorded during different aversive contexts (CEUA #8879130522). **Results.** The projections of excitatory and inhibitory CUN neurons follow the same pathways but provide clear different terminal fields in several CUN targets. The OP and the RTPP resulted in the immediate stop exploration and the flight of the stimulated chamber in both VGAT-CRE and Vglut2-CRE mice suggesting increased activity in both neuron populations is aversive. In the CPP, no memory context formation was observed in both VGAT or Vglut2 mice. The FP showed that those neurons are recruited in different moments of defensive behavior. **Conclusion.** Glutamatergic and GABAergic populations participate in defensive behaviors.

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Chronic unpredictable stress induces heightened alertness and facilitates the retrieval and extinction of aversive memories in male rats

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Chronic stress effects in the aversive mnemonic processes, such as memory retrieval and extinction, are still poorly known. This study aimed to verify the effect of 14-day chronic unpredictable stress (CUS) on anxiety and aversive memory extinction in male rats. We found that CUS reduced weight gain when compared to the control group, 24h after the final stress exposure ($t_{26} = 2.21$, $p = 0.03$) and during the extinction test ($t_{26} = 3.39$, $p = 0.01$). In addition, a high CORT baseline was maintained up to 24h after the end of CUS, during the aversive conditioning period ($t_{26} = 2.97$, $p = 0.01$) and extinction test, despite no significant change in CORT compared to the control group. CUS provoked anxiety-like behavior evaluated on elevated plus-maze 24h after the last stress session (%OAT ($t_{15} = 2.45$, $p = 0.02$), %OAE ($t_{15} = 3.92$, $p = 0.001$), and a total of SAP ($t_{18} = 2.67$, $p = 0.015$), but not in the protected SAP ($t_{17} = 0.81$, $p = 0.425$) indicating that an increase in SAP occurred by the elevation in the open-arms. Regarding CUS influence on memory, the CUS group showed increased freezing after the US in the conditioning and during retrieval test, but no impairments at extinction (stress [$F(1, 29) = 5.16$, $p = 0.03$], time [$F(7, 203) = 66.33$, $p < 0.01$], and interaction between factors [$F(7, 27) = 3.25$, $p = 0.01$]). Similar effects were observed when comparing freezing separately on the first day (retrieval test) ($t_{38} = 3.08$, $p < 0.01$) or the sixth day (extinction test) ($t_{26} = 0.61$, $p = 0.54$) between the experimental groups. Our findings suggest that the 14-day CUS leads to greater alertness in the face of an aversive situation such as aversive conditioning, causing greater responsiveness to the contextual aversive stimuli and consequently increasing the freezing. However, a compensatory approach linked to extinction memory allowed them to overcome the disadvantageous effects of higher freezing. In this case, a high extinction gain resulting in an aversive memory extinction in CUS animals was similar to the control group (stress [$F(1, 15) = 3.18$, $p = 0.094$], time [$F(5, 75) = 20.31$, $p < 0.0001$], and interaction between factors [$F(5, 56) = 4.76$, $p = 0.001$]). In addition, there was no memory generalization (stress [$F(1, 5) = 23.68$, $p = 0.004$], time [$F(7, 35) = 121.80$, $p < 0.0001$], and interaction between factors [$F(7, 35) = 7.86$, $p < 0.0001$]). We suggest that the 14-day CUS is capable of causing alertness to increase without altering homeostasis or leading individuals to exhaustion of memory systems.

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Anti SARS-CoV-2 vaccine based in VLPs

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The SARS-CoV-2 virus emerged in 2019 and spread, resulting in millions of lost lives and a global socio-economic crisis. The COVID-19 pandemic has sparked numerous efforts to develop vaccines and many fundamental studies to better understand the biology of the coronavirus. Currently, there are some licensed vaccines for humans using different technologies as attenuated virus vaccines, subunit vaccines, non-replicating viral vector and mRNA vaccines. This virus has a capacity to generate Variants of Concern (VOCs) and new vaccines must be generated more quickly to serve the population, especially poorer countries and regions in the world. For this reason, we aim to produce and test SARS-CoV-2 vaccines using vaccine platforms based on Virus-Like Particles (VLPs) as a mechanism for delivery antigens to the cellular components of the immune system. The Receptor Binding Domain (RBD) of the Spike was chemically conjugated to the Q β VLPs and after vaccine characterization animal models were immunized for immunological parameters determination and subsequently protective potential evaluation after challenge with SARS-CoV-2 virus. Our results show that the vaccine based on VLP conjugated with the Spike protein RBD (Q β VLP-RBD) has high humoral immunogenicity with the production of neutralizing antibodies specific for molecules that make up the viral particles of the SAR-CoV-2 virus. We also show evidence of cellular immunogenicity that is often difficult to induce when using conventional platforms and adjuvants already known in vaccine formulations. In addition, the vaccinated K18-hACE-2 mice proved to be protective to the clinical manifestations of COVID-19 when challenged with SARS-CoV-2 and showed minor histopathology injury and decreased viral load in the lungs. In conclusion, the Q β VLP-RBD vaccine is a safe, effective and economical vaccine candidate for the use against SARS-CoV-2.

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Integrative systems immunology uncovers molecular networks of the cell cycle that stratify COVID-19 severity

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Several perturbations in the number of peripheral blood leukocytes, such as neutrophilia and lymphopenia associated with Coronavirus disease 2019 (COVID-19) severity, point to systemic molecular cell cycle alterations during severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection. However, the landscape of cell cycle alterations in COVID-19 remains primarily unexplored. Here, we performed an integrative systems immunology analysis of publicly available proteome and transcriptome data to characterize global changes in the cell cycle signature of COVID-19 patients. We found significantly enriched cell cycle-associated gene co-expression modules and an interconnected network of cell cycle-associated differentially expressed proteins (DEPs) and genes (DEGs) by integrating the molecular data of 1,469 individuals (981 SARS-CoV-2 infected patients and 488 controls [either healthy controls or individuals with other respiratory illnesses]). Among these DEPs and DEGs are several cyclins (CCNs), cell division cycles (CDCs), cyclin-dependent kinases (CDKs), and

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mini-chromosome maintenance (MCMs) proteins. COVID-19 patients partially shared the expression pattern of some cell cycle-associated genes with other respiratory illnesses but exhibited some specific differential features. Notably, the cell cycle signature predominated in the patients' blood leukocytes (B, T, and NK cells) and was associated with COVID-19 severity and disease trajectories. These results provide a unique global understanding of distinct alterations in cell cycle-associated molecules in COVID-19 patients, suggesting new putative pathways for therapeutic intervention.

Characterization of immune cell infiltrated in breast cancer model and the influence of moderate aerobic training

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BACKGROUND: Lower levels of physical activity is considered one of the main external factors in cancer development. Based on the protective role of exercise many works have emerged trying to explain key mechanisms of interaction with tumour immune cells. In some types of cancers, including breast cancer, it has been hypothesized that PPAR γ has anti-tumorigenic functions. Thus, the purpose of this study was to evaluate the effect of both, PPAR γ deletion in macrophages and a moderate exercise protocol in the immune cell profile of triple-negative breast cancer in mice. **METHODS:** Female mice with deletion of PPAR γ in myeloid cells and their control littermates were orthotopically injected with a triple negative breast cancer cell line (E0771) or saline (control). The group that received the tumour cells was subdivided in: a) moderate aerobic training protocol (60% of maximum speed, 5 days/week for 4 weeks) or b) sedentary. After exercise protocol, tumour growth, inflammatory parameters and subpopulations of tumour associated macrophages (TAMs) and infiltrated lymphocytes (TIL) were analysed. **RESULTS:** Exercise was efficient in reducing tumour volume regardless of the genotype, however no significant change in the proliferation marker KI-67 was found. Percentages of TAMs subpopulation (CD45+CD11b+F4/80+) M0 (CD86-CD206-) M1 (CD206-CD86+) or M2 (CD86-CD206+) were not affected by genotype nor exercise. The relative number of CD4+ T cells and cytokines such as IL-4 and IL-6 were increased in tumour of wild type exercised mice, while MCP-1 was increased. IKBKE (inhibitor of nuclear factor kappa b kinase subunit epsilon), a breast cancer known oncogene was slightly lower in tumour infiltrated cells from exercised WT mice compared to KO. **CONCLUSION:** Exercise reduced tumour volume and this positive effect seems to be related to increased tumour infiltrated CD4+ T lymphocytes.

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Application of the *Galleria mellonella* invertebrate model in experimental *Leishmania amazonensis* infection

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The invertebrate *Galleria mellonella* model can be used for several investigations, such as the study of experimental leishmaniasis. This neglected tropical disease, which has a high incidence worldwide, is caused by species of the genus *Leishmania*. By using *G. mellonella* model, it was shown that hemocytes internalize *Leishmania* parasite by phagocytosis, allowing intracellular parasite proliferation, and differentiation inside the larvae. Despite the interesting data, these results are still preliminary and further studies need to be generated on this important invertebrate model, which has several biological characteristics to be explored. In this project, the main objective is to validate the experimental *Leishmania* infection in the larvae of *G. mellonella*, by analyzing the immune response against the parasite infection and evaluating the virulence degree between different *Leishmania* isolates. The results obtained from this research will bring important knowledge in the *Leishmania*-host interaction field and will reduce the cost of using *in vivo* experiments in the study of parasitic diseases, as a new valid model.

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Transcranial Photobiomodulation in pain control in Parkinson's Disease: analysis of brain connections through functional Magnetic Resonance Imaging

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Contribute to the improvement of pain in individuals with Idiopathic Parkinson's Disease, through Transcranial Photobiomodulation. It consists of a therapy through the emission of LED light. The project aims to analyze painful, motor and cognitive behavior using specific questionnaires for screening that will be applied before and after Photobiomodulation, in addition to analysis of brain connections through of rest functional Magnetic Resonance Image.

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Understanding the transcriptional landscape of *Mycobacterium africanum* L6 and copper induced toxicity in mycobacteria

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Tuberculosis is an infectious disease caused by species of the *Mycobacterium tuberculosis* complex (CMTB). While *M. tuberculosis* (Mtb) is widely spread, *M. africanum* (Maf) is mostly restricted to West Africa. The aim of this study was to evaluate the global transcriptome of Maf L6 compared to Mtb H37Rv during growth in vitro. RNA from Maf L6 and Mtb H37Rv grown at mid-log phase in Middlebrook 7H9 medium were sequenced in an Illumina platform. ProkSeq was applied to detect differentially expressed (DE) genes using Mtb H37Rv as reference genome. Flux Balance analysis (FBA) was then performed in Matlab with COBRA analysis Tool and Moomin, taking as input the metabolic model iEK1011 2.0. Differential Expression analysis data from EdgeR and Loss of Function mutations, detected with GATK, were also used. Genes with low TPM counting were not included. The metabolic model was also adjusted according to culture medium conditions (7H9– OADC–Pyr–Tween). A total of 241 and 212 genes were found upregulated and downregulated, respectively, in Maf L6 compared to Mtb H37Rv. Genes of the operon *cso* and regulon *ricR*, were highly upregulated in Maf L6, suggesting that under the conditions tested, this strain was responding to copper toxicity. The *vapC4* gene, whose protein is a positive regulator of the CsoR and RicR and a global activator of cysteine and mycothiol production, was also upregulated, indicating that Maf L6 was under oxidative stress compared to Mtb. FBA coupled with transcriptomics of the Maf L6 metabolism shows fluxes through cysteine metabolism, confirming possible re-routing to increase mycothiol production. Our results suggest that Maf L6 is undergoing copper induced toxicity with the current copper concentration used in traditional 7H9 medium.

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Chimeric monoclonal antibodies as a strategy to activate immune responses against SARS-CoV-2 infection

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The SARS-CoV-2 virus, belonging to the Coronaviridae family like SARS and MERS, causes a severe acute respiratory disease with a fatality rate of approximately 2%. Given this vulnerable situation that necessitates investment in vaccine strategies, it is crucial to prioritize versatile and safe approaches. Our research group has conducted several studies demonstrating that fusing antigens to isotype monoclonal antibodies enhances the immunogenicity of vaccination formulations. In line with this approach, the main objective of our research project is to construct and evaluate the effectiveness of recombinant monoclonal antibodies fused to the RBD protein of SARS-CoV-2, referred to as Isotype-RBD. To achieve this, we produced the recombinant antibodies in a eukaryotic system, purified them through G protein affinity chromatography, and administered them subcutaneously in K18 transgenic mice along with the Poly (I:C) (pIC) adjuvant. Immunization with Isotype-RBD plus pIC induced robust serum levels of RBD-specific IgG antibodies in mice, capable of neutralizing the virus in vitro. The protective capacity of these antibodies will be assessed by challenging the animals with the virus and monitoring their survival. Notably, immunization with ISO-RBD+pIC conferred full protective immunity to mice challenged with the SARS-CoV-2 virus. We believe that this innovative vaccine strategy can make a significant contribution to the current and future epidemics, becoming a promising tool to combat other respiratory diseases.

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TNF- α pathway and podocyte dysfunction in diabetic kidney disease in female and male BTBR ob/ob mice

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Patients with diabetic kidney disease (DKD) are at increased risk of developing chronic kidney disease (CKD) regardless of blood glucose levels, indicating that other pathological pathways are involved in DKD progression. Studies suggest that TNF- α contributes to glomerular inflammation and podocyte injury, however, the molecular mechanisms underlying need to be elucidated. The aim of this study is to investigate how TNF- α can contribute to podocyte dysfunction in DKD and whether sexual dimorphism modulates this response. Male and female BTBR WT and ob/ob mice were observed for 16 weeks. In vitro, immortalized mouse podocytes were treated with TNF- α (24 h). Preliminary data show that BTBR ob/ob mice were obese, hyperglycemic and had augmented albumin excretion in comparison to WT. In the kidneys, gene expression of TNF- α and TNF- α receptor type 1 (TNFR1) were not changed among groups, but TNF- α receptor type 2 (TNFR2) were upregulated in BTBR ob/ob independently of sex. *Snai1* transcript levels were not changed, but there was an effect of sex and obesity on *Snai2* mRNA. Females have higher gene expression of nephrin and podocin, and obesity reduced the expression of these genes, regardless of sex. Podocytes treated with TNF- α showed increased TNF- α and TNFR2 gene expression in a dose dependent manner. Moreover, TNF- α treatment reduced *Snai2* mRNA in these cells. In conclusion, results suggest that BTBR ob/ob mice presented kidney inflammation, podocyte dysfunction and alteration of the cellular dedifferentiation pathway. Sexual dimorphism was observed in the gene expression of podocyte markers and in *Snai2* transcript levels. In vitro, we confirmed the association of environment inflammation with changes in dedifferentiation and inflammation pathways in podocytes.

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Obtaining specific polyclonal antibodies to the SARS-CoV-2 nucleocapsid protein

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Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) is an RNA virus responsible for the Coronavirus disease-19 (COVID-19). The SARS-CoV-2 genome encodes the Nucleocapsid protein (N) that forms a major component of the ribonucleoprotein complex within the virus particle and play a vital role in virus transcription and replication. Although the S protein has been very important for the development of vaccines, a high propensity to mutate has been observed. This fact made N protein a good candidate for the development of diagnostic tests, for being stable, conserved, immunogenic, and less likely to mutate. With the aim of developing a new diagnostic kit, our group developed three constructions of the N protein, the full-length protein (Cfull), the N-(NTD) and the C-terminal (CTD) portion, that were used in the immunization of Wistar rats. The immunizations induced the production of specific polyclonal IgG antibodies against all recombinant proteins. Assays were also carried out where recombinant proteins derived from the nucleocapsid were tested against non-specific polyclonal antibodies. Anti-Cfull antibodies demonstrated high efficiency in binding to the NTD protein. The antibodies present in the anti-CTD and anti-NTD sera have recognized the Cfull protein, but they were not able to recognize the NTD and CTD proteins, respectively. Our findings suggest an efficient protocol in obtaining high antibody titers, were was observed specificity of both for recombinant proteins derived of Nucleocapsid.

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The conquest of the Americas by malaria parasites: a population genomic view

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The Americas were the last continent to be settled by modern humans, approximately 15,000 years ago, but human malaria parasites – *Plasmodium falciparum*, *P. vivax*, and *P. malariae* – appear to have arrived much later. Most available evidence suggests that malaria was introduced in the Americas after the European colonization – by settlers from Portugal and Spain, where malaria was endemic at the time of conquest, and, more importantly, by the massive Trans-Atlantic slave trade from Africa. Once in the Americas, *P. vivax* and *P. malariae* were able to adapt to new local vertebrate hosts, New World platyrrhine monkeys, originating the sister species *P. simium* and *P. brasilianum*, respectively. Here we propose to combine publicly available data with 185 newly generated whole-genome sequences to investigate the historical founding events and subsequent evolution of human malaria parasites in the Americas and their recurrent transfers to non-human primates. We will apply the same standardized population genomic approaches to sequence data from three species to address the following questions: (a) Can the relative contribution of different source regions to present-day parasite populations in the Americas be inferred? (b) Are genomic sequence data consistent with similar routes and dates of introduction and subsequent spread in the Americas for all three human malaria parasites? (c) Is there evidence for genetic bottlenecks during the adaptation to new local vectors and vertebrate hosts upon arrival in the New World? (d) Are there genomic signatures of adaptation to platyrrhine monkeys following the host shift that originated *P. simium* and *P. brasilianum*?

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Elevation in blood pressure induced by hyperosmotic stimulus involves purinergic signaling between OVLT and PVN of rats

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The paraventricular nucleus of the hypothalamus (PVN) plays a critical role in neural control of blood pressure (BP) during hyperosmotic challenges, as it receives a major source of excitatory inputs from sensory circumventricular organs, comprising the organ vasculosum of the lamina terminalis (OVLT). Among the well-described excitatory neurotransmitters that are released in PVN during hyperosmotic challenges, including glutamate and angiotensin, our laboratory has identified a new potential one: the adenosine triphosphate (ATP). Previously, we have shown that purinergic signaling is involved in the control of hyperosmotic-induced sympathoexcitation at the level of the PVN, via activation of P2 receptors. Recently we have shown that hyperosmotic stimulus stimulates the release of ATP in the PVN, at least in part, from glial cells. Here we hypothesize that an additional source of ATP acting as excitatory neurotransmitter on PVN neurons during hyperosmotic challenge originates from the OVLT, as a central sodium-induced pressor response. To investigate whether the changes in the BP induced by acute hyperosmotic stimulus of the OVLT depends on release of ATP into the PVN of rats, we used adult Wistar rats (10–12 weeks old; CEUA ICB/USP: #4895140819) were initially anesthetized with isoflurane (2–4% inspired O₂). Catheterization of the femoral vein and artery was conducted for the administration of anesthesia (urethane, 1g/kg) and BP recording signals, respectively. Subsequently, stereotaxic surgery was performed to access the OVLT and PVN, simultaneous to BP monitoring. Following the collection of baseline data, microinjections of 1M NaCl (50nL) were administered into the OVLT, before and after bilateral antagonism of P2 purinergic receptors (PPADS, 10uM–100nL on each side) in the PVN. Data were expressed as the mean $\pm$ SEM, and statistical significance level of $p \leq 0.05$ by Student's T test. Preliminary data (n=3) have shown that microinjection of 1M NaCl into the OVLT elicited a significant increase in the BP, an effect that was attenuated after bilateral injection of PPADS in the PVN (NaCl OVLT: +10.5 $\pm$ 4mmHg vs. NaCl OVLT post-PPADS PVN: +0.4 $\pm$ 1.4mmHg, $P=0.0157$). There were no significant changes in heart rate. These findings show that elevation in the BP induced by hyperosmotic stimulus of the OVLT involve a purinergic signaling with endogenous release of ATP in the PVN, likely as part of the neural control of circulation during osmotic challenges.

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Marine natural product as insecticide agent

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Vector-borne diseases are a current public health challenge in Brazil and in the world, and the control of the vector *Aedes aegypti* remains as the main strategy to reduce the disease spreading, such as dengue and Zika. Natural products-based insecticides are considered as possible sustainable allies in the mosquito control. This work aimed to evaluate the metabolic diversity of marine bacteria from the Brazilian coast which extracts presented larvicidal activity against *Aedes aegypti*. Three hundred bacteria strains were cultivated in liquid culture medium, and their organic crude extracts were analyzed by liquid chromatography tandem mass spectrometry (LC-MS/MS). These data were used to create a Molecular Network (MN) through the Global Natural Products Social Molecular Networking (GNPS) platform. The biological activity assay indicated that 19% of all extracts presented moderate to strong larvicidal activity, with a mortality rate above 40% in 24h. The taxonomic identification of the active samples showed that *Bacillus* (37%) was the most abundant genus among them, followed by *Streptomyces* (35%). Furthermore, it was observed that the detected chemical classes on active extracts are taxonomically-related to the producing bacteria: steroids, carboxylic acids, quinolines, benzenes and organoxygen compounds were generally produced by the Actinomycetes – *Streptomyces* and *Saccharomonospora*; while peptidomimetics, organic phosphoric acids, glycerophospholipids and organonitrogen compounds were detected mostly in Firmicutes (*Bacillus* and *Brevibacillus*) and Proteobacteria (*Limimarinicola*).

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Development of nasal vaccine nanoformulation for COVID-19

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Due to the current course of the pandemic in the world and especially in Brazil, the development, improvement and autonomous national production of vaccines for COVID-19 has become an urgent task. Our group is composed of experts in lung inflammation, immune modulation by adjuvants that activate Toll-like receptors (TLRs), mucosal immunology (lung and gastrointestinal tract), infections, compound synthesis and nanotechnology. We developed a liposomal nanoformulation containing spike viral glycoprotein (S protein) from SARS-CoV-2 and a TLR agonist synthetic oligonucleotide. This nasal-inoculated nanoformulation was able to increase the production of antibodies in the pulmonary mucosa and in the serum, in addition to stimulating the production of IgA in the airways, favoring the neutralization of the virus right after its first contact with the airways. Like the Sabin vaccine, administered orally, this strategy of neutralizing the virus in the mucosa may reduce the chance of virus transmission. The proposing group implemented a complete platform for the study of COVID-19, with facilities with biosafety level 3 (NB3) for the maintenance of viral samples and infected animals, well-established viral infection protocols, lung histology, quantification of viral load in the lung, plaque reduction neutralization test, quantification of immunoglobulins in lung and serum and evaluation of cellular response (B and T lymphocytes). Preliminary results in an animal model using transgenic mice expressing the human ACE2 receptor showed that our nasally administered vaccine formulation was 100% efficient against the ancestral strain of SARS-CoV-2. In this way, the present project aims to use the already established platform to test the efficiency of the nasal vaccine, produced entirely in Brazil, against different variants of SARS-CoV-2, in addition to comparing it with vaccines already approved for human use, also using immunization heterologous (using more than one vaccine), seeking a more effective vaccination strategy against COVID-19. We aim to contribute to the development of an efficient, safe immunization scheme and national technology against COVID-19. In addition, we aim to make this platform available for further studies of COVID-19, and in the future for other diseases involving infectious agents that require biosafety level 3 laboratory environment and practices.

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1. Instituto de Ciências Biomédicas da USP.

2. Fundação Oswaldo Cruz.

Long term glucocorticoid infusion impairs epididymal adipocyte maturation and metabolism via upregulating miR150-5p expression

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Iatrogenic hypercortisolism could lead to Cushing Syndrome disease, inhibiting the adrenal hormone axis function. The prominent effects of maintaining high concentration of glucocorticoid in the circulation are disrupting the adipose tissue distribution and increasing the incidence of metabolic disorders. Recently, studies discovered adipocytes as the main contributor to intercellular communication by secreting a high amount of adipokines inside of exosomes, such as miRNA. In pathological conditions, this mechanism is impaired and could disrupt other tissues function and metabolism. Thus, our hypothesis is that dysregulated circulating miRNAs could modulate the expression of several genes in adipocytes, controlling adipocyte turnover and resulting in fat redistribution. Here we demonstrate that fat turnover is a process sharply regulated and very resilient. Our results show that high concentration of glucocorticoid in the circulating induces absorption of epididymal adipocytes miR150-5p, which could be regulating adipogenesis factors during adipocyte maturation. Also, the apoptose of those cells were similarly dysregulated by this hormone, determining a balanced number of adipocytes. However, metabolites and structures of this tissue were highly affected by the treatment, leading to high lipolysis, lower lipids incorporation and adipocyte size redistribution. In summary, the similar CT and GC epididymal adipose tissue mass is the resultant of higher dense fibrogenic tissue and lower adipocyte volume, induced by the lipolytic effect of GC, instead of a proper cellular turnover. All these data together show that each fat deposition is extremely important and complex tissue, with a really well controlled cellular turnover and with a high plasticity, even in a pathological condition.

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Nanostructured lipid platform for simultaneous delivery of simvastatin and adenosine in the management of challenging cutaneous ulcers: design, characterization and in vitro evaluation

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The present study focuses on developing nanostructured lipid carriers co-encapsulating simvastatin and adenosine (NLC-S/A) to improve wound healing for challenging cutaneous ulcers. These nanoparticles offer advantages over conventional formulations for topical treatments. The nanoparticles were prepared by hot homogenization technique followed by sonication. Various solid and liquid lipids, along with hydrophilic surfactants were tested to optimize the formulation. The nanoparticles were characterized, and in vitro activity was assessed in NIH-3T3 and HaCat cell lines. Skin penetration profile were evaluated in pig ear skin. The optimized formulation contained two drug ratios: NLC-S/A 2%/2% (simvastatin and adenosine at 2% relative to total lipid content) and NLC-S/A 0.6%/2% (0.6% simvastatin and 2% adenosine). Formulations showed an average size of ≈ 200 nm, polydispersity index ≈ 0.150 , zeta potential ≈ -20.0 mV, and spherical morphology. The association efficiency for simvastatin and adenosine were $\approx 99\%$ and $\approx 13\%$, respectively, independently on the drug content added. The nanoparticles displayed excellent physicochemical stability during a 60-day storage period. NLC-S/A 2%/2% decreased more cell viability compared to NLC-S/A 0.6%/2%. Regarding cell proliferation, for NIH-3T3, NLC-S/A 0.6%/2% showed activity at concentrations of 0.25–0.5 $\mu\text{g/mL}$ simvastatin/0.8–1.6 $\mu\text{g/mL}$ adenosine ($\approx 50\%$ proliferation). This activity was not observed for NLC-S/A 2%/2%. For HaCat, NLC-S/A 0.6%/2% showed activity at concentrations of 0.25–6.2 $\mu\text{g/mL}$ simvastatin/0.8–2 $\mu\text{g/mL}$ adenosine (145–107% proliferation), while NLC-S/A 2%/2% showed a lower proliferative effect. In scratch-wound assay, for NIH-3T3, NLC-S/A 0.6%/2% exhibited 52% wound closure, while NLC-S/A 2%/2% exhibited 25%. For HaCat, NLC-S/A 0.6%/2% exhibited 86% closure, while NLC-S/A 2%/2% exhibited 50% closure. There was an increase in the cutaneous permeation of the drugs when associated with NLC-S/A 0.6%/2%, but cutaneous retention was more pronouncedly increased (4.6 and 3 time for simvastatin and adenosine, respectively) compared to drug solutions. In conclusion, NLC-S/A 0.6%/2% exhibited superior biocompatibility, enhanced cell proliferation, improved wound closure and promoted tissue localization of simvastatin and adenosine, highlighting its potential application in promoting tissue repair.

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NLRP3 inflammasome activation in neutrophils and lymphocytes and the contribution to inflammation and immune dysregulation during chronic viral infections

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Background: The inflammasome is an intracellular multiprotein complex formed after the recognition of pathogen or danger-associated molecular patterns (PAMPs or DAMPs), both from sterile or infectious conditions. The NLRP3 inflammasome is one of the most explored and is well known to be able to activate caspase-1 leading to the process of the inflammatory cytokines pro-interleukin-1 β (IL-1 β) and pro-IL-18 to generate their active forms, as well as the pore forming protein gasdermin D, which may induce the highly inflammatory cell death process pyroptosis. During viral infections, NLRP3 dynamics was deeply explored in myeloid cells such as monocytes and macrophages. However, for other cellular populations like neutrophils or lymphocytes, the presence and function of NLRP3 remained elusive. **Aim:** During the past 7 years we aimed to perform a broader genetic and functional characterization of NLRP3 during HIV and SARS-COV-2 infection. **Methods:** Peripheral blood was collected from chronically HIV infected patients (n = 400) and severe and mild Covid-19 patients (n = 500). From HIV group the NLRP3 activation profile was evaluated ex vivo and in vitro in purified CD4+ and CD8+ T lymphocytes and B lymphocytes. From Covid-19 patients, the main cellular target was peripheral blood neutrophils. From both groups it was also performed a wide genetic association study for 15 single nucleotide variants (SNVs) in inflammasome genes. **Results:** In HIV group NLRP3 inflammasome in constitutively hyperactivated in both, CD4+ T lymphocytes and B lymphocytes. Similarly, in severe COVID-19, the NLRP3 was highly activated in a basal state, which also affected the neutrophil activation state by itself in terms of augmented NET release and degranulation. As a consequence of this dysregulation, these leukocytes from both groups showed an impaired response to several PAMPs and DAMPs in vitro, which could explain, at least in part, the increased susceptibility to co-infections and co-morbidities. Nonetheless, the SNVs analysis was also able to generate a direct link between this leukocyte's inflammatory dysregulation and the comorbidities and disease severity. **Conclusion:** The NLRP3 inflammasome is a central player during inflammatory viral infections in a cellular specific manner, influencing directly the disease pathogenesis.

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Mathematical modeling and numerical simulation of the Wheatley Heart Valve

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Prêmio Pós-Doc USP

In recent decades, the number of occurrences of cardiovascular diseases has been increasing significantly in underdeveloped countries, where rheumatic heart diseases mainly affect the young population. In advanced cases of stenotic disease, aortic valve repair becomes impractical, and the replacement with a prosthetic valve becomes the only way to prolong the patient's life. The replacement valves available on the market have drawbacks, either because of rapid deterioration (in the case of bioprosthetic valves) or because of the high risk of coagulation (in the case of mechanical valves). Dr. Wheatley has presented a new way of designing leaflets that aims to reducing the risk of clotting, which would avoid the need for antiplatelet treatment. The present study brings together computational simulation expertise from the University of São Paulo and experimentation from the University of Strathclyde to refine and optimize Wheatley's design before it is submitted for regulatory testing. This study is a computational proof-of-concept. The valve's operating mechanism involves high amplitude displacements (geometric nonlinearity) and hyperelastic materials. In order to simulate the operating conditions, a three-dimensional fluid-structure interaction model was implemented so that the forces applied on the valve's leaflets could be accurately imposed. The chosen technique, Arbitrary Lagrangian Eulerian (ALE), proved adequate to take into account the relative motion between meshes. This technique made it possible that two physics (solids and fluid) could be used simultaneously. It was able to accurately capture valve behavior under experimental conditions (Figure 1). It is observed that the leaflets respond to dynamic loads applied to them relying on contact pairs, showing both a rapid opening and closing. The numerical investigations show encouraging results and can be used to achieve optimized design parameters for the Wheatley valve.

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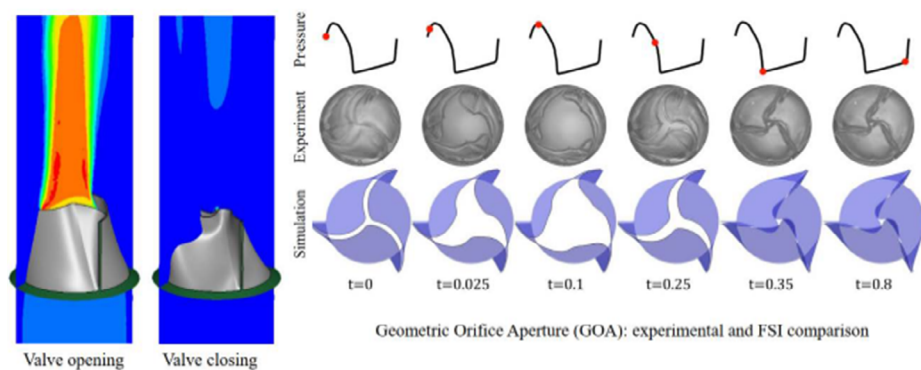


Figure 1 Fluid Structure Interaction results for the Wheatley Heart Valve simulation

An analysis of mortality in the framework of Sickle Cell Disease in the State of São Paulo using the Modified Zero-Regression model

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Sickle cell disease (SCD) is a genetic and hereditary disease, resulting from a mutation in one of the structural genes of hemoglobin (Hb), present in erythrocytes (erythrocytes), which gives rise to a mutant hemoglobin called hemoglobin S (HbS). Specifically, this mutation results in the alteration of the red blood cells which, in individuals with SCD, under adverse conditions (cold, dehydration, stress etc.), have a sickle shape, which makes circulation and the arrival of oxygen to the tissues difficult, leading to some symptoms such as chronic pain and infections. According to (Brasil, 2015), the behavior of SCD in Brazil is in line with its historical perspective, with a greater predominance among the black and brown population, with a smaller number of cases among whites. On the other hand, there are no consistent data on the lethality of SCD in the country due to factors such as the absence of computerized records in reference centers and blood centers, lack of information on death certificates, existence of an undiagnosed population, among others. In this sense, it is important to advance in the analysis of SCD mortality data, aiming mainly at the implementation of public policies for better quality and life expectancy of individuals with SCD. In this work, the dataset referring to the number of deaths diagnosed with sickle cell disease reported in cities in the State of São Paulo (Brazil) between 2011 and 2021 is considered (DATASUS, 2023). From a modeling point of view, the proportion of zero observations in the sample is an important factor in the analysis of count data, mainly for the use of an adequate model. Therefore, for the analysis of these data, the Zero-Modified regression model is considered since no prior knowledge about the frequency of zero (inflated or deflated) is necessary (Conceição, 2013). In addition to the regression model, a study is carried out to describe the epidemiological profile regarding sociodemographic aspects (gender, race, age group).

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ePMSL – Development of a Present Mood States List in a digital version to assess momentary subjective states of Brazilians

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Emotions are immediate responses, triggered by external events or internal thoughts. Self-reports serve as an effective means to access emotions. Various instruments, often in digital form, have been developed to measure psychological aspects through self-reports. The Present Mood States List (PMSL) allows individuals to report their present mood states. However, the PMSL requires enhancements in terms of psychometric properties. This project aimed to evaluate the feasibility of using a revised and validated PMSL within a digital system (EmoFrame) to identify mood states in the Brazilian population. Experts in Psychological Assessment (8) reviewed and validated the content of the PMSL and, then, digitalized in the EmoFrame system, utilizing Participatory Design and Evolutionary Prototyping techniques, ensuring that the PMSL was highly applicable and user-friendly. The psychometric properties of the PMSL were analyzed based on 332 Brazilian volunteers (37.7% male; $Mage = 33.87 \pm 12.76$) responses. Data indicated poor fit indices for the factorial structure and low reliability in certain factors of the PMSL. Nevertheless, the PMSL demonstrated good concurrent validity when compared to two other instruments measuring affects, as well as a pleasure-displeasure judgment of a list of activities. Furthermore, a case study involving 8 elderly volunteers (5 women, $Mage = 70 \pm 3.64$) enrolled in the free course “Fake News: Recognition and Attitudes for Making a Difference” offered by ICMC-USP was conducted to investigate the impact of engaging with a fake news detection tool on the volunteers’ mood states and just factor 5 of the PMSL showed changes. Results confirmed the attainment of research aims, as the PMSL showcased new items, a revised factorial structure, demonstrated concurrent validity and high applicability and usability within the EmoFrame system. In conclusion, this research strongly supports the widespread utilization of ePMSL integrated into the EmoFrame system for studying mood states among adult Brazilians in various situations.

1. Instituto de Ciências Matemáticas e de Computação da USP.

The Brazilian Health System in the Covid-19 pandemic: inequalities and reflections based on the concept of financialization

Lucas S. Andrietta

The COVID-19 pandemic has dramatically exposed long-standing trends in the Brazilian health system. In addition to the social tragedy, it has intensified inequalities and deepened structural distortions. The Unified Health System (SUS), which plays a crucial role in our society, emerges weakened from the pandemic, facing greater challenges to affirm its universal, egalitarian, and effective principles. Fragmentation and weak control mechanisms have hindered the healthcare system's ability to counter ineffective government decisions. The private sector has exerted significant influence in the healthcare industry, benefiting from a lack of accountability, loose regulations, and opportunistic actions and omissions in health policies. The financialization of healthcare has impacted various aspects mentioned above, particularly preventing the pursuit of universal health policies and health sovereignty. It poses obstacles to democratic control, social participation, and the promotion of public interest, as well as the development of health policies that promote social justice and challenge the prevailing accumulation patterns. The combination of healthcare privatization and financialization intensifies the exploitation of public funds and collective resources intended for social policies. The inability to fulfill healthcare promises contributes to social dissatisfaction and widening inequalities, despite the growing demand for strengthened public services, which has gained symbolic significance during the COVID-19 pandemic. The dynamics of financialization in healthcare deepen current political and social contradictions in Brazil and worldwide. It is crucial to find avenues for politicizing the healthcare issue, integrating the healthcare system with alternative proposals for social justice and substantive democracy.

A systematic review of the use of blockchain in the healthcare sector

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The health sector is a key economic activity, and a complex sector due to the combination of public and private interests. For Sustainable Development Goal 3 achieving Universal Health Coverage of the UN is one of the overarching targets by 2030. This requires transparency, accountability, and equity in the allocation of resources. Blockchain technology, a distributed ledger with characteristics of transparency, immutability, and traceability, initially used in cryptocurrencies and financial applications, has evolved into other application sectors such as healthcare. In recent years, many blockchain application researches in the healthcare sector are being conducted to deal with the challenges facing this sector. In this research, a systematic literature review was carried out to identify the current blockchain application areas in the healthcare sector, as well as to determine the research maturity level and research topics for each identified application area. The review results show ten application areas, of which the health records area contains the largest number of articles, 49.3%, and the electronic prescription area includes the smallest number of articles, 1, 3%. In the 10 application areas, the greatest amount of research is concentrated on the implementation maturity level (simulations, experiments, or prototypes). The results show that there is great enthusiasm for applying blockchain in the health records area. Already, in the areas of clinical trials and medical research, genomics, and electronic prescription there is less expectation to apply blockchain. Also, the results show which topics receive more or less attention from research, for each application area. The topic of data sharing is covered in almost every application area identified. Likewise, the results show that security and privacy are challenges facing the healthcare sector, and blockchain is being used to address these challenges. In this way, this review reveals a comprehensive overview of blockchain application research in the healthcare sector, showing current application areas, and research trends in the identified areas, making it possible to find gaps to direct future research.

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Atomic vapors: a platform for quantum informations and quantum sensing

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and A. M. Guerrero¹; R. L. R. Celis¹; M. Martinelli¹; A. M. Marino

We present the recent advances of studying optical interactions with atomic vapors. Such simple system allows us to explore investigations in quantum information and quantum sensing. In the case of quantum information, we have been exploring the idea of using atomic vapors to produce entangled intense beams of light. Entanglement is a quantum property in which the strong correlations between two or more systems allows one to know the complete information of the whole system but almost no information of each one of the subsystems. Such a property is a very important resource for quantum processing and quantum communication. On the other hand, atomic vapors are today the state of the art to produce magnetic sensors to measure, for instance, the weak magnetic fields generated from our brains. In this work we show how we produce the entangled beams of light and how they can enhanced the sensitivity of atomic sensors. Atomic vapors are simple systems that allow us to generate of entangled beams of light employing a third order non-linear optical medium as the hot alkali atoms. This kind of medium naturally operates in the atomic wavelength which makes it compatible with quantum memories, and achieves high gain of amplification when compared to solid state medium. We show the most recent results on the first demonstration of producing entanglement beams for such χ_3 medium operating within a cavity as an optical parametric oscillator (OPO) above threshold. One consequence of entanglement, is that the noise fluctuations of total intensity of both beams is reduced beyond the quantum limits. Such property can be useful for sensors with optical reading. One of these sensors are the atomic magnetometers, which we also have been investigating. In particular, we studied the optical demodulation in 2D, that allows us to acquire an image of weak magnetic fields distributions within an area of 1cm without re-positioning the sample around the sensor. Combining quantum correlations of light with atomic sensors can be of high impact on quantum technologies development.

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Emergent dynamics in a sender-receiver neuronal network

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and M. Hansen³; K. C. Iarosz⁴; I. L. Caldas¹; A. M. Batista⁵; J. Kurths⁶

Synchronization in neuronal networks and the influence of connectivity on firing activities are important topics in neuroscience. With this in mind, we consider two neuronal networks with excitatory and inhibitory neurons to investigate how specific connections between the networks can be associated with the appearance of phase, anti-phase, and shift-phase synchronization. In our simulation, we observe that for small time delays in signal transmission, the identified connectivities from a sender to a receiver are related to the emergence of different synchronous patterns. We also study if the synchronization level of the sender network could play a role in the emergence of synchronization in a receiver one. As a result, we verify that a synchronous sender network is more effective in inducing different types of synchronization in the receiver due to specific and combined connectivities. Beyond that, we find that the connectivities have a role in increasing and decreasing the mean velocity of the resulting phase angle of the receiver network. Our results improve the comprehension of the emergence of different dynamics due to specific conductivities between neuronal networks.

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Microstructural changes of hair caused by cosmetic procedures

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Hair fiber is composed of main three regions: cortex, in which there is a protein, α -keratin (the crystalline structure of the hair) cuticle and cellular membrane complex (CMC), structure that held together cuticle layers and cortex. Aesthetics procedures like bleaching, straightening, and ironing in the hair promote the alteration in these structures. In this sense, we aim to of this study was to understand the damage mechanisms in hair fiber subjected to chemical cosmetic procedures (bleaching and acid straightening pH ~ 1) from a porosity perspective, denaturation protein and thermal behavior. To this, we combined 3D-microstructure images of hair before and after damaging treatments and associate to in-situ SAXS experiments and differential scanning calorimetry (DSC) data to get insight on changes in the hair. The quantitative data and images from cortex porosity were analyzed using X-ray micro-computed tomography (micro-CT) that allows the obtaining of non-destructive imaging of morphological structures. The micro-CT quantified hair samples porosity analyzed, within became almost four times (4x) more porous for the hair subjected to bleaching followed acid straightening. In-situ X-ray scattering patterns showed that straightened hair fibers exhibited an increase bilayer distances in the multi-lamellar lipid structures (of the 45 Å – virgin hair to 56 Å – straightened hair), which suggests the swelling on the hair CMC. DSC data evidenced by denaturation of the α -keratin (decrease of the area of the endothermic peak related to the melting of the crystalline fraction) Therefore, these techniques allowed evaluating alterations like porosity and thermal behavior in the hair samples subjected to cosmetic treatments, in particular, the superposition of bleaching and acid straightening.

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Validation of tissue-equivalent materials for dosimetric applications in diagnostic imaging

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Phantoms manufactured with tissue-equivalent materials (TEMs) are fundamental tools for quality assurance, dosimetry and research procedures. Our project consists of the development and characterization of TEMs for the manufacture of phantoms with X-ray transmission and scattering properties equivalent to the human body for patient dose studies in the range of radiation energies used in diagnostic imaging (15 – 150keV). The prototypes that are being researched do not have similar national ones and, even those available in the market outside Brazil, are not adequately characterized for a good representation of the attenuation and scattering properties of ionizing radiation in the range of energies used in diagnostic imaging. Thus, the relevance of the research is concentrated in the characterization of tissue-equivalent materials for applications in radiology, as well as in the construction of prototypes that are being validated by experimental techniques.

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Development of an oral vaccine adjuvant in inducing mucosal immunity against *Mycoplasma hyopneumoniae* for piglets

Luís C. C. da Silva¹

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Since the discovery of ordered mesoporous silica (OMS) by the researchers of the Mobil Company in 1992 significant progress has been made in the synthesis, characterization, and application of ordered mesoporous materials, which can be prepared using either ionic or nonionic surfactant templates. The latter has many advantages compared to ionic surfactants, such as biodegradability, commercial availability, low cost, and low toxicity. Nowadays, the ordered mesoporous materials have attracted the attention of researchers due to their potentials applications in the research fields of adsorption, catalysis heterogeneous, sensors development, separation chemistry, drug delivery, nanoscience, biotechnologies, and recently in the field of immunology with advances in the research of oral vaccines. *Mycoplasma hyopneumoniae*, the main etiological agent of Porcine Enzootic Pneumonia, is widely spread in swine production worldwide. Its prevention is of great interest for the productive system, since its colonization in the lung tissue leads to intense production losses. This study aimed to compare the *M. hyopneumoniae* shedding and acute-phase response in piglets submitted to different vaccination protocols: an experimental oral vaccine using a nanostructured mesoporous silica (SBA-15) as adjuvant.

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Light interaction with natural photonic crystal from band gap structure to possible light localization phenomena

Cláudia P. Barrera-Patiño

and Vicente S. Mattos; Camila de P. D'Almeida; Éverton L. de Oliveira; Lucas O. de Oliveira; Jarbas C. de C. Neto; Vanderlei S. Bagnato

Nature exhibited beautiful optical phenomena when the light interacts with special organic materials. Complex natural nanostructures have been unwrapped from age ago to develop specific functions, between them are physics behavior that are waiting to be understood. The structures that conform these natural systems are so sophisticated that in our time they are the reason to start research work in this new field of knowledge, it implies the combination of scientific knowledge from diverse areas. Here, we start our study with the optical and structural characterization of the wing samples of *Quesada gigas*, *Greta oto*, and *Morpho cypris*. There are three native species from South America that exhibit structural color on the surface of their wings known as iridescence, this optical effect is attributed to photonic structure arrays inside the samples (Vukusic and Sambles, 2003). Our focus in this work is to understand how the structural disorder influences the light interaction with the natural photonic systems. In order to obtain this goal, interferometric measurements using spatiotemporal resolution were done, and experimental and computational methods were implemented too. Our results offer promissory evidence for the light localization in natural photonic systems when structural disorder is present in the studied system. Therefore, in this work we suggest one way to detect light localization in natural photonic structures with the purpose to establish a correlation between optical effect and structural array in natural systems.

Synthesis and characterization of 4-(dimethylamino) benzaldehyde hydrazone and its diorganotin (IV) complex

Pedro H. de O. Santiago¹

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Hydrazones are a versatile class of organic compounds with medicinal interest due to their biological potential, showing antimicrobial, antitumor, antiviral, and anti-inflammatory properties. Additionally, these compounds have been used as chelating for developing new metal complexes with pronounced catalytic and biological activity. In this sense, we describe the synthesis and characterization of the 4-(dimethylamino) benzaldehydenicotinichydrazone (HL) and its diphenyltin (IV) complex $[\text{SnCl}(\text{Ph})_2(\text{L})]$, aiming the development of a new bioactive complex. Both the compounds were characterized by single crystal X-ray diffraction (SCXRD) technique, FT-IR, electronic and NMR spectroscopies, and thermal analyses (DSC and TGA). The SCXRD results show that the free ligand crystallizes with E-configuration concerning the iminic bond and as a ketonic tautomer. Meanwhile, the complex is composed of one pentacoordinate Sn(IV) cation, coordinated to two phenyl ligands, one chloride, and one bidentate hydrazonate ligand, with the last one attached to the metal center through the Z-configuration and enolic tautomer. Hirshfeld surface analyses indicate the presence of non-covalent interactions stabilizing the crystalline structure of both compounds. The spectroscopic data agree with the structural analyses performed with the SCXRD technique.

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Comodulação das variabilidades das frequências cardíacas durante a interação imitador-modelo

Daniel O. Dantas

and André Fujita

A coordenação do comportamento nos permite interagir socialmente, porém bases fisiológicas dessa coordenação ainda são desconhecidas. Uma hipótese é a de que a comodulação dos estados fisiológicos é crucial. Para testar isso, monitoramos o equilíbrio dos níveis simpático/parassimpático por meio da variabilidade da frequência cardíaca (VFC). Nossa hipótese é que os indivíduos sincronizam a modulação da VFC durante a interação social, indicando que a interação social está associada à comodulação de estados fisiológicos. Os resultados mostram que o p-valor combinado das correlações das frequências cardíacas dos voluntários é menor que o nível de significância de 0,05 quando os usuários interagem. Além disso, o p-valor combinado é maior que o nível de significância na maioria dos casos quando eles não interagem. Esta é uma evidência de que os batimentos cardíacos dos indivíduos tendem a sincronizar quando eles interagem com gestos. Usamos os métodos de Fisher e Stouffer para combinar os p-valores.

Connected by heart

André Fujita^{1, 2}

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Emotions have a ubiquitous effect on human affairs. The physiological component underlying it has a fundamental role in the development of experiences since changes in the physiological state reflect the emotional state. In addition, recent studies show that the behaviors, biological rhythms, or emotional states of individuals interacting become coupled, exhibiting time-synchronized response patterns. This synchrony establishes the physiological connection that refers to the degree to which people's physiological responses change in coordinated ways in some interpersonal interaction, which can even occur during performing a game, which also makes up a social action. One of the physiological signals widely used to verify the physiological link is heart rate variability, a global parameter representing the body's and the brain's behavioral state. Here, the partial-directed coherence concept was applied to heart rate variability signals to identify whether individuals can or how they differently affect each other's physiological states and emotional experiences in the absence of direct communication while playing a game. The current study proves that individuals can affect each other's physiological states and converge their emotional responses even without direct communication.

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Breakthrough of the cancer-related biological networks

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Cell fate determination is a complex process that is frequently described as cells traveling on rugged pathways, beginning with DNA damage response (DDR). non-coding RNAs (ncRNAs) such as long-non-coding RNAs (lncRNAs) such as ANRIL, UFC1, GAS5 and TUG1 and microRNAs (miRNAs) such as miR-221, miR-16, miR-34a and miR-449a are essential players in this process. Although all these tiny proteins are known to be key cell fate regulators, the exact mechanism by which they collaborate in the DDR remains unknown. Therefore, we dedicate attention to systems biology approaches such as dynamical Boolean networks on the G1/S and G2/M cell cycle checkpoint regulation contemplating the role of these ncRNAs in response to DNA damage in Lung, Cervical, and Gastric cancer. First, we look at the oncogene roles of ANRIL, UFC1, and XIST in the control of miR-34a activation in NSCLC cell lines. Second, we investigate the synergistic effect of miR-449a, miR-34a, and miR-16 on triggering autophagy in HeLa cells. Third, we uncover novel molecular pathways mediated by GAS5 that suppress proliferation in gastric cancer. Fourth, the involvement of TUG1 in quadra stable dynamics of p53 and PTEN in lung cancer. Worth noting that these works proposed by us are the first in the field. Additionally, the findings presented in these publications will lead many cancer researchers in new directions. We believe that our findings, which provide an exceptionally successful therapeutic target and predictive model, will help accelerate drug discovery and development efforts while informing future cancer biology research.

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Development of a questionnaire to assess fish consumption in the State of São Paulo: pilot study

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And Thais M. Machado¹; Cristiane R. P. Neiva¹; Albert G. J. Tacon^{2, 3}; Daniel Lemos²

Introduction: According to the FAO food balance for fish and fish products, Brazil is well below the world average, with fish consumption being 8.08kg/capita/year in Brazil against 20.49kg/capita/year in all the world. Although we have national fish production and consumption data, there are few studies that seek comprehensive local information. **Objective:** The aim of this work was to develop a questionnaire to evaluate the consumption of fish in the state of São Paulo, followed by a pilot application study. **Materials and methods:** We carried out a bibliographic survey to identify studies that developed questionnaires to assess fish consumption, in addition to reviewing market studies carried out by the INFOPESCA. The questionnaire we prepared for the consumer has 24 questions including the Free and Informed Consent Form, questions on frequency of fish consumption, place of purchase, method of preparation, species consumed and socioeconomic issues. The response time for the questionnaire is less than 10 minutes. **Results:** The survey was carried out online from March to April 2023, with a total of 38 participants, 23 women (54%) and 19 men (45%) all from the State of São Paulo. 66% and 85% of the sample of respondents have high schooling and medium/high income, although the questionnaire will be aimed at all social strata. More than 30% consume fish and crustaceans once a month and shellfish only on special occasions. Respondents prefer to buy fish in supermarkets (42%), crustaceans in fishmongers (39%) and mollusks to consume only in restaurants (21%). **Conclusion:** It is already known that price is a determining factor for purchase, but with the application of this questionnaire by the state of São Paulo it will be possible to better understand the factors associated with fish consumption and identify consumer preferences to propose public policies but also predict access and logistics issues with the production chain and increase consumption in the second instance.

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Psychosocial support and challenges in the academic success of black students and those benefited by affirmative actions in higher education

Carlos V. G. Melo¹

and Alessandro de O. dos Santos¹

This paper presents a synthesis of results from two studies addressing the academic experience of black students and the student assistance services of public universities. Both emphasize the importance of psychological support, affirmative actions, and proactive combat against racism. The first research, a quanti-qualitative study, used the Subjective Well-being Scale (BES) and interviews to capture the experience of USP students. The second investigated, by interviews, the experience of psychologists from different universities with expertise in affirmative actions. The studies reveal the diversity of the university population in Brazil and the urgency of specific actions to ensure everyone academic success, especially those who face racial-ethnic prejudice and discrimination. Significant challenges were identified, such as the level of BES below expected among students and the workload in psychosocial services, lack of resources, and complexity in treating severe mental health problems. The need for collaboration among different university sectors and the continuous updating of professionals in psychological theories and mental health protocols is emphasized. In addition to humanized psychological support, the demand for more objective and instrumental interventions, mental health monitoring policies, and awareness about racism is highlighted. In short, the importance of establishing a safe environment for black students to express their experiences and the imperative need for greater institutional support for programs aimed at combating racism, inequality, and promoting ethnic-racial diversity is underlined.

1. Instituto de Psicologia da USP.

Mental health in the Marajó archipelago: actors, practices and current configurations

Pedro P. F. Piani¹

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This research being carried out in the sixteen municipalities of the Marajó archipelago, Pará, Amazon, is the first of its kind in the theme, in the Amazon region, which is undergoing major transformations of an economic nature, in the world of work, including access to technology that enables the connection with the large economic and urban centers. It is a region distant from these urban centers, but connected by basic technology. The demands of families for psychosocial support and mental health or intersectoral services indicate an increased demand for mental health in the region: alcoholism, drug abuse, depression, child abuse and other situations of psychological suffering are the most frequent reports that point to the need for a broader research in the region that maps the demands and services, collective actions, institutions, as well as circulating repertoires that can help in a more appropriate analysis for the formulation of programs and policies that are also broader and permanent psychosocial support in this large region.

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Use of Information and Communication Technologies (ICT) in health promotion in public high schools: young protagonists

Valéria N. Silva¹

The Information and Communication Technologies (ICT), used daily by young people, so mediating social relations and access to information. Within the objectives of the post-doctoral study, I describe how ICTs and social networks can collaborate for knowledge production and the dissemination of information about health promotion (STI/AIDS prevention, mental health, and SARS-CoV2), with the active participation of high school students. This research-intervention involved 6 public schools, located in the outskirts of São Paulo and Sorocaba, through weekly educational meetings (2020 to 2022) with about 100 students enrolled in the Scientific Initiation High School Program (SI-HSP). Students were introduced to knowledge about research methodology, stimulated to study topics/problems they experience, and finally to produce strategies for disseminating related information. During the context of physical distance (COVID-19 pandemic), students researched: the violation of rights, difficulties in studying (remote teaching); Fake News; virtual love relationships; selling nude images (“Packs”). And, they produced: lives (mental health and school routine); profiles on social networks (Instagram and Twitter) and informative videos (ethnic-racial relations, gender and pregnancy prevention). With the resumption of face-to-face classes, in addition to mental health, discrimination against LGBTQIAPN+, mapping graffiti in the school, and preventing STI/HIV, became topics of interest; and, there was the production of Podcast about pandemics and mental health. Despite the difficulties imposed by the pandemic and the difficulty of access to the Internet that still exists in the Brazilian suburbs, the approach (participation and human rights) and the methods (educommunication) used allowed us to foster debates on the themes pointed out by the students as relevant and the co-production of answers – dissemination of information, which contributed to the promotion of health (and rights).

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Self-sacrifice in the testimonies of hibakushas: a study of memories in the context of Japanese culture

Cristiane I. Nakagawa¹

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This post-doctoral research has as its core the psychological examination of memories of hibakushas², and it can be considered as a continuation of the master's and doctoral work³. In the master's research a historical and political recognition of the development, construction, and use of the world's first atomic bombs was made, a historical review that proved to be rather important for a first Freudian psychoanalytic analysis of the memories of hibakushas. At that time, it was noted that two phenomena – together with the trauma and associated with it – were very recurrent in the memories studied: the phenomena of guilt and shame. These, due to the dimension assumed in the context of the biographies of the memoirists, became the focus of examination in the doctoral research, which was theoretically carried out by Freudian-Laplanchean psychoanalysis and by social psychology. To this end, thirteen extensive interviews were conducted with hibakushas which, together with the study of testimonies previously done, pointed to and highlighted yet another remarkable phenomenon in all collected memories, and which now claim for clarification so that a proper understanding of those memories is now possible: the strange deaths witnessed by survivors throughout the war, on the day and after the atomic explosion, that is, the phenomenon of self-sacrifice and its meaning in Japanese culture.

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2. Hibakusha is the Japanese word meaning survivor of the atomic bombing.

3. Respectively entitled, "Hiroshima: the atomic catastrophe and its witnesses" and "Trauma and meaning, guilt and forgiveness, shame and honor in the hibakushas: a study of testimonies and their paradoxes" (the latter carried out with FAPESP support and awarded with the USP Outstanding Thesis Award 2021).

The repetition of the search for harm and non-adherence to treatment: contributions of Psychoanalysis to the daily life of health teams

Daniela S. Bezerra¹

and Maria L. T. Moretto²

Our research implemented a method of qualification and evaluation of public mental health policy from the partnership of the Research Laboratory “Psychoanalysis, Health and Institution” under the supervision of Professor Maria Livia T. Moretto and the State Department of Health of Mato Grosso, as an action of the Technical Area of Mental Health. It fostered discussions in the Psychosocial Care Networks (RAPS) of the six macro health regions of the State by monthly webmeetings, between 03/2021 and 08/2022. It had three PUB/ USP fellows and four volunteer students. The participants of the research were the teams of the 46 CAPS of the State, technicians of the 16 Regional Offices of Health, as well as the municipal and state specialized care teams. The hypothesis derived from our doctoral research as to what leads a neurotic subject to “seek the self-flagellum” and not adhere to the Therapeutic Projects proposed by the team, showed the fragility of RAPS regarding the quality of psychosocial care provided in the pre before and after pandemic. At a time of increased demand for RAPS services and suicide mortality rates, it was revealed a “vacuum” of assistance in cases of psychic suffering that do not have a psychiatric diagnostic, such as those caused by violence. Another critical point observed was the absence of clinical-territorial supervision, making impossible the function of CAPS in network logic. Within the theoretical-clinical contributions, was taken in work of the concept of transference from the impasses that each hard case presented to the team, the insertion of students of IPUSP in the discussion of the daily life of the SUS services, as well as the approach of SES-MT directly to the teams of most of the 141 municipalities.

1. Secretaria de Estado de Saúde de Mato Grosso.

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Cancer news coverage in Brazilian online newspapers: limitations and challenges

Eduardo B. Cardoso¹

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The theme cancer has demonstrated impact on individuals and community, with important participation of the media. Objective: to examine the content of news coverage about the disease in major Brazilian online newspapers. Method: 232 articles were selected, which were unraveled into variables of interest, in the period from 2019 to 2022, and submitted to quantitative analysis. Results: 77% of the news were national; 1/4 of the sample involved the participation of celebrities; diagnosis, treatment and prevention occupied, in decreasing order the reports; the presence of symptoms signaled the importance of diagnosis; the use of technical expressions and the production of extensive texts made comprehensibility difficult, while the existence of metaphors, favored it; breast cancer was the most reported; however, issues related to palliative care and age of risk, were neglected. Conclusions: it is expected that these findings will be useful to make public information, more effective and accurate.

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The vitalizing function of the analyst

Fatima R. F. C. de A. Graça

The term “vitalization” has been presented indirectly (for example, in the thinking of Ferenczi and Winnicott) or directly (as in Ogden, Figueiredo and Alvarez). However, there is a certain tendency to think of it almost exclusively in the clinic of non-neurotic pathologies. Furthermore, there is no known study concerning what I call the metapsychology of vitalization. The interest in proposing a research along the proposed lines is justified, therefore, not only in terms of theoretical contributions, in metapsychological terms and in the expansion of the analyst’s vitalizing function for the entire therapeutic process, but also in the consequences for a thought of the technique that helps in the direction of change and gains in terms of the patient’s ability to be alive. A first direction is proposed: care for both vitalized and devitalized aspects involved in the call to life. Present since Ferenczi, when he refers to the introduction of “positive life impulses” (1992/1929, p.51), this care also appears in Winnicott’s clinic, when he highlights the vitalizing role of the analyst by recognizing, through his look, what subsists of health and life, arising both from the recognition of the patient’s primary creativity and from the essential belief in human nature. Let us follow in this sense the words of Winnicott (1993/1954, p.478): “For any work to be done, it is necessary that a belief in human nature and in the processes of development exists in the analyst, and this is quickly felt by the patient”. From these authors who are so fundamental to thinking about the vitalizing function of the analyst, I will start with authors of Contemporary Psychoanalysis such as Ogden, Bollas, Luis Claudio Figueiredo, Dianne Elise and Anne Alvarez who have been highlighting the importance of games, pleasure and playing as a strategy of healing both with non-neurotic and neurotic pathologies.

Intercultural and interdisciplinary study on the maternal role: scope and limits

Izabella P. M. de Barros¹

Thinking about aspects of the maternal function as one of the operators of psychic constitution from a transcultural perspective comprises, more than dialoguing between different sciences, the challenge of interculturality. Thus, any approximation of this field requires interdisciplinarity. It is known that there is influence of culture in the process of child development, but there are few studies on the process of psychic constitution of babies in cultures other than the Western one. The objective of this exploratory study is to apprehend modes of operation of the maternal function in indigenous cultures, especially if there are speeches directed at the baby that function as symbolic attributions and, therefore, as a form of anticipation of the Self, in varied ethnic groups that inhabit the northern region of Brazil, especially eastern Pará and northern Tocantins. The instruments used for ethnographic research are observations and interviews, recorded in a field diary. Indigenous women and mothers were heard and one of their babies was monitored at 4 time points: between 0 and 4, 4 and 8, 8 and 12 and 12 and 18 months. From listening and observations, narratives were reconstituted through qualitative analysis. The results of this work are expected to establish an interdisciplinary dialogue that includes cultural diversity as a political dimension in the psychic constitution. Psychoanalysis needs to produce new references not only to support its ethics, but also so that the multiple forms of subjectivity in the contemporary world can be thought about.

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Expression of emotions in the context of anxiety in twin children: physiological indicators and environmental sensitivity

Lilian C. Luchesi¹

and Emma Otta

Dental anxiety (DA), an aversive emotional state of worry/apprehension in anticipation of dental treatment (DT), affects more than a third of the population. Facial thermography is a new method for assessing emotions from a psychobiological perspective. As some individuals are more vulnerable to environmental stressors than others, Environmental Sensitivity (ES) could predict the response to negative and positive exposures. In partnership with the Faculdade de Odontologia of the Universidade de São Paulo (USP), 20 twin pairs born at the Hospital das Clínicas of USP, and now aged 7–12 years have been studied since their first visit to the Dental Clinic. We aim to analyze whether there are differences between the reactions of twins to the potentially anxiety-triggering context of DT. We consider the reported anxiety and physiological measures as a function of zygosity and ES. For this, we use the facial version of the Modified Corah Dental Anxiety Scale (MCDASf), the Highly Sensitive Child Scale (HSC), and facial thermographic images in two moments: baseline pretreatment (BA) and DT. Three areas of interest were selected: the nose, ear, and forehead. First, we calculate the DA and HSC scores and sub-scores: Low Sensory Threshold (LST); Aesthetic Sensitivity (AES); Ease of Excitation (EOE), and the temperature difference between BA and DT (Δt). Then we calculated the twin similarity by intraclass correlation index (ICC) and nonparametric correlations between Δt and: a) MCDASf; b) HSC. Monozygotic twins (MZ) were more similar on HSC and DA than female and opposite-sex (OS) dizygotic dyads (DZ). The temperature of the nose in MZ decreased throughout the session, from BA to DT. We found correlations between LST and DA in all same-sex dyads, EOA and DA in MZ males and OS twins, and AES and DA in MZ females and OS twins. Overall, the MZ were more alike than the DZ siblings, and the tip of the nose presented the most expressive changes in temperature. In the future, we will analyze the ES and DA relations considering age and treatment stages.

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Ateliê dos Sonhos: o que sonham os estudantes imigrantes da Universidade de São Paulo?

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O presente trabalho tem como objetivo apresentar uma pesquisa de pós-doutorado realizada junto aos estudantes imigrantes da USP. O projeto “Ateliê dos Sonhos” foi uma pesquisa-intervenção que buscou investigar os sonhos – oníricos e projetos de vida – de imigrantes estudantes na USP e, também, ofertar um espaço grupal que visa promover acolhimento, cuidado e trocas interculturais entre seus participantes. A partir da perspectiva da psicanálise, entendemos os sonhos como uma forma simbólica e imaginária de significar a vida e a si mesmo, de reparação narcísica e fortalecimento do desejo – processos fundamentais para os imigrantes que vivem em constantes rupturas, perdas e lutos. Além disso, compreendemos os sonhos em sua dimensão onírica, que revela tanto a psicodinâmica do sujeito singular, bem como as marcas de seu contexto histórico-político, conferindo aos sonhos o caráter onipolítico. Nesse sentido, o “Ateliê dos Sonhos” foi um espaço de partilhas dos sonhos dos estudantes imigrantes, atuando no fortalecimento: da identidade; do sentimento de continuidade de si; de pertencimento; do desejo e da inclusão simbólica destes estudantes ao cotidiano universitário. A partir de encontros semanais e da técnica da associação livre da psicanálise, percebemos, em termos de resultados, que este dispositivo promoveu a integração entre os participantes; acionando as memórias psíquicas e culturais da vida pré-migratória e das experiências atuais; fortaleceu a identidade, desejo e projetos de vida voltado para a vida na universidade e na cidade de São Paulo. Trabalhos como este são de extrema relevância social, política, psicológica e pedagógica pois se configura como uma ação institucional da universidade para a humanização e qualificação do acolhimento ao estudante imigrante.

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The nature of work and the engagement of the subject in post-Fordism: reflections from Freud and Lacan

Marcelo G. Ferretti¹

This research represents the initial stage of a larger project of investigation of the links between psychoanalysis and work, which aims to investigate the possibilities of developing a psychoanalytically oriented work practice. This first stage aims to search, in the works of Freud and Lacan, for elements to review what it is to work, from the psychic point of view, and to analyze how the subject engages in the so-called post-Fordist organization of work. The research is justified both for probing a facet of the writings of these authors which has not been explored in sufficient depth and for testing the psychoanalytic framework in the face of one of the greatest challenges to mental health today: the increase in work-related illnesses and diseases.

1. Fundação Getulio Vargas; Universidade de São Paulo.

Systemic view about gender differences in toys offered to Brazilian infants

Renata P. de Felipe

Elucidating the elements involved in the gender development is challenging and transcends the nature/nurture dichotomy. We investigated if gender differences would be more pronounced in older infants (11–18 months) than younger ones (6–11 months); and related to gendered toys (masculine: vehicles, and feminine: dolls, dress-up accessories, and domestic items). We discussed our findings in line with the Dynamic Systems Theory. Mothers filled out an online sociodemographic questionnaire, and the Affordances in the Home Environment for Motor Development – Infant Scale. Gender differences were found just from 12 months on and in three out of the four gendered toys. Girls presented more dolls and dress-up accessories and boys, more vehicles and animal toys. Male gender, number of siblings and older infants predicted higher number of vehicles and animal toys, while only female gender predicted higher number of dolls and dress-up accessories. Socialization influence gender role stereotyping, producing distinct sex-typed toy preferences.

Psychoanalytic clinic and audiovisual: correspondences and limits between reality and fiction

Renato C. Tardivo¹

and Daniel Kupermann¹

The Covid-19 pandemic implied a series of transformations in bond procedures. For us, psychoanalysts, the question was posed with force: would the clinic survive? But, while facing the crisis, creative solutions were found, so that remote assistance, previously considered an exception, began to take on a leading role. Thus, in this work, one raises the question about online analysis, through articulations between psychoanalysis and Eduardo Coutinho's cinema. Coutinho's filmography questions the simple duality between reality and fiction. Psychoanalysis, too, questions this duality, from notions such as psychic reality and material reality, what demands the capability to be in uncertainty, the negative capability. The experience of negative capacity, explored in the filmmaker's documentary work and presented by us in a clinical vignette, points to transference circuits that can favor the emergence of symbolic paths. Thus, we will suggest an analogy between Eduardo Coutinho's method of filming and the resources we can use in remote assistance, with the use of the camera, making use of psychoanalyst André Green's concepts of ternary logic, the analyst's inside frame and the work of negative.

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Relations between neoliberal policies and the medicalization of life in contemporary times

Willian T. M. Santos¹

and Nelson da S. Júnior¹

This research aims to understand the relationship between the neoliberal policies developed in the West during the 20th century and the increasingly present process of medicalization of life, as well as to understand the ways in which medicalization impacts on the actions and policies in the field of psychiatry and the Brazilian psychiatric reform. We are carrying out the demarcation of the “state of the art” on these themes from a critical-qualitative analysis of texts coming mainly from studies, researches and reflections from the field of Psychology, Psychoanalysis, Psychiatry, Philosophy, Social Sciences, among other fields of knowledge, in an attempt to perform a careful and judicious analysis of the social, scientific and political processes involved. We have also used information found in the press and in social networks, in order to broaden the view and understanding of these processes and to contribute to the necessary scientific-political debate.

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Goldilocks calcium concentrations and the regulation of oxidative phosphorylation: too much, too little, or just right

Eloisa A. Vilas-Boas¹

and João V. Cabral-Costa; Vitor Ramos; Camille C. da Silva; Alicia Kowaltowski

O cálcio (Ca^{2+}) é o mineral mais abundante no corpo humano e é um regulador-chave em diversas vias de sinalização intracelular, impactando em processos fisiológicos e bioquímicos importantes. Seus níveis intracelulares são mantidos em concentrações bem baixas. Em resposta a estímulos específicos, as concentrações de Ca^{2+} intracelular aumentam por influxo do meio extracelular ou mobilização de reservas intracelulares. Os dois principais estoques intracelulares de Ca^{2+} são o retículo endoplasmático (RE) e a mitocôndria. Já era sabido que o Ca^{2+} dentro da mitocôndria pode ativar enzimas da matriz mitocondrial, possivelmente impactando na produção de ATP. Porém, a atividade do Ca^{2+} na respiração celular ainda não havia sido determinada de maneira quantitativa usando ferramentas de alta resolução. Sabe-se que o excesso de Ca^{2+} na matriz mitocondrial é deletério devido à abertura de poros de transição da permeabilidade mitocondrial (mPTP) e consequente dissipação do potencial de membrana, levando ao inchaço mitocondrial, ruptura e morte celular. Aqui, pretendemos determinar de maneira quantitativa se o Ca^{2+} extra ou intramitocondrial modula a fosforilação oxidativa em mitocôndrias de fígado de camundongo e linhagens celulares de hepatócitos intactos. Monitoramos os efeitos de aumentos mais modestos versus aumentos suprafisiológicos de Ca^{2+} citosólico e mitocondrial no consumo de oxigênio frente a diferentes substratos. As mitocôndrias isoladas apresentam aumento da eficiência da fosforilação oxidativa quando expostas a concentrações específicas de Ca^{2+} . Em células intactas, tanto baixas como altas concentrações de Ca^{2+} citosólico levaram a taxas respiratórias diminuídas, enquanto as taxas ideais estavam presentes em condições fisiológicas de Ca^{2+} . Mostramos que alta concentração de Ca^{2+} diminui a respiração mitocondrial de maneira substrato-dependente e mediada por mPTP. Nossos resultados revelam um efeito do tipo “cachinhos dourados” nas mitocôndrias do fígado, no qual tanto muito quanto pouco Ca^{2+} limitam a fosforilação oxidativa, mas a concentração “na medida certa” promove ativação significativa.

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Studies on structure & activity of Ru(II)/arene/mercaptopyridine complexes against cancer

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and Jocely Dutra²; Analu Rocha³; Letícia Pires²; Javier Ellena³; Alzir Batista²

The synthesis of metal complexes with mercaptopyridines (MP), has attracted the attention of scientists due to the structural diversity of this class of ligands, enabling the evaluation of the influence of different functional groups on the biological activity of these complexes⁴. In this work, we report the synthesis and characterization of Ru(II)-arene complexes coordinated to MP, aiming at obtaining a new potential antitumor agent. The structural alterations carried out in these new complexes make it possible to evaluate the influence of these modifications on the antitumor activities against different cancer cells (ovarian, breast, lung, and prostate) and on the interaction with DNA. So, four new Ru(II) half-sandwich complexes containing p-cymene (cp), MP and different ligands in the Y position (Cl and PPh₃) were synthesized Fig. 1(A). Compounds A1-A2 were obtained from the precursor [RucpCl₂]₂ and the complexes A3-A4 from the precursor [Rucp(PPh₃)Cl₂]. All complexes were characterized by elemental analysis, molar conductivity, infrared, 1D/2D (¹H, ³¹P and ¹³C) NMR spectroscopies and single crystal X-ray diffraction Fig. 1(B), confirming the proposed structures. The compounds were tested in human tumor and non-tumor cells. Compound A3 stands out, presenting the IC₅₀ = 0.30 ± 0.06 µmol/L in the cisplatin-resistant ovarian cancer cell line, and IC₅₀ = 0.80 ± 0.03 µmol/L in the human lung tumor cell line. The high cytotoxicity in the non-cancer lung cells MRC-5, IC₅₀ ≥ 50 µmol/L, gives this complex a considerable selectivity index of 166. Moreover, the interaction between A1-A4 and DNA was evaluated by viscosity measurements, and gel electrophoresis with plasmid pBR322. In the electrophoretic runs, the absence of changes in the DNA bands was observed in relation to the negative control and the trend of constant relative viscosity for the ct-DNA solutions in all complexes. Thus, an electrostatic interaction of the complexes with the DNA through the grooves is suggested.

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4. Advanced Therapeutics, 2019, DOI 10.1002/adtp.201900042.

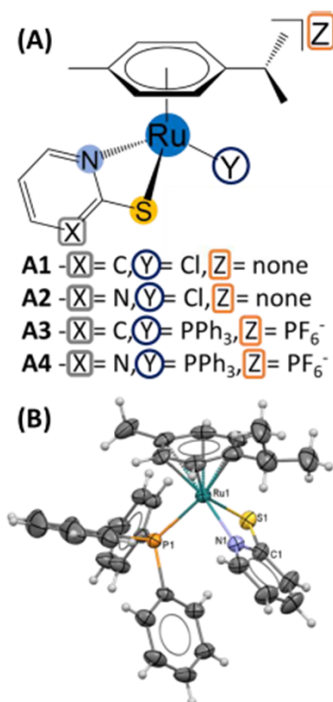


Figure 1. (A) General structure of the new half-sandwich Ru(II)/arene/ mercaptopyridines complexes (B) Crystal structure of A3.

Acknowledgement: Capes; CNPq (312505/2021-3); Fapesp (2020/14561-8, 2017/15850-0)

Aptasensing of beta-amyloid (A β (1-42)) by a 3D-printed platform integrated with leaf-shaped gold nanodendrites

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Menção Honrosa

In this study, beta-amyloid (A β (1-42)), an essential biomarker for diagnosing Alzheimer's disease (AD), was detected via an electrochemical aptasensing platform. Here, an innovative signal transducer was developed using a CO₂ laser-ablated 3D-printed electrode modified with leaf-shaped gold nanodendrites (LSG NDs, mean diameter: ~ 92 nm), which could provide an efficient interface for immobilizing aptamer strands. The modified electrode with LSG NDs exhibited an enhancement in its electrochemically active surface area about 7 times, compared with the bare electrode. This modification showed that the size, morphology, and distributions of LSG NDs in amplifying electrochemical signals might effectively provide a highly sensitive infrastructure for analyte detection. The strands of a thiol-functionalized aptamer sequence interacted with the gold surface, which created an optimized biointerface to detect A β (1-42) in a linear range from 0.1 pg mL⁻¹ to 10 ng mL⁻¹ (limit of detection (LOD): 83.7 fg mL⁻¹, (S/N = 3)). The developed aptasensor confirmed satisfactory stability, desired reproducibility and regeneration, and minimal impact of interfering agents. In addition, the application of this aptasensor was monitored via an assay of spiked analyte concentrations in 20 samples, including cerebrospinal fluid (CSF) and human serum.

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Uric acid oxidized promoted modification on serum albumin and it correlates with the worsening of the patient's health status admitted to intensive care unit

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Uric acid is considered the main low molecular weight antioxidant in human plasma. However, the increase in uric acid is associated with inflammatory disorders. Our group demonstrated that uric acid can be oxidized by the inflammatory enzyme myeloperoxidase to produce highly reactive intermediates, such as urate free radical and urate hydroperoxide. Urate free radical can trigger a free radical chain reaction whereas urate hydroperoxide is a thiol and amine oxidant. A decrease in the production of hypochlorous acid, an important microbicide, is also a consequence of the oxidation of uric acid by myeloperoxidase, resulting in an inability to contain bacterial growth. Here we show that modification of serum albumin by products from urate oxidation, which we called uratylation, is associated with poor outcomes in patients admitted to intensive care unit. In addition, we developed a mass spectrometry-based method to monitor the levels of uric acid, its uric acid oxidation products, such as hydroxyisourate and allantoin, and uratylated albumin. All these metabolites were evaluated in serum of patients who died or survived during their Intensive Care Unit (ICU) stay. A total of 207 patients admitted in ICU were included in the study. Of these, twenty-five serum have been analyzed so far. Sepsis was the cause of death in 46% patients. Our data showed that uric acid, hydroxyisourate, allantoin and uratylated peptides from albumin were significantly elevated in serum of patients who died. Additionally, there was a positive correlation between uric acid and its oxidation products. Moreover, uratylated peptides of serum albumin correlated with uric acid and SOFA score, Sequential Organ Failure Assessment (SOFA), which predicts death. In conclusion, our data demonstrated that uric acid oxidized promoted modification on albumin and it correlates with the SOFA score, showing the relationship with the worsening of the patient's health status and suggests that uratylated albumin is a potential biomarker that could predict death in infectious conditions. Additionally, these data shed light on the discovery of new therapeutic targets and clinical management in the ICU, such as treatment for lowering uric acid levels.

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Rho pathway: a fragile point in the GBM resistance to radio and chemotherapy

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Glioblastoma (GBM) is the most incident and malignant glial tumor, and its high resistance to usual therapies contributes to its poor prognosis. Molecular analyzes have identified a high frequency of mutations in Rho GTPase pathway and actin cytoskeleton organization genes that seem to contribute to the maintenance of glioma stem cell (GSC) properties and to the infiltration of adjacent brain tissue. The actin cytoskeleton of GBM also cooperates with its high invasive capacity and recent work from our group shows that Rho GTPases modulate DNA damage repair and sensitivity to therapies. To show that Rho GTPase pathway and the actin cytoskeleton has a role in therapeutic resistance and, therefore, is a potential target in the treatment of relapsed tumors and its relationship with the maintenance of the population of GSCs we used cultures of immortalized GBM cells, sensitive or resistant to ionizing radiation (IR) and temozolomide (TMZ) and GSCs in vitro or xenotransplanted in Zebrafish subjected to Rho inhibition or F-actin pharmacological disruption followed by genotoxic stress by IR and TMZ. DNA repair was evaluated by comet assay, γ H2AX foci formation, functional NHEJ repair assay and host cell- reactivation assay (HCR). The xenotransplanted cells in Zebrafish was analyzed by tumor development and survival and health of the animals, where they will finally be analyzed histologically for different stemness markers, from death, proliferation and signaling of DNA damage and repair after different treatments with radio and chemotherapy. Rho inhibition increases the sensitivity of gliomas to therapies by increasing DNA double-strand breaks (DSB) and delaying DNA repair of DSB and DNA methylation. IR and TMZ-resistant GBM cells show altered morphology and stress fiber formation: the inhibition of Rho or actin polymerization decreases cell viability reversing the resistance phenotype. Inhibition of Rho and F-actin promotes the decrease in the population of GSCs in spheroid cultures of resistant GBM through the induction of differentiation. Similar responses were observed in xenotransplanted cells in Zebrafish animals. Targeting Rho GTPase pathway components significantly diminishes GMB resistance to IR suggesting the potential value of these proteins as therapeutic targets.

Acknowledgement: Fapesp; Capes; CNPq

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Magnetic coatings and hydrogels for biomedical applications: fabrication, characterization and potential advancements

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This poster aims to present significant results obtained during the Alavarase's postdoctoral studies. Over the course of 3.5 years, the researcher developed biomaterials with the potential for various biomedical applications. The following highlights will be addressed: (I) Functionalized polymeric thin films with amino acids applied as coatings for biomaterials. In this study, crosslinked xanthan gum polymeric matrices were developed through esterification reaction with citric acid. The work demonstrates that the presence of hydrophilic amino acids, such as glutamic acid, promotes improved cell adhesion to the coating. (II) Functionalized hydrogels with anti-inflammatory peptide. In this study, xanthan gum-based hydrogels were chemically modified with an oligopeptide capable of regulating pro-inflammatory cytokines, resulting in the increase of biocompatibility. (III) Magnetic hydrogels. This study involved the construction of polymeric matrices containing magnetic nanoparticles (MNPs). Magnetic force microscopy (MFM) was utilized to track the MNPs by the magnetic domains formed on their surface. Hydrogels synthesized under the influence of an external magnetic field directed the MNPs along the surface, resulting in a distinct cellular response compared to hydrogels with randomly dispersed MNPs. (IV) 3D printing of magnetic hydrogels. In this work, polymeric hydrogels containing MNPs were fabricated using 3D printing technology. Rheological studies of the solution and solid matrix, as well as printer parameter adjustments, were conducted. Results demonstrate that under specific solution and printing conditions, the extrusion process can form oriented polymeric matrices, potentially leading to a different cellular response compared to hydrogels synthesized via lyophilization (manuscript in preparation).

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Development of a redox proteomics workflow to study cell surface proteins oxidized by urate hydroperoxide in endothelial cells

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INTRODUCTION. We have demonstrated that uric acid (UA) oxidation occurs at the early events of atherosclerosis and during the inflammatory oxidative burst, which could be associated with vascular damage. Oxidation of UA by peroxidases generates urate hydroperoxide (HOOU), an oxidant able to oxidize the protein disulfide isomerase-A1 and other thiol-proteins at the extracellular cell surface of endothelial cells, impairing cell adhesion. **OBJECTIVE.** The objective of this work is to perform a global study of extracellular cell surface redox proteomics to identify which proteins are oxidized by HOOU, interfering with vascular homeostasis. **MATERIAL AND METHODS.** The method was based on a thiol-reactive cell-impermeable biotin label, maleimide-PEO₂-biotin (MPB), and purification by affinity chromatography with monomeric avidin agarose beads. For proteomics analysis, proteins were denatured and doubly digested with peptide-N-glycosidase F (PNGase-F) and trypsin according to the FASP method (Filter-Assisted Sample Preparation), resulting in deglycosylated tryptic peptides. The peptides were analyzed by LC-MS/MS with further label-free quantification. **RESULTS.** We showed a tendency for increased oxidation in cell surface proteins and integrin beta1 by 400 μ M HOOU. Regarding proteomics, we initially tested a control sample and identified hundreds of cell surface proteins, as channels, receptors, enzymes, and cytoskeleton, which play a crucial role in several signaling pathways. Also, we observed modifications with MPB in some proteins, suggesting thiol switches. **CONCLUSIONS:** These partial results point to the oxidative effect of HOOU in cell surface proteins. Moreover, the method used proved efficient in studying extracellular redox state. These analyses will elucidate the role of thiol-protein redox modification in the interaction with extracellular matrix and vascular remodeling and help to comprehend the role of UA in vascular damage and cardiovascular diseases.

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Study of biodegradable hydrogels composed of cellulose acetate fibers for optical biosensors

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The synthesis of biodegradable hydrogels composed of cellulose acetate fibers for optical biosensors was conducted in this study. The hydrogels were formed by incorporating cellulose acetate fibers into a polymer network consisting of chitosan and gelatin. Additionally, silver nanoparticles were synthesized using a green methodology and integrated into the hydrogels. The morphology and optical response of the hydrogels were investigated using techniques such as Field-emission gun scanning electron microscopy (SEM-FEG), Transmission electron microscopy (TEM), and UV-visible spectroscopy. Numerical simulations employing the Finite Element Method (FEM) were also performed to understand the relationship between the optical response and the formation of nanoparticle clusters within the hydrogels. The cellulose acetate fibers played a vital role in providing structural integrity and stability to the hydrogel matrix. Furthermore, these fibers give unique properties such as a high surface area and good mechanical strength, making them advantageous for optical sensing applications. Preliminary results indicated that the inclusion of cellulose acetate fibers enhanced the optical response by facilitating the interaction between the sensing elements and target analytes. In conclusion, the synthesis of biodegradable hydrogels composed of cellulose acetate fibers holds significant potential for the development of advanced optical biosensors with improved performance and broader applicability.

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The lncRNA PVT1 operates in the transcriptional panel of Prostate Cancer through histone marks remodeling

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and Fabio N. de Mello^{1, 2}; Gabriel N. Fortes¹; Felipe Beckedorff⁴; Sergio Verjovski-Almeida^{1, 2}

Prostate cancer (PCa) is the second most diagnosed cancer and the lead cause of cancer-related death in men. The development of PCa is highly dependent on the androgen receptor (AR) transcription factor, which modulates the effect of androgenic hormones to regulate gene transcription in prostatic cells, promoting genes transcription activation or inhibition. Long non-coding RNAs (lncRNAs) are a class of nucleic acids composed of 200 or more nucleotides and not translated into proteins. A wide range of lncRNAs is associated with cancer development by altering cellular processes like proliferation, apoptosis, and induction of metastasis. Our group has previously reported that the lncRNA PVT1 is associated with AR in the LNCaP cells, and the PVT1 knockdown in androgen-stimulated cells caused expression alterations of hundreds of genes, suggesting PVT1 is involved in a genome-wide androgen-dependent transcriptional program. To further explore our data, we performed Cut&Run assays followed by sequencing and RNA-seq in androgen-stimulated LNCaP control and PVT1-knockdown cells to characterize the mechanisms leading to this transcriptional program. To promote PVT1 knockdown, we used the lentiviral CRISPR-Cas13 system, then the cells were treated for 48h with 10nM of R1881 androgen-analog or the corresponding vehicle (non-treated cells). Total RNA was used for RNA-seq library construction. In Cut&Run, 100,000 cells were applied to each assay to immunoprecipitate the histone modification marks H3K27ac, H3K4me3, H3K4me1, and H3K27me3. The protein-associated DNA was purified, and NGS libraries were constructed, followed by sequencing. Results showed that, in general, under androgen stimulation, the PVT1 knockdown promoted loss of enrichment of histone modification marks. In this context, loss of histone activation marks (H3K27ac, H3K4me3, and H3K4me1) particularly affected genes associated with the Rho GTPases signaling pathway, known by its oncogenic function with essential roles in cell migration and invasion in different types of cancers. RNA-seq results showed that the expression of 428 genes initially repressed by the presence of androgen was recovered after PVT1 knockdown. Moreover, intersecting the Cut&Run and RNA-seq results, we observed that

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among the 428 genes with expression recovered by PVT1 knockdown, 55 genes lost the histone mark of repression H3K27me₃. These genes are associated with tumor suppressor roles, corresponding to apoptosis-related and p53 signaling pathway genes. Our results evidence, for the first time, a mutual role of the androgen receptor and PVT1 in the oncogenic scenario of PCa, with PVT1 promoting the expression of oncogenes through the deposition of activation histone marks under androgen stimulation. Furthermore, we demonstrated that a set of tumor suppressor genes, whose expression is repressed by androgen stimulation, is upregulated after PVT1 knockdown by the loss of H3K27me₃. Taken together, we show that PVT1 is involved in a complex genome-wide androgen-dependent transcriptional program through histone marks remodeling.

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In vitro characterization of a fluorescent biosensor with specificity for organic peroxides

Mikaela P. Pinz¹

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Hydroperoxides are important mediators of the inflammatory response and can act as signaling molecules and/or cytotoxic mediators. Urate hydroperoxide (HOOU) is a product of the oxidation of uric acid by heme peroxidases, a key event in vascular inflammation. Lipid peroxides are also important mediators in inflammation. So far there are no selective probes capable of detecting cellular organic hydroperoxides. The biosensors based on fluorescent proteins such as GFP (green fluorescent protein) allow non-invasive and real-time monitoring of cellular oxidants production, supporting dynamic studies in a sensitive and specific way. The aim of this study was to characterize a new biosensor to monitor the production of cellular organic hydroperoxides in a more specific way. The recombinant biosensor was expressed in *E. coli* and purified for kinetic studies. Biosensor's oxidation by HOOU or H₂O₂ was followed by measuring the intrinsic fluorescence increase of the peroxidatic subunit. Pre-reduced protein was mixed with increasing concentrations of HOOU or H₂O₂ in a stopped-flow instrument. The second-order rate constants were 2.7×10^6 and 1.5×10^5 M⁻¹s⁻¹ for HOOU and H₂O₂, respectively. Human kidney embryonic cells (HEK293T) were successfully transfected with the reporter plasmid encoding the biosensor using Lipofectamine 2000 and cells were observed in the FLoid™ Cell Imaging Station. The next steps will be to monitor the probe behavior upon addition of these oxidants on HEK293T cells. Then, cultured inflammatory cells will be transfected to monitor the production of endogenous organic peroxides. These preliminary results arise optimism about the potential application of the biosensor to detect the formation of organic peroxides at intracellular level.

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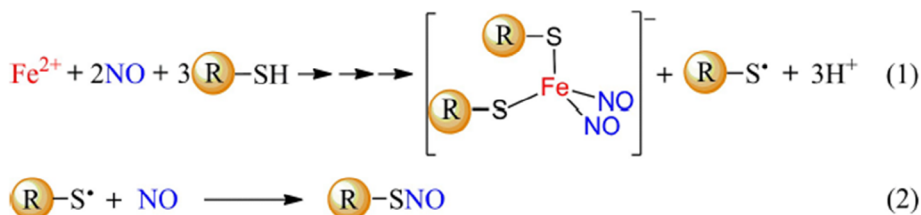
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Dinitrosyl Iron Complexes (DNICs) reactivity study

Nathália F. B. Azeredo¹

and Helena B. Augusto; Daniela R. Truzzi

Nitric oxide (NO) is a signaling molecule involved in numerous physiological and pathological processes. Among its abilities is to efficiently sequester cellular iron (reaction 1), forming dinitrosyl iron complexes (DNICs), and reducing oxidative stress from Fenton's chemistry. This process may play an important role in several pathologies associated with redox stress, such as neurodegenerative diseases and cancer. DNICs are rapidly formed in cells exposed to NO and are considered the most abundant NO metabolites in the intracellular environment. However, there is little information about the chemical and biological properties of DNICs.



Since the DNICs are formed in situations of redox stress, we intend to study the reactivity of DNICs against oxidants such as hydrogen peroxide and potassium ferricyanide. The study of the reactivity of these complexes can lead to the understanding of the mechanisms that regulate the storage and transport of NO in the form of DNIC, in addition to providing information about the biological conditions in which DNICs can promote S-nitrosation reactions.

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Interactions between albumin and new iron chelators

Tatiana A. Pereira¹

and Breno P. Espósito

Introduction. Interactions with plasma proteins are relevant in drug development. Deferoxamine (DFO) use for treatment of iron overload is limited by its poor cellular absorption. This work aims to evaluate the interaction of bovine albumin (BSA) with new DFO derivatives, as well as SIH (Q) (Fig. 1), which present low toxicity and good potential antiviral activity against SARS-CoV-2.

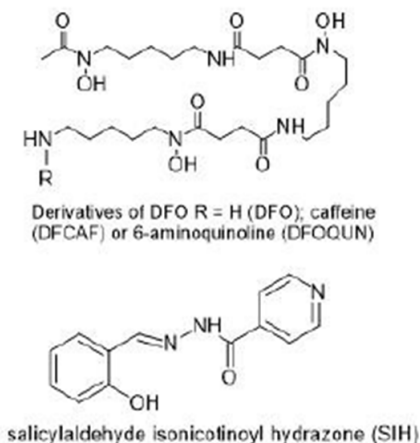


Fig 1. Chelators under study.

Methods. Q-BSA interaction was evaluated by measuring the relative fluorescence of BSA in the presence (F) or absence (F₀) Q6. Results. F₀/F vs [Q] is nonlinear for DFO and its derivatives, but all iron complexes of Q completely suppressed F₀ (data not shown). SIH interacts with BSA (Table 1) through dynamic mechanism ($K_{SV} \propto T$), determined by hydrophobic interactions ($\Delta H > 0$ and $\Delta S > 0$), with $n \sim 1$. Analysis of variance showed that BSA F₀ suppression by 17.6 μ M DFOQUN was $\sim 20\%$ ($P < 0.01$). DFOQUN fluoresces at ~ 350 nm, according to the polarity of the solvent, but it is quenched by iron complexation (Fig. 2). **Conclusion.** Chelators under study may be good candidates for therapeutics, given their low toxicity plus higher lipophilicity compared to DFO. BSA-[FeQ] interaction

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would not be but excess of protein-bound FeQ could impair the excretion of mobilized iron. Also, some BSA functions could be affected, such as transport of biomolecules and oncotic pressure regulation⁷. DFOQUN native fluorescence may be a complicating factor in BSA interaction analysis, but it might be an interesting probe for labile iron in plasma.

Table 1. *SIH-BSA Stern-Volmer calculated parameters.*

T (°C)	K _{SV} (x10 ⁻³)	ΔH (kJ mol ⁻¹)	ΔS (J mol ⁻¹)	ΔG (kJ mol ⁻¹)
25	11	4.5	2.8	7.8
30	18			5.3
37	20			5.1

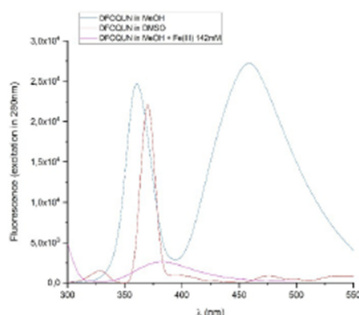


Fig 2. Fluorescence emission of DFOQUN and [FeDFOQUN] ($\lambda_{exc} = 280 \text{ nm}$).

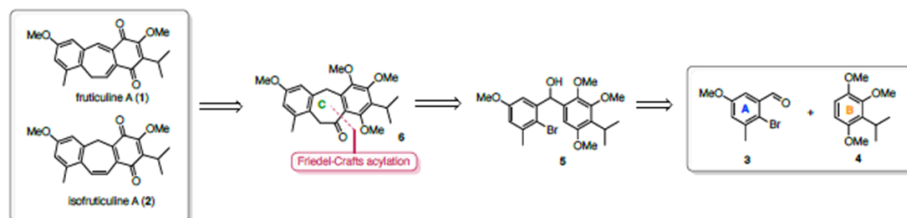
Acknowledgement: Fapesp; CNPq

Continuing the anticancer exploration: studies towards total synthesis of fruticuline A and isofruticuline A, icetexane-type diterpenes

Cristhian S. Oliveira¹

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Icetexanes, diterpene compounds found in terrestrial plants, have a tricyclic [C6–C7–C6] structure with variable functional groups. Fruticuline A (1) and isofruticuline A (2). These compounds exhibit significant anticancer activity *in vitro*, demonstrating potent cytotoxicity against human tumor cells ($GI_{50} < 7.4 \mu\text{mol L}^{-1}$) while showing low toxicity to non-tumor cells. *In vivo* studies have confirmed the antitumor effects of compound 1, including the reduction of Ehrlich tumor size and induction of apoptosis and necroptosis. Additionally, 1 displays a range of pharmacological activities, including bacteriostatic, anti-inflammatory, analgesic, anti-hyperalgesic, anti-arthritic, antinociceptive, and antidepressant effects. The total synthesis of these icetexanes is a logical approach, aiming to meet the demand for these compounds in comprehensive pharmacological studies, particularly for exploring their anticancer potential. The synthetic strategy involves the individual preparation of rings A and B, followed by their coupling through nucleophilic addition (Scheme 1).

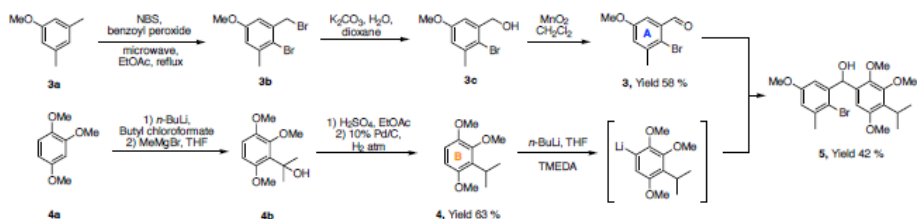


Scheme 1. Synthetic strategy to obtain rings A and B

In the synthesis, bromobenzaldehyde (3, ring A) was obtained from dimethylanisole (3a) through NBS bromination, yielding the dibrominated compound (3b). Hydration of 3b produced the corresponding alcohol (3c), which was then oxidized to aldehyde 3 with an overall yield of 58% in three steps. For the synthesis of the C ring, 1,2,4-trimethoxybenzene (4a) was reacted with *n*-BuLi and butyl chloroformate, resulting in a tertiary alcohol (4b) through nucleophilic addition with MeMgBr. Dehydration of 4b, followed by a two-step hydrogenation process, afforded the aromatic compound 4 with an overall yield of 63%. After the synthesis

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of compound 3, different experimental conditions were tested for the coupling reaction with the lithium anion of compound 4. Various solvents, reaction temperatures, and TMEDA, were evaluated. Ultimately, by using 2 equiv. of 4, along with TMEDA and THF as the solvent under reflux conditions, compound 5 was successfully prepared with a yield of 42% (Scheme 2).



Scheme 2. Synthesis of compound 5

After extensive efforts, the crucial coupling reaction between 3 and 4 was successfully achieved. Currently, the conversion of compound 5 to tricycle 6 is being examined, which involves the evaluation of a Friedel–Crafts acylation reaction to construct the icetexane skeleton.

The potential of Human Hsp70-Escort Protein 1 (hHep1) to interact with cell membranes

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Human Hsp70-escort protein 1 (hHep1) is a co-chaperone that assists the biogenesis and stability of mitochondrial HSPA9. Like HSPA9, hHep1 is also located outside the mitochondria and is able to interact with liposomes. In this study we investigated the structural and thermodynamic behavior of the interaction between hHep1 and negatively charged liposomes as well as the interaction with cellular membranes. Our results showed that hHep1 interacts superficially with liposomes formed by phosphatidylserine and cardiolipin and remains partially structured, having similar affinities for both of them. Interestingly, the association of HSPA9 with hHep1 enhanced the incorporation of both proteins into the lipid bilayer. Recombinant hHep1 was also incorporated by cells in a dose dependent manner indicating that this incorporation happens via hHep1 interaction with cell membranes. Live images also showed hHep1 accumulating around the cell membrane. These results demonstrate that hHep1 is able to interact with lipids in membranes which may reveal a new role of this co-chaperone outside mitochondria.

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Development of an analytical device for newborn screening using dried matrix spot and paper spray mass spectrometry

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Newborn screening is considered one of the most significant advances in preventive medicine and one of the most extensive public health campaigns. The early diagnosis of diseases can reduce or eliminate irreversible sequels. A group of illnesses analyzed in newborn screening is the aminoacidopathies, such as phenylketonuria, leucinosi, and tyrosinemia type II. Dried plasma spot (DPS) is a simple, easy-to-use sampling method that eliminates hematocrit interference. However, chromatographic techniques with mass spectrometry detection are frequently employed, but they need several steps, are time-consuming, and use large amounts of solvents. In this way, we proposed to use paper spray mass spectrometry (PS-MS) as a tool to integrate the advantages of the paper platform (3D- μ PAD), such as low cost, easy availability, flexibility, hydrophilicity, light weight, biocompatibility, and power-free fluid transport with the reliability of mass spectrometric. The proposed 3D- μ PAD device fabricated using lamination, paper, toner, and plasma separation membrane was employed to sample blood, separate the red cells to form DPS and store the plasma sample for analysis. The 3D- μ PAD device reproducibility and homogeneity were tested using fingertip blood and showed that it could be used for blood microsampling. After sampling, the detection layer was analyzed using PS-MS. An aliquot of p-dimethylaminobenzaldehyde solution in MeOH:H₂O:formic acid was added to the DPS to extract the analyte and generate the spray to promote the determination via reactive PS-MS. Analytical curves were constructed using multiple reaction monitoring in a triple quadrupole mass spectrometer from 2.5 to 100 mg L⁻¹ for valine, leucine, isoleucine, phenylalanine, and tyrosine. Our method produced detection limits between 0.57 and 0.95 mg L⁻¹ and limits of quantification between 1.47 and 1.91 mg L⁻¹. The 3D- μ PAD was successfully integrated with mass spectrometry analysis using reactive PS, and the proposed method can determine amino acids with no sample preparation in plasma samples for aminoacidopathy screening.

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HSPA5-HEP1 interaction: mechanistic, structural and functional insights

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HSPA5 (BiP/Grp78) is a molecular chaperone member of the Heat Shock Protein 70 kDa (HSP70) family. The HSPA5 is constituted by the Substrate Binding Domain (SBD) connected to the Nucleotide Binding Domain (NBD), which together regulate the different structural conformations of the chaperone, as well as its functional cycle, due to their interaction with ATP and ADP nucleotides and their co-chaperone partners. Because it plays an essential role in protein homeostasis, HSPA5 has been studied as well in different pathologies, including cancer, neurodegenerative diseases and, more recently, Covid-19. Although it is mostly described as a resident of the endoplasmic reticulum, the presence of HSPA5 in cell subcompartments such as mitochondria, nucleoplasm and cytoplasm are reported. Here, combining cellular assays and biochemical methods, we report for the first time the ability of HSPA5 to interact with a mitochondrial co-chaperone known as HEP1 (HSP70 escort protein 1), thus demystifying the idea that HEP1 is an exclusive co-chaperone of mitochondrial HSP70 (HSPA9/mortalin). Our in vitro data suggest a HEP1-HSPA5 interaction thermodynamically favored by entropy and enthalpy, and our in silico data demonstrate that the interaction site directly involves either the HSPA5 NBD (HSPA5-N) and the hydrophobic core of the co-chaperone. Surprisingly, HEP1 did not alter the HSPA5 ATPase activity, however it prevented the propensity to auto-aggregation of HSPA5-N and retarding such a process. Finally, using biotin-dependent proximity identification (BioID) by cellular approaches, we now find that HEP1 is also capable of interacting with other proteins moreover to HSP70s and studies are underway to explore the functional implications of these interactions.

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Multi-platform metabolomics approach driving considerations of pathways affecting SARS-CoV-2 symptoms severity

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Concerns about the SARS-CoV-2 outbreak (COVID-19) persist three years later, with the emergence of new variants and the disease severity risk. A wide variety of common clinical symptoms, like cough, fever, and respiratory symptoms, characterize the non-critical patients, who are classified from mild to moderate. In a more severe and complex scenario, the virus infection can affect vital organs, resulting, for instance, in pneumonia and impaired kidney and heart function. However, it is well known that sub-clinical symptoms at a metabolic level can be observed previously but require a proper diagnosis because viral replication on the host leaves a track that has a different profile depending on the severity of the illness. Metabolomic profiles of mild, moderate, and severe COVID-19 patients were obtained by more than one platform (LC-HRMS and MALDI-MS), increasing the chance to elucidate a prognosis for severity risk. A strong link was discovered between phenylalanine metabolism and an increase in COVID-19 severity symptoms, a pathway linked to cardiac and neurological consequences. Glycerophospholipids and sphingolipid metabolisms were also dysregulated linearly with the increasing symptom severity, which can be related to virus proliferation, immune system avoidance, and apoptosis escaping. Our data, endorsed by other literature, strengthens the notion that these pathways might play a key role in a patient's prognosis.

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Studies to increase robustness, versatility and efficacy for the determination of alanine, carnosine, catecholamines, caffeine and their metabolites in blood and muscle by LC-MS/MS

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Individuals who practice physical activity often choose to use nutritional supplements searching for better performance, recovery or muscle gain. Several studies discuss caffeine and β -alanine as options for better performance in different types of exercise. However, the variability in the results obtained raised the question that supplementation may not be effective for all individuals, justifying the need for studies that can demonstrate which are the determining factors that lead to positive effect of this supplementation. The quantification of these substances, their metabolites and catecholamines in different biological samples is fundamental step for the evaluation of the response of each individual, while challenging from an analytical point of view. The development of a fast, efficient, robust and versatile analytical method to overcome this challenge contributes to technological advances with potential application to various purposes such as diagnosis of diseases and intoxications, therapeutic monitoring, monitoring of the progression of endocrine, psychiatric or neurodegenerative disorders, nutritional assessment and in the food supplement industry. The aim of this work is to assist a FAPESP Young Researcher project to achieve its objectives, through the development and validation of a quantitative method that is easy to perform and high productivity for the nine substances of interest: β -alanine, carnosine, norepinephrine, epinephrine, dopamine, caffeine, theobromine and paraxanthine. Blood and muscle samples will be analyzed by liquid chromatography–tandem mass spectrometry, through analytical innovations which aim at the previously mentioned methodological qualities.

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AGRICULTURA E PECUÁRIA

***In vitro* screening of plants with secondary compounds for decreasing total gas and methane production from ruminants**

Flávia de O. S. van Cleef¹

and Adibe L. Abdalla¹

Prêmio Pós-Doc USP

The objective of this study was to determine the effect of the inclusion of polyethylene glycol (PEG) on the *in vitro* gas and methane (CH₄) production of tannin-rich substrates added as sole source or in binary mixtures (50:50) with Tifton-85 (*Cynodon* spp.) hay as potential additives to feed ruminants. Substrates were *A. pintoi*, *C. pyramidallis*, *C. heliotropiifolius*, *C. sonderianus*, *M. caesalpiniiifolia*, *Z. joazeiro*, *M. hostilis*, *G. sepium*, *M. oleifera*, *L. leucocephala*, *M. axillare*, *T. diversifolia*, and a *S. lorenzii* extract. Samples were dried at 39°C for 72 hours in an air-forced oven and ground through a 1 mm sieve. Three *in vitro* incubation runs were conducted (weeks), by weighing 1 g of substrate into Ankom F57 bags and incubating them into 160mL-serum bottles (25 mL of ruminal fluid and 50 mL of artificial saliva solution). Bottles were sealed with rubber stoppers and placed in an air-forced circulation oven at 39°C for 24 hours. Pressure (in psi) was taken at 0, 2, 4, 8, 12 and 24 hours after closing bottles. Subsamples of gas were collected at 4, 12 and 24 hours. Data were analyzed in a randomized block design in a factorial arrangement using the SAS Proc GLIMMIX. Substrate, PEG inclusion and hay inclusion and their interactions were the fixed effects, while incubation run the random effect. Means were compared by Tukey's test at 5% significance. There were interactions observed for plant with hay mixture ($P < 0.0001$) and plant and addition of PEG ($P = 0.0003$) on total gas produced and net production of CH₄ ($P = 0.0301$). When *C. sonderianus* and *Z. joazeiro* were mixed with hay the gas production was decreased in 23.6% and 30.3%, respectively. Conversely, *G. sepium* and *M. oleifera* increased gas production in 18.8% and 18.3%, respectively. *G. sepium*, extract of *S. lorenzii* and *C. sonderianus* when mixed with hay and in the presence of PEG showed the greatest net production of CH₄ in relation to the net amount of total gas produced (23.1; 22.6; 21.5 mL/100 mL, respectively). However, *G. sepium* mixed with hay showed the least net CH₄ production (3.1 mL/100 mL). Therefore, the increment in gas and in CH₄ illustrated the role of PEG in precipitating tannins, enhancing the use efficiency of substrates by ruminal microorganisms.

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Maternal-descent occurrence of antibiotic-resistant bacteria at postpartum and weaning in Santa Inês ewe

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Antimicrobial resistance is an alarming problem in animals of zootechnical interest. Information in ewe farming is scarce, with insufficient reports on the increase in antimicrobial resistance and maternal–descendant occurrence. Thus, it is necessary to understand the dissemination of the mechanisms of resistant bacteria in ewe farming. Resistance to antibacterial drugs has become a worldwide problem for both human and animal health, influenced by both human and non–human usage of antibiotics, and further enhanced by transmission through increasing international movement of people, animals and food. Thus, we aimed to estimate the occurrence of antimicrobial resistance of *Escherichia coli* and *Enterococcus* spp from the progenitory and their descendents in postpartum and weaning. For this purpose, 26 pregnant ewes with 40 ± 2.0 kg body weight and 3.5 ± 0.3 body condition score were used. At postpartum and at weaning, blood and fecal samples were collected from the ewes and lambs. Complete blood count and antibiotic sensitivity test for penicillin, tetracycline, enrofloxacin, ampicillin, streptomycin, erythromycin and ceftiofur were performed on the bacteria, *Escherichia coli* and *Enterococcus* spp as Gram negative and Gram positive bacteria, respectively. The results showed that in the postpartum and weaning period, both ewe and lamb had non–resistant antibiotics to *Enterococcus* spp and *Escherichia coli* bacteria showing that there are still efficient mechanisms to attack bacteria, except for erythromycin and penicillin, which showed levels above 60% of resistance, with phases with up to 100% resistant. It is concluded that there is a maternal–descent occurrence of *Enterococcus* spp and *Escherichia coli* bacteria in the postpartum and weaning periods. Ceftiofur, tetracycline, streptomycin, ampicillin, and enrofloxacin did not show alarming percentages of resistance, but erythromycin and penicillin showed high resistance. Emphasizing that this result is specific to this herd, further studies are recommended to confirm a generalized resistance of erythromycin and penicillin in the sheep farm.

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2. Faculdade de Americana – SP.

Database with the production of small ruminants in Brazil and the emission of enteric methane

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The recent transformations in agriculture and livestock regarding the commitment to public policies for the preservation of the environment, establish a new territorial dynamic for the application of sustainable production practices. The aim of this study was to characterize the production systems of small ruminants and the impacts of practices on rural development, in a multidisciplinary perspective, in the context of the Sertão Alagoano and its possibilities of contributions in the minimization of negative anthropic effects to the environment, from the investments farmers from rural communities in the feeding management of small ruminants. Forms were applied on family farms and 299 samples of food used in animal nutrition were collected to determine bromatological components such as crude protein, ether extract, neutral detergent fiber and lignin. These parameters will be used to investigate the eating habits of the animals and determine diets for an *in vivo* study, to verify the emission of GHG, with a view to the productive viability and improvement of the economy of the traditional communities of the territory. About 14,749 observations and 192 variables make up the multidisciplinary database. The preliminary results of this research were obtained through inferential statistics and direct counting. About 230 individuals were interviewed, 73.04% of them living in rural and 26.95% in urban areas. Rural properties are predominantly family activity, distributed in 79 communities. About 80% of livestock production is sheep, goats and cattle, for commercial or subsistence purposes. We found that cactos per forage and native pasture are the main sources of forage in animal feed, with emphasis on the production of dairy cattle and goats, and sheep for meat. Also, the supply of corn, soybean meal and wheat meal is common. We observed that 23% of interviewed farms used forage conservation (e.g., silage), for use in times of shortage of rain. This work contributed to studies on rural demography, based on research on the territory to highlight aspects that distinguish it in the economic, social and political context of Alagoas. Finally, the animal production system is based on several combinations of ruminant production, with similar animal feeding management in the Caatinga territory of Sertão Alagoano.

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1. Centro de Energia Nuclear na Agricultura da USP.

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Will energy cane be the solution for the energy transition? An insight into its utilization, sustainable potential, and nutritional challenges

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Energy cane is a promising alternative in the energy transition, being the best biomass option to meet the demand for renewable energies. Despite the lack of information regarding fertilization, its cultivation can reduce greenhouse gas emissions (GHG), enhance the sustainability of the sugarcane industry in São Paulo, and diversify Brazil's energy matrix, both in electricity cogeneration and 2G ethanol production, maximizing its biomass production and energy potential. The sustainable production of ethanol from energy cane biomass aligns with the United Nations' Sustainable Development Goals (SDGs), specifically SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action), by providing a renewable energy source, reducing GHG, and contributing to climate change mitigation. In a previous field experiment, during three years of cultivation, we used two varieties of energy cane (Vertix II and III) to study the influence of potassium fertilization on biomass production. The dose of 120 kg ha⁻¹ of K₂O increased all analyzed biometric variables, resulting in an increase in stem and biomass yield. Our hypothesis is that the quantity of NPK required for maximum energy cane yield is essential to meet the growing demand for biofuels and renewable energy. The objective of this study is to investigate the development of energy cane under field conditions, identify its nutritional needs to achieve high yields, and develop a first version of a fertilization manual for the crop in the state of São Paulo, maximizing raw material yield for clean energy generation.

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1. Centro de Energia Nuclear na Agricultura da USP.

2. Embrapa.

3. Escola Superior de Agricultura Luiz de Queiroz da USP.

4. Nuseed S.A.

Adapting to a thirsty world: understanding the effects of drought on the rhizosphere microbiome to enhance productivity in warmer climates

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Rising global temperatures and declining water availability due to climate change pose consequential threats to food security. Understanding the complex interplay of the rhizosphere microbiome offers a strategic solution for increasing agricultural productivity. Here, we assessed the response of four distinct cultivars of common bean (*Phaseolus vulgaris* L.) to drought conditions, considering drought-tolerant (TL) and susceptible (SC) genotypes. The central hypothesis is that the distinctive rhizosphere microbiomes within TL and SC genotypes could be key to their respective drought responses and resilience. We conducted an experiment where the four cultivars were subjected to 96-hour drought stress (<40% water field capacity) and subsequently rehydrated. Metagenomic sequencing and metagenome-assembled genomes (MAGs) revealed a similar composition of the rhizosphere microbial community across genotypes prior to water stress conditions. Following 96 hours of induced drought, notable changes were observed: the rhizosphere microbiome of SC plants remained unchanged, while the microbiome of TL plants demonstrated the recruitment of specific microorganisms. Out of 513 high-quality genomes, only four species from the Alphaproteobacteria, Thermoleophilia, and Actinomycetia phyla (*Mycobacterium*; *Pararhizobium_B*; BOG-931; Palsa-465) showed to be exclusive TL stress-resistant species. Functional analysis of these MAGs suggested these species utilize diverse survival strategies, ranging from osmolyte synthesis, employing two-component systems for environmental sensing and response, maintaining DNA integrity, managing oxidative stress via antioxidant systems, and maintaining cellular equilibrium with antiporters. Enhanced mutualistic interactions between bacteria and the rhizosphere may help improve plant genotypes, and isolating these bacteria for use as inoculants could alleviate drought stress. Our study describes the impact of abiotic stress on plant survival and underscores the crucial role of the rhizosphere microbiome in facilitating plant stress tolerance. These insights pave the way towards potential strategies to bolster food production in a world increasingly challenged by climate change.

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Can water and nutritional management of energy-cane crops reduce greenhouse gas emissions and improve energy sustainability?

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The world is fostering for clean and renewable sources to supply energy and reduce dependence on fossil fuels and greenhouse gas emissions. Sugarcane has become an important raw material as a solution to this demand since it is grown in over 100 countries. The 20 largest world producers reached 1.75 billion tons per year of cane raw material with an average yield of 73 t ha⁻¹. The energy cogeneration of by-products, such as bagasse and straw burning, and the production of 1G ethanol from sugarcane juice, is self-sufficient for the Brazilian sugar-energy sector, besides allowing the sale of the surplus of bioelectricity to the conventional energy system. Recently, energy cane crop, a new varietal type, with high fiber content, medium sugar content, greater productivity, and stump longevity, has aroused the interest of the sector. However, due to the high contrast in relation to the traditional varieties of sugarcane, it is essential to investigate the agronomic management of the energy cane crop, especially the nutritional and water management, which represents a disruptive opportunity to increase bioenergy raw material yield and the sustainability of the sugar-energy sector. Promising results have been found for both sugarcane and energy cane varieties, when water management is adopted to supply the plant requirement, resulting in sustainable land use as pressure for sugarcane production lands is reduced. Such bioenergy management can lead to energy production of more than 160 MWh ha⁻¹. Expectations of improvements in nutritional and water management in energy cane crops could bring up yield increments, in bioenergy raw material, of up to four times when compared to the current yield.

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1. Centro de Energia Nuclear na Agricultura da USP.

2. Nuseed®.

3. Escola Superior de Agricultura Luiz de Queiroz da USP.

Dynamic multi-body simulation of agricultural robotic systems with variable terrains in coppeliasim

John F. A. Diaz¹

and Marcelo Becker²

The Brazilian economy is based on the agricultural sector, which generates 27.4% of GDP (Gross Domestic Product) in 2021, according to CEPEA (Center for Advanced Studies in Applied Economics) of ESALQ/USP. Brazil is the world leader in several agricultural products such as the production of oranges and orange juice, supplying 79% of the world's orange juice (CitrusBR, 2022), first in the production of coffee, soy, sugar cane (FAO, 2021) and is responsible for feeding 10% of the world's population according to data from Conti and Aragon (2021). the agricultural sector also makes a very significant contribution to the energy matrix, it is made up of 45% of energy produced by renewable sources and sugarcane contributes 30% (Embrapa 2021) with the production of fuel alcohol for the growing fleet of cars in the country Brazil and with oil costs and the possible change in the use of gasoline being a very important sector and its strengthening is a priority. On the other hand, FAO (2015) projects an increase in population and an increase in demand for food, which must be produced using the same resources: the same cultivable area and limited resources such as water and fertilizers. The presented makes it very important to modernize the agroindustry and propose systems that aim to improve agricultural production with the inclusion of robotic technologies, IoT, Smart Farming etc. therefore lower technology costs. In the area of mobile robotics, there are now several simulation software that allow validating the performance of robotic systems, among which stand out Gazebo, Webots, V-Rep, among others (Shamshiri et al, 2018). and costs This project aims to apply the CoppeliaSim simulation platform (formerly V-REP) in the testing phase of agricultural robotic systems developed at LabRob at EESC – USP, specifically the robot R2A and Mirã II, and comparing it with the commercial robot TerraSentia®.

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The role of micrnas-regulated genetic pathways in plant root and shoot architecture

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Plant architecture (PA) is defined as the three-dimensional organization of the plant body. While the Root Apical Meristem will form the root system (RS), the Shoot Apical Meristem will form the shoot architecture (SA). Exogenous and endogenous factors influence PA, including transcription factors (TFs), phytohormones, and microRNAs (miRNA). Unraveling the networks of molecular mechanisms underlying the establishment of PA is a central aspect in plant breeding. Here, we initially reviewed the interplay between miRNAs, TFs and phytohormones that control RS, and then, we explored the effect of the miRNA156 (miR156)-targeted SQUAMOSA PROMOTER BINDING PROTEIN-LIKE (SBPs) family of TFs on SA. The miR156/9, miR160/4/5/6/7/9, miR171, miR390/3, and miR396 by regulating their targets and interacting with Auxin, Cytokinin, Brassinosteroids, GA, and ABA regulate primary, lateral, and adventitious root. This data shows an interplay between miRNA regulatory hubs and phytohormones to shape the RS. Regarding the SA, we combined genetic and molecular tools to demonstrate that the miR156-regulated SlSBP15 modulates tomato SA by connecting phytohormones with SA-associated genes to regulate both axillary bud development and outgrowth. MiR156-overexpressing plants (156-OE) displayed high SA, this phenotype depends on LATERAL SUPPRESSOR and PROCERA genes. Phylogenetic analysis of the SBP-box domain shows that SlSBP15 clusters with known SA-associated genes. Plants overexpressing a miR156-resistant SlSBP15 allele display arrested SA and its activation depends on auxin transport inhibition. Transcriptomics analyses from ABs revealed differentially expressed GA-, auxin-, and abscisic acid ABA-associated genes. Hormonal measurements revealed that IAA and ABA concentrations were lower in 156-OE and higher in rSBP15 ABs. SlSBP15 regulates AB by inhibiting auxin transport and GOBLET activity, and by interacting with BRANCHED1b to control ABA levels. Our data provide a new mechanism by which the miR156/SBP15 hub regulates SB, and suggest that modulating SlSBP15 activity might have potential applications in shaping tomato SA.

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3. Universidade Federal de Viçosa.

4. Instituto de Biociências da USP.

Influence of plastic cover on the dynamics of airborne *Aculeastrum americanum* urediniospores in a field of raspberry plants

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and Gabriel W. C. Leite¹; Yasmin V. da Silva¹; Lilian Amorim¹

Brazilian raspberry producers have adhered to the use of plastic covers at the orchards, which minimize climate variations, mitigate the effects of radiation and excessive temperatures on the fruits, leading to higher yield and extended shelf life. However, the occurrence of late rust caused by *Aculeastrum americanum* challenges growers and limits the fruits production. The reproductive structures (urediniospores) of this fungus are easily dispersed by the wind, contributing to the evolution of epidemics in the field. The aim of this study was to evaluate the influence of plastic covering on the temporal dynamics of airborne *A. americanum* urediniospores. The experiment was installed in a commercial orchard located in the municipality of Piracicaba, Brazil, on raspberry cv. Heritage plots with and without plastic cover. Airborne urediniospores were monitored during two crop cycles, between January and July 2022 and between January and June 2023. Three passive impactor spore traps, with glass slides covered by double-sided self-adhesive tape, were installed in the plots with plastic cover and another three were installed in plots without plastic cover. The total number of urediniospores, single and as clusters, captured by the traps as well as those germinated on the slides were quantified weekly under a light microscope. The incidence of symptomatic plants and the disease severity in the leaves were also recorded along the urediniospores monitoring period. The presence of airborne urediniospores in the traps was detected in the same period that the disease occurred in the field. The highest daily average of captured *A. americanum* urediniospores was observed in the uncovered plots, where disease severity was also higher. Most captured spores were organized as clusters. Germinated urediniospores were only observed on slides from the uncovered plot. The results suggested that plastic covering reduce the dispersal of *A. americanum* and reduces the period of wetness, which is essential for the germination of urediniospores.

1. Escola Superior de Agricultura Luiz de Queiroz da USP.

Unveiling the contribution of bee pollinators to Brazilian crops with implications for bee management

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The need for basic information on tropical crop pollinators remains a key priority. Here, we used a dataset on Brazilian bee–crop interactions to determine important bee species for crop pollination and discuss their management in Brazilian croplands. We developed an analytical approach to select key bee species and genera from datasets based on different criteria, selecting only interactions reported as effective pollination events. Data on pollination included 261 records of unique crop–pollinator interaction, 144 bee species, and 23 crops. Despite the importance of social species, solitary bees accounted for 56% of the observed interactions. Of the 14 most important species, eight are solitary and six are social. A few of the selected species are already reared in Brazil (e.g., honeybees and some stingless bees), but practical knowledge on their management for crop pollination is poorly disseminated among farmers, hindering such an application.

1. Escola Superior de Agricultura Luiz de Queiroz da USP.

2. Instituto Tecnológico Vale.

3. Embrapa.

4. Escola Politécnica da USP.

5. Instituto de Biociências da USP.

Using the CROPGRO Perennial Forage Model to simulate asymbiotic nitrogen fixation effect on *Brachiaria* growth

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Carlos G. S. Pedreira¹

There is increased global demand to reduce fossil fuel use and to create a more sustainable intensification of animal production systems. Given this, studies using alternative sources of chemical nitrogen fertilizers have been carried out and have been shown to increase forage production. However, the environment in which plants thrive is dynamic and complex due to the nature of soil–plant–atmosphere interactions. Mathematical modeling can evaluate and explain these dynamic aspects. Our objective was adapting the CROPGRO–Perennial Forage Model (PFM) to simulate brachiariagrass (*Brachiaria* hybrid ‘BRS RB331’ Ipyporã) growth under several N supply methods: no N (Control), N–fertilizer (N), *Azospirillum brasilense* (Az), and Nitrogen + *A. brasilense* (N+Az). The experimental period was from November 2014 to March 2017 in Sinop, MT, Brazil. The Ipyporã brachiariagrass parameterization was based on values found in literature. The calibrations were carried out by modifying the parameters’ values that affect the photoperiod, leaf and root senescence, sensitivity to dormancy, respiration, and maximum activity for BNF on growth, development, dry matter accumulation, and partition from Marandu palisadegrass and Alfalfa (*Medicago sativa* L.) parameters. Dormancy effects were minimized, the leaf partition was increased, and the stem partition was decreased. After modifying the model parameters, the accumulation of aboveground living biomass was better simulated (3771 kg DM ha^{−1}), with RMSE of 598 kg DM ha^{−1}, and d–stat of 0.7. Our results prove that we can efficiently simulate the Ipyporã brachiariagrass growth and integrate the physiological aspects of asymbiotic biological nitrogen fixation in the CROPGRO–PFM.

1. Escola Superior de Agricultura Luiz de Queiroz da USP.

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Early-stage metabolic perturbation caused by water deficit in the interaction of soybean and the causal agent of soybean rust, *Phakopsora pachyrhizi*

Fernanda R. Castro-Moretti¹

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Brazil is the world's greatest soybean producer, making soybean one of the primary commodities for the Brazilian market. Soybean rust, caused by *Phakopsora pachyrhizi*, is one of the most important diseases of soybean, causing losses of up to 80%. In combination with water deficit, infection by *P. pachyrhizi* adds to productivity loss. Few studies investigated the metabolic changes regarding the combination of rust infection and water deficit in soybean. Leaves were collected 12 hours after inoculation for analyses of primary and secondary metabolites using liquid chromatography coupled to mass spectrometry (LC-MS). Spectral databases were used to identify the transitions. Untargeted metabolomics resulted in over 5,000 transitions, of which more than 400 were annotated. It was possible to relate several transitions with greater relative abundance in the inoculated treatments compared to the controls. Among the annotated molecules, dihydrophaseic acid and daidzein were found in greater relative abundance in inoculated treatments with water limitation and without limitation, respectively. These results can give information related to the increased susceptibility caused by drought stress, which in turn can provide tools to improve soybean rust management.

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New approach to determine nitrogen requirement on brazilian sugarcane fiels

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Menção Honrosa

Nitrogen (N) is one of the most widely used fertilizers in crops and the most harmful to the environment. The increased consumption of nitrogen fertilizers is one of the main factors that affect the sustainability of the bioenergy production process from sugarcane. Currently, N recommendations in sugarcane are based only on the expected yield. However, several factors of the plant, soil and climate can affect the response of sugarcane to N fertilization. In this context, the objective of the present study was to investigate what are the main soil and plant factors that affect the N response to sugarcane in researches available in the literature using multivariate and meta-analysis, aiming to guide models for nitrogen site-specific management. A wide literature review (130 experiments) showed that 60% of the total evaluated experiments were responsive to N. The general average of the N optimal rate (N_{opt}) of the responsive experiments was 118.20 (kg N) ha⁻¹. The results showed that soils with low yield potential (< 70 t ha⁻¹) presented higher N_{opt} when compared to soils with high yield potential (> 100 t ha⁻¹); N_{opt}= 120.18 and 111.80 (kg N) ha⁻¹, respectively, for soils with low and high yield potential. Among the factors of the plant assessed, the crop variety, the N application rate and the geolocation of the field are the three factors that most affect the N responsiveness. About soil factors, the soil texture and the organic matter content are the ones that most impact the crop's response to N.

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Mining the soybean microbiome for disease-suppressive microbes

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Plant-associated microorganisms can exert beneficial effects on the host, offering possibilities for the improvement of agronomical traits in crops through the manipulation of their microbiomes. Among these traits, resistance to pathogens is of major relevance for agriculture. In this work, we investigated how infection of soybean with Asian Soybean Rust (ASR) affects the leaf and root/rhizosphere microbiome. We hypothesize that leaves infected with ASR present an altered bacterial community that is enriched in strains with the ability to antagonize the fungus *Phakopsora pachyrhizi*, the causal agent of ASR. We also hypothesize that soybean plants exposed to aboveground infections can modulate the rhizosphere microbiota and recruit beneficial microbes via root exudates. To test these hypotheses, we evaluated the bacterial communities that colonize healthy and infected field-grown soybean leaves and roots via high-throughput sequencing of the 16S ribosomal gene. We found remarkable differences in the bacterial populations inhabiting these leaves and identified taxa that show either higher or lower relative abundance in infected leaves. These results confirm that ASR affects the soybean leaf microbiome. In the roots/rhizosphere, however, we did not detect significant differences between healthy and infected plants. We also isolated bacteria from soybean leaves and roots to assemble a culture collection of 'soybean-associated bacteria'. This collection (named *Soybiome*) currently consists of 3,038 strains and constitutes a valuable resource for the identification of microorganisms that can exert any kind of beneficial effects on plants. Indeed, initial screenings have revealed strains that can antagonize a set of 6 soybean pathogens, including *Phakopsora pachyrhizi*. The characterization of such strains will pave the way for the development of biofungicides effective against one of the most important plant diseases in soybeans plants.

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Low cost flow analysis system for applications in agronomic samples

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Automatic analysis and recording flow system for applications in agronomic samples. Construction entirely in-house based on innovative and low-cost techniques such as additive manufacturing and electronic prototyping. High sensitivity solid state multispectral detector and gas diffusion chamber. Modern and low-cost techniques such as electronic prototyping and additive printing have enabled the development of this automatic analyzer based on flow analysis technique for applications in agronomic samples. The Figure 1 show the components and the Figure 2 the structure the of the analytical system.

Figure 1 – 1 system control, 1A shield; 2 manifold 2A detector, 2B gaseous diffusion chamber, 2C components supports, 2D mixing and reaction coil; 3 peristaltic pumps.

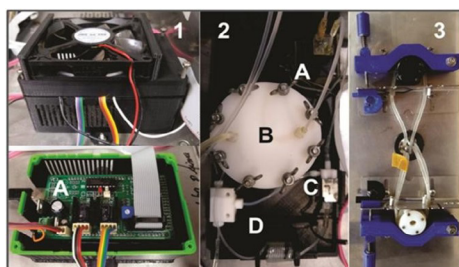
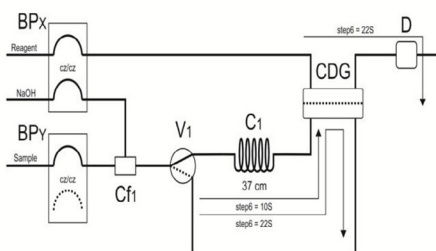


Figure 2 – Analytical system for determination of N. BPx,y – peristaltic pumps, Cf1 – confluence 1, V1 – three-way valve, C1 – mixing and reaction coil, CDG – gaseous diffusion chamber, D – detector.



Flow analysis systems have a strong green appeal by using microvolumes of reagents and samples, resulting in a reduced volume of waste. In the presented application, environmentally friendly reagents were used, such as low-concentration sodium hydroxide and bromocresol purple indicator. The determination procedure of the system is colorimetric and is based on the reaction of ammonium present in the sample solution with sodium hydroxide (NH_4^+) to produce ammonia (NH_3), which diffuses through a Teflon® membrane installed in a flow chamber. The same flow chamber circulates the bromocresol purple indicator solution, which undergoes proportional color change based on pH upon receiving ammonia. In this configuration, a detection limit of 2.2 mgL^{-1} and a linear range between 2.2 to 25 mgL^{-1} were obtained, with an analytical frequency of 13 samples per hour (triplicate determinations). The system was employee as an analytical tool for the determination of N in 800 samples of soil and plants in post-graduate works.

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The contrasting gene expression of the extremophytes *Prosopis tamarugo* and *Prosopis alba* provides new insights in abiotic stress tolerance

Pedro B. Ferreira¹

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This study focused on understanding the molecular basis of the divergent relationships to desiccation stress and photosynthetic capacity in two *Prosopis* species, *P. tamarugo* and *P. alba*. By conducting RNA-seq analysis, we identified significant differences in gene expression between the species, with *P. tamarugo* displaying up-regulation of stress-associated genes. Gene expression analysis using ddPCR confirmed the reliability of the RNA-seq results. Up-regulated genes include HOS3, which inhibits abscisic acid-mediated stress responses; MTS1, involved in melatonin biosynthesis, plant growth, and defense responses; ANR, involved in the production of proanthocyanidins; and FLS, which is responsible for the formation of flavonols. The down-regulated gene PER42 is associated with heat shock-like defense mechanisms, and AAO may be involved in a redox system with ascorbic acid. Physiological and metabolomics analyses supported the finding that *P. tamarugo*'s response is multifaceted, involving efficient photoprotection and the synthesis of specific metabolites with antioxidant and osmoprotectant properties. Under controlled growth conditions, both species exhibited changes in leaf water content and xylem water potential in response to drought, but *P. tamarugo* showed a faster decline in leaf water content. In greenhouse experiments, the previously identified drought-responsive genes demonstrated increased expression in *P. tamarugo*. Interestingly, the melatonin biosynthesis gene MTS1 did not show response during the treatment, but it shows higher expression in *P. tamarugo* in control conditions compared to *P. alba*. These findings hold promise for the development of biotechnological applications aimed at enhancing drought tolerance in related legume crops. Overall, this study provides valuable insights into the molecular mechanisms underlying drought tolerance and suggests potential strategies for improving crop resilience in water-limited environments.

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On the attractant pheromones of South American Cerambycid beetle species

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and José M. S. Bento¹

The large beetle family Cerambycidae comprises over 38,000 species described worldwide. Most of them play an essential role in maintaining the health of ecosystems by acting as primary wood decomposers or serving as a food source for other animals. However, some wood-boring cerambycid beetles are one of the world's most important groups of invasive insect species, some of which are serious pests in agricultural and forestry systems. These beetles infest woody tissues from the trunks, branches, twigs, and roots of healthy-standing trees and shrubs to cut lumber and finished wooden products. Because their larvae are long-lived and develop and pupate in the woody tissues, they are simultaneously hard to detect and readily transported between continents by international commerce. Developing more sensitive and effective methods of detecting and monitoring these beetles is of immediate importance. Research over the past two decades has shown that the pheromones of cerambycid beetles are often highly conserved within related taxa (genera, tribes, and even subfamilies), so that the identification of a new cerambycid pheromone chemical from a species anywhere in the world, can result in a cascade of identifications of pheromones for many other related species worldwide. In this study, we applied this concept to identify pheromones and related semiochemical attractants for cerambycid species native to South America. Results from this research represent the bases for using semiochemical-based traps for surveillance programs of invasive species and integrated management of cerambycid pests.

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The genome of the wild, tropical species *Passiflora organensis*: a resource for the genus *Passiflora*

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Andrea Pedrosa-Harand³; Hélène Bergès⁴; Claudia B. Monteiro-Vitorello¹; Maria L. C. Vieira¹

The genus *Passiflora* comprises a large group of plants popularly known as passion fruits, much appreciated for their exotic flowers and edible fruits. Species (~500) are morphologically variable and adapted to distinct tropical ecosystems. In this study, we generated the genome of the wild, diploid species *P. organensis* by adopting a hybrid assembly approach. Genome was assembled in 482 contigs on 360 scaffolds. Some of the genome sequences could be integrated into its chromosomes using satellite DNAs as references. *P. organensis* has a small genome of 259 Mbp and a heterozygosity rate of 0.81%, consistent with its reproductive system. The repeated sequences accounted for approximately 59% of the total and the *Tekay* lineage was the prevalent retrotransposon. In total 25,327 coding genes were predicted. *P. organensis* retains 5,609 singletons and 15,671 gene families. Genes potentially involved in the self-incompatibility determining locus were identified. The MADS-box family of transcription factors were identified and expansions and contractions were inferred within specific sub-families. The distribution of pairwise synonymous substitution rates among paralogs in conserved genomic blocks were studied in *P. organensis* and other Malpighiales genomes, and whole genome duplications were found in all species. Two mitochondrial DNA molecules were assembled. The linear sequence possibly represented the master mitochondrial DNA molecule (1,031,229 bp), harboring at least one full copy of most canonical mitochondrial protein-encoding genes. Interlarding these genes were 2 mitoviruses comprising a repetitive region of ~1,800 bp. The second molecule is circular comprising 102,307 bp. A typical chloroplast DNA circular molecule was recovered (144,959 bp) with structural rearrangements. In conclusion, we presented the first draft genome assembly of a *Passiflora* wild species. Our findings will be a valuable resource for genomic and evolutionary studies on the genus, and will also assist in breeding cropped species.

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Ozonation as an alternative for the degradation of toxic compounds in food: potential and challenges

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Ozonation is a technique that involves exposing a matrix to ozone gas, allowing oxidation reactions to occur between the gas and the components present in the matrix. However, the high oxidizing power of ozone poses a challenge in optimizing this technique to achieve the best compromise between reducing the target compound while minimizing degradation of non-target compounds. In the food industry, ozonation has been widely used in various applications, but there is still untapped potential for the degradation of many toxic compounds. The objective of my postdoctoral research is to explore the application of ozonation for the degradation of toxic compounds in food. In the following sections, I will discuss the findings of these studies, considering the opportunities and challenges associated with ozonation.

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Putative causative mutations regulating gene expression are associated with muscle development and meat quality in Nellore cattle

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Muscle development and meat tenderness are essential attributes of the beef industry because they impact production efficiency and meat quality. Integration of genomics tools offers the opportunity to understand the biological process underlying these traits and can result in valuable information for breeding programs. Our main goal was to identify regulatory mutations controlling ribeye area (REA) and meat tenderness measured by shear force (SF) by integrating information from DNA polymorphism, gene expression, and open chromatin regions. We used an experimental population to obtain phenotypic data from 374 Nellore steers, whole genome sequences from 26 bulls, high-density genotypes from 778 animals, RNA-Seq from 192 animals, and ATAC-Seq data from four animals. Our integrated analysis resulted in an imputed panel containing 4,522,914 SNPs that were pruned based on linkage disequilibrium (PLINK with $r^2 = 0.8$) to 553,581 tag-SNPs. To identify variants that regulate genes expressed in muscle, Matrix eQTL R package was used to associate 553,581 genotypes with 12,991 genes identified by RNA-Seq. We found 36,916 cis-eQTLs (< 1 MB from the regulated gene) and 14,408 trans-eQTLs (> 1 MB from the gene) (FDR < 0.05), regulating 5,142 and 4,707 genes, respectively. The association between significant eQTLs and phenotypes was performed using a linear model in PLINK. As a result, 12 eQTLs were associated with REA, and 8 with SF. Together, they regulate the expression of 22 and 12 genes, respectively. Next, using a dataset of 33,734 ATAC-Seq peaks, we identified the eQTLs present in regulatory regions. The rs518937461 (chr11:2425786) associated with SF with 1 day of aging overlaps a peak in chr11:2424313–2429286. This variant, located upstream of the *ITPR1PL1* gene, negatively regulates in cis the *NCAPH* gene, which encodes a condensin protein required for the development of mature condensed chromosomes. Additionally, we discovered a peak (chr25: 34575358–34579662) within an LD block of an associated eQTL, the rs136403268 (chr25:34572106) associated with REA, that regulates in cis the *RHBDD2* and *UPK3B* genes. These genes participate in basic cellular functions, like cell signaling, proliferation, and interact with transcription factors. These findings help identify potential causative SNPs that regulate gene expression, are associated with complex traits and can be used in cattle breeding programs.

1. Escola Superior de Agricultura Luiz de Queiroz da USP.

2. University of Liège.

3. Embrapa.

Carbon farming national initiative: the largest global public-private partnership to expand the ecological intensification of agriculture in Brazil

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and Maurício R. Cherubin¹; Carlos E. P. Cerri¹; Cimélio Bayer²; Lucas A. Alves³; Adriano A. Anselmi⁴

The effect of climate change has shown negative impact on crop yields, threatening the food security of a growing global population. Given this scenario, the ecological intensification of agriculture (EI) has shown an important strategy for ensuring the increase in crop yield and soil organic carbon (SOC) sequestration. The aim of this study is to present the main goals and productive and environmental variables measured, and the execution stages of a partnership to expand EI in Brazil. The initiative includes 10 institutions (universities and foundation research) and several companies from the agricultural sector. The program is divided into three main stages: (1) “Scientific Basis” stage has as its goal, execution of multiple levels of use intensification, and define accurate sustainability parameters; (2) “Carbon +” stage consists in validating the adoption of EI practices through of monitoring changes in SOC stock, comparing three plots (native vegetation, farmer management, and EI practices); (3) “Pro-Carbon” stage consists of scaling up EI practices, involving almost 2,000 farmers, with the main goal of promoting crop intensification and monitoring changes in SOC stock. As the program advances, it will be possible: (i) to identify the carbon footprint and mitigation potential of Brazilian farmers, (ii) developing a model to predict SOC stocks adjusted for tropical and subtropical climatic conditions, and (iii) establish more reliable criteria for the carbon market through SOC sequestration.

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Interactions between plants and soil microbiomes under intensive and diversified agricultural systems

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Intensive and diversified agricultural production systems contribute to the sustainability of farming systems. Crop diversification contributes to a higher diversity of microorganisms and ecosystem services, making environments more tolerant to biotic and abiotic stress, therefore, more resilient. In the Cerrado biome context, water and nutrient availability limit agricultural production. The soils have low natural fertility, with the clay fraction consisting mainly of Fe and Al oxides. Thus, understanding the soil microbiome in these systems is essential to identify strategies that can conserve and enhance “soil services.” This ongoing research aims to identify more efficient groups in the availability of phosphorus and water in conservationist and intensive management systems by evaluating the soil microbiome and its interactions with plants. A greenhouse experiment will be conducted using soils from native Cerrado vegetation and agricultural areas. In the first experiment, we collected soil samples from an Integrative Crop and Livestock area at Embrapa Agropecuária Oeste, Dourados-MS, Brazil. The second experiment began in 2009 after the corrected and prepared soil. Since then, there have been treatments involving the succession and rotation of crops without any disruption. Both experiments are under Dystroferic Red Latosol, which is very clayey. We evaluated soil microbial activity and extracted DNA and total reactive proteins. We are currently in the initial stage of the greenhouse experiment. Our goal is to evaluate and manipulate soil biodiversity by measuring the structure and breadth of the niche through sequencing and analyzing the 16S rDNA gene and ITS region. Finally, this research will make it possible to identify more efficient microorganisms in the availability of phosphorus and water and verify which uses and soil management favor such groups. We expected to use these results to convince producers and professionals in the area to implement more efficient management systems less dependent on fertilizers and other external inputs.

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Climate change and the resilience of agroforestry systems: the potential to produce healthy foods, income generation and environmental conservation in areas of agrarian reform

Fábio F. Marchetti¹

and Paulo E. M. Marques¹

Climate change is altering the structure of ecosystems and, together with the conversion of land use, causing an accelerated reduction in biodiversity and the deactivation of ecosystem services, including the extinction of crop varieties and creole races, in addition to the loss of associated traditional knowledge. It is a consensus in the scientific community, the urgent need to consolidate resilient productive systems, which effectively contribute to adapting to climate change and help to mitigate its impacts. Agroecology is decisive in this process, with methodological, practical, and technological paths, in which agroforestry systems (AFS) play a central role. Social movements in partnership with public universities have promoted articulations that guide the construction of agroecological, sovereign and resilient territories, in line with international climate agreements and the Sustainable Development Goals. This work, through an interdisciplinary approach, promotes the collective construction of agroecological knowledge and designs of agroforestry systems inserted in the sociocultural, environmental, and economic context of 23 families settled in agrarian reform territories in the state of São Paulo, guiding the agroecological transition based on participatory, educational, and social intervention methodologies in the agro-environmental reality of the settlements. Innovations such as the design of an AFS sketch with up to 83 species, with functional, productive, fertilizer, and logging functions, were developed in workshops that took place throughout 2022, followed by the implementation of 13 hectares of biodiverse AFS in a joint effort system. In 2023, the focus is on monitoring the AFS, covering their biophysical, productive, economic, and sociocultural dimensions. The works have enabled the engagement of extension and research groups, in addition to lectures and didactic classes in related disciplines, demonstrating the potential of postdoctoral studies in the development of actions capable of combining the university tripod of teaching-research-extension.

1. Escola Superior de Agricultura Luiz de Queiroz da USP.

Identification and characterization of *Diatraea saccharalis* odorant receptors in the insect-fungi interaction

Flávia P. Franco^{1, 2}

and Pingxi Xu²; Felipe T. Caten³; Felipe G. Gonçalves¹; Emile Goutorbe¹; Marcio C. Silva-Filho⁴; Walter S. Leal²; José M. S. Bento¹

Insects have developed a sophisticated sensory system, and through smell have the ability to locate mating partners, food sources, habitats, oviposition sites and to escape from predators. Odorant receptors (OR), with other proteins, are responsible for the reception of chemicals, leading to the perception of odor in the central nervous system, and the consequent insect behavioral response. A recent study showed an interesting plant-insect-pathogen interaction mediated by volatile organic compounds (VOCs). The phytopathogen *Fusarium verticillioides* is able to manipulate the sugarcane host plant VOCs emission and the sugarcane borer behavior, attracting caterpillars to feed in a contaminated diet and also guiding females to oviposit in infected plants. Many studies have shown the expression and activity of ORs in insects, which make them able to identify pheromones and allelochemicals. However, there is little information about caterpillars ORs that respond to fungal VOCs. Furthermore, we are not aware of scientific studies involving the molecular mechanism of olfaction in *D. saccharalis*. Thus, the goal of this project was to identify and characterize *D. saccharalis* caterpillars ORs, including ORs that might mediate the plant-insect-pathogen interactions. We used next generation sequencing to identify genes evolved in odor perception in *D. saccharalis* and TEVC (two electrode voltage clamp) to identify OR ligands. In this work, we identified 14 gustatory receptors, 11 odorant receptors, 32 odor-binding proteins, 23 odor-degrading enzymes, 37 ionotropic receptors and 3 sensory neuron membrane protein sequences. We identified the full-length of five *D. saccharalis* ORs, and the sequence of *D. saccharalis* odorant receptor co-receptor, DsacOrco. Only one of these OR showed response to compounds from our panel, DsacOR26/DsacOrco, which responded to sulcatone, geranyl acetate and geranyl acetone, VOCs associated to plant-insect-pathogen interaction. Despite DsacOR26 had recognized geranyl acetate as a ligand, this odorant didn't affect caterpillar's behavior. DsacOR26 showed to be highly sensitive to geranyl acetone and sulcatone, and both odorants affected insect behavior in different concentrations.

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Ecological aspects of spittlebugs of the genus *Clastoptera* (Hemiptera: Cercopoidea: Clastopteridae), possible vectors of *Xylella fastidiosa* in olives in southeastern Brazil

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Spittlebugs of the genus *Clastoptera* (Cercopoidea: Clastopteridae) are xylem-feeder, can be potential vectors of *Xylella fastidiosa*. In olive orchards in southeastern Brazil affected by the bacterium, individuals of an as yet unidentified species of *Clastoptera* were frequently observed in association with olive plants. Then, surveys of regions and times of occurrence of nymphs and adults, natural infectivity by *X. fastidiosa*, and association with host plants of *Clastoptera* were carried out to understand their potential involvement in the dissemination of *X. fastidiosa* in olive orchards. Surveys with yellow sticky cards and visual observations in different locations in southeastern Brazil showed that *Clastoptera* occurs only in olive orchards above 1000 m altitude in the Mantiqueira Mountain Range, with population peaks of adults and nymphs between February and April (late summer and early autumn). *Clastoptera* adults collected in cards were positive for *X. fastidiosa* by qPCR, indicating that individuals are naturally carrying the bacterium in olive orchards. By visual observation, adults and nymphs of *Clastoptera* were detected in shoots of olive trees and other shrub or tree plants close to olive orchards, such as *Duranta erecta*, *Salvia rosmarinus*, *Rhododendron sp.*, *Tibouchina mutabilis*, and *Prunus persica*. New studies are underway to identify or describe the species of *Clastoptera* (apparently a new species) collected from olive trees and alternative host plants, as well as to assess their ability to transmit *X. fastidiosa* to olive trees.

1. Escola Superior de Agricultura Luiz de Queiroz da USP.

Development of analytical methodologies for the analysis of congeners in cachaça aged in Brazilian wood barrels

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The aging of cachaça in wooden barrels is essential to improve its quality, adding diversity and market value to the product. The level of maturation of the distillates can be determined based on the levels of phenolic compounds that are aging markers extracted from the lignin in the wooden barrel. This study aimed to characterize the aging process of cachaça, analyzing the mechanism of lignin degradation during its maturation in barrels of the second use of amburana (*Amburana cearenses*), cabreúva (*Myroxylon peruiferum*) and castanheira (*Bertholletia excelsa*) from 3 to 24 months. A chromatographic methodology was developed for analysis (HPLC/UV) of cinnamic aldehydes (synapaldehyde and conifer aldehyde), benzoic aldehydes (syringaldehyde and vanillin), and benzoic acids (syringic and vanillic acids). Higher levels of all identified phenolic compounds were found in cachaça aged in cabreúva and castanheira barrels. The total contents of benzoic acids (vanillic and syringic acids) can predict the maturation level of the cachaça aged in barrels of the mentioned wood species.

1. Escola Superior de Agricultura Luiz de Queiroz da USP.

Glycyphagus (Lepidoglyphus) destructor (Schränk) (Glycyphagidae) as factitious prey for the production of the predatory mite *Neoseiulus californicus* (McGregor) (Phytoseiidae)

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Neoseiulus californicus (McGregor) (Phytoseiidae) is commercialized worldwide for the control of the spider mite, *Tetranychus urticae* Koch (Tetranychidae). For costs reductions, phytoseiids are often cultivated with astigmatid mites as an alternative to their natural prey. *Glycyphagus (Lepidoglyphus) destructor* (Glycyphagidae) was evaluated as factitious prey for mass rearing *N. californicus*. When fed on *G. (L.) destructor* and *T. urticae* (natural prey; control) no significative differences were observed on the fecundity (18.3 ± 0.9 and 19.1 ± 1.1 eggs/female, respectively) and survival (86% and 89% individuals alive, respectively) at the end of the ten days experimental period. A preliminary protocol for the mass production of *N. californicus* was established using plastic pots as an experimental unit. Each unit was filled with 600 ml of moistened vermiculite, 60 ml of vermiculite containing predatory mites and 150 ml of brewer's yeast infested with *G. (L.) destructor*. Weekly, the contents of each unit were homogenized and the prey was replaced. To evaluate the changes in the population density of *N. californicus*, at the time of establishment of the units and during the four subsequent weeks, 10 aliquots of 1 ml of vermiculite were withdrawn for counting the predators. The total mite density was estimated by extrapolation. The experiment consisted of ten repetitions; each being represented by an experimental unit. The highest density was obtained three weeks after the establishment of the units, followed by a reduction in the number of predators after this moment. The estimated density on the units were: 516 ± 12 , 1908 ± 45 , 4380 ± 114 , 2676 ± 60 and 2304 ± 71 mites/experimental unit, at the moment of the establishment and after 1, 2, 3 and 4 weeks, respectively. Therewith, we consider that *G. (L.) destructor* is a suitable factitious prey for mass rearing of *N. californicus*, which will allow a significant reduction on the costs for producing the predator.

1. Escola Superior de Agricultura Luiz de Queiroz da USP.

SAMBA regulates growth and development in tomato (cv. Micro-Tom) plants

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The Anaphase-Promoting Complex/Cyclosome (APC/C) is an E3 ubiquitin ligase involved in ubiquitin-dependent proteolysis of key cell cycle regulators by the proteasome. Furthermore, the identification of genes encoding APC/C subunits in *A. thaliana* suggests that the complex has other specific functions during plant development, such as gametogenesis, growth regulation, hormone signaling and symbiotic interactions. Despite extensive research on APC/C, only a few components have been functionally characterized in plants. Sequence alignments of SAMBA homologs revealed two regions of sequence conservation. SAMBA constitutes an APC/C regulator unique to plants. The green fluorescence emission from SAMBA-EGFP fusion protein was observed distributed in the cells, signals were detected in the cytoplasm and nuclei. SAMBA expression is present at much lower levels in leaves and flowers in anthesis than in flowers and fruits in development, and its expression decreased extremely during fruit development until ripening, this implies that SAMBA may be involved in tomato fruit development. Therefore, to better understand SAMBA's role in plant development, we used CRISPR/Cas9 to generate sequence-specific mutations at *S. lycopersicum* (tomato) cv. Micro-tom in the SAMBA gene. We produced CRISPR-Cas9 *samba* mutants, which was confirmed by PCR and sequencing analysis. The mutant lines are delayed in growth and development compared to the wild-type plants. *Samba* knockout lines displayed leaves with longer and higher density trichomes. Additionally, disruption of SAMBA function decreased pollen viability, reducing the average fruit size and weight, showing severe defects in their shape, seed number and embryo development. To investigate whether the observed modifications in fruit growth kinetics are associated with changes in fruit composition, fruit samples were harvested at three developmental stages (3, 5 and 8 dpa) from homozygous *samba* free Cas9, dissected and subjected to metabolomic (GC/MS and LC/MS) and RNA-seq analyses. Also, the genomic complementation construct was generated, and *samba* mutant plants are being transformed via *Agrobacterium* to phenotypic and molecular characterizations. Our results suggest that SAMBA plays an important role in tomato development and provides important insights for further discoveries of fundamental biological processes that will improve the performance of this commercial crop.

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Two-dimensional gel-based proteomics identifies biomarkers for early detection of beef quality

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The ultimate pH (pHu) is a relevant indicator of beef quality. At the slaughter, bulls regularly present a reduced concentration of muscle glycogen in response to stressors, which alters *post mortem* ATP and lactate levels, hindering the pH decline, leading to an abnormal beef pH (> 5.80). The pH decline *post mortem* has a remarkable impact on muscle biochemistry and structure, influencing beef tenderness and color. In the last years, many studies have used proteomics approaches to identify differentially abundant proteins (DAPs) associated with beef quality with different pHu values, but using samples with 1 to 24 h *post mortem*. This study aimed to identify potential biomarkers on proteome of *Longissimus thoracis* (LT) muscle obtained from Nellore bulls at 30 min *post mortem* with different pHu and slaughter seasons (summer and winter). Eighteen carcasses classified as Normal (≤ 5.79 , $n = 6$), Intermediate (5.80 to 6.19, $n = 6$) and High-pHu (≥ 6.20 , $n = 6$) from pasture-finished Nellore (*Bos Indicus*) bulls, ranging from 30 to 35 months of age (4 to 6 permanent incisors teeth) were obtained in Brazilian summer (1st slaughter) and winter (2nd slaughter) seasons from a commercial abattoir. LT muscle samples (~ 15 g) were obtained from the carcasses (10th ribs) at 30 min *post mortem*, frozen in liquid nitrogen and stored at -80°C until the proteomic analysis. Protein extraction was carried out using 50 mg of LT muscle sample in 500 μL of lysis buffer. Bradford method was performed using BSA as standard. The 2-DE maps were obtained using IPG strips of 13 cm pH 4–7, loaded with 400 μg of protein and 12.5% SDS-PAGE. Gels were stained with Coomassie Brilliant Blue G-250, and analyzed using ImageMaster 2D Platinum 7.0 software. Spots differentially expressed ($P < 0.05$, 1.5-fold intensity) were excised from the gels and digested with trypsin. The protein was identified by mass spectrometry (n-ESI-QTOF MS/MS) and the relative quantification of each protein was determined through the emPAI and log FC ratios at either time point were defined as up- or downregulated proteins, respectively. The STRING database, via the Cytoscape were used to the potential protein–protein interactions (PPI) between the DAPs. In the 2-DE proteomic profiles, more than 300 protein spots were detected. We identified

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DAPs (25 for 1st and 12 for 2nd slaughter, respectively), up- or downregulated. Eight DAPs were commonly identified in both slaughters. PGM1, ENO3, PKM, GAPDH, TNNT1 and ACTA1 were enrichment in Intermediate- and High-pHu in comparison to Normal-pHu samples, whereas LDHA was downregulated in Intermediate-pHu vs. Normal-pHu and ATP5B was downregulated in High-pHu vs. Intermediate-pHu for both slaughters, suggesting an accentuated rate of *post mortem* glycolysis. Gene ontology (GO) results revealed enrichment for processes that are involved predominantly in small molecule metabolic process (GO:0044281), carbohydrate metabolic process (GO:0005975) and phosphorylation (GO:0016310). Intermediate- and High-pHu promote changes in the protein profiles involved in biological process including metabolic proteins and glycolytic enzymes, which corroborate their contribution to early post mortem metabolic changes and as potential biomarkers to predicting beef quality.

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COMPSOHMA: a software for assessing the risk of soil compaction induced by agricultural field traffic

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With the advance of agricultural mechanization, there was a growing gain in the efficiency of planting and harvesting operations. However, agricultural machinery drives under the main basis for plant growth: the soil. With traffic, there is contact between the tire and the soil, which depending on the soil texture and soil moisture conditions, may not withstand the pressure applied by the machine, and become deformed. This deformation is called compaction, which in turn reduces the soil's porous system as the main means of water and air flow to plants. As a consequence, plants can be prevented from developing their root system due to the formation of compacted layers. From an environmental point of view, water may not infiltrate, and limit the recharge of aquifers and cause erosion, silting up and contaminating water rivers. Since 1950, researchers have been trying to theoretically describe the compaction process induced by agricultural machinery, but it was recently, with the advancement of computers, that these models gained practical application. Based on a series of theoretical models, we have developed software that allows to assess the risk of soil compaction induced by agricultural field traffic. The software was written in R language, and implemented in the form of a dashboard. The model was registered at the National Institute of Industrial Property – INPI (BR512023000761-7), and was named COMPSHOMA. To perform a simulation, the software requires machine and soil information such as tire diameter, wheel load, clay content and soil water content. The result is an assessment of the compaction risk: no risk, moderate risk, and high risk. The software is available for access through a link: <https://testbeta.shinyapps.io/compsohma/>. The model can be customized for sugarcane, grain or cotton machines, as well as evaluating soils with different textures and moisture content. With the application of the software, it is expected to reduce the formation of compacted layers in large agricultural areas, minimizing the increase in degraded fields and increasing the yield of agricultural crops.

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The Social Development Index (IDS): study of rural space in Goiás

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The Social Development Index (IDS), along with three other indices: the Environmental Development Index (IDA), the Economic Development Index (IDE) and the Technological Development Index (ITE), are the 4 (four) indices that makes up the Sustainable Rural Development Index (IDRS), a synthetic indicator that aims to measure the level of sustainability of the rural environment. This study aims to analyze the importance of the IDS in defining the level of rural development in the 246 municipalities of Goiás. The selection of relevant variables for the composition of the IDS took place through structured research with researchers who develop work in the area of sustainability, from all major areas of knowledge, according to the table of the Coordination for the Improvement of Higher Education Personnel (CAPES). The IDS is formed by the Family Farming Index (IAF), Producer Education Index (IEA), Rural Income Index (IRR) and Social and Land Organization Index (IOSF). The IOSF was formed by the Index of Condition of the Producer in Relation to the Land (ICPRT) and by the Index of Association of the Producer to the Cooperative or Class Entity (IAP). The IDS was composed of data from the 2017 Agricultural Census, from the Brazilian Institute of Geography and Statistics (IBGE) and defined for the 246 municipalities in the state of Goiás. The composition of the IDS contributed to the determination of the level of sustainable rural development of the 5 (five) mesoregions of Goiás, namely: Center, East, Northwest, North and South of Goiás. The results show a very heterogeneous social development in rural areas, indicating an unequal scenario of social development in rural regions of Goiás. The analysis of these indices contributes to the provision of fundamental information in decision-making that promote the creation of public policies for sustainable rural development in the different regions of Goiás.

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Biological networks shed light on signaling pathways leading to pathogenesis-related protein expression during early sugarcane-smut interaction

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Sugarcane (*Saccharum* spp.) serves as a source of sugar, ethanol, and bioenergy, with Brazil leading global production and exportation. However, the crop faces a significant threat from the pathogenic fungus *Sporisorium scitamineum* (smut), resulting in reduced productivity. In response, plants activate defense mechanisms, including pathogenesis-related proteins (PRs). We investigated the signaling pathways leading to PR expression during the early sugarcane-smut interaction through an integrative network analysis. We annotated PRs in related genomes (*S. spontaneum* AP85-441, sugarcane variety R570, *Sorghum bicolor*) and a reference transcript set (COMPGG), yielding 1245, 330, 468, and 200 PRs, respectively. Among the 17 existing PR families, we identified thirteen in sugarcane, with PR-9, PR-7, PR-2, PR-5, and PR-1 as the most abundant (in descending order). RNAseq analysis from smut-resistant and smut-susceptible genotypes, collected 48 hours after inoculation, revealed 28 and 17 differentially expressed pathogenesis-related proteins (PRDEGs), respectively. To gain insights into the associated pathways, we integrated the PR annotation and RNAseq data into an *Arabidopsis*-based dual-layered sugarcane network, enriched with plant immune elements. Gene Set Enrichment Analysis identified 28 and 27 smut-responsive sub-modules in the resistant and susceptible genotypes, respectively. Two sub-modules with PRs showed positive enrichment in resistant plants, while other positively enriched sub-modules were directly connected to additional PRs. These modulated nodes included Resistance Gene Analogs, the ethylene and jasmonate pathways, Mitogen-Activated Protein Kinases, transcription factors, as well as various enzymes such as reductases, transferases, ribonucleases, and ligases. Our findings reveal modulated signaling pathways that converge in PR expression during the early sugarcane-smut interaction, offering new avenues for functional characterization and suggesting potential targets for sugarcane breeding programs aimed at developing smut-resistant genotypes.

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Applications of omic technologies for the development of non-conventional beers with probiotical strains

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The craft beer market is growing worldwide, especially the unconventional beers. This study aimed to evaluate the potential in the use of starter culture *Streptococcus thermophilus* TH-4 (TH-4), and the probiotic cultures *Lactocaseibacillus paracasei* F19 (F19) and 431 (431), in association with *Saccharomyces cerevisiae* US-05, in the brewery of unconventional sours beers. Thus, some techniques were employed: enumeration by pour-plate and qPCR; hops resistance gene expression (*horA*, *horB*, *horC*, *hitA*, *bsrA*, and *recA*); proteome by Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS); and flavorome, and metabolome by Headspace Solid-Phase Microextraction (HS-SPME), coupled with the gas chromatography-mass spectrometry (GC-MS) analysis. We concluded that LAB tested in this study are good candidates to be used in sour beers brewery, due some mechanisms, like membrane adhesion proteins and H⁺ pump. The probiotic viability varied between 5 and 8 log CFU/mL in the formulations. *HorC* gene expression seemed to be involved with microbial resistance in control and passion fruit juice formulations while *hitA* in peach juice. F19 and 431 proved to be very suitable for brewery with a high hop content, which is antimicrobial. These formulations in particular, a higher amount of *bsrA*, is more effective in reducing the hop stress than a combined expression of *horA* and *bsrA*. Proteome analysis showed that 431 are best adapted, and flavoring analysis showed that the strain used may interfere with flavor and odor.

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Biotechnological application of new bacteriocinogenic probiotic bacteria as a possible alternative to the use of antibiotics in aquaculture

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The sustainable aquaculture is one of the most viable alternative to face the challenges generated by the growing demand for animal protein intended for human consumption. Because of this, several classes of antibiotics were used in breeding systems to prevent disease and improve growth. However, this practice has been internationally condemned for its biological risks, leading scientists around the world to search for alternatives to antibiotics, such as bacteriocinogenic probiotic bacteria. Recent FAO (Food and Agriculture Organization of the United Nations) reports also ratify the fundamental role of sustainable aquaculture in fighting hunger and social inequalities in the world, as it generates profit for countries, provides healthy food to needy communities, generates jobs localities, reduces rural exodus and environmental degradation, especially in developing countries such as Brazil. Therefore, this work aimed to search for alternatives that can be used in sustainable aquaculture to increase its efficiency and replace antibiotics. Bacteria isolated and characterized for their safety and antimicrobial activity had positive results and can be considered as candidates for future *in vivo* studies of probiotic supplementation in animal models. It was observed that the newly isolated strains (*Lactococcus lactis* L1 and L2 and *Enterococcus faecium* 135) produced BLIS (antimicrobial substance similar to bacteriocin) with inhibition of several food and aquatic pathogens, mainly *Listeria monocytogenes*, *Salmonella* Choleraesuis and *Salmonella* Typhimurium. All isolates were sensitive to all tested antibiotics (ampicillin, clindamycin, streptomycin, chloramphenicol, rifampicin, gentamicin, vancomycin). In an adhesion test with Caco-2, the strains showed a percentage of adhesion greater than 60%, with no expression of virulence factors (gelatinase and hemolysin) being observed. In resistance tests, EF was resistant to pH 2.5 and 3.0 and EF/L2 was resistant to bile salts. Genes for bacteriocins such as Nisin (L1 and L2) and Enterocin A, B, P and Mundticin KS (EF) were observed.

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Governança de dados para a pesquisa agrícola: segurança jurídica e autorregulação

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The digitization of agriculture, supported by public agricultural research, generates a large volume of agricultural and personal data. There is a relevant intersection between agricultural data (agrodata) and personal data, since, through the use of digital technologies, it becomes possible to identify farmers, raising questions about the effectiveness of the holders' rights. For science and technology institutions (ICT, acronym in Portuguese), it is essential to associate scientific progress with the protection of personal data, since agrodata are relevant inputs for the knowledge production process. This article explores the theme of agrodata governance in agricultural research and reports on ongoing actions in an ICT, the Brazilian Agricultural Research Corporation (Embrapa), to adapt to the general law for the protection of personal data (LGPD, acronym in Portuguese), based on the analysis of the case study of a research project. Embrapa's conservative stance is evident in adopting, as a priority, obtainment of the consent form of the holder for the processing of their personal data, and in some cases the framing of other legal hypotheses occurs. It is concluded that legal certainty, through the establishment of clear and well-founded guidelines for data governance, is an effective path for this connection.

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The axiology in the decision-making process and in the governance configurations of agribusiness cooperatives constituted by entrepreneurial families

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The objective of the research resides in analyzing the axiology that guides the decision-making process and the configurations of governance of a set of agribusiness cooperatives, formed by enterprising families. Specifically, it is intended: (I) to establish a classification of family organizations, constituted by different ownership structures, in terms of governance and values, building their typology and taxonomy; (II) develop a system based on the classification, with a view to identifying the hierarchy of values that affect the constitution and management of family businesses; (III) study the impact that the hierarchy of values can produce in the governance of a set of cooperative agribusiness organizations, in which these companies participate; and, (IV) contribute to the dissemination of knowledge regarding the themes related to the research problem through the publication of scientific works, carrying out and participating in academic events in the area of governance and producing didactic material throughout the research.

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2. <http://lattes.cnpq.br/2605156496293365>.

Proposal framework for organizational performance in geographical indications in Brazil

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The general objective of this research was to outline elements for analyzing the organizational performance of Brazilian IGs, in the light of national studies. The bibliometric study was carried out based on the defined criteria, which enabled the mapping of 1490 articles over the last ten years, of which 80 articles had at least 1 citation, a criterion for analysis. Data were analyzed using the parameters of bibliometric analysis followed by the Integrative Review. The panorama structured based on bibliometric indicators showed a relevant production in the period between 2017 and 2023. Considering the existence of a gap between the publication and citations of documents of 02 years, the historical evolution occurred in an equivalent way in the last years, which suggests the interest in the theme of organizational performance inserted in the context of Brazilian GIs. The Integrative Review explained a set of elements performance in Brazilian GIs is approached from seven elements/indicators: (1) Regional Development; (2) Organization of the Production Chain; (3) Local Governance; (4) Innovation and Intellectual Property; (5) Social Innovation; (6) Local Production; and (7) Associativism and Cooperativism. As future studies, surveys on the indicators that make up the performance construct for this management environment could be carried out.

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Território ambiente e políticas públicas: projeto “Regulariza Amazônia” cooperação bilateral Brasil-União Europeia para a governança fundiária

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A Amazônia enquanto território legal abrange uma área estratégica mais de 500 milhões de hectares e representa cerca de 60% do território nacional. A pesquisa de pós-doutorado buscou analisar os resultados do Projeto Regulariza Amazônia, uma parceria Incra-União Europeia com o intuito de aprimorar e acelerar o processo de destinação e regularização fundiária de terras públicas no âmbito do Programa Terra Legal. Dessa cooperação bilateral, com enfoque estratégico na perspectivada governança fundiária, os diversos desdobramentos do espaço agrário da Amazônia merecem investigação, sendo fundamental para a construção epistêmica de refletir sobre a (re)produção do espaço agrário da Amazônia e suas (res)significações no tempo-espaço. É cada vez mais frequente a cobrança por políticas de desenvolvimentos sustentável na região. Países que possuem terras no território da Pan-Amazônia estão sendo cada vez mais cobrados e pressionados a colocar em pauta, sobretudo, ações de contenção, principalmente, aos desmatamentos. O grupo de países da União Europeia, denominado Parceria das Declarações de Amsterdã, atualmente liderado pela Alemanha, emitiu uma carta em 16 de outubro de 2020, ao governo brasileiro, com o intuito diplomático de estabelecer uma agenda comum, para garantia de próspero e sustentável para o Brasil e principalmente para Amazônia. O projeto promoveu ações no que tange à modernização operacional e técnica do acervo fundiário da Amazônia. Realizou, também, consultorias e promoveu inovações na gestão de terras públicas realizada pelo Incra, como: suporte técnico ao Sistema de Gestão Fundiária; atualização e adaptação do Painel de Inteligência Territorial(PIT); estruturação e manutenção do banco de dados geoespacial; e, aprimoramento metodológico da câmara técnica de destinação de terras públicas federais Desta forma, o Pós-Doutorado, é fundamental e permiti alargar a visão e identificar outros elementos de gestão do território e governança fundiária no maior patrimônio da sociedade brasileira: as terras da União na Amazônia Legal.

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ROS tolerant *Metarhizium robertsii* is effective against *Rhipicephalus microplus* on semi-field conditions combined with an anti-tick vaccine

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Entomopathogenic fungi (EPF) have been widely explored for their potential in biological control as an alternative to pesticides. The present study sought to induce tolerance to oxidative stress in EPF and tested it combined with an anti-tick vaccine. Tolerance was induced by successive subculturing with a pro-oxidant agent. CTR (control ticks exposed to water and 0.1% polysorbate 80), CTR-EPF (EPF after subculturing in medium), and EPF-T (ROS-tolerant isolate) were divided into groups, fixed in petri dishes and topically treated with 10 µL EPF at 1×10^8 conidia mL⁻¹. Total weight of egg mass (WEM), larvae hatching percentage (LHP), egg production index (EPI), nutritional index (NI), reproductive efficiency (RE) and tick control (%) were evaluated. After the *in vitro* assay, *Urochloa decumbens* seeds were sown in plastic pots and, after vegetation growth, EPF was distributed on the pots. Engorged *Rhipicephalus microplus* ticks were collected from bovines previously immunized with a multicompetent anti-tick vaccine containing antigens that target tick innate immunity and also control, then were distributed on the pots and some were dissected for RNA extraction and gene expression related to tick immune genes. Ecloded larvae were then recovered from grass apices and quantified. The relative efficacy to control larvae was calculated based on their population density in each pot. The sub-cultured, tolerant strain showed increased antioxidant defenses. In addition to having greater virulence towards tick females, the tolerant EPF showed a significant increase in tick control (84.44%) and 70% reduction in WEM and EPI. Tick immune related genes were down regulated by the tick vaccine. For larvae recovery, EPF reduced tick larvae on pots by 30% in the non-vaccinated group. Furthermore, when ticks from vaccinated bovines were exposed to EPF, larvae reduction was ~75%. The present study may open improvements in tick control, replacing harmful chemicals by association between entomopathogens for biological control and vaccines that neutralize tick immunity.

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Effect of waste milk use on metabolome, inflammatory profile, oxidative stress in holstein calves

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The use of waste milk in the liquid diet of dairy calves is a common practice in several farms in Brazil and around the world to reduce costs in milk production systems, despite the biological risk and variations in the bromatological composition and nutritional value. The hypothesis of this research is that the consumption of waste milk, with a high microbial load and antimicrobial residues, can change the profile of the intestinal microbiota and its by-products, with consequences on the metabolome and modulation of the immune response of calves towards a pro-inflammatory associated with the state of oxidative stress. Given this context, the general objective of this work is to evaluate the effect of using waste milk on the relationship of the metabolome with innate immunity and inflammatory response in the balance between health and disease, as well as determining the oxidative stress of calves from birth to weaning. The study will be carried out in “Calf Lab Research – Prof. Fernando José Benesi” at FMVZ/USP, where 30 calves will be reared, distributed into three experimental groups according to the liquid diet they will receive: saleable milk group (n=10), waste milk group (n=10) and pasteurized waste milk group (n=10). The intestinal health of calves will be evaluated by the daily fecal score and intestinal permeability thesis. Blood samples will be collected in weeks S2, S3, S4, S6 and S8 of life for metabolome evaluation; innate immune response by macrophage activity and neutrophil function and production of reactive oxygen species against *Escherichia coli* and *Staphylococcus aureus* bacteria; analysis of oxidative stress biomarkers; and serum haptoglobin dosage. Fecal samples will be collected for metabolome and fecal concentration of short-chain and branched fatty acids, as well as for quantification of dry matter. At the end of the experiment (S8) the animals will be euthanized and a necroscopic, histopathological and immunohistochemical examination of the intestine will be performed. The results will be tabulated and stored in Excel spreadsheets for further statistical analysis with appropriate tests, according to data distribution.

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Use of nanomaterials as an alternative treatment for uterine infectious diseases in cows

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Reproductive efficiency in cows is an important issue, as it affects herd profitability, leading to a decrease in milk production and the number of calves. In the postpartum period, endometritis has a negative impact mainly on dairy animals. In order to seek new forms of treatment, currently much is said about alternative therapies, such as the use of biomaterials, based on nanotechnology. This study was conducted on 29 cows with 21 to 35 days postpartum, separated into three groups (control, Agb and Limax), the last two clay-based biomaterials without antibiotic composition. After the diagnosis for endometritis through endometrial cytology, conventional ultrasonography and Doppler mode in addition to vaginoscopy, the animals were treated and monitored for 14 days, in order to analyze the clinical cure. The obtained results highlight that the biomaterials used improve the clinical aspect of the uterus of cows. However, the return to reproductive activities was not immediate. The treatments did not cause negative effects on the reproductive function, since pregnancy was confirmed in the animals involved in the study. The diagnostic methods demonstrate that the use of cytology, conventional ultrasonography and Doppler mode, represent accurate information about endometritis and that the studied biomaterials can be an alternative for the control of endometritis. Therefore, aiming at the adequate control and use of antibiotics, the development and studies with biomaterials represent the demands of world society regarding animal and human health.

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Development and validation of a practical and economical culture medium for routine use in the cultivation of *Leptospira* spp

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Leptospirosis is a bacterial zoonosis of great impact in one health, as it affects several species of animals, including humans. In veterinary medicine, the diagnosis of leptospirosis is essential to assess the behavior of the disease in herds and for the treatment of pet animals; however, despite the diversity of laboratory techniques, the microscopic agglutination test (MAT) is still the reality of laboratories in Brazil. This test has as a major limiting factor the use of live antigens of *Leptospira* spp. requiring the laboratory to cultivate viable antigens in culture media, and for that, subcultures are performed regularly for seven to 14 days. Traditionally, in this process, the EMJH medium (Ellinghausen–McCullough–Johnson–Harris) is used, which consists of a salt base enriched with a high-cost supplement, composed of bovine albumin, fatty acids, vitamins and metals. This project aims to develop a practical and economical culture medium for the routine cultivation of *Leptospira* spp. used in MAT, as an alternative to EMJH. To this end, some accessible nutrients will be evaluated such as energy sources, metals, vitamins, reducing agents, detoxifiers, among others, combined into different formulations. At moment, 78 different formulations have been prepared, evaluating carbon sources (sodium acetate and sodium bicarbonate), vitamin B (yeast extract), reducing agents (L-cysteine and sodium sulfoxylate), detoxifying agents – polymers (soluble starch and polyvinylpyrrolidone), sources of metals and non-metals (soy peptone); in addition, the chemical compatibility between components when subjected to heat sterilization (autoclaving). Most of the formulations were not satisfactory, since there was incompatibility between some reagents and the non-growth of *Leptospira* spp.

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Use of nanotechnology for treatment of infectious diseases in cows

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About 30 % of the cows is affected with infections in the reproductive system, consequently, 3 % remains sterile, which imply economic losses for milk producers and physical discomfort for the cows. The treatment for this type of infections is based on the use of antibiotics such as tetracycline, which can be administered in situ (uterus of the cow) or systemically. Administration of these drugs must be carried out by a veterinarian who provide 1 daily dose for 8 days, which makes the treatment expensive. Thus, a drug delivery system that reduces the time application to cure the disease becomes desirable. In this work, the use of clays loaded with tetracycline, aiming to decrease the number of applications of medication and thereby decrease the cost of treatment and decrease damage to soil caused by the presence of antibiotics in milk and feces. Two smectitic clays were used, one American another Brazilian. Tests of incorporation of the antibiotic were carried out between the clay mineral lamellae, which were characterized by X-ray and Tg diffraction techniques coupled with FTIR. And the rheological behavior of the clays was studied. Biological tests, in which they were applied in situ products derived from this research were made. The results showed that there was intercalation of the antibiotic, and the molecules are parallel to the surface of the clay-mineral. It was also possible to identify that the clays were able to protect the antibiotic from heat. The maximum capacities of absorption calculated from the results for the American clay was 123 mg g⁻¹ and for the Brazilian clay was 260 mg g⁻¹, values within the literature data for incorporation of tetracycline in smectitic clays. It was possible to make a refined mathematical treatment of the rheological measurements obtained. It was also found that although the two clays have the same type of clay mineral, both clays exhibited different rheological behaviors when exposed to the antibiotic. The biological tests showed that the one of the formulations proved to have promising results when tested in vivo. Thus, having this potential material to become a simpler treatment and with less tetracycline use than conventional treatments.

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Repeated administration of non-steroidal anti-inflammatory agents in chickens: potential use as a performance enhancer

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Antibiotic growth promoters (AGPs) have been used in animal production for decades. However, there is worldwide concern related to the potential of AGPs to select multidrug-resistant bacterial strains that can be transmitted to humans. AGPs have been banned in many countries, and potential replacements have been evaluated. One of the best-founded theories about the mode of action of AGPs is related to their potential anti-inflammatory effect (Niewold, 2007). The present study reports the effects of three non-steroidal anti-inflammatory drugs (NSAIDs – SS, sodium salicylate; MLX, meloxicam; CAR, carprofen) on the growth performance, hematology, serum biochemistry and histopathology of broiler chickens. The experiment to evaluate each NSAID was performed independently. In each experiment, 70 Cobb 500 male chicks, one day old, were randomly allocated in cages and divided into five treatments: 1) basal diet (DB): negative control; 2) Zinc bacitracin (ZB): BD+55 ppm zinc bacitracin – positive control; 3) dose 1 (SS: 10 mg/kg; MLX 0.4 mg/kg; CAR: 3 mg/kg); 4) dose 2 (SS: 30 mg/kg; MLX 1.2 mg/kg; CAR: 6 mg/kg); and 5) dose 3 (SS: 90 mg/kg; MLX 3.6 mg/kg; CAR: 9 mg/kg). The hematological and biochemical parameters obtained did not indicate signs of toxicity. Although the performance results did not show statistical differences, it can be seen that there was an improvement in weight gain up to the 21st day in the animals that received the highest doses of these NSAIDs (i.e., 90 mg/kg of SS, 3.6 mg/kg of MLX and 9.0 mg/kg of CAR), showing the promising potential of these drugs as performance enhancers. Furthermore, Thus, the non-observance of toxic alterations produced by both SS, MLX and CAR, it is concluded that the three evaluated NSAIDs have potential as a performance promoter, especially if used up to the first 21 days of life. However, this experiment was designed to assess toxicity, and further experiments designed to assess performance parameters are needed.

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Avanços no diagnóstico, epidemiologia e controle da leptospirose em pequenos ruminantes sob condições de semiárido

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As características da Caatinga, um bioma único, oferecem condições epidemiológicas únicas que requerem atenção em circunstâncias diferentes das de outras regiões do Brasil e do mundo. Estudos na região semiárida mostraram que mesmo durante longos períodos de seca, doenças como a leptospirose tem notável frequência nos rebanhos da região. A infecção pode apresentar aspectos clínicos distintos nas espécies animais acometidas, de maneira que em pequenos ruminantes a forma crônica é mais comum e é caracterizada por baixa fertilidade, mortalidade neonatal e abortamentos, levando a perdas econômicas importantes. Neste contexto, é necessário a condução de trabalhos mais abrangentes envolvendo animais de produção no sentido de elucidar aspectos epidemiológicos de doenças presentes nessas populações. Deste modo, o objetivo deste trabalho é promover avanços no conhecimento relacionado ao diagnóstico sorológico, aspectos epidemiológicos e controle da leptospirose em cabras mantidas em condições semiáridas. Foram coletadas amostras de urina de 71 cabras para reação da polimerase em cadeia (PCR), isolamento e caracterização molecular, bem como amostras de sangue de 91 para detecção de anticorpos através da soroglutinação microscópica. Foram encontrados anticorpos anti-*Leptospira* em 18 (19,78%) animais, sendo 6 para o sorovar Bratislava, 5 para Icterohaemorrhagiae, 3 Butembo, 2 Castellonis e 2 Panamá. A respeito do diagnóstico molecular, foram testadas até o momento 22 amostras de urina, sendo todas negativas. O isolamento ainda não apresentou crescimento de bactérias com morfologia sugestiva de *Leptospira*.

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Characterization of sperm subpopulations and their relation with functional and metabolic profiles bulls with different fertility rates using artificial intelligence methods

Roberta F. Leite¹

and Fernando Ferreira¹

The use of sperm from subfertile bulls implies high productivity losses and, therefore, has a great impact on production sustainability. Results from a previous study associating functional and metabolomics analysis of sperm from Angus and Nellore bulls with high and low fertility rates showed important differences related to energy metabolism, oxidative status and correlations with sperm kinetics. Considering these results and taking into account differences observed between sperm samples, even from the same bull, this study aims to characterize sperm subpopulations based on individual sperm kinetics of each sperm batch obtained by CASA (Computer-Assisted Sperm Analysis; Hamilton – Thorne®, IVOS II, US), correlating the subpopulations with their functional and metabolic profiles. This study will analyze individually a high number of cells with representativeness in relation to semen batches (about 60,000 cells from each batch) and use the relation of the subpopulations with the functional and metabolic profile for a better understanding of the physiological effects of sperm subpopulations on fertility. This analysis will allow the establishment of kinetic parameters values related to sperm cell viability related to energy metabolism, oxidative status, and patterns of hyperactivation and early capacitation. Moreover, for the big data subpopulations analysis and its association with the sperm physiological profile the project includes the creation of a partitioned database and the development of an algorithm for automatic reading of subpopulations from the files obtained in the CASA system. This algorithm will be validated and adjusted to the usual readings performed by semen collection centers, with the use of the database where this algorithm will be improved through the process of machine learning.

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Ultrasound-mediated nanoliposomes as promising carriers to deliver miRNAs to cells of interest during *in vitro* production

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Nowadays, the use of extracellular vesicles (EVs) as drug delivery systems remains challenging, mainly due to the lack of standardized isolation methods, limited drug loading efficiency, and insufficient clinical grade production. In turn, nanoliposomes (NLPs) are lipid carriers that have been efficiently produced in several large-scaled industrial practices, as well as easily characterized by well-established techniques. One can say that EVs can be considered as more complex forms of NLPs due to their biological origin. Therefore, we intended with this study to produce NLPs containing miRNAs usually found in EVs and of interest in *in vitro* production of bovine embryos, in order to design a synthetic vesicle with increased endogenous properties and possible to be scaled-up. Unloaded NLPs were produced using cholesterol and commercial pharmaceutical phospholipids at multiple ratios. Vesicle dispersions were sonicated for 5 s on and 2 s off cycles (50–75 in total) at a 60–70% amplitude using an ultrasonic tip homogenizer, and extruded at 12 bar through 100-nm polycarbonate membranes. Samples were characterized in respect to their average mean diameter, size distribution and zeta potential using dynamic light scattering, and to concentration using nanoparticle tracking analysis. Morphology of vesicles was observed using atomic force microscopy. NLPs staining with rhodamine-labeled lipids was confirmed by flow cytometry. NLPs were incorporated into bovine granulosa cells to verify possible uptake mechanisms, which were analyzed using fluorescence microscopy. Results showed that NLPs were spherical with diameters lower than 100 nm, electrically stable with zeta potential values ranging from –60 and –50 mV, and homogeneous in size with polydispersity index values lower than 0.3. Fluorescence microscopy showed that NLPs appeared to remain in the perinuclear region, around the nuclei. Further studies regarding the engineering of NLPs in respect to the amount and transfection of incorporated miRNAs are needed to validate their potential as genetic delivery systems.

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Mapping migratory bird sites to access avian influenza risks in backyard birds – Insights from a São Paulo State study

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The 2021/2023 epizootics caused by the H5N1 highly pathogenic avian influenza virus (HPAIV) remain one of the largest worldwide. The virus has been spread across the continents throughout the migration of wild birds, mainly *Anseriformes* and *Charadriiformes* orders, and it usually is introduced to resident wild birds and backyard and commercial poultry flocks. In May 2023, the virus was detected in wild birds in Brazil, including in SP, for the first time after. As of the 19th of June, the virus was found in twelve wild bird species from five Brazilian states: ES (n=29), RJ (n=10), BA (n=2), SP (n=1), and RS (n=1), totaling 39 cases. The present study aims to adjust the virus surveillance in backyard flocks closed to waterfowl sites to identify the virus spread. The study has been carried out in collaboration with the Secretary of Agriculture and the Poultry Health State Program from São Paulo state. Waterfowl sites in São Paulo have been studied, and samples (sera and swabs) from backyard flocks have been collected. A database was created with geographical coordinates, the taxonomic classification of birds, and the municipality of sighted birds collected from CEMAVE/ICMBio and WikiAves. Spatial analyses were performed using the Kernel Density Estimator. Maps were generated, classified with relative densities using a color scale, and divided into five classes. The highest concentration of *Anseriformes* birds was found in the Vale do Paraíba, São Paulo Metropolitan region, and South Coast. In contrast, the *Charadriiformes* and *Pelecaniformes* orders are found in all state regions. The initial surveillance was performed in the Vale do Ribeira (Cananéia, Iguape, and Ilha Comprida) in December/2022 and May/2023. In total, 103 swab samples (pools of cloacal and tracheal swabs) from 273 birds from 39 backyard poultry farms (chickens and ducks) were collected. All collected swabs were negative for avian influenza; sera samples and other locations will be tested. Understanding the waterfowl sites and the risks of the introduction of avian influenza in domestic bird flocks will be essential to drive the actions of the official veterinary service.

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Inclusion of dietary guanidinoacetic acid rates for sows and their progenies on performance and milk traits

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A total of 160 healthy gilts were randomly divided into 4 groups with 40 replicates, being each gilt considered an experimental unit. Gilts were fed corn and soybean meal-based diets containing 0, 1.2, 2.4 or 3.6 kg/ton of Creamino®, a source of guanidinoacetic acid, from 80 days after the confirmed pregnancy until delivery. Greater final BW and milk production in gilts fed dietary Creamino® was observed ($P=0.008$ and <0.001 , respectively), as well as lower delivery time when compared to the control group. Feeding dietary Creamino® decreased the number of mummified piglets ($P<0.001$), while also increasing the number of liveborns ($P=0.036$). No differences were observed regarding piglet performance at birth. However, at weaning, litters born from gilts fed 2.4 or 3.6 kg/ton of Creamino® were heavier than litters from other groups, also showing higher number of weaned piglets, litter WG and viability ($P<0.001$). Concerning piglet performance after weaning, it was observed that piglets born from gilts fed 2.4 kg/ton of Creamino® showed higher ADG and final BW when compared to the piglets from other groups ($P<0.001$). Regarding colostrum composition, it was observed that gilts fed Creamino® showed higher levels of dry matter, creatine, fat, and crude protein when compared to the control group. Milk composition was analyzed on days 11 and 19 of lactation, being observed that the milk from gilts fed 1.2 kg/ton of Creamino® showed higher concentrations of creatine and crude ash in D11, and milk from the treatment groups showing higher crude ash levels at D19.

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Can beef consumer habits be affected by the media?

Cross-cultural study: Brazil, Spain and Turkey

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“Shared Culture in Virtual Communities” refers to group interaction on websites and social media platforms that may have an impact on a person’s choices and actions. Concerns regarding the effects of beef consumption on human health, animal welfare, the environment, the administration of hormones, and other topics connected to animal production are extensively discussed. This study aimed to assess the impact of different media outlets on consumers in Brazil, Spain, and Turkey that were changing their habits of beef consumption. A quantitative analysis was carried out through the application of a questionnaire, obtaining a sample number of 412 consumers in Brazil, 407 in Spain, and 424 in Turkey. The results came from a non-probabilistic sampling. To compare the variances between the averages of consumers in the three countries, a descriptive analysis of the data was performed using cross tables and the ANOVA test, significance level 5%, using the SPSS v28 software. Study approved by CEPH – CAAE: 46941121.3.0000.5422. The findings describe some agents that positively, negatively, or do not influence the consumption of beef. The factors that most positively influence the studied populations to consume beef are the medical opinion of 53.9% of Brazilians, 45.9% of Spanish, and 61.1% of Turks. In second place, is the opinion of nutrition experts, which positively influences 45.6% of Brazilians, 44% of Spanish, and 53.5% of Turks. Channels of marketing advertisements, documentaries, and series from streaming platforms, digital influencers, NGOs, and non-specialists were mostly characterized as “no” influence. However, documentaries and series, NGOs, and digital influencers are among the mentioned channels that encourage more Brazilians and Spanish to reduce or discontinue eating beef. What can be inferred is that the social, economic, technological, and political contexts in which the consumers are inserted affect their decisions and preferences for products and services, making the consumer’s role in information filtering not always easy.

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Análise sensorial do café em diferentes graus de torra e sua correlação com a composição

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A planta do café, conhecida como cafeeiro, pertence ao gênero *Coffea* da família *Rubiaceae*, cultivadas no Brasil desde o século XVIII, as espécies *Coffea arábica* e *Coffea canéfora* destacam-se por serem as mais cultivadas. Em virtude a expressiva concorrência mundial, o café produzido no Brasil tem procurado atender às condições impostas do mercado e, com essa atitude, várias tecnologias estão sendo aplicadas para a classificação e melhoria da qualidade do café. O sabor peculiar dessa bebida deve-se à presença e aos teores de vários constituintes químicos voláteis e não voláteis, entre eles os ácidos graxos livres. Estes compostos, aromáticos ou não, conferem sabor e aroma ao café influenciam na preferência do consumidor. Desse modo, esta pesquisa pretende analisar a composição de grãos de café cru e com distintos níveis de torração de duas cultivares (IPR 99 e 107) de café e correlacionar sensorialmente esta composição com os atributos da bebida. Os grãos de café serão fornecidos pela propriedade rural localizada na região no Norte Pioneiro Paraná e serão classificados, torrados quanto às torras clara-85, média-65 e escura-45. Os óleos dos grãos de café cru e torrados serão obtidos por meio da extração com dióxido de carbono supercrítico e posteriormente caracterizados por meio umidade, carboidratos, lipídios, proteínas, cinzas, açúcares totais e redutores, isômeros dos ácidos clorogênicos, ácidos orgânicos (acético, cítrico, láctico, málico, quínico, succínico e tartárico, trigonelina, cafeína, cafestol e caveol), os macronutrientes (nitrogênio, cálcio, magnésio, fósforo, potássio e enxofre), micronutrientes (boro, cobre, ferro, zinco e toxicidade de manganês), acidez titulável, pH, sólidos solúveis e compostos fenólicos. Depois serão determinadas suas propriedades físicas como cor instrumental, viscosidade, densidade e índice de refração. Em seguida, as bebidas do café, preparadas a partir dos grãos torrados serão avaliadas sensorialmente aplicando a análise descritiva quantitativa utilizando dois tipos de avaliadores: experts e equipe treinada, os dados obtidos das análises sensoriais serão correlacionados à composição físico-química dos grãos. Pretende-se, com os resultados obtidos nestes experimentos, demonstrar que a composição dos grãos e o grau de torração influem na bebida.

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Dairy cows metabolic status effects on epigenetic changes in the embryo and endometrium: the role of extracellular vesicles

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The advances in genetic selection of dairy herds to increase milk production did not come with an improvement of reproductive parameters. Negative energy balance (NEB) during postpartum period is important risk factor in the establishment of reproductive failure and has significant economic impact due to the reduction in animal production. Metabolites generated during NEB state negatively affect reproductive cells. However, there is a gap in knowledge about intercellular communication in the follicular and uterine environment of cows affected by NEB. Extracellular vesicles (EVs; exosomes and microvesicles) are mediators of intercellular communication, modulate several reproductive processes and can carry molecular signals in response to stressors such as BEN. Epigenetic mechanisms are known to regulate critical cells functions and modulate cell adaptation responses including cell metabolism and stress. In this way, epigenetic changes due to exposure to a stressful environment may be one of the causes of the negative effects observed in reproductive cells exposed to NEB. *The hypotheses that will be tested are: follicular fluid EVs isolated from cows presenting NEB can affect oocyte quality, early embryonic development and modulate epigenetic changes; uterine fluid EVs from cows with NEB modulate epigenetic and molecular changes in endometrial cells.* To test these hypotheses, the follicular and uterine fluid from heifers and cows with high and low NEB state will be collected 30 and 60 day after calving and VEs will be isolated and analyzed. The EVs isolated will be added to the oocyte maturation and endometrial cell culture medium to evaluate the effects on the epigenetic and molecular modulations of these cells. The first aim is to investigate the functions of the vesicles present in the follicular fluid of dairy cows with different metabolic status during oocyte maturation and embryo development, evaluating specially the epigenetic changes. The second aim is to determine the content of the vesicles present in the uterine fluid of dairy cows with different metabolic status and to investigate the functions of these vesicles in the endometrial cells. The results obtained in this research will make possible to understand the follicular and uterine environment of cows in NEB state in two important moments for the IA allowing the development of new technologies and management methods to reduce the economic losses in milk production.

Extracellular vesicles as an amplifier of embryonic signals: implications to maternal immune response

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During maternal recognition of pregnancy, compounds secreted by the single bovine embryo create an immunotolerant-like environment, modulating the multicellular maternal system. In this project, we aim to test the hypothesis that small extracellular vesicle (sEVs) modifies the maternal immune response to establish an embryo-tolerant environment. The first aim of this study is to evaluate the sEVs migration ability and their effects on polarization and transcriptional patterns from 0 hours until day 21 post sEVs intrauterine infusion in cows. The second aim of this study is to investigate the polarization and transcriptional patterns induced by sEVs generated by day 8 bovines' embryos on maternal immune cells in vitro. To address the first question, we examined whether sEVs can migrate from the uterine environment and directly interact with circulating leukocytes. On day 7 post ovulation, three Nellore heifers received fluorescently labeled sEVs (GT), two heifers received a dye (GC), and one heifer received only the diluent (GN) in the ipsilateral horn to the corpus luteum. Plasma-derived sEVs were isolated at various time points (0 to 1440 min post-infusion), and the presence of fluorescent labeled sEVs was assessed using flow cytometry. Our results show that the positive labeled sEVs varied over time and among groups (GT > CC > CN; $P < 0.05$) in flow cytometry. The detection of sEVs in the bloodstream was relatively rapid, occurring within 30 min, and gradually decreased over time. We used the same plasma-derived sEVs in an in vitro assay to co culture with polymorphonuclear cells to assess the presence of labeled sEVs by epifluorescence microscopy. The results demonstrated that PMNs co incubated with sEVs derived from the GT group had endocytosed labeled sEVs. Despite some limitations in this experiment, our data suggest that labeled sEVs can exit the uterine environment and elicit an endocrine. Overall, this project will contribute to our understanding of how sEVs modulate the immune response.

1. Faculdade de Medicina Veterinária e Zootecnia da USP.

In vitro derivation of gamete-like cells from porcine induced pluripotent stem cells (piPSCs)

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Germ cells are the source of totipotency, reproduction, inheritance, and evolution of organisms. For this reason, many studies aim to clarify the fundamental mechanisms of germ cell development, and for that, several in vitro models are developed. One of the most promising models for the in vitro reconstitution of gametogenesis is through pluripotent stem cells, which can produce functional oocytes/spermatogonia. This technology has shown great advances, mainly in mouse, human and rat models. However, it has never been reported in other species, such as porcine. In this context, this study aims, in an unprecedented way, to create a translational model capable of producing in vitro mature germ cells from porcine induced pluripotent stem cells (piPSCs). Thus, piPSCs were initially differentiated into primordial germ cells (PGCLCs) and then subjected to differentiation into gametes using xenogeneic reconstituted ovaries (xrOvary) and in vitro reconstitution of the whole male germ-cell (rTestis). All cells were analyzed for morphology, gene, and protein expression during different culture periods. Results indicate that porcine oocyte-like cells (pOLCs) or germline cell-like cells (GSCLCs) can be generated from pPGCLCs from iPSCs lineages when cultured in the reconstitution systems with murine fetal gonad cells. In the xrOvary system, pOLCs, formed large clusters of GFP+ cells and showed signs indicative of meiosis progress after 21 days in culture through the expression of *GDF9* and, after 36 days, through the expression of the *FOXL2* gene. Likewise, in the rTestis system, cells formed large clusters of GFP+ cells expressing *GFRA1* and *PLZF*. When cultivated for 7 days on MEFs, they expressed *GFRA1*, and on Sertoli, they expressed the *SCP3* gene. By immunofluorescence analysis, pGSCLCs were positive for OCT4, PLZF, and SPC3. These results suggest that the reconstitution system used in porcine can contribute to the success in the generation of germ cells-like in vitro in this species. Furthermore, the somatic cells used in the reconstitution process act in the modulation of the phenotypic, genetic, and morphological profile of the pOLCs or pGSCLCs cells generated in vitro. Thereby, this study can contribute to the areas of improvement of animal reproduction, transgenics, cloning, genetic gain, and precision farming, as well as in future studies related to possible alterations in germ cells or other diseases that cause infertility or lack of functional gametes in humans.

1. Faculdade de Zootecnia e Engenharia de Alimentos da USP.

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Resistant pH decline is related to slower rate of beef tenderization in excitable *Bos indicus* cattle

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Beef from *Bos taurus indicus* is linked to a slower rate of tenderization when compared to taurine cattle, which is also negative influenced if animals are raised non-castrated. Testosterone also influences cattle temperament, and more excitable animals are related to inferior beef quality. It was hypothesized that excitable Nellore males, independently of gender, have slower rate of beef tenderization. From a larger group of 72 Nellore males, a sub-group (n = 23) was selected based on temperament tests during the first handling (after animals were transferred from pasture and adapted to feedlot). After slaughter, pH and temperature decline were measured (1, 3, 6, 9 and 24h *postmortem*) in the *Longissimus lumborum* (LL) muscle, where steaks were sampled, vacuum packaged and aged (2, 7, 14 and 28d). Cooking loss and Warner-Bratzler shear force (WBSF; N) were determined. Data was analyzed as a factorial design [2 × 2; 2 genders (non-castrated – NC or immunocastrated – IM) and 2 temperaments (excitable or calm)], using a mixed model with random effect of slaughter date and fixed effects of gender (G), temperament (T), time *postmortem* (time), as well as its interactions. Time *postmortem* was considered a repeated measure. There was an interaction effect between temperament and time *postmortem* for pH decline (p = 0.067) with pH at 3h greater in LL from excitable than calm animals. It was also observed an interaction effect for WBSF (G × T × time: p = 0.077), with beef from IM and calm animals with lower values at 28d. Taken together the results pointed that the resistance in pH decline observed in animals classified as excitable was related to less extended beef tenderization for this group. Nellore males classified as excitable would not benefit from immunocastration as well as calm animals. Therefore, temperament in Nellore cattle must be considered when adopting immunocastration and aiming for superior beef quality produced in tropical areas.

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Cell therapy and animal sciences: mesenchymal stem cell transplantation aiming the increase of reproductive efficiency in cows

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Assisted reproduction technologies (ARTs) are extremely important tools aiming infertility treatments, and are also responsible for important advances regarding livestock efficiency worldwide. Cell therapy based on multipotent stem cells (MSC) is widely used in human and veterinary regenerative medicine due to its trophic and immunomodulatory properties. The present study aims, therefore, to analyze the effects of transplantation after uni and bilateral intraovarian MSC application on the reproductive function of cattle. Specific analysis are the follicular count, and uterine characteristics before and after cell transplantation. Also, oocytes retrieved by ovum pick-up (OPU) were classified and submitted to IVF to produce embryos derived from cows with high or low follicular count and treated with MSC. For this purpose, fragments of adipose tissue from cows with high or low follicular counts were collected, the cells isolated and characterized in terms of multipotency (growth curve, differentiation and specific markers). Bovine females (*Bos indicus*, n=15) were analyzed for the presence of corpus luteum, follicular count, and allocated to the experimental groups: low follicular count (LFC; ≤ 20 follicles of ≥ 3 mm in diameter) or high follicular count (HFC; ≥ 30 follicles ≥ 3 mm in diameter). The groups were submitted to 3 applications of MSC or saline solution (SS), with intervals of 14 days, followed by OPU. COCs were submitted to IVP and will be evaluated for the expression of genes related to folliculogenesis. Anti-Mullerian hormone (AMH) will be quantified between treatment. Reproductive evaluations were realized before and continuously until the end of treatment, and include rectal palpation, follicular count using B-mode ultrasound imaging of uterine horns and ovaries. All images are analyzed containing evaluations of corpus luteum (CL), area (cm²) and uterine horns, echotexture (edema; grades 1 to 4). The next steps involve the morphological and molecular analysis of pools of COCs and embryos (gene expression of NOBOX, Gdf9, Bmp15, Fgf2 and Bmp4), in addition to the analysis of cell migration performed by screening with the application of MSC positive for the GFP reporter. We expect that MSC-based cell therapy will increase follicular count (ovarian reserve), optimizing reproductive clinical protocols in cattle and enhancing national and global livestock production, in addition to serving as a functional assay for future use in human assisted reproduction.

1. Faculdade de Zootecnia e Engenharia de Alimentos da USP.

Processing and evaluation of functional yogurt using grape seed extract obtained from waste from the wine industry encapsulated in waste yeast from breweries

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Functional foods are those that, in addition to basic nutritional functions, provide other health benefits to the consumer. Yogurt is a product with high acceptance and has a favorable matrix for the incorporation of new functional ingredients. An important functional component is phenolic compounds, a class of secondary metabolites synthesized by plants and can act as antioxidant, antihypertensive, and antidiabetic agents, playing a fundamental role in the prevention and treatment of several diseases of public health interest. These compounds can be present in large amounts in industrial waste that are often discarded, and their reuse can be an alternative to increase the profitability of industries and offer new products, in addition to reducing environmental damage. A very common industrial residue in the wine industry is a grape seed, which has been constantly used to treat various diseases. To ensure that the body better uses bioactive compounds, microencapsulation is a technique that allows greater protection and use of these compounds when they reach the intestine. In this context, residual yeast from the brewing industry has important encapsulating properties and can be added to the formulation of functional foods. This project aims to use residual brewery yeast for encapsulation of phenolic compounds from grape seed residue (ESU) derived from the wine industry, and addition of these particles in yogurt formulation, for evaluation of in vitro biological activities, rheological characterization, microstructural, physicochemical, microbiological and sensorial, in addition to the in vivo evaluation of the efficacy in the treatment of inflammatory bowel diseases. It is expected to obtain a functional product proven through in vitro and in vivo analyses, also presenting the desired technological characteristics, and which will be well accepted by consumers.

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Differential organellar gene expression of sugarcane submitted to biotic stress

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Plants have bioenergetic organelles that have their own genomes, originating from ancient bacterial endosymbiosis. Due to their vital role, we explored the general expression of the annotated genes under biotic stress. Total transcriptomes generated from one tolerant sugarcane cultivar and three susceptible cultivars inoculated with different pathogens and/or an endophyte were sequenced by Illumina NovaSeq technology. The gene expression of these cultivars was analyzed, totaling ten comparative conditions. Genes whose fold-change has a p-value less than 0.05 are being considered differentially expressed. Overall, there were no differences in fold change dispersion between susceptible varieties, whereas in tolerant cultivars, some conditions produced changes in fold change dispersion. Some genes showed significant changes in expression, such as the chloroplast genes *atpE*, *ndhK*, *ycf4* and three mitochondrial proteins, the delta ATPase subunit and two other highly conserved proteins in plants. It was observed that sets of genes are activated or repressed in the presence of the pathogen. 62 sets of genes show a pathogen-specific pattern. Interestingly, in the presence of a pathogen, DE genes were upregulated in the susceptible cultivar, while in the tolerant cultivar, only downregulated values were observed. Thus, these results open the opportunity for further research on the organellar response of tolerant and susceptible cultivars in the presence of pathogenic and endophytic microorganisms.

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2. Escola Superior de Agricultura Luiz de Queiroz da USP.

3. Centro de Cana – IAC.

SlBBX28 positively regulates plant growth and flower number in an auxin-mediated manner in tomato

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B-box domain-containing proteins (BBXs) comprise a family of transcription factors that regulate several processes, such as photomorphogenesis, flowering, and stress responses. For this reason, attention is being directed toward the functional characterization of these proteins, although knowledge in species other than *Arabidopsis thaliana* remains scarce. Particularly in the tomato *Solanum lycopersicum*, only two out of 31 SlBBX proteins have been functionally characterized to date. To deepen the understanding of the role of these proteins in tomato plant development and yield, *SlBBX28*, a light-responsive gene, was constitutively silenced, resulting in plants with smaller leaves and fewer flowers per inflorescence. Moreover, *SlBBX28* knockdown reduced hypocotyl elongation in darkness-grown tomato. Analyses of auxin content and responsiveness revealed that SlBBX28 promotes auxin-mediated responses. Altogether, the data revealed that SlBBX28 promotes auxin production and signaling, ultimately leading to proper hypocotyl elongation, leaf expansion, and inflorescence development, which are crucial traits determining tomato yield.

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3. Faculdade de Ciências Farmacêuticas da USP.

Hormonal signaling network can contribute to design strategies to improve the growth and yield of sugarcane plants

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Sugarcane is an essential crop in the agricultural scenario, mainly as a sugar and bioethanol production source, and constitutes a sustainable energy source that contributes to mitigating carbon emissions. In this sense, attention to the production of biofuels has led to a scientific advance in understanding sugarcane physiology, biochemistry, and molecular biology. Integrating the sugar sensing, signaling processes, and hormonal networks systemically helps design strategies to modulate plant growth, increase yield and adapt to different climatic conditions. Biochemical analyses were employed to determine the levels of polyamines (PAs), amino acids, abscisic acid (ABA), indole-3-acetic acid (IAA), and brassinosteroids (BR) in leaves and culm of sugarcane. Also, a bioinformatic analysis was performed to identify a set of genes related to these biosynthesis and hormonal signaling pathways. PAs were most abundant in leaves, and putrescine was the main one. The most abundant amino acids found in the leaves were ornithine and lysine, whereas in culm were asparagine, glutamine, and histidine. High levels of hormones IAA and ABA were detected in leaves during the last month of sugarcane development. A deep search by genes related to receptors and signaling of ABA, BR signaling, PAs-, ethylene- and amino acids-biosynthesis, allowed recovery of 3042 sequences from 7 databases of sugarcane (transcriptomes and genomes). After restrictive filtering (coverage, presence of domains, and removing redundant sequences) it was set 115 sequences corresponding to 36 genes group of pathways described above. *In silico* expression profiles are being determined to evaluate the pattern of the primary genes expressed in this hormonal signaling network, which will be correlated to the biochemical analysis. These findings could be used to genetically modify sugarcane to accelerate growth and sugar accumulation.

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Actions proposition as a pathway to more sustainable Brazilian agriculture and livestock production

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The objective of this study was to propose actions to contribute to the creation of public policies for the sustainable development of Brazilian agricultural and livestock production. For this, a semi-structured questionnaire was produced based on the 17 UN Sustainable Development Goals (SDGs). The questionnaire was subdivided into three levels of action: Inclusion Actions, Innovation Actions, and Sustainability Actions, and submitted to 12 professors specialized in Agricultural Sciences who were responsible for coordinating four Working Groups: (WG1) Infrastructure & Logistics; (WG2) Rural Development; (WG3) Environment; and (WG4) Production and Single Health. A total of 358 sustainability promote action suggestions for Brazilian agricultural and livestock production were obtained. Of the total, 22% corresponded to SDG02, followed by SDG01, SDG06 and SDG12 (13%, 12% and 9%, respectively). Furthermore, 42% of the actions were characterized as Inclusion Actions, followed by Innovation Actions (32%) and Sustainability Actions (26%). For smallholder farmers, the actions were directed towards the financial incentive policies for family farmers, traditional peoples and/or socially vulnerable, with encouragement to cooperativism, strengthening and insertion in local/regional markets; encouragement of research and initiatives that support the transition or creation of systems for the production of ecologically based food. For corporate agriculture, the actions were directed to logistics issues; reduction of losses and costs; policies for better use of pesticides; as well as waste reuse, bioenergy generation, and better use of water resources. In conclusion, sustainable development promotion for Brazilian agricultural and livestock production involves the encouragement of policies that support socially and environmentally responsible practices, such as respect for the environment and support for socially vulnerable communities. Such policies should present a multisystemic and multidimensional vision of incentives to smallholder farmers, large farmers, and agroindustries.

1. Instituto de Estudos Avançados da USP.

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Establishment of the base population for the future usage of Single Nucleotide Polymorphism (SNP) markers as a tool in breeding programs to increase the nutritional quality and cost-effectiveness of the production of nilotic tilapia (*Oreochromis niloticus*)

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The project “Pescado para a Saúde” (Fish for Health), under development in the FAPESP call for Problem-Oriented Research Centers (NPOP) in the state of São Paulo, is focused on promoting and increasing the consumption of fish, including nutritionally fortified aquaculture products, as a healthier alternative to “red meat” and fast-food consumption in the fight against the epidemic of obesity, coronary heart disease and associated ills in the state and country. This research center is composed of an alliance between universities (led by the University of São Paulo), government agencies (led by the Fisheries Institute) and private companies, both domestic and foreign, engaged in aquatic species nutrition and the productive sector, in order to clarify the benefits to human health of increasing fish consumption, as well as the application of public policy and fish dietary recommendations for the São Paulo and Brazilian consumer. According to the latest statistical information, it is reported that overweight represents more than 53% of the Brazilian population, and obesity increased 67.8% between 2006 and 2018, reaching 20.7% and 18.7% of Brazilian women and men, respectively. It is also reported that diseases of the circulatory system (31.3%), cancer (16.3%), diabetes (5.2%) chronic respiratory diseases (5.8%) represent 72% of the causes of death annually in Brazil. Additionally, the prevalence of diabetes has also been growing; it increased from 5% to 9% of the Brazilian population from 1980 to 2014, with a prevalence of 7.5% reported for the city of São Paulo, representing 6% of deaths nationally. Faced with this problem, the increase in the consumption of waterborne foods emerges as an alternative to try to reverse this scenario. Aquatic Food, which includes all foods derived from fishing and aquaculture, including fish, crustaceans, mollusks, and plants, offers a healthier food than land-based meats to combat malnutrition and obesity. Compared to other types of meats, Aquatic Food has higher protein content on an edible

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portion basis than most land-based meats, lower calorie density and is generally leaner than red meat and processed foods, higher content of long-chain omega-3 polyunsaturated fatty acids than any other food, and generally higher levels of minerals and vitamins than land-based meats and processed meat products. Nutritional fortification of the meat is one of several alternatives raised by the research group involved in this project to increase fish consumption. Genetic improvement also appears as an important tool to incorporate more desirable nutritional profiles to the meat as well as to overcome some bottlenecks faced by the productive sector by enabling fish to reach optimal performance indexes. In the last decades, most fish farmers have been incorporating genetically improved strains of some species in their production systems. Traits that directly affect the cost of production, such as growth rate, fillet yield and feed conversion among others, are commonly used in breeding programs. However, more recently, other traits such as body composition and nutrient content, welfare, and environmentally friendly production systems are gaining prominence in consumer preferences. The era of Next Generation Sequencing (NGS) has opened new opportunities to explore the genome of farmed fish.

Fish for health – Improving the nutrient profile of farmed shrimp for the consumer

Rafael T. I. Coelho¹

and Daniel E. L. de Lemos

The main goal of the project is to obtain data that will help the Fish for Health Research Nucleus in its main objective, which is to promote and increase the consumption of fish and seafood as a healthier alternative to red meat, highly processed foods and “fast foods” in the fight against the epidemic of chronic non-communicable diseases (NCDs) that include cardiovascular diseases, hypertension, obesity and associated illnesses in the State of São Paulo. More specifically, the project will act on two key points, the first point includes monitoring the variability in the nutrient content and quality of the main marine shrimp consumed in the State (fishing and farmed, and the nutritional composition and quality of the aquaculture feeds used in farms, indicating a clear picture of the potential benefits of consumption for human nutrition and health. The second key point is to carry out experiments focusing on enhancing the nutrient content and potential value for human health of farmed shrimp through dietary fortification with omega-3 polyunsaturated fatty acids (EPA and DHA), fat-soluble vitamins (vitamins E), and the reduction of cholesterol levels by the use of phytosterols, as to obtain an even more interesting food in terms of nutrition and health. The data will be important to promote increased awareness and understanding of the benefits of aquatic food for health, and will be disseminated through scientific and sectorial publications, social media, exhibitions and seminars to the general public.

1. Instituto Oceanográfico da USP.

MEIO AMBIENTE

How long have we been mistaken? Multi-tools shedding light into the systematics of the most widespread scleractinian deep-water framework engineer

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Deep-water coral reefs are found worldwide and harbor biodiversity levels that are comparable to their shallow-water counterparts. However, the genetic diversity and population structure of deep-water species remain poorly explored, and historical taxonomical issues still need to be resolved. Here we used microsatellite markers as well as ultraconserved elements (UCE) and exons to shed light on the population structure, genetic diversity, and phylogenetic position of the genus *Madrepora*, which contains *M. oculata*, one of the most naturally widespread scleractinian species. Population structure of 107 samples from three Southwestern Atlantic sedimentary basins revealed the occurrence of a cryptic species, herein named *M. piresae* sp. nov., Kitahara, Capel and Zilberberg, which can be found in sympatry with *M. oculata*. Phylogenetic reconstructions based on 134 UCEs and exon regions corroborated the population genetic data, with the recovery of two well-supported groups, and reinforced the polyphyly of the family Oculinidae. In order to better accommodate the genus *Madrepora*, while reducing taxonomical confusion associated with the name Madreporidae, we propose the monogeneric family Bathyporidae fam. nov. Our findings advance the knowledge on one of the main framework builders of deep-water reefs, resolve a long-standing question regarding the phylogenetic position of the genus *Madrepora*, and highlight the need of a worldwide review of the genus.

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Space-time dynamics in the diversity and abundance of competent reef fish larvae on the northern coast of the State of São Paulo

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Reef fishes present a planktonic and potentially dispersive larval stage that usually ends with the settlement of individuals in shallow coastal habitats. The coast of São Paulo includes extensive rocky reefs that support important fishing activities. This project aimed to evaluate spatial and temporal variations in the diversity and abundance of competent reef fish larvae in the State of São Paulo and their relationships with oceanographic variables and habitat characteristics (complexity, depth and coverage of benthic organisms). A pilot study was carried out comparing the efficiency of four types of traps to fish larvae. A trap made with transparent plastic containers of 20 liters with artificial light (white led) and placed on the background captured the highest abundance of competent fish larvae and was chosen for the following sampling. Samplings of competent larvae were then carried out at six locations, three of them coastal, two in Ilhabela and two in Ilha dos Alcatrazes. After 14 field expeditions lasting 1–2 days, 5077 larvae/juveniles of fish have been captured in the traps. Most of this material is still in the screening/identification phase. 10 families and 16 genera have been registered, with sizes varying between 8 and 68 mm. The highest total abundances of larvae were recorded on the coastal Islet of Itassucê. A marked seasonality was recorded between autumn/winter 2022 and summer 2023, with higher abundances recorded in summer. These results, yet to be analyzed, will allow a broader understanding of the life cycle and patterns of habitat use along the continental shelf (cross shelf) of species of economic importance in the region.

1. Centro de Biologia Marinha da USP.

Effect of pre-chlorination on inactivation of *Microcystis aeruginosa* cells and removal of microcystins

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The increased pollution of water sources increases the concentration of nutrients, causing different environmental impacts, which directly reflect on human beings. One of the problems is the proliferation of toxic cyanobacteria, such as *Microcystis aeruginosa*, which produces microcystins, which is hepatotoxic. The presence of this cyanobacteria directly impacts water treatment, creating a problem in the drinking water supplied. Given this context, this study aims to evaluate the cellular inactivation of *Microcystis aeruginosa* and the degradation of microcystin indications. Satisfactory results were obtained in this research, where the loss of cellular integrity was observed with the increase in chlorine concentration. Maximum cell permeability without cell disintegration occurs at 2.5 mg Cl₂ L⁻¹. Degradations of up to 70% and reductions in chlorophyll-a above 70% are observed after 60 min of exposure, with complete degradation at 2.5 and 3 mg Cl₂ L⁻¹. However, exposure to chlorine (Cl₂) above 40.66 mg min L⁻¹ is required for the presentation of MC-LR microcystins (i.e. radicals: leucine (L) and arginine (R)) and MC-RR (that is, radicals: arginine and arginine) for concentrations below the value of legislation for potable water.

1. Centro de Energia Nuclear na Agricultura da USP.

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Bioproducts from microalgae and cyanobacteria biomass as new agricultural inputs and food supplements: a sustainable approach

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and Ernani Pinto¹; Marli Fiore¹

The artificial increase of nutrients, particularly phosphates and nitrogen compounds, in aquatic ecosystems, creates an ideal environment for the excessive growth of aquatic plants and phytoplankton (algae, microalgae, and cyanobacteria). This leads to ecological imbalance, alterations in water physicochemical patterns, and the release of significant amounts of gases upon decomposition, exacerbating the greenhouse effect. Algal blooms caused by certain cyanobacteria species can also release toxic compounds, posing risks to aquatic, terrestrial, and human organisms. Studies indicate that over 40% of the world's water bodies are eutrophied, and climate change is expected to accelerate this process further. Urgent implementation of policies and actions involving society, the public sector, and private companies is crucial to preserve and sustainably manage aquatic ecosystems. In Brazil, water treatment plants (WTPs) and hydroelectric power plants (HPPs) have invested in technological resources and chemical treatments to ensure water quality and prevent the proliferation of cyanobacteria/microalgae. However, algal blooms remain a significant challenge, especially during seasons with increased temperature, intensified solar radiation, and altered rainfall patterns that promote the growth and accumulation of these microorganisms. Our solution involves collecting microalgal biomass from eutrophied environments and utilizing technology to convert it into value-added agricultural inputs. Although the exploitation of microalgal byproducts is established in the international market, it is largely overlooked in Brazil. Our proposal aims to demonstrate the technical feasibility and innovation through strategic research and method enhancements. This includes collecting microalgal biomass from eutrophied environments, identifying compounds with biotechnological potential, improving techniques for selecting high-value bioactive substances (macro and micronutrients) for soils, plants, and animal feed, as well as evaluating the quality and safety of the biomass as a raw material for developing bioproducts. Our P&D project aligns with several Sustainable Development Goals (SDGs) supported by the United Nations in Brazil. Moreover, microalgal biomass captures carbon from the atmosphere, demonstrating our connection to clean energy and potential utilization as a carbon credit.

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Functional forests – Urban parks for mitigating and adapting to climate change in cities

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Urban forests are one of the main tools available for the adaptation of cities to global climate change. However, there are still fundamental gaps to support decision-making in urban forests toward resilient cities. In this sense, this project assesses the ecosystem services provision of two parks in the city of São Paulo, namely: Ibirapuera Park (a central public park) and Fontes do Ipiranga State Park (one of the largest urban patches of the Atlantic Rainforest). We aimed at understanding the processes behind, and quantifying the ecosystem services provision, from both urban forests by using Eddy Covariance sensors that measure the fluxes of carbon dioxide, water vapor, and energy between the biosphere and atmosphere at hightemporal resolution (10 Hz). The flux data is compared to micrometeorological observations on precipitation, air temperature and humidity, soil temperature and moisture content, and ecophysiological parameters measured at tree level in different native tree species. This comprehensive dataset spans from October 2022 to June 2023, with prospects for permanent measurements in both parks. The results show that these urban forests provide ecosystem services for the population, such as the promotion of carbon assimilation for urban mitigation, and climate regulation through the decrease in air temperature by the attenuation of surface sensible heat emission and increase in latent heat flow, as the evapotranspiration process of trees favors temperature reduction of the atmosphere. Thus, urban forests provide essential benefits to the population well-being, leveraging the resilience of cities in the face of climate change.

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REDD+ impacts on forest conservation and local livelihoods: a longitudinal assessment in the Brazilian Amazon

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REDD+ is supposed to advance forest conservation and climate change mitigation while improving rural livelihoods or, at least, doing no harm to local people. Accordingly, many REDD+ initiatives provide incentives to enhance farmers' livelihoods and reduce their deforestation practices. However, evidence of such win-win outcomes is rare. Using counterfactual impact evaluation methods, we investigated the impacts of an incentive-based REDD+ program in the state of Acre (western Brazilian Amazon) on a series of land use and livelihood outcomes. Impacts were evaluated during and after the program, contributing to scientific knowledge about REDD+ effectiveness and permanence of outcomes. We used panel survey data from 262 households (treatment: 150; comparison: 112) collected over three years (2010, 2013, 2019). We found that the program saved an average of 6.23% to 7.33% (6.25 to 7.35 ha) of forest cover per participant household in the first years of implementation, and forest conservation came at the expense of pasture reduction. Forest loss later resumed, but not at a rate that eliminated previous forest conservation gains from REDD+ saving years. Moreover, long-lasting increases in farm income were detected. Our findings suggest that incentive-based programs can achieve the hoped-for win-win outcomes for REDD+.

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Scientific investigation in light of indigenous knowledge and decolonial thought

Vitor F. M. de Souza

The present work aims to bring forth restorations, reactivations, and proposals for scientific investigations based on alternative logics of knowledge that have been obfuscated by colonial invasions. Investigations, such as those conducted by indigenous peoples, which do not adhere to linear time, consider the episteme of relationships among beings, both human and non-human agents present in research, the unconditional respect for life, the complexity and non-segmentation of knowledge, have been pointed out as possible solutions, including for the degradation of the globe that the Anthropocene carries. In this sense, we propose the beginning of a supposedly decolonial scientific investigation practice. The chosen cosmopolitical case to initiate this investigation is that of ruins. That is, environments disturbed by humans, subsequently abandoned, and in which non-human life, plant and animal, gradually returned and continues to reclaim the space every day. This web of relationships can be seen from the perspective of various knowledges and interconnected ecosystemic connections. In this work, we will present preliminary results from a long-term research project in which an abandoned area in the municipality of Matinhos, Paraná, on the borders of the Atlantic Forest, was acquired for mapping, description, and research on traditional knowledge, cosmopolitical history, biology, geology, and climate of its ruins. We named this project “Revida”, and over the past two years, we have developed discretionary systematizations of the past and present of this space through measurements, ethnological, geophysical, climatic, artistic, literary, and photographic research and writings.

Barriers, risks and opportunities in the preparation of greenhouse gas inventory in USP units

Alexandre de O. e Aguiar¹

and Sergio A. Pacca¹

The project aims to identify the operational and strategic barriers to carrying out the inventory of greenhouse gases within the scope of the University of São Paulo (USP), proposing solutions. The strategy chosen was to develop greenhouse gas emission inventories applied to the units that make up USP, from a “bottom-up” approach, considering their specific characteristics, the variety of sources and types of units, and the administrative specificities of each unit. The research is relevant because the elaboration of reliable greenhouse gas inventories adhering to international standards is one of the important bases for managing climate change mitigation. The project is essentially action research. There are seven pilot units: a hospital, a museum and five teaching units. The project is structured in learning cycles. In each unit, a staff team is involved and interacts with the researcher to gather the necessary data and identify the barriers, risks and opportunities of the inventory preparation process. The research, still in progress, has revealed that the process of obtaining the necessary data for the inventory presents some facilities, for example in relation to the consumption of electricity and fuels of the fleet managed by the University itself in a centralized way. However, there are data that in several units are difficult to obtain because management systems are not prepared to facilitate collection, such as relating to refrigeration gases, waste management and effluents. The survey also revealed that the organization of staff in each unit needs to adapt to its administrative configuration, and that employees prefer on-the-job training rather than classroom training.

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Contributions of visitation in parks to health and well-being: a comparative study between urban and non-urban parks in Brazil

Altair Sancho-Pivoto¹

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According to Sancho-Pivoto & Alves (2017), in the last decades, the relevance of protected areas such as parks with experiences associated with tourism, leisure, recreation, health, well-being, practice of sports and admiring the landscape has increased significantly, in Brazil and in the world. In the specific case of the relation between visitation, health and well-being, it is possible to recognize a recent effort, from international organizations and, also, researchers, in order to better comprehend the potential of parks for the promotion of health and well-being of their visitors. In general, a large number of current researches direct their focus to parks and green areas located in urban centers, giving preference to aspects related with physical health, prevention of diseases and restoration through contact with nature. Other aspects such as social, cultural, community, economic, psychological, intellectual and environmental well-being are still far from the center of the debates. There are, thus, few studies that aim to offer a more encompassing view about diversity and potential contributions of parks – including non-urban parks – to the improvement of health and well-being of their visitors. In this context, the goal of this study is to propose an investigation aiming to comprehend the importance of urban and non-urban parks to their users, as well as specificities of visitation and leisure experiences in each case, keeping our focus on the benefits in relation to health and well-being, in a broader sense.

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Scientific dissemination of Zero Waste practices

Andres F. R. Torres¹

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The project aims to disseminate Zero Waste practices beyond communities and organizations. Among the contributions include: knowledge exchange to raise awareness, advocacy for policy changes, community involvement, and the scaling up of pro-sustainability practices. Through the production of dissemination materials, including e-books, videos and workshops. All products and activities focus on disseminating the negative impacts of the linear economy and the urgent need to incorporate Zero Waste practices at all levels of the socio-economic infrastructure. In this way, its impact extends beyond its immediate scope, inspiring a sustainable future. Two key elements of the approach are the Theory of practice (Shove, 2012) and the visual communication (Rose, 2015). The theory of practice, specifically the 3 elements approach (Shove, 2012), established that the behaviour of the agents is a product of the social practices, so if we want to change the behaviour of the agents towards more sustainable practices we need to change the elements of practices such as materials, symbols and skills. On the other hand, the visual methodologies (Rose, 2015) place that nowadays the agents are living immersed in a visual culture in which visual elements transit widely through the internet and the screens. Therefore, this project aims to produce and disseminate visual materials to promote sustainable practices for consumption and production. The postdoctoral research has had the support of several organizations, including: Nucleus of research in Organizations, Society and Sustainability – NOSS/USP, Paideia project from the Sustainability laboratory – LASSU/USP, the Global Alliance of Incineration Alternatives – GAIA, the global movement against plastic pollution Break Free From Plastic – BFFP and Zero Waste Europe.

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From the forest to the digital screens: smart governance of urban forests

Fabrício R. Neves¹

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Picture a world where the scenarios portrayed in movies like ‘The Day After Tomorrow’ become a freezing reality. It is known that climate change engenders devastation, intensified by social inequality and poor urban infrastructure. Governments could balance such a scenario, introducing technology to compose a smart green government model. It’s a daunting challenge, much like the struggle of humans in ‘Wall-E’ to overcome their disconnected existence. This offers global challenges for preserving and creating urban systems. Fortunately, the growing integration of technological artifacts and emerging technologies within government operations provides an opportunity to explore smart cities as novel organizational forms. Local governments may improve urban planning by using digital monitoring, policy assessment devices, and remote apps into public administration establishing innovative governance systems to meet grand challenges like the pandemic. Yet, as we journey through the urban landscape, we stumble upon a neglected subplot – the monitoring of public policies regarding urban and peri-urban forests. While these green domains capture our interest, their protection often falls by the wayside in certain regions. Our understanding of how technology-supported governance impacts the environment, society, and economy is like an unfinished script, with key scenes missing. To bring this story to life, we venture into the Brazilian Atlantic Forest, where we explore the environmental governance efforts of two municipalities at different stages of digital transformation. Using mapping methodologies and fieldwork, we’re gaining valuable on-the-ground insights. Delving into this landscape, we explore the notion of “smart green governance”, encompassing the collaborative “smart” interaction between citizens and local governments, as well as the transformative impact of technology on forests. These valuable insights can shed light on how governments can track their actions toward sustainable forest management and conservation, leading to a comprehensive public policy picture.

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Sustainable sanitation: application of the UI greenmetric sustainability model for USP Campus – São Paulo

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According to the World Health Organization (WHO), sanitation is the management of all environmental elements that can have harmful effects on humans in terms of their physical, mental and social well-being. Discussions on the environment and sustainable development began in 1972 at the first United Nations (UN) conferences, reinforcing improvements in sanitation every year, with integrated proposals and implementation of sustainable development indicators by 2030. The objective of this work was to apply sustainable development indicators in higher education institutions, in the water modality for the Campi of the University of São Paulo, using the EACH/USP East Campus as a pilot model. Based on the criteria presented by the UI GreenMetric model, several fronts and actions were initiated, such as the reactivation of the Wastewater Treatment Station and Reuse Water Production (WWTP), the inventory of drinking water consumption on the campus based on series historical data between the years 2012–2023, as well as the quantitative survey of all hydraulic devices in the building units on the campus. From this pilot project, there are perspectives for applying the methodology in other USP Campuses in São Paulo.

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Potential of hydrogen production in a microbial fuel cell from acidified sugarcane vinasse

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Economic growth of Brazil is largely supported by bioethanol production, which is a biofuel obtained from a renewable material, and its combustion is less aggressive for environment, as compared to fossil fuels. Nevertheless, each liter of bioethanol generates between 10 and 18 L of vinasse, which contains high amount of organic matter, as well as antibacterial and recalcitrant compounds. Anaerobic digestion has been considered as an attractive method to stabilize the organic matter from vinasse, since it recovers sustainable energy, such as H_2 . However, the fact remains that the energy recovery is low and the yield is thermodynamically limited to 4 mol H_2 per mol of glucose, although the theoretical stoichiometric potential is 12 mol H_2 mol⁻¹. A microbial electrolysis cell (MEC) has been used to overcome the thermodynamic limit. Therefore, this work aims to study the potential of a MEC for hydrogen production from anaerobic digested vinasse in order to increase the overall hydrogen production from vinasse. Preliminary results indicated a maximum hydrogen production of 4.8 mol H_2 mol⁻¹, with 73% of purity and 30.6 L H_2 .d⁻¹ m⁻².

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Mapping and analysis of mangrove gaps in the Cananéia-Iguape/SP coastal system, focusing on climate interference

Nádia G. B. de Lima¹

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Mangroves are among the most productive ecosystems in the world, providing many ecosystem services to societies and coastal systems, such as climate regulation, protection from winds and storms, shoreline stability, among others. However, mangrove areas have been reduced, causing loss of their ecosystem services. Mangrove are affected by a variety of natural events that differ in scale, intensity and frequency, such as storms, droughts, frost and lightning. These phenomena can cause disturbances in the forest structure, damaging trees and promoting the occurrence of gaps and compromising its ecosystem services, such as carbon sequestration and storage and shoreline protection. When considering climate change, this process can be enhanced due to the increase in frequency and intensity of weather events, and consequently a greater presence of gaps. These changes, combined with cumulative anthropogenic environmental impacts, can further affect the spatial distribution, functionality, and structure of the ecosystem, in ways that intensify its vulnerability and affect its resilience. The research aims to map and analyze the gap dynamics of the Coastal System–Cananéia–Iguape and its interaction with climatic events incident in the area, at different spatial–temporary scales. For this, regional climate data, vegetation structure in permanent plots and time series of nanosatellite images will be used. The study will support proposals for coping with natural impacts on mangroves and will contribute to the understanding of mangrove resilience and/or resilience. In addition, it may subsequently contribute to proposing measures to adapt to climate change for conservation units and the coastal zone.

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The impact of urbanization on the diversity and structure of aquatic communities in the largest metropolis of Latin America

Thiago A. Leão-Pires¹

and R. M. Pelinson¹; P. Tonin¹; V. Saito²; T. Siqueira³; E. Shimabukuro²; L. Schiesari¹

The conversion of forests into urban clusters represents one of the most profound anthropogenic alterations to nature. These perturbations have significant implications for the structure, functioning, and biodiversity of aquatic ecosystems. The aim of this study was to identify patterns of alteration in macroinvertebrate communities in streams draining micro-watersheds distributed along an urbanization gradient in the Alto Tietê Basin, which spatially converges with the Metropolitan Region of São Paulo. Thirty micro-watersheds were sampled along an urbanization gradient, ranging from micro-watersheds with 100% forest cover and 0% urban cover to micro-watersheds with 0% forest cover and 100% urban cover. We found a strong correlation between macroinvertebrate diversity and the urbanization gradient, but richness and total abundance responded differently to this variation. The best model selected for richness (sech function with negative binomial errors) showed a direct response, with the richness declining monotonically with increasing urban cover. On the other hand, the best model for total abundance (Gaussian function with negative binomial errors) showed a unimodal response, increasing with growing urban cover, peaking at intermediate levels of urbanization, and then decreasing towards the end of the gradient. Furthermore, NMDS analysis showed that communities in preserved environments (0% urbanization) were completely distinct from those found in even slightly or moderately altered environments (e.g., 12.5% or 25% of urbanization). Organisms exclusively found in preserved streams included insects from the orders Megaloptera, Plecoptera, and Trichoptera. In contrast, macroinvertebrates found in degraded streams included insects from the order Diptera (especially chironomids) and oligochaete worms. Overall, the observed patterns are consistent with the subsidy-stress model, which posits that intermediate levels of urbanization result in reduced species richness but higher total abundance, as tolerant organisms benefit from increased primary productivity resulting from nutrient enrichment, such as carbon, nitrogen, and phosphorus. In summary, our study demonstrates that even small-scale urbanization can destabilize aquatic communities by causing the loss of a significant portion of biodiversity. Also, a tolerant fraction of aquatic biodiversity seizes opportunities to dominate communities in slightly or moderately urbanized streams, thereby exerting negative effects on the evenness and structure of urban aquatic ecosystems.

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Understanding capuchin monkey culture

Tiago Falótico¹

Robust capuchin monkeys (*Sapajus*) are divided into several species and inhabit numerous environments, having a large area of occurrence. Their behavior is quite variable partly because of this great diversity of environments. However, not all variation is due solely to ecological or genetic factors. Part of the behavioral variation of capuchin monkeys is due to the different cultures of each population. These cultures maintain innovative behaviors for several generations through socially mediated learning mechanisms. One of the behaviors in which we clearly see this variation is tool use. Even populations of the same species and with similar resource availability may have different uses of objects as tools and process some resources differently. Understanding the multiple influences that cause or influence these differences and determining the weight of ecological, genetic, or cultural factors is the primary goal of the Capuchin Culture (CapCult) project. I am initially analyzing 6 populations of *S. libidinosus* and *S. xanthosternos*, in the *Cerrado* and *Caatinga* biomes, forming a database to compare the populations, with the possibility of expanding data with other populations in the future. This information will help to understand the cultural evolution of capuchin monkeys better, as well as provide input for initiatives to conserve behavioral variations that are rarer or that may be important for the survival of some populations. Grants: FAPESP (2018/10292–9); National Geographic Society; The Leakey Foundation; Animal Behavior Society.

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“Autochthonous journalism” in Legal Amazon: democratizing communication for sustainable development and the protection of the life of native peoples

Paulo V. G. Pires¹

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The study seeks to understand the work of journalists in the *Legal Amazon*, by investigating the professional activity, routine, support and working conditions in newsrooms/vehicles of alternative journalism in the Amazon region. From the perspective of the binomial ‘Communication and Work’, the analysis is centered on the understanding of the role of Communication for Sustainability and the defense of the standing Forest, through the guarantee of access to communication and information, rescuing the proposals of the National Policy of Regional Development (PNDR) and the Regional Plan of Development of the Amazon (PRDA). The investigation evidences the productive restructurings in local journalism and its precariousness, under the bias of the verification of the *news deserts* in the North region of Brazil, with 63.1% of its territory without news coverage. Thus, of the 450 cities mapped, 284 do not have any public communication vehicle. Therefore, these are Amazon regions – such as the traditional communities and native peoples (*ribeirinhos, quilombolas and indigenous*), which do not have access to local information, fundamental for the full exercise of critical and participatory citizenship. The role of alternative journalism becomes fundamental in the daily life of the population, being the only source of communication, information, and news. In the context of the debate on the future of the Amazon, with a focus on the COP-30 – in 2025, in Brazil (Belém/PA), this study results in a singular and unprecedented proposal, mainly, by noting the need to train “*autochthonous journalists*” in the Public Universities, to act in their local communities in the Amazon, from the commitment to indigenous lands and traditional territories, through the practice of original communication and democratization of information, in view of a political economy of dignity and protection of life of the peoples of the Amazon.

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Vision and practices of the postdoctoral project: resilience and the construction of new pacts of trust in Brazil – Educommunication, demarketing and brand activism in the post-pandemic

Decio F. Forni¹

Demarketing was an expression used for times when the organization wanted to inhibit consumption, in times of specific need. The scenario of excessive use of resources and unsustainable models that brought us to a global pandemic generated the need to expand that concept and help new forms of production, consumption and communication. Starting from theoretical studies related to resilience, in centers such as Stockholm, an ecosystem was initially proposed that would bring together the SDGs (Sustainable Development Goals) of the UN to various organizations, leading these to be participants in environmental and social causes and – once actors – could add educommunicational partners for brand activism. Starting from studies of theories of decolonialism with the vision of Epistemologies of the South, in Boaventura Souza and South American authors such as Dussel and Mignolo, also of degrowth, in theorists such as Latouche and Rogen, currently disseminated by Alier, one of the main objectives was to take to a so-called solidarity economy, proposed in Brazil by Paul Singer, in which a more inclusive economy helps vulnerable people and contributes to some of the objectives of the 2020–30 agenda, linked to hunger, unemployment and greater equality and diversity, in addition to a culture of ecological respect. The two-year post-doctoral project (2021/2023) proposed a group of 06 macro-activities that initially discussed theories related to Demarketing and new economic models, the use of Design Thinking (Brown, 2010) in conceptualization, prototyping and validation an app that connects organizations to the SDGs and generates reports and activist digital communication (Kotker; Sarkar, 2017) and, finally, the organization of an e-book and an international event. The actions carried out brought some evidences: of a global and local interest in the new theme, engagement of the new generations and interest of small organizations and the possible focus on the use of networks and cell phones to start the generation of new social models of marketing, with gains to everyone involved.

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Cartography of the socio-environmental vulnerability of riverside populations on the islands of Cotijuba and Combú in Belém/PA: planning and organization for Community Tourism

Silvia H. R. Cruz¹

and Reinaldo M. de S. Teles²

This study arises from readings, empirical and technical experiences regarding the problems faced by the islands of Belém in terms of disorderly occupation in the last twenty years. The occupation of the territory of the islands of Cotijuba and Combú presents two decades of advances in terms of the installation of tourist accommodation, food and beverage, entertainment, second home and commerce in general. These installations have contributed to a process of deforestation on the islands, occupations without structural conditions in terms of sanitation, disorderly occupation and lack of comfort for the resident population and visitors. It aims to analyze the socio-environmental vulnerability of the riverside populations of the islands of Belém/PA, specifically the islands of Cotijuba and Combú, for the planning and organization of Community Tourism, islands that are in an extensive and deep process of disorderly occupation. The methodological procedures will be based on studies of environmental risks and vulnerability through the use of Geographic Information Systems and preparation of maps for analysis; An important tool for analyzing social vulnerability is the socioeconomic profile of the population investigated and prone to risks, which in the case of this project, the population living on the islands of Cotijuba and Combú, as well as the application of the Social Cartography technique, when the population can self-identify in the tourism process and point out the problems arising from it. Also, a table will be elaborated with the characteristics, variables, nature of the influence of tourism so that researchers can represent the risk actions inherent to the territories. The analyses, both of environmental and social vulnerability, will go through an intersection process of exposure and propensity to risks and vulnerabilities on the part of the local population arising from disordered tourist activity, and thus define the Action Plan for community tourism.

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Development of contemporary techniques for lignocellulosic biomass pretreatment and multi-product fermentative processes in column bioreactors

Felipe A. F. Antunes¹

and Silvio S. da Silva¹

In this multidisciplinary project with the application of current potential techniques, this study focuses on the process conditions of new proposals for the sustainable use of sugarcane bagasse, with hydrodynamic cavitation and nanotechnology as contemporary techniques for the development of lignocellulosic biomass pretreatment and new multi-product fermentative processes operated in column bioreactors. In this work, (i) for the hydrodynamic cavitation pretreatment stage, variables such as process time, alkali concentration, and the use of biosurfactants are being studied. In the (ii) enzymatic saccharification stage, using biomass previously pretreated under defined conditions, the aim is to study this process to obtain enzymatic hydrolysate composed of glucose and xylose in bioreactors using enzymes immobilized on magnetic nanoparticles, aiming carbon source obtaining for subsequent fermentative processes. Once the enzymatic hydrolysate is obtained, in a novel approach to the fermentative process, the production of biosurfactants from the glucose present in the medium by the microorganism *Starmerella bombicola* is evaluated, followed by the subsequently production of xylitol from the xylose present in the fermentative broth using the microorganism *Candida tropicalis* UFMGBX12-a (a typical C5 fermenter), both in a column reactor operated in a fluidized bed configuration. It is highlighted that this technology aims to serve as a model for the production process of these biomolecules and for the development of other metabolites to be produced using the technique presented in this project, enabling establishing important variables in an innovative process that is scalable and can contribute to the development of Brazilian research.

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Life cycle assessment of plant-based nanocellulose production via enzymatic route

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Nanocelluloses are bionanomaterials with promising applications in several sectors of the economy. Its renewable origin combines sustainability potential with excellent functional properties (mechanical, optical, thermal, and fluidic). However, its production can be energy-intensive, reducing its economic and environmental sustainability and, consequently, the market interest for some applications. Enzymatic treatment is a recent approach used for their production, which presents several technical and economic advantages over the purely chemical or chemical-mechanical routes. However, like other nanomaterials under development, there is a concern about the environmental performance of these innovative materials. The aim of this study is to identify the environmental hotspots of the nanocelluloses production process via the enzymatic route. This study evaluates and compares cellulose nanofibrils (CNFs) and cellulose nanocrystals (CNCs) made from bleached eucalyptus Kraft pulp (BEKP) with the more commonly used production routes. The four production routes considered are: (1) mechanical ultra-refining to obtain CNF (reference), (2) enzymatic pretreatment and mechanical ultra-refining to obtain CNF, (3) acidic hydrolysis with H_2SO_4 to produce CNC (reference), and (4) enzymatic hydrolysis to produce CNC. The attributional life cycle assessment study considers the cradle-to-gate process and the functional unit of 1 kg. Inventory data were obtained from laboratory experiments, published literature and databases and the impact assessment method selected was the Recipe Midpoint. The results indicate that CNF produced via enzymatic, and no pretreatment routes have lower environmental impacts of similar magnitude, as well as CNC produced via acid and enzymatic routes. This LCA study highlights the direction for future research to further improve the sustainability of nanocellulose production using enzymatic route technologies.

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Study of water quality in a rural settlement in Ribeirão Preto: investigation of herbicides, intestinal parasites and metals

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and Guilherme S. Zagui²; Cristina F. Paschoalato²; Daniela C. Sudan¹; Maria L. Leipner³; Susana Segura-Muñoz¹

Scientific data on the water quality for the peri-urban and rural settlements are still lacking, considering the significant number of people who are potentially without access to drinking water with adequate quality according to the standards recommended by the GM/MS n. 888/ 2021. Furthermore, the expansion of the public water supply coverage goes through several complications in Brazil, and, consequently, its registration is also neglected. The objective of the present study was to evaluate the contamination of drinking water in a rural settlement in the municipality of Ribeirão Preto with microbiological information (total coliforms, fecal and parasite counts), metal concentrations, and quantification of herbicide Diuron, widely used in sugar cane farming. It was observed that in 59.7% of the samples there was growth for total coliforms, 13% for fecal coliforms, and in 20.8% helminth larvae were detected. The concentration of metals was in accordance with the Brazilian recommendations, with the exception of lead in two houses. Diuron was not detected in the analyzed water samples. Health education activities were carried out with the settlement community for six months. Educational workshops were held on methods for preventing waterborne diseases, as well as domestic solid waste management. In addition, as practical results for the community, signs were installed to provide guidance on the proper disposal of domestic solid waste, collection points for recyclables and waste with biological risks, and associating the correct discharge to the prevention of environment-related diseases and potential water contamination. Settled communities are at risk of remaining invisible to public services and to the statistics that portray the coverage of access to drinking water.

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Empirical model for predicting the formation of carcinogenic byproducts in chlorinated water

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The municipality of Ribeirão Preto is supplied with 100% of potable water from the Guarani Aquifer, whose water level has been drastically declining. Due to the possibility of water scarcity and based on the recommendation of the National Water Agency (ANA), the municipal government is considering using water from the Pardo River to fulfill a portion of the public supply. In this perspective, the raw water of the Pardo River will undergo pre-oxidation treatment with chlorine, followed by a complete purification cycle technology. In this process, the formation of carcinogenic byproducts, such as trihalomethanes (THM) and chloral hydrate (CH), is enhanced and represents a challenge in the context of public health. Chlorine facilitates the formation of these byproducts through the oxidation of organic carbonaceous matter present in the raw water. Considering the carcinogenic risks associated with these byproducts in water and aiming to comply with the potability standards of Ordinance MS n. 888 (2021), the present study developed a mathematical model to predict the formation of THM and CH in chlorine pre-oxidized water. Monthly samples were taken in 2021 and 2022 to monitor the non-purgable organic carbon (NPOC) content, pH and chlorine demand tests to establish the dosage with the attainment of a free residual between 1 and 2 mgCl₂.L⁻¹. THM and CH were quantified by GC- DCE. From the analysis of the results using the employed mathematical model, equations were derived that presented acceptable RMSE and R² with calculated THM = 1.036. NPOC 0.998. D 0.970. pH 0.876 and calculated CH= 0.914. NPOC 0.745. D 0,714. pH 0.681. The employed model allowed us to conclude that the Pardo River can serve as a future water source for abstraction; however, it is essential to ensure a total chlorine dosage ≤ 8.3 mg.L⁻¹ in the pre-oxidation stage to minimize the formation of chlorination byproducts with carcinogenic potential and consequently, mitigate risks to human health and the 2030 Agenda.

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Metals in fish commercialized in the Tapajós Region, Amazon: analysis of risks to human health

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Fish is an important source of animal protein for riverine and urban people living in the Amazon context. However, anthropic activities such as the non-treatment of effluents, dumping of chemicals directly into rivers, and the tailings from mineral exploration are sources of metals and pollutants to the aquatic system in the Amazonian context. As a consequence, there is damage to the environment and an increased risk of human health problems. The objective of this study was to determine the concentration of metals in raw and cooked fish samples, as well as, evaluate the health risk attributed to the exposure to metals through the ingestion that are part of the daily diet of the urban population of Santarém, Pará State, Amazon. Different species of fish including carnivores (pirarucu, piraíba, surubim and tucunaré), dentrivorous (arraia and curimatá) and omnivorous (tambaqui and matrinhã) from the Tapajós Basin were collected and analyzed for metals concentration. The fish samples were processed in the Laboratory of Ecotoxicology and Environmental Parasitology (LEPA) of the School of Nursing of Ribeirão Preto (EERP/USP). Subsequently, the raw and cooked fish samples were oven-digested and metal concentrations were determined Inductively Coupled Plasma Mass Spectrometry (ICP-MS). The quantitative noncarcinogenic and carcinogenic health risks were estimated based on the methodology proposed by the U.S. Environmental Protection Agency (USEPA). The results of this study will contribute to the discussions that have been gaining prominence in recent months about the contamination of the Tapajós Basin and fish in the Amazon. In addition, risk assessment studies are of fundamental importance to identify population groups at higher risk of exposure to a particular contaminant and can be the basis for the development of public policies to mitigate contamination.

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Ecotoxicity and bioaccumulation of pharmaceuticals: evaluation of treatment in anaerobic bioreactors

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Pharmaceuticals, when released into the environment, can have harmful effects, and tend to accumulate in various organisms even at low concentrations. Therefore, it is crucial to eliminate these emerging contaminants in effluent treatment plants in anaerobic reactors, which have already demonstrated potential for degradation, particularly during the acidogenic phase. The project aims to assess the ecotoxicity and bioaccumulation of pharmaceuticals before and after treatment using anaerobic bioreactors. Nine specific compounds are being studied: acetaminophen, atenolol, caffeine, carbamazepine, diclofenac, ibuprofen, naproxen, propranolol, and triclosan. This research is a part of Project SABESP-FAPESP ATIVA-ETE (2020/09912-6). The initial phase involved batch removal of the target compounds in a synthetic sanitary sewage treatment using an anaerobic system with phase separation (acidogenesis and methanogenesis). Subsequently, samples taken before and after the anaerobic system were evaluated for lethal and sublethal ecotoxicity effects using two bioindicator species: the microalgae *Raphidocelis subcapitata* and the cladoceran *Ceriodaphnia silvestrii*. In the third phase, the bioaccumulation of the studied pharmaceuticals in the samples before and after anaerobic treatment will be analyzed in the species *R. subcapitata*, *C. silvestrii*, as well as the macrophyte *Salvinia auriculata* and the microcrustacean *Hyaella meinerti*. We propose the following hypotheses: i) The concentrations at which pharmaceuticals exhibit toxic effects are expected to be higher than the reported concentrations in wastewater, as stated in the literature; ii) The presence of multiple contaminants in wastewater may enhance the toxicity of pharmaceuticals; iii) The removal of pharmaceuticals in an anaerobic system with phase separation (acidogenesis and methanogenesis) is anticipated to reduce the ecotoxicity to the bioindicator organisms. The results obtained from this study can provide support for the application of ecotoxicological tests to assess the treatment and elimination of target compounds using anaerobic bioreactors. The selection of native species is essential in evaluating the quality of water and wastewater and assessing ecological risks in tropical environments.

1. Escola de Engenharia de São Carlos (USP).

Valuation of vinasse from ethanol industry through anaerobic digestion: treatment, recovery of organic volatile acids and production of biohydrogen

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Today, anaerobic digestion (AD) treatments for organic waste can generate not only biofuels such as hydrogen (H_2) and methane (CH_4), but other higher value-added products such as organic acids (OAs). This work presents the results of optimization of OAs and H_2 production by anaerobic cultivation of sugarcane vinasses as substrates with an acidogenic inoculum without the addition of other nutrients and salts in batch reactors (500 mL), at an initial COD of 10 gL^{-1} , an initial pH of the medium between 4,5–9,9; with temperature control between 33–60°C and a stirring speed of 130 RPM. Studies were done using first Box Behnken design (factorial 3^3) and then central compound design (2^2). Both the production of OAs and H_2 were favored using the initial pH of the culture medium of 7,5–8,8 and one of the tested vinasse. However, the production of AOs occurred in the mesophilic range and H_2 production was favored in the thermophilic range (50–60°C) and the optimum conditions for the production of AOs were at an initial pH of 8,8 and 40°C. Studies of the effect of the addition of ethanol (EtOH) and lactic acid (LaH) as pure standard or wastewater from fermented cassava flour (WCFF) on vinasse fermentation for the production of OAs showed that the addition of EtOH did not have a positive effect on AOs production. However, the addition of LaH from pure standard and WCFF increased the productivity of propionic acid (PrH), butyric acid (ButH), valeric acid (ValH), isovaleric acid (iValH) and caproic acid (CH). Adjusted WCFF at pH 7 increased HBut productivity ($409\text{ mg.L}^{-1}.\text{d}^{-1}$) and yield ($0,55\text{g/gVSa}$) by three and four times compared to the negative control, respectively. Studies of the production of AOs in the packed fixed bed reactor (APBR) in the treatment of vinasse showed that the 24 h hydraulic retention time (HRT) had the best results, besides all the tested APBR's support showed equivalent results. On the other hand, studies of the microbial composition of the production processes of AOs and H_2 by mass sequencing of 16S rRNA from populations showed that a large number of genera are involved in these processes, such as *Bacillus*; *Caloribacterium*; *Caproiciproducens*; *Clostridium*; *Desulfotomaculum*; *Klebsiella*; *Megasphaera*; *Moorella*; *Olsenella*; *Oxotobacter*, among others. But only some of them are beneficial (as *Bacillus*; *Clostridium*; *Megasphaera* or *Ruminiclostridium*; *Ruminococcus*; *Selemonas*; *Thermoanaerobacterium*, among

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others), although others were consumers (as *Moorella* e *Desulfotomaculum*) or producers of alternative substrates (such as *Lactobacillus* e *Olsenella*) for the production of OAs and H₂. The composition of these communities plays a very important role in the vinasse acidogenesis processes, and a large number of alternative substrate producers and suppliers are desirable.

Towards a circular bioeconomy to produce methane through the anaerobic co-digestion of solid and liquid wastes from coffee and beer industries using granular sludge and cattle manure

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Every year there is excess waste generated from coffee processing, such as wastewater and solid waste (pulp and husk), in addition to waste from the breweries' production chain that causes environmental impacts due to inappropriate disposal. This study focuses on optimizing the interaction of these wastes for anaerobic co-digestion to obtain methane in batch reactors with mixed culture composed of cattle manure and granular sludge. Thus, the experimental planning via Rotational Central Composite Design (RCCD) with a complete factorial design of 2^3 was carried out to evaluate the influence of the concentration of coffee wastewater processing ($5.25\text{--}17.25\text{ g COD L}^{-1}$), wastewater from brewery industry ($0.51\text{--}1.25\text{ g COD L}^{-1}$) and coffee pulp and husk hydrothermally pretreated ($0.51\text{--}1.25\text{ g L}^{-1}$). After validation, the optimal conditions for CH_4 production were 10 g COD L^{-1} of coffee wastewater co-digested with 0.88 g COD L^{-1} of brewery wastewater and 1 g L^{-1} of coffee pulp and husk, obtaining a yield of $750.79 \pm 18.69\text{ mL CH}_4\text{ g}^{-1}\text{ TVS}$. The taxonomy and metabolic inference were carried out by sequencing of the 16S rRNA gene on the *Illumina* HiSeq platform. Under validation assay conditions, producers of cellulolytic enzymes were inferred by *Macellibacteroides*, *Christensenellaceae_R-7_group*, *Ruminococcus* and *Bacteroides*, in addition to archaea *Methanosaeta*. With that, it was possible to infer that acetyl-CoA synthetase enzyme was inferred in higher proportion in validation assay, related to acetoclastic methanogenesis. Through the optimized condition and the energy balance, it was possible to predict the supplying of 91.13% of the farm's energy demand.

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Alignment between Industry 4.0 and Circular Economy for sustainability in manufacturing: proposition of a conceptual framework

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At the same time that supply chain management seeks to develop skills and resources for a cleaner operation and aligned with the global agenda, companies face the management challenges arising from the technological transition of industry 4.0 in their daily lives. The pressures exerted by higher bodies like the UN to fulfill the Sustainable Development Goals (SDGs) lead organizations to seek to development and implementation of a Circular Economy principles. In an attempt to understand the benefits of Industry 4.0 for implementing sustainable practices in the supply chain, in order to make it part of a Circular Economy, this project seeks to develop the alignment between these themes, identifying possible drivers, barriers and consequences of the innovative technologies application for the three dimensions of sustainability. As a final result, it purposes to construct a framework that involves the required elements for the alignment between Circular Economy and Industry 4.0 to be achieved in Brazil.

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Contaminant retention in biochars derived from the organic fraction of municipal solid waste produced at different pyrolysis temperatures

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The growth of human population associated with the exploitation of natural resources and waste generation has led to the emergence of a scenario marked by social, economic, and ecological challenges. Against such a backdrop, the United Nations has established 17 sustainable development goals (SDGs) to be pursued by the year 2030 as a “blueprint to a better and more sustainable future for all”. The recovery of soil and water health, including remediation of contaminated areas, is a necessary practice for the achievement of the SDGs. Potentially toxic metals (PTMs) are among these contaminants that posed serious threats to both biota and human health due to their non-degradability, bioaccumulation, and toxicity. Mining and metallurgical operations, while crucial for economic development, are significant sources of anthropogenic PTMs in the environment. Various technologies, such as using stabilizing agents and organic residue-derived sorbents, offer cost-effective and environmentally friendly methods for reducing PTM mobility. Sorbents derived from organic residues have shown promising options within the principles of circular economy, contributing to the correct disposal and management of solid waste (one of the SDGs); however, the organic fraction of municipal solid waste (OFMSW) has received little attention to date. It can also be an alternative to the global need for waste management, especially in developing countries such as Brazil, where OFMSW corresponds to almost 50% of solid waste. This study assesses the feasibility of OFMSW-derived biochar produced at different temperatures (300°C, 500°C, and 700°C) for remediating areas contaminated by cadmium (Cd), lead (Pb), and zinc (Zn). Batch equilibrium tests will evaluate its capacity to retain contaminants in mono and multi-component solutions, and desorption tests (H₂O, HCl, NaOH) will analyze sorption effectiveness. Pot experiments will assess future impacts and compare synthetic (Cd, Pb, Zn) and natural contamination (mining residues from Ribeira Valley, Brazil). Contaminated soils will undergo analysis for contaminant retention, interaction with the environment, phytoavailability, ecotoxicity, sequential extraction, and bioaccessibility. This multidisciplinary research aims to evaluate biochar’s remediation potential while minimizing environmental impacts on biota and human health in the medium and long term.

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The production of adhesive free cross-lamella timber (CLT) panel using products generated by the sustainable forest management of the Amazonian

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Brazil has about ten thousand species of catalogued trees and only one hundred is used commercially. This study selected by the criterion of abundance four species. In addition to the simple exploration of wood, a more valuable use was designed through use in a wooden engineering product, which in this case was a structural panel cross-lamella timber (DCLT). The DCLT is a type of adhesive free construction system which uses wooden dowels as connectors between the lamella layers. The use of wood in construction is environmentally friendly because it is the only building material of renewable origin. This is true only if the wood comes from sustainable forest management plans. In this sense, this work aims to study physical and mechanical characteristics of four species in the Amazon Forest of sustained forest management, use these species for the production of dowels and to determine the rigidity of the connection. The species was Pau Rainha (*Brosimum Rubescens*), Matá Matá Amarelo (*Eschweilera Wachenheimi*), Cardeiro (*Scleronema micranthum*) and Breu Vermelho (*Protium altsonii*). Tests of compressive strength, shear, and density were performed according to the Brazilian Standard of Wooden Structures parameters and slip modulus was obtained by a test developed specifically for this purpose. Among the four wood species studied for use as dowel, only the Pau Rainha wood and Matá Matá Amarelo obtained good results. Matá Matá Amarelo did not get the best results, but in the criterion of abundance, that is, number of tree individuals per m² in the rainforest, it has advantages over the Pau Rainha. Thus, it is possible to apply the concept of sustainable forest management and rationally use this tree species.

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Ecotoxicological effects of sugarcane vinasse on terrestrial oligoquete *Enchytraeus crypticus*

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Sugarcane vinasse, the main effluent from ethanol production, represents one of the main burdens of the sugar and alcohol industry in Brazil. In the mid-1970s, restrictive laws were enacted that prohibited the direct and indirect disposal of vinasse in water bodies, resulting in the encouragement of disposal of vinasse in the soil through fertirrigation, driven both by the recycling of nutrients, such as potassium, as well as for the irrigation of sugarcane fields. Despite the proven technical-economic viability of fertirrigation, in the long term, the disposal of vinasse in soils has great potential to trigger a series of harmful environmental effects. Anaerobic digestion can be considered the main alternative for handling vinasse in sugarcane biorefineries. However, little is known about the toxicity of in natura and biodigested vinasse on terrestrial and aquatic biota. The soil ecotoxicity assays to evaluate the toxic effects of biodigested vinasse in acidogenic and methanogenic anaerobic reactors on the reproduction of the soil species *Enchytraeus crypticus* were applied. Increasing the reproduction of new individuals in samples from acidogenic reactors with the addition of metals (Fe+2 and Co+2) influent and effluent with an average of 921 and 1136 juveniles in 240 mL.kg⁻¹, respectively. This increase can be related to the fact of Co+2 may have influenced the nutritional supplementation of this organism, as well as the addition of iron may have increased metal precipitation by decreasing the bioavailability of toxic metals. Moreover, no influence on the number of new individuals was observed for methanogenic reactors. The biomonitoring of vinasse is important to guarantee the health of terrestrial and aquatic ecosystems. In addition, it was possible to conclude that toxicity tests are important tools allied to the biomonitoring of reactors in vinasse biodigestion.

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Antibiotic removal from water using clay-packed reactor with in-situ electrochemical regeneration

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Prêmio Pós-Doc USP

The presence of emerging contaminants, such as antibiotics, in the environment has raised growing concern worldwide. Once present in surface waters and other environmental matrices, these compounds can drive the spread of bacterial resistance, particularly in situations of greatly increased drug consumption, such as pandemic health emergencies. The appearance of emerging contaminants in the environment has demonstrated that conventional wastewater treatment methods are ineffective in removing these compounds, so new and more effective treatment processes need to be investigated and improved. Adsorption process and electrochemical oxidation are promising technologies that have been successfully applied to the removal/degradation of different organic pollutants. However, although electrochemical processes are an attractive alternative for wastewater treatment, the low current efficiency remains a critical issue due to mass transfer limitations in the case of dilute solution treatment, while adsorption processes require a final disposal and/or reuse regarding the saturated adsorbent. To address these questions, this research project aims to investigate a system that allows continuous wastewater treatment by adsorption and in situ electrochemical regeneration of a low-cost unconventional adsorbent (clay). It is noteworthy that the electrochemical regeneration of adsorbents has not been widely investigated and studies exploring alternative adsorbents are rare. Thus, this research intends to bring original scientific and technological contributions in a context where the concern with treatment systems capable of removing contaminants of emerging concern is gaining importance.

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Potential of clays for CO₂ capture and storage: advances from an atomistic perspective

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In the current global context, the development of innovative and cost-effective solutions for carbon dioxide (CO₂) mitigation emerges as an urgent necessity. In response to this challenge, our research, carried out at the Research Centre For Gas Innovation-Poli-USP and in collaboration with an experimental group from the Norwegian University of Science and Technology, explores the multifunctional potential of clays in applications aimed at CO₂ capture, storage, and separation. Clays, widely available and low-cost, are promising materials for such applications due to their compact two-dimensional interlayer structure and swelling capacity. Using computational simulations based on Density Functional Theory (DFT), we investigate the electronic and structural properties of smectite-type clays and their interaction with CO₂. This study led to a deeper understanding of the mechanisms governing CO₂ adsorption, clay expansion in response to CO₂, as well as the correlation between interlayer charge and CO₂ adsorption capacity. Additionally, the study revealed the impact of chemical species and humidity in this process. We show that water permeates the clay swelling process, and that ions such as Na and Ni play a central role in this process, potentially leading to the formation of nickel hydroxide. We investigated the contribution of each factor to the optimization of the swelling process. Our work highlights the potential applicability of clays in critical sectors, such as CO₂ capture and deep layer storage, and reveals their potential in the development of devices for greenhouse gas separation with industrial applications. In conclusion, this project illustrates the contribution of clays to technological innovation and their potential in mitigating climate change. This project reaffirms the importance of interdisciplinary research and international collaboration in the quest for solutions to contemporary global challenges.

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Influence of ruthenium and graphene on the photocatalytic properties of the $\text{TiO}_2/\text{RuO}_2$ and TiO_2/GO heterojunction applied in the photodegradation of acetaminophen

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Acetaminophen is one of the most consumed drugs in the world. The photo-oxidation of acetaminophen has been considered due to its effectiveness. Photocatalysis using TiO_2 has become widely studied due excellent properties. To improve the photocatalytic properties of TiO_2 , many strategies have been considered, such as obtaining p-n heterojunctions by combining TiO_2 with a p-type semiconductor, efficiently separating the e^-/h^+ pairs and thus increasing photocatalytic efficiency. In this context, the p-type semiconductor ruthenium oxide (RuO_2) has great potential for structural modification of TiO_2 , exhibiting lower band gap energy ($E_g=2,2-2,5$ eV) [2]. In fact, it is observed that the presence of RuO_2 contributes synergistically to the transfer of photogenerated carriers through the heterostructural interface. In this context, this work aims to obtain $\text{TiO}_2/\text{RuO}_2$ and TiO_2/GO heterojunctions, to later characterize the photocatalysts and apply them in the photodegradation of acetaminophen. To evaluate the influence of the synthesis method on the heterojunction properties, the $\text{TiO}_2/\text{RuO}_2$ system was obtained using three different methods. The materials were characterized by different techniques (X-ray diffraction; N_2 physisorption; UV-Vis diffuse reflectance spectroscopy; Raman spectroscopy; scanning electron microscopy and energy dispersive X-ray spectroscopy). The photocatalytic activity was evaluated by the degradation of the model emerging contaminant acetaminophen. For the wet impregnation method, where the ruthenium content was varied, the resulting material provided a good distribution of ruthenium cations under titanium, as confirmed by EDS; however, as the ruthenium content increased, particle aggregation occurred, which could impair the photocatalytic activity. For the co-precipitation method using PVP as the directing agent, SEM images showed materials with well-defined porous morphology. The UV-vis spectra of the photocatalysts were recorded in the wavelength range 200–800 nm, with broad bands between 400 and 600 nm corresponding to RuO_2 , whose high intensity is due to the strong absorption of RuO_2 . The width of these bands is probably associated with charge transfer between oxygen and ruthenium. For $\text{TiO}_2/\text{RuO}_2$, it is observed that the presence of TiO_2 causes the appearance of bands in the UV region, which was already expected for this material.

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Comparative study of rubber sole produced with rice husk ash silica and activated silica

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The rubber sole is the component that comes into contact with the ground and offers greater comfort, lightness and flexibility to the shoe, it also offers greater durability and abrasion. So the sole is the fundamental part in the production of footwear. In the construction of the sole, several materials are used, from rubber to the reinforcing fillers used to improve the mechanical properties of the soles. Silica is widely used in the rubber industry, due to its wide applicability, the knowledge of its characteristics is, until today, a source of interest for many researchers. Thus, the present work aimed to verify the physical and mechanical properties of soles manufactured with rice husk silica, replacing the active silica used for the production of light colored soles, aiming at the production of more sustainable soles, preserving the environment. Silica in a rubber compound has the function of reinforcing load in addition to providing mechanical resistance and, consequently, increasing the durability of the sole. In this work, formulations for soles with natural rubber compounds reinforced with different types of silica are presented and their characteristics are evaluated, with emphasis on abrasion resistance, hardness and dispersion, in addition to vulcanization characteristics. The product obtained did not show variation in the hardness of the compounds, as for the mechanical properties such as traction and elongation, they also showed similar values for the two compositions, a slight increase in the optimal vulcanization time (T₉₀) was noted for the composition containing silica from bark sílica, rice, indicating that the degree of crosslinking is higher for the standard silica-containing composition.

1. Escola Politécnica da USP.

Deep removal and subsequent photo-degradation of methylene blue dye using biodegradable superabsorbent polymer composite hydrogel incorporated with activated charcoal and TiO₂ nanoparticles

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Hydrogels have attracted large attention in wastewater treatment fields due to their low-cost and good interaction with pollutants. This study investigates the efficient removal and subsequent photo-degradation of methylene blue (MB) dye using a novel biodegradable superabsorbent polymer (SAP) composite hydrogel incorporated with activated charcoal and TiO₂ nanoparticles. The incorporation of activated charcoal and TiO₂ nanoparticles enhanced the adsorption capacity and photo-catalytic activity of the composite hydrogel, respectively. A continuous up-flow fixed-bed column with an internal flow rate of 28 mL/min was fed with 300 mL of MB (50 ppm) using a peristaltic pump. About 70 mg of dried composite adsorbent was immersed in the glass tubular reactor with a 6 cm internal diameter and 30 cm in length. The adsorption reaction was maintained for 24 h time duration and a small sample aliquot (5 mL) was collected at definite time intervals and was analyzed using a UV-Vis. spectrophotometer ($\lambda_{\text{max}} = 665$ nm) for the residual MB concentration. After 24 h time interval, MB adsorption capacity reached 198.99 mg g⁻¹ using SAP-TiO₂, and 203.97 mg g⁻¹ using SAP-AC/TiO₂ respectively. After 24 h time interval for maximum MB adsorption, the degradation of MB was carried out using a UV- A source at a distance of 15 cm. A small aliquot sample was drawn at every 5 min interval and was analyzed for the residual MB concentration. Maximum MB degradation percentage under UVA irradiation reached 77.11 ±1.9 using SAP-TiO₂ and 87.77 ±2.9 using SAP-AC/TiO₂ respectively. The study demonstrates that the biodegradable superabsorbent polymer composite hydrogel incorporated with activated charcoal and TiO₂ nanoparticles can be a promising material for the efficient removal and degradation of MB dye from wastewater.

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Electricity generation from ammonia nitrogen in sidestream treatment in WWTPs: characterization and improvement of electrogenic activity

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The pressing need to expand services in the sanitation and energy sectors in Brazil represents an opportunity to implement innovative and sustainable processes to reduce the energy consumption of wastewater treatment plants (WWTP). In this sense, the recent discovery of the process of direct conversion of ammonia nitrogen into electricity through bioelectrochemical systems stands out (Cano et al., 2023; He et al., 2009; Shaw et al., 2020; Vilajeliu-Pons et al., 2018). This process has potential application for treating the high loads of ammonia nitrogen in the sidestreams of WWTPs. However, fundamental aspects of the syntrophic development of biofilm associated with the anode of microbial fuel cells oxidizing ammonia are not fully elucidated, which hinders the optimization and consequent application of the process on a full scale. Thus, this research project aims to explore the effect of regulating the resistance of the external electrical circuit (R_{ext}) on the activity of different types of bacteria (electroactive, ammonia oxidizing and anammox), aiming to increase the ammonia conversion rate in electric current. Currently the influence of external resistance over the process by different functional bacterial groups is under assessment. In the second phase of the study, the effect of the availability of organic substrate as an electron donor will be studied, with the aim of evaluating the potential application of the process for the treatment of anaerobic digesters centrate. The evaluation of the system includes aspects of treatment efficiency and energy generation, with extensive physical-chemical and electrochemical characterization, and study of microbial ecology based on DNA extraction and 16S gene sequencing. As a result, the study will elucidate complex phenomena, contributing to the development and future implementation of this novel bioelectrochemical process in wastewater treatment systems, with potential gains for the energy sector.

1. Escola Politécnica da USP.

Análise da influência dos fatores contingenciais para a transição para a economia circular: uma abordagem sob a ótica de ecossistemas circulares

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Resumo: A operacionalização da sustentabilidade por meio de princípios de economia circular (EC) e seus ciclos técnicos e biológicos tem sido encarada como uma alternativa integrada para equilibrar “prosperidade econômica, qualidade ambiental e equidade social” (ELKINGTON, 1997; MACARTHUR, 2013). Entretanto a abordagem de ecossistemas e o conceito da interdependência entre os agentes para equilíbrio dos modelos de negócio baseados em circularidade é difícil de ser operacionalizada, sem uma abordagem sistêmica do setor em se está concentrando o foco de pesquisa. Para desenvolver uma manufatura sustentável, é obrigatória a criação de “produtos manufaturados que utilizam processos não poluentes, conservam energia e recursos naturais e são economicamente seguros para funcionários, comunidades e consumidores” (KHORRAM- NIAKI; NONINO, 2018). Por esse motivo, a assistência à saúde é frequentemente mencionada como uma área na qual os sistemas produto/serviço (PSS) possuem grande potencial (MITTERMEYER et al., 2011), devido à necessidade de soluções completas, incluindo ativos físicos e suporte contínuo aos serviços operacionais para garantir a funcionalidade às necessidades dos clientes (MONT, 2002). No entanto, estudos sobre esse assunto ainda são muito escassos (XING; RAPACCINI; VISINTIN, 2017). Neste sentido, não apenas o PSS, mas inúmeras possibilidades de negócios tem sido atualmente exploradas como modelo de negócios que pode permitir a transição de uma economia linear para uma circular (KJAER; PIGOSSO, 2018), dentro de uma abordagem de *open looping*. Buscam otimizar o desempenho de um sistema através do suporte a usuários e outras partes interessadas “em todos os estágios do ciclo de vida” (KJAER et al., 2016), em uma perspectiva de ciclos técnicos e biológicos (MACARTHUR, 2013). Neste sentido, este trabalho tem como objetivo contribuir com a identificação dos fatores contingenciais que mais influenciam no desenvolvimento de um ecossistema de negócios (ADNER, 2016) que fomenta a transição para uma economia circular (EC) (MACARTHUR, 2013) no setor de manufatura da saúde. Pretende-se trazer evidências empíricas das maneiras pelas quais o setor de saúde enfrenta os desafios da EC, através de uma survey com gestores de engenharia clínica, para identificar caminhos para que essa rede de dependência entre os agentes do sistema possa ser fomentada, favorecendo a criação e o desenvolvimento de ecossistemas circulares. Os dados serão analisados via modelagem de equações estruturais.

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Separation of critical metals through membrane technologies

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Critical metals have a severe risk of interruption in the supply chain in the short and medium term. The leading economies worldwide have rare earth elements, Li and Co, in their list of critical metals. These elements are critical to producing technologies in strategic sectors, as in the case of renewable energy, e-mobility, defense, and aerospace, and they are essential to achieve a net zero society. The processes to obtain these metals may be designed and performed considering the aspects of sustainable development, which includes low energy consumption and fewer CO₂ emissions. The hydrometallurgical process (aqueous route) includes leaching and separation/purification steps and represents great sustainable advances, including producing high-pure products. The critical step of the process is separation/purification, in which the presence of contaminants negatively impacts the production of high-pure products. Moreover, the rare earth elements are chemically similar and represent a challenge to overcome. Membrane technology for the separation of metals represents the next generation of separation/purification techniques, which represents the knowledge beyond the state-of-art. The current project aimed the study membrane separation of rare earth elements, Li and Co, using membrane separation. First, commercial membranes will be evaluated for Li separation (monovalent, NF and UF membranes). Further, new membranes will be synthesized and electrodialysis will be tested to evaluate electricity as driving force. According to the results obtained, the separation of rare earth elements from drainage acid mine will be tested. Finally, the potential application of membrane for gas separation might be tested.

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Eco-efficient concrete structures and its durability: corrosion of reinforcements

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New technological challenges have appeared in recent years due to the increase in the deterioration of 50-year-old structures that are in need and increasing repair costs, in addition to the expansion of infrastructure construction that takes place daily. These challenges are related to the need for new designs and buildings that are more sustainable, durable and have low environmental impact. That is why in recent years, there has been an increase in the development of new types of cement and new technologies that use a low binder content in concrete that generates a decrease in CO₂ emissions in the environment and additionally help in capturing it. This mitigation technology, concretes produced with low binder content using filler material, present comparable mechanical properties, lower permeability, and more significant tortuosity than traditional concrete. However, the Ca(OH)₂ content is lower in this type of concrete, representing a faster advance of the carbonation front and a greater risk of corrosion induced by rapid carbonation. What makes the development of new steels for civil construction necessary. ArcelorMittal and “*Catedra construindo o amanhã*” understand this need and the importance of industrial investment in the research and innovation of new micro-alloyed steels that enable these sustainable structures of lower environmental footprint.

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Production of PES/PVDF mixed matrix hollow fiber membrane modules and their characterization

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The membrane separation process (MSP) plays a crucial role in processes involving water purification. Water is considered essential to human life because it's vital to its survival and indispensable in its activities, such as domestic activities, energy production, recreation, industry and agriculture. Due to this dependence, attention has been focused on issues related to water, due to the pollution of water bodies and the increased demand for water consumption. The search for technologies that provide better quality and greater ease in the treatment processes becomes one of the main subjects studied today. Among all water treatment processes, the membrane separation process is considered one of the most innovative technologies, as they are fast, more economical processes, occupy less area, are highly selective, flexible and compatible, in most cases, with other treatment processes. In this study, mixed matrix hollow fiber polymeric membranes were prepared using polyethersulfone (PES) and polyvinylidene fluoride (PVDF) as polymers in their composition. N-methyl-2-pyrrolidone (NMP) was used as solvent and demineralized water with conductivity lower than 3 $\mu\text{S}/\text{cm}$ was used as non-solvent. The amount of 25 PVDF was varied by 10, 20, 30, 40, 60, 70, 80 and 90%. As a result, it was verified that the presence of PVDF decreases the mechanical properties of the composite membranes, however, it increases their plasticity. Scanning Electron Microscopy (SEM) results showed good dispersion of both polymers in the polymeric matrix. Furthermore, it was observed that membrane permeability showed a slight negative correlation with contact angle, suggesting that increased membrane hydrophilicity may be responsible for increased permeability. Finally, it was found that membranes with smaller amounts of PVDF can be interesting for their application in water and effluent treatment, due to the combined properties of PES and PVDF.

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Water reuse through membrane technologies for a dairy industry using a water pinch simulation software

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The main goal of this study is to evaluate possible reuse routes of effluents from a dairy industry. First, the water flow in the industry was evaluated. All water consumed and effluents generated by the industrial process were quantified and characterized. In addition, the water quality parameters required for different industrial activities were assessed. Secondly, a treatment system using a membrane bioreactor and a nanofiltration reactor, from a study previously conducted by the authors, was considered. After that, water pinch analysis was carried out through the application of the collected data on the Water Pinch software. Both direct reuse/recycle and regeneration schemes were investigated. In this context, although the direct reuse/recycle of effluents showed to be able to reduce the freshwater use for the clean-in-place process (CIP) in 33.4%; the schemes with the regeneration of the effluents showed up to 66.7% and 95.4% of freshwater re-reduction for the CIP and general processes, respectively. Finally, four water reuse routes were proposed. The proposed route combining the most advanced treatment technologies studied showed the best performance in terms of reduction of the total freshwater consumption (69.5%) in the dairy industry.

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Performance analysis of Nature-Based Solutions aiming at the sizing standardization in the Brazilian cities' context and its adaptation to climate change

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The watercourses degradation in urban areas is a result of inefficient rainwater management and wastewater in the watershed, resulting in pollutant loads, aquatic ecosystems degradation, and limiting the use of water resources, so demanded by society. The gray techniques usually adopted for rainwater management have limited action in the qualitative control of the flow and when it comes to wastewater treatment, the systems still deliver unsatisfactory rates, in terms of environmental control, removal of organic load, and little or no removal of contaminants such as emerging ones and microplastics, which have been discussed as having a major impact on the population and ecosystems health. Green Infrastructure through the recovery of green areas, open spaces, and the application of Nature-Based Solutions (NBS) comes as a response to society's demands not only due to its important role in sustainable management but also as a promoter of several other ecosystems services. that have an impact on the social, environmental, and economic spheres. Although Nature-Based Solutions have been widely adopted and studied in countries where the basic sanitation infrastructure is already consolidated, Brazil still lacks studies, models, regulations, and standardization of its application. In view of this context, the present study, through a survey of the state of the art, bench-scale experimentation, and mathematical modeling, to contribute to the evolution of this field of research and to obtain as a result the proposal of sizing methodologies for different SBN typologies based on calibration parameters compatible with the Brazilian context, thus helping to create urban water management models for adapting Brazilian cities to climate change.

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AAE na gestão dos recursos hídricos: uma visão geral da literatura internacional

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Como uma abordagem mais ampla da Avaliação de Impacto Ambiental, a Avaliação Ambiental Estratégica (AAE) surgiu da necessidade de adoção de abordagens mais transparentes, em relação à tomada de decisão, ponderando crescimento econômico, equidade social e preservação ambiental, reforçando assim o conceito de desenvolvimento sustentável. Por sua vez, fomentando o planejamento estratégico do uso nos diversos setores de desenvolvimento, a Gestão Integrada dos Recursos Hídricos busca uma abordagem multissetorial para o gerenciamento dos recursos hídricos, considerando-se o uso do solo e outros recursos relacionados. Assim, reconhecendo os potenciais benefícios da AAE para a gestão integrada dos recursos hídricos, este trabalho teve como objetivo analisar o estado da arte de aplicação da AAE como instrumento de gestão integrada dos recursos hídricos, identificando as principais ferramentas analíticas empregadas nesse processo. Nesse contexto, foram identificados casos de utilização da AAE na formulação: de plano de desenvolvimento intersetorial no Nepal, abordando o uso da água aos setores de energia, agricultura (irrigação), gestão de desastres e saneamento; de plano de recursos hídricos no Egito; de plano de bacia hidrográfica no Reino Unido, Irlanda e China; de plano de desenvolvimento da industrial em Ordos na China. Dentre as principais ferramentas analíticas utilizadas para avaliação dos impactos das estratégias de desenvolvimento sobre a qualidade dos recursos hídricos, destacam-se: checklists, matrizes de interação e consultas ad-hoc, modelagem e sistemas de suporte à decisão. Conclui-se que, a AAE é ferramenta adotada no planejamento e gestão dos recursos hídricos há algum tempo, com aplicações em diferentes setores e escalas de planejamento, tendo como principais contribuições: a contextualização dos planos elaborados, a integração de questões ambientais transversais e estratégicas, a maior consistência na comparação das alternativas e a facilitação da identificação de indicadores de monitoramento.

Adoption of Circular Economy practices in companies

Tiziana B. de Vincenzi

The general objective of this research is to investigate circularity practices from the perspective of social inclusion. It was conducted a systematic literature review about the topic and also empirical research. The empirical research undertook 80 interviews with professionals from the waste management ecosystem. The research was also developed with academics from international universities (UK, France, and Ghana). The outcomes indicated that reuse and reduce circular strategies were the main focus of previous literature. The main stakeholders addressed by the literature are consumers and communities.

Impacts of climate change on iron dynamics in mangrove soils: experimental insights

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and Antônio E. B. da Silva¹; Guilherme I. Sanches¹; Alexys G. F. Boim¹; Angelo F. Bernardino³; Tiago O. Ferreira¹

The dynamics of iron (Fe) in mangrove soils play a crucial role in the accumulation and stability of organic matter. However, Fe dynamics are highly sensitive to variations in the geochemical environment, including redox conditions, temperature, and moisture. This study aims to assess the effects of lower rainfall, increased salinity, and higher temperature on Fe dynamics in mangrove soils using laboratory incubation experiments. Three mangrove soil samples were incubated in mesocosms under simulated conditions for 120 days, and their results were compared to field samples collected without incubation. After 120 days, a significant loss of pseudo-total Fe (average $10,639 \pm 1,025 \text{ mg kg}^{-1}$) compared to initial levels (average $13,520 \pm 3,591 \text{ mg kg}^{-1}$) can be observed. Additionally, the FeFR and FeCR fractions showed significant losses of 14% and 64%, respectively. On the other hand, the FeEX fraction increased by 88% at the end of the experiment. Physicochemical conditions indicated the establishment of suboxic to oxic conditions, favoring the loss and transformation of Fe forms. The findings were supported by Fourier Transform Infrared (FTIR) analysis, revealed a shift from a Fe oxide crystalline dominance to amorphous Fe oxide forms with higher interaction potential with soil organic matter but greater susceptibility to reductive dissolution. These results suggest that climate change may hinder the soil's capacity to sequester and stabilize carbon due to altered geochemical processes associated with Fe dynamics. Understanding these effects is crucial for predicting and managing the impacts of climate change on mangrove ecosystems.

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Bioeconomia da energia renovável de biomassa - Estrutura para avaliar os padrões voluntários de sustentabilidade

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A pesquisa buscou desenvolver uma ferramenta de avaliação dos padrões de sustentabilidade que estão sendo adotados, medindo a sustentabilidade da agricultura comercial de bioenergia no Brasil, de forma independente, melhorando assim as políticas de incentivo, os investimentos e a tomada de decisões. O levantamento de dados apontou que alguns dos objetivos previstos no início da pesquisa eram inviáveis como: aplicar critérios de medição da intensificação de sustentabilidade para desenvolver uma ferramenta de avaliação dos padrões de sustentabilidade que estão sendo adotados. Isso porque dada à falta de transparência dos dados corporativos a respeito da sustentabilidade da produção e a inexistência de obrigatoriedade jurídica de divulgação a respeito disso o acesso aos dados fica comprometido. Contudo em alguns tipos de padrões privados, a falta de transparência é um pouco menor o que permitiu que eles fossem investigados com mais detalhes. Assim, dentro da temática padrões voluntários de sustentabilidade, vários aspectos peculiares foram identificados no decorrer dos primeiros meses da pesquisa, aprofundados e convertidos em principalmente três textos no decorrer dos dois anos subsequentes. Ficaram de fora desta pesquisa também os padrões voluntários de sustentabilidade para obtenção de crédito de carbono; especificidades como linha de base e protocolos de análise utilizados para agricultura, pecuária e floresta; padrões públicos exigidos para concessão de pagamentos por serviços ambientais; bem como padrões para reconhecimento de um produto ou serviço como indicações geográficas. Importante ressaltar que a pesquisa integrou em diferentes momentos: o Convênio de Cooperação Técnica Comissão Econômica para a América Latina e o Caribe e o Instituto de Pesquisa Econômica Aplicada (CEPAL-IPEA: M1-32BTS-000175, Conta: IO-SB-018484, TOR: 22 - CEPAL -177196-Consultor), a pesquisa levada a cabo pelo time de soluções baseadas na natureza do Research Centre for Greenhouse Gas Innovation (2014/50279-4 e 2020/15230-5), a consultoria encomendada pela Universidade do Café e durante sua etapa final recebeu bolsa da Fundação de Estudos Agrários Luiz de Queiroz.

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Applying citizen science in ecological researches in Brazil: a theoretical-practice assessment

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Citizen science may be defined as “non-professionals participating in authentic scientific inquiry”. The role of citizens in the scientific investigation and the intensity of their participation may vary. This scientific approach is becoming popular among Brazilian academics, as it short the gap between academy and society and, specifically within ecological subjects, may raise awareness on citizens. In the current postdoctoral project, we are analyzing different factors that may influence the progress of a citizen science projects performed under the Brazilian academic scenario. We are doing theorical discussions based on literature review and a citizen science project is being used as a case study (i.e., “Did I see a banded bird!”; It is currently investigating impacts caused by bird feeders on bird communities). As preliminary results, we observed that graduate students that aims to do a scientific project based on citizen science principles, but also under academic rules (i.e., few years, pressure to produce traditional scientific indicators, such as impacting papers), are facing the following options: (1) Doing a project that have citizens only collecting data; (2) Doing a project that have citizens performing tasks beyond data collection (i.e., data analysis, discussions, etc.), but assuming the risk of not having time enough to publish high impacting papers during their research contract (i.e., as citizens participate in more levels of the inquiry, more time is demanded); (3) Avoiding citizens during the investigation, but in the end make available to society the materials used and the outcomes (open science movement). We also observed that popularization of crowdsourcing citizen science platforms, although useful for scientific advances, may not create environmental awareness among citizens, and may even discourage projects to have citizen beyond data collection. The project “Did I see a banded bird!” has been demonstrating key points necessary for a well succeed investigation: Good relationship between project coordinator and public; adopt easy-to-use technological tools; long term budget; institutional foundations. Since the project beginning (in 2016), 986 records of banded birds were performed with the participation of 329 citizens. However, low engagement of citizens is currently compromising a good performance of the investigation of bird feeders impacts. This project research will finish in 2025.

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The contribution of the Environmental Development Index (IDA) to the composition of the Sustainable Rural Development Index (IDRS) in Goiás

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The Sustainable Rural Development Index (IDRS) seeks to measure rural sustainability from a multidimensional perspective: environmental, economic, social and technological, represented by the Environmental Development Index (IDA), Economic Development Index (IDE), Development Index (IDS) and Technological Development Index (IDT). Each of these contributes substantially and equally to the composition of the IDRS. In this way, the objective of this investigation is to analyze the IDA of the municipalities of the State of Goiás. The Environmental Development Index (IDA) is an indicator that measures the degree to which rural areas comply with environmental compliance. Formed by three other indices, namely: Biodiversity Preservation Index (IPB), Water Availability Index (IDpH) and Low Environmental Impact Agricultural Availability Index (IPABIA). The IPB is composed of the Legal Reserve Area Index (IRL) and the Permanent Preservation Area Index (IAPP) while the IPABIA is formed by the Organic Production Index (IPO), Pasture Conservation Index (ICP) and the Sustainable Agricultural Production (IPAS). The data that make up the IDS were derived from secondary data from the 2017 Agricultural Census, from the Brazilian Institute of Geography and Statistics (IBGE). The IDA was defined for all 246 municipalities in the state of Goiás, grouped in the 5 (five) mesoregions of Goiás: Center, East, Northwest, North and South of Goiás. Environmental compliance in rural properties contributes to the improvement of environmental quality, thus cooperating for sustainable rural development. The Brazilian rural development model needs to reduce the gap between the use and the conservation and preservation of natural resources and biodiversity, in order to minimize the environmental problems that affect both the rural population and the population of urban centers, showing that the dimensions of sustainability must be present in the various productive spheres, at the same time that they help in decision-making regarding the implementation of public policies.

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Advancing urban-rural forest restoration: challenges and opportunities

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Amid increasing attention from policymakers, the intricate dynamics across the urban–rural continuum pose challenges and demand integrated approaches to fortify environmental protection and enhance restoration outcomes. The alignment or divergence of urban and rural forest restoration efforts in practice and research remains uncertain, along with the potential of research comparisons to advance the restoration field. This study aims to identify opportunities and obstacles in enhancing forest restoration by scrutinizing scientific evidence, engaging stakeholders, and employing an urban–rural restoration framework. Drawing on the Society for Ecological Restoration’s International Principles, we highlight convergent and divergent aspects between urban and rural forest restoration, expanding our comprehension of the subject and promoting holistic management strategies for future forest conditions along the urban–rural spectrum. Our findings reveal that both urban and rural forest restoration exhibit both convergent and divergent characteristics. Emphasizing the need to tailor goals and design suitable institutions and incentives based on the social and ecological contexts of various regions, we also explore the challenges of achieving extensive ecological restoration. Furthermore, we propose that rivers and watersheds can serve as connecting elements between rural and urban landscapes, while forest restoration can integrate with other environmental protection measures. The study underscores the imperative of integrative management approaches that address future forest conditions along the urban–rural continuum. Our framework provides valuable insights for policymakers, researchers, and decision-makers to advance the field of forest restoration and tackle the restoration challenges in urban and rural contexts. The interface between rural and urban domains serves as a meeting point for forest restoration, enabling mutual exchange of expertise and knowledge between both fields.

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Communication in environmental management: from theory to practice

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Environmental communication is the process an organization puts in place to provide or obtain information and engage with internal or external stakeholders to create an understanding of environmental issues and performance. The triggering question of the research is: how can communication contribute to the management of water resources in Brazil? The objective is to present strategies and tools for external environmental communication to public and private organizations. The final product is a plan to be used to implement or enhance communication, with an emphasis on water resources management. The research has the PCJ Basin Agency (Piracicaba, Capivari and Jundiaí) as a case study. It is a legal entity responsible for managing the water and financial resources collected by charging for the use of water in the PCJ basins. The methodology consists of document analysis, conducting semi-structured interviews with managers, applying a questionnaire with employees and analyzing communication products. Based on the results, theoretical framework and guidelines presented by institutions, such as ISO14063:2009, eight elements about communication in the selected organization were identified: (1) situational context: lessons learned; human and financial resources; motivations, objectives and goals; themes; (2) planning: tools; partnership with strategic groups; target Audience; geographic scope. The next steps consist of the survey of strategies and tools related to the production, distribution and evaluation of the communication on the management of water resources, and the elaboration of the communication plan.

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Transdisciplinaridade para mitigação das colisões com animais nas rodovias do estado de São Paulo

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A busca por soluções de mitigação das colisões entre veículos e animais nas rodovias é urgente, entretanto, dada a complexidade ambiental, econômica e política deste problema, é imprescindível aliar propostas mais colaborativas, como a transdisciplinaridade e a coprodução de conhecimento. O estado de São Paulo possui dados alarmantes de atropelamentos de animais e tem vasta experiência com monitoramento de carcaças pelos inspetores das vias focados na segurança do usuário. Apesar disso, ainda não possui uma norma técnica destinada à elaboração de Planos de Mitigação de fauna atropelada. O objetivo aqui é apresentar três produtos do pós-doutorado iniciado em set/23 que envolvem coprodução de subsídios para elaboração de políticas públicas que acelerem a implementação de medidas de mitigação. Todo o trabalho foi desenvolvido em conjunto com técnicos do órgão licenciador do estado de São Paulo (Cetesb) e faz parte do Programa USPSusten (SGA/USP). O primeiro é a coprodução das “Diretrizes para elaboração de Plano de Mitigação de atropelamento de fauna em rodovias” no âmbito do Grupo de Trabalho (GT) da Câmara Ambiental da Indústria da Construção da Cetesb, que contou com a participação de profissionais de todo o setor rodoviário do estado. O documento elaborado colaborativamente será aberto à consulta pública para tornar-se um novo regramento da Cetesb. O segundo produto é a elaboração do “Guia de boas práticas para avaliação da efetividade de medidas de mitigação em rodovias”. O guia foi uma demanda do GT, pois saber se as medidas adotadas são adequadas e estão funcionando é um passo fundamental para reduzir os impactos. O terceiro produto é a identificação de áreas importantes para mitigação de atropelamentos de fauna nas rodovias do estado por meio de modelagem dos dados de atropelamento e de variáveis da paisagem. Esse mapa está em fase de elaboração e será discutido junto aos técnicos da Cetesb para que sejam identificadas as áreas estratégicas para priorizar a mitigação. Os produtos desse projeto baseiam-se em uma ciência

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focada na solução de problemas demandados pela sociedade e os resultados encontrados auxiliam a tomada de decisão. A coprodução de subsídios envolvendo os diversos atores aumenta a credibilidade e aceitação das recomendações, tornando o processo mais democrático. Ainda, a definição de ações de mitigação e de conservação da biodiversidade baseadas em evidências é a melhor forma para reduzir as incertezas nas decisões.

Assessing the sustainability of the monetary environmental compensation in Conservation Units in São Paulo state, Brazil

Ligia M. B. Campanhão¹

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Brazil's National Environmental Policy, established by Law n. 6.938/1981, incorporates various instruments such as the creation of protected areas, environmental licensing, and environmental impact assessment. In the convergence of these three instruments there is the monetary environmental compensation implemented through the National System of Conservation Units (SNUC, Law n. 9.985/2000). This mechanism mandates that development projects with potential negative environmental impacts contribute financially towards the implementation or maintenance of Conservation Units (UCs), a form of protected area. In São Paulo state, compliance with this compensation is a condition for obtaining the environmental license required for project installation. Payments are made either to a savings account owned by the entrepreneur or to the Special Expense Fund for the Preservation of Biodiversity and Natural Resources (FPBRN), a public fund. These resources are used to finance actions proposed by UC management agencies and approved by the environmental compensation chamber (CCA), a collegiate responsible for allocating the compensation. This research aims to evaluate the environmental and economic sustainability of monetary compensation in São Paulo over the past decade (2012–2022). The evaluation focuses on assessing the compliance of compensation practices with the law and regulations, as well as comparing the benefits funded by the mechanism against the negative impacts caused by development projects. Moreover, we intend to propose guidelines and criteria to enhance the effectiveness of this mechanism. To date, we have identified the actions financed by the mechanism, considering the activities permitted by federal decree (Decree n. 4.340/2002). Additionally, a spatial and temporal analysis has been conducted, tracing the path of payments from their origin (development projects) to their destination ((beneficiary UCs). We have also examined whether the creation of new UCs through monetary compensation has targeted areas identified as high-priority by the Ministry of Environment. A diagnostic report is being elaborated, which will be available to all stakeholders involved in the implementation of the compensation mechanism in São Paulo. Additionally, we intend to share this report at the federal level to initiate discussions on improving the effectiveness of monetary compensation throughout Brazil.

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Visual attention and choice for decarbonization attributes in beef

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One of the recent changes in consumer behavior was the greater awareness in the purchase decision, highlighting the growing concern with environmental conservation and the need for a more efficient use of natural resources. Visual attention is a precursor to consumer behavior and is responsible for the buying process. The general objective is to verify the influence of visual attention on food choice related to the low carbon production process. This study seeks to analyze the visual pattern and test the relationship between consumer attitudes and food choice (beef) regarding to production process information of beef. Using eye-tracking, volunteers will observe a set of different types of information arranged on slides with distinct images. In the next step, based on the discrete choice model, the experiment will use the image of beef packaging with different claims of meat attributes. The dependent variable will be represented by the attributes when chosen (analysis 1), and the time to look at the area of interest of the attributes when chosen (analysis 2) in the main metrics generated by eye movement. Additionally, this research will also use multivariate data analysis, whose hypotheses will be evaluated from the Structural Equation Modeling (SEM). To measure the constructs, present in the SEM, the following scales will be used: Environmental concern, Knowledge of the low carbon meat concept, Concern about the low carbon meat production process, Trust in companies that produce low carbon products and Intention to buy low carbon meat. The claim information of the production process will be evaluated through the Low Carbon Beef (CBC) seals and “meat without deforestation” seals. It is hoped, considering multimethod approach, to collaborate with the literature on the influence of visual attention on consumer purchasing decision making for products with various attributes. From a practical, managerial, and public health perspective, the study can guide food labeling policies regarding negative claims and guide companies on how to communicate their positive claims more effectively. This work will bring contributions aimed at helping in the definition of labeling by responsible agencies of the Brazilian government. This work will contribute to the definition of policies that aim to help label health claims, safety claims and concern with the production process.

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Comparative phylogeography and evolution of Neotropical rodents (Rodentia: Sciuridae, Cricetidae, Echimyidae) using next-generation genomics

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Neotropical biomes and ecosystems exhibit high biodiversity as a result of multiple ecological and geological processes that fomented diverse biogeographical patterns. This high biodiversity is present in all organisms inhabiting this region and covers all taxonomic levels. Among these groups, the rodents (Order Rodentia) represent more than 50% of mammalian species in the Neotropics, with highly specialized taxa at morphological and ecological levels. However, to date, there is no clear understanding of the biogeographical and evolutionary processes molding the diversity of rodents in the Neotropics from a genomic perspective, with scarce data on some groups or species. To understand the evolutionary history of these taxa it is necessary to test biogeographic hypotheses that could offer explanations regarding vicariance and/or dispersal events, for instance. Additionally, an approach based on comparative genomics will allow more informative phylogeographic hypotheses for these taxa and a better understanding of their population genetics. For this reason, the main objective of this project is to elucidate the evolutionary and biogeographic mechanisms underpinning the diversity and distribution of species of three families of Neotropical rodents: Sciuridae, Cricetidae, and Echimyidae by using comparative genomic analyses. The results from this study will not only provide insights into the evolutionary and biogeographical history of these Neotropical taxa but also will provide grounds for further research on other mammalian species of this region. In the same way, it will provide valuable data that will allow the improvement of conservation and management strategies for the analyzed species.

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Determination of tree root quality from spectral analysis of GPR data

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It is known that afforestation brings many benefits, both aesthetic and functional, to the population and the environment. However, the lack of planning from the choice of the appropriate species to the management of the plant implies inconvenience, including accidents resulting from falling trees, mainly due to problems related to the roots, the lack of them or an advanced state of degradation. The use of the geophysical method GPR (Ground Penetrating Radar) is highly recommended, since it uses the principle of reflection of electromagnetic waves (EM) at high frequencies, allowing the obtaining of a high-resolution image of the subsoil, being possible map the root system of trees quickly and accurately. In this work, in addition to identifying the roots, to determine health patterns of these structures using GPR (900 and 1600 MHz antennas), depending on the frequency used, depth and diameter of the targets, distance from the trunk and density of the species, both in the time domain with reflection amplitudes and in the frequency domain with the short-time Fourier transform tool (spectral or time-frequency analysis), applied in different species located in ESALQ Campus (Piracicaba/SP). These results were compared with data obtained by the mechanical impulse tomograph, applied to roots, which provides an indication of the quality of the roots based on the propagation speed of the mechanical waves.

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Land cover differences effects on growth and carbon storage of *Cenostigma pluviosum* (DC.) (Sipipiruna tree) in a subtropical urban environment

Julia Rodrigues-Leite¹

and Denise Duarte²; Astrid Moser-Reischl³; Thomas Rötzer³

Our findings contributed to understanding the role of sub-tropical urban trees on carbon storage and CO₂ remotion in an urban context like Sao Paulo city. Also, to highlight the urban context implications to the tree's potential to perform these regulation ecosystem systems. The study was conducted on three trees *Cenostigma pluviosum* in different environmental conditions: one, in Pinheiro's neighborhood (PIN), and another in a green area, Ibirapuera Park (IBIRA). To define the tree's growth pattern along the studied period, segmented linear regression models were adjusted. The microclimate interference on steam growth tax was tested by a Spearman Correlation, during the growth season. Considering all tree's mean values, their stem growth presented a similar pattern, starting on 1st September 2021 and lasting until 31st March 2022, corresponding to 212 days with active metabolism and significant basal growth. For both areas, analyzing the growth period, the microclimate parameters showed a positive and significant correlation. The soil's volumetric water content and air relative humidity were the microclimatic variables that most positively impacted the steam growth. Considering the entire study period, for the IBIRA's trees the total mean stem growth was 1869.5 µm, and for PIN is 1091.03 µm. So, comparing both areas, PIN had a total growth lower by 58.3% in comparison to IBIRA. We could estimate, in value per tree, in the period studied, that the total biomass increment in IBIRA was 7.6 kg C, and at PIN was 3.5 kg C and they fixed 27.88 kg CO₂ and 12.86 kg CO₂, respectively. The results indicated that the land cover difference implicates a significant interference in the promotion of Carbon fixation and also CO₂ remotion, demonstrating that is more efficient for this ecosystem services promotion to plant urban trees in soils with more water permeability conditions.

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Legislative and judicial analysis of planned obsolescence in Brazil

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The voluntary action of anticipating the useful life of a certain product, with the justification of a quick and continuous replacement for the promotion of the economy – programmed obsolescence – has become a characteristic of the post-modern society and a kind of “perpetual engine” of capitalism. This strategy produces innumerable impacts, especially on the environment and on consumer relations, with relevant points of vulnerability, demanding effective and efficient public policies that can contain this abusive practice. The debate between economic growth and environmental preservation is a constant in this project, especially because the former is considered unlimited while the latter has scarce resources. Thus, for the maintenance of the consumerism imposed by the adoption of the planned obsolescence strategy, according to capitalist logic, it is necessary to exploit natural resources; transformation into products; distribution; commercialization (consumption); and, disposal, in a linear economic system. Obviously, one must consider in this process the relationship between consumers and economic organizations, impacting each other. Specifically, the focus of this research fell on the survey and identification of laws and court decisions that can combat or discourage the adoption of the practice of planned obsolescence in Brazil, bringing as results, despite the absence of specific legislation, the verification of provisions of the Code of Consumer Protection (CDC) that are used as grounds in consumer lawsuits, culminating with the civil liability of those involved when considering such practices as abusive. When considering that European countries such as France have legally prohibited the practice of planned obsolescence, the measures adopted by Brazil are insufficient to effectively combat it.

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Experimentalist governance in bioeconomy: insights from the Brazilian Amazon

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Policy making in the Amazonian bioeconomy is complex and demand collective action from different actors to design transversal public policies, strategies and find solutions for systemic problems. We used the experimentalist governance theory to understand whether (and how) the subnational processes to develop the bioeconomy policy are integrated with local efforts at implementation in the Brazilian state of Amazonas. A nascent system of experimentalist governance to foment the Amazonian bioeconomy is taking shape. However, the potential for experimentalism to improve policy reforms within Brazilian state of Amazonas is far from realized due to policy coordination problems, incipient collective actions among actors, and the absence of incentives to promote experimentation and systematic learning from local experiences. We argue that the experimentalist problem-solving approach could have a significant impact in the Amazonian bioeconomy by demonstrating and replicating the success initiatives to generate useful local policy experiments, learning, and promoting socioeconomic opportunities with environmental conservation. This case suggests that the quintuple helix innovation model is a promising approach to engage state and non-state actors in the design and implementation of bioeconomy experiments based on a multilevel governance system. In that case, state actor assumes the central coordination and local actors implement their experiments. Political will and long-term strategy based on metrics and a system for review are essentials. Policy experimentation can be a new viable alternative to move state and non-state actors from conflicts based on divergent economic interests to a cooperative way to promote socioeconomic development by demonstrating and escalating the success cases that can foster policies and new opportunities in the region.

1. Faculdade de Economia, Administração, Contabilidade e Atuária da USP.

Building the past: early Cretaceous fossils of the Crato Formation provide key information to calibrate molecular studies and to fill gaps in the evolution of groups

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Flies – insects of the order Diptera – are one of the most abundant groups of terrestrial organisms. Flies are found in all biogeographic regions and explore a wide range of habitats. Recovering the evolution of such important group, however, is tricky. There are conflicts between hypotheses based on morphology and molecules and important conflicts between different molecular phylogenies. Fossils allow time-calibration in molecular studies, fill gaps due to extinction at certain levels of the evolution of groups, and show past geographic distribution of groups when the design of the continents in the planet was different. In a series of recent papers, we described new fossils of the Early Cretaceous Crato Formation. They brought up relevant information to understand the morphology and evolution of the groups to which they belong. In one of these papers, we described the oldest known Therevidae, demonstrating that the origin of the family was 50 million years earlier than previously assumed, falsifying a pre-existent biogeographic hypothesis for the evolution of the family. We used also bayesian inference to check if previous reconstructions based on the principle of parsimony were stable in fly families Tabanidae and Mycetophilidae, offering new understanding of the evolution of key morphological traits. We are currently working on the Stratiomyomorpha from Crato Formation. Our study describes new taxa and explore anew morphological traits within the evolution of the infraorder. Collectively these results help building a framework for the evolution of Diptera as a whole, a group that had success facing the huge flora turnover worldwide. Understanding when and where these groups originated is crucial for a broad understanding of fly diversification and of extant fly biodiversity: these fossils confirm, adjust, or reject hypotheses obtained with other sources of data. Furthermore, the discovery of additional extinct species fills gaps in the tree of life and often twist previous interpretations of character polarity and evolution.

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Socio-biodiversity and bioeconomy: analysis of strategies for the conservation of the flora of São Paulo

Nina L. de A. Nunes

The University of São Paulo awarded the 2023 USP Mothers in Research Prize – Humanities, Applied Social Sciences, Linguistics, Literature, and Arts, in the Postdoctoral category, to Nina Lys de Abreu Nunes for her contributions to multidisciplinary research in environmental management, addressing issues of socio-biodiversity, bioeconomy, and public policies in the Brazilian context. The ongoing project is entitled “Public Policies in the Field of Socio-biodiversity and Bioeconomy: Analysis of Strategies for the Conservation of the Flora of São Paulo,” which aims to analyze the effectiveness of public policies in the territory of São Paulo regarding the sustainable use and conservation of endangered flora biodiversity. As a researcher in the USP Susten Program, coordinated by the USP Environmental Management Superintendence (SGA), the objective is to generate knowledge for the development of sustainable societies, environmental conservation, and the training of human resources committed to these goals. The topic of Environmental Conservation takes into consideration scientific, political, and social aspects of the various actors involved, with the expectation of contributing to the improvement of public policies for the conservation, restoration, and sustainable use of biodiversity in the state of São Paulo. This research is carried out by the Epistemology and Biology Didactics Laboratory (LEDiB/USP), from the Department of Biology of the College of Philosophy, Sciences, and Letters of Ribeirão Preto – University of São Paulo (FFCLRP/USP). The applied research in the field of interdisciplinary assessment of environmental public policies involves teaching, research, and university extension activities in formal and non-formal educational settings. These activities seek to bring the university closer to society, benefiting the community by providing exchange and access to knowledge produced through teaching and research. The project identifies policies, programs, or projects aimed at the sustainable use of genetic heritage, which value associated traditional knowledge and benefit-sharing in the state of São Paulo. The project links public policies to service offerings to promote the structuring of value chains in plants within territories inhabited by indigenous peoples, traditional communities, and family farmers (PCTAFs). This research experience can strengthen the territory and demonstrate that it is possible to promote governance focused on biodiversity conservation, involving institutional arrangements that include the university, government, and organized civil society, particularly traditional communities and family farmers.

Behavioral psychology applied to innovation for human-nature integration

Adriana S. de O. Ueno¹

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Human-nature contact is vital in promoting mental health and raising awareness about environmental conservation. Some technologies can stimulate this contact since the relationship with the internet, cell phones, and applications has been increasing in universal daily life, covering different cultures and social classes. However, by placing technology as an intermediary in the relationship with nature, we add another source of variations in the behavioral dynamics of attracting and retaining users, making the final objective even more complex. The researcher's experience in the scientific methodology applied to the biological bases of human behavior and environmental conservation can help adopt more efficient routes for technological innovations. One of our projects addresses the ecological and public health issue of abandoned animals, whose objective is to analyze the behavioral profile of actual and potential users, generating knowledge that helps in the more attractive and efficient design of apps for adopting dogs and cats. A second project scheduled for the 2nd half involves using "QR codes" on signs installed in urban green areas (parks and squares) that invite users to interact with children and images that they can detect in the specific location where the signs are. We want to analyze the difference that such a mechanism can bring to the well-being experience of users of the sampled green areas, including patients undergoing treatment for depression and anxiety. In sum, we argue that integrating behavioral researchers and those interested in innovations can leverage several aspects of environmental preservation and mental health.

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Integrated use of morphological and molecular analyzes in the taxonomic study of *Aegla schmitti*: an endemic aeglid taxon from Brazil suspected of constituting a species complex

Gabriel L. Bochini¹

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The genus *Aegla* is the only taxon of Decapoda Anomura found exclusively in continental waters of South America. Most species are viewed as threatened organisms, based on the characteristic highly endemic pattern of distribution they exhibit. Recent investigations, however, have focused on other species that show wide distribution pattern, as several studies point to great genetic diversity among populations, and suggest that these populations might actually represent a still unknown number of cryptic species. This is the case of *Aegla schmitti*, a species found in high altitude low order streams of the Atlantic Forest Bioma in the states of São Paulo, Paraná and Santa Catarina. In order to contextualize the taxonomic status, we aim to carry out an integrative taxonomic and phylogeographical study to unravel the evolutionary history concerning all known populations of *A. schmitti*. Such multidisciplinary analysis is based in the following methodological approaches: morphological analyses based on traditional as well as new informative characters to help morphologically differentiate possible cryptic species; ultra-structural analyses on histology, histochemistry, and morphology of male reproductive system and, of the ultra-structure of the spermatozoa (spermiotaxonomy); molecular analyzes, aiming at the detection of genetic differences between populations and the construction of phylogenetic trees based on the nucleotide sequences of the 16S and COI genes.

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Electrochemical sensor based on carbon screen printed electrode modified with phosphorene and molecularly imprinted *o*-phenylenediamine for determination of benzene in oilfield produced water

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Oil is a product of great importance in advancement of modern civilization. However, oil have raised several environmental concerns, among the extraordinary volume of oil water produced (OWP) formed. It is estimated that for each barrel of oil, 3 to 10 barrels of OWP are generated. Among the compounds present in OPW, the benzene is extremely toxic at low concentrations and can contribute to the increase of genotoxicity, mutagenicity and to the destruction of the ozone layer. The present work aims to develop an methodology for determination of benzene in OWP, through of the construction of an electrochemical sensor, obtained by modifying of a carbon screen printed electrode (CSPE) with phosphorene (BP) together with PEDOT:PSS and molecularly imprinted polymers (MIPs) composed of *o*-phenylenediamine. The modification of CSPE was performed by dripping 3 μL of BP-PEDOT:PSS at 0.5mg mL^{-1} (CSPE/BP-PEDOT:PSS). To obtain MIP, CSPE/BP-PEDOT:PSS was electropolymerized by cyclic voltammetry, with 30 voltammetric cycles ($-0.4 - 1.0\text{ V}$; $v=50\text{ mV/s}$), in 0.1 M acetate buffer at pH 5, containing 2 mM *o*-phenylenediamine (functional monomer) and 1 mM benzene (template molecule), thus obtaining the CSPE/BP-PEDOT:PSS/MIP. The template molecule was removed by heating for 5 min at $50\text{ }^{\circ}\text{C}$. The religation of the template molecule was performed by immersing the CSPE/BP-PEDOT:PSS/MIP for 15 min in phosphate buffer 0.1 M at pH 6.5 containing benzene. The electrode response was monitored by differential pulse voltammetry ($-0.40 - 0.50\text{ V}$), using pulse amplitude of 50 mV , pulse width of 100 ms , step potential of 2 mV . The obtained results showed that the modification with BP-PEDOT:PSS promoted an increase in the current around 25%. The developed sensor presented the following two linear ranges: $4.0\times 10^{-8} - 1.0\times 10^{-7}\text{ M}$ and $2.0\times 10^{-7} - 1.0\times 10^{-6}\text{ M}$. The limits of detection and quantification were $7.4\times 10^{-9}\text{ M}$ and $2.3\times 10^{-8}\text{ M}$, respectively. The sensor showed good inter and intra-day repeatability ($\text{RSD} \leq 5\%$). The results indicate that the method is an attractive alternative for the benzene detection in OPW.

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What is the meaning of male-female interaction in courtship displays?

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The courtship display is a dynamic communicative process where the males signal their qualities, and the females evaluate them to choose mates. During these exhibitions, males and females interact, and the males may adjust their behavior accordingly to female responses. Therefore, mate choice occurs as a result of these dynamics. Among mammals, the courtship display of guinea pigs (*Cavia porcellus*) stands out for its complexity, including signals from different sensorial modalities (acoustic and visual). Previous studies demonstrate that courtship display features are individualized, but the origin of these differences is unknown. This study aims to investigate the individual variation in guinea pig courtship display. We hypothesize that males modify their behavior over the courtship display according to female responses. We will record audio and video of guinea pig courtship displays from male-female pairing sessions, describe the behavior sequence exhibited during male-female interactions, and measure the acoustic parameters of vocalizations to analyze the vocal expression of emotions during the courtship. We predict that the guinea pig courtship display is a feedback cycle. As the male exhibits social behaviors and tries to mount the female, her stress level increases, and she utters distress calls. These calls will express the stress level in their acoustic parameters. In response, the male decreases the frequency of the social behavior and of the mount tentative and utters the courtship call, the purr. The purr calls probably calm the female. The purr's acoustic parameters encoded this function, then they could be adjusted in response to female behaviors. After the emission of purrs, the female distress level decreases as well as the emission of the distress call, and the male intensifies their display again. They repeat this cycle until the female exhibits lordosis or the male leaves.

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Ecocide in Anthropocene narratives: science fiction and climate change

Ana Rüsche¹

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In a comparative and ecocritical perspective, the research studies how science fiction is able to represent catastrophes and social change, through the estrangement induced by these literatures, and to cultivate collective responsibilities in the face of the “New Climate Regime”, in Bruno Latour’s expression. Based on contributions by Anna Tsing, Ailton Krenak, Donna Haraway, Isabelle Stengers, Malcolm Ferdinand, Naomi Klein, Timothy Morton and other authors, the theme of ecocide is analyzed in the following works: *The Word for World Is Forest* (1972), by the American Ursula K. Le Guin; *And Still the Earth* (“*Não verás país nenhum*”, 1981), by the Brazilian Ignácio de Loyola Brandão; *The Swarm* (“*Der Schwarm*”, 2004), by the German Frank Schätzing; and *Tentacle* (“*La mucama de Omicunlé*”, 2015), by the Dominican Rita Indiana. The post-graduation course FLT5127: Scientific Ecological Fictions and Climate Change (FFLCH-USP) was offered as an institutional activity.

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Exploring climate extremes in Brazil's Legal Amazon

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This study evaluates extreme climate indicators for precipitation and temperature in the Brazilian Legal Amazon (BLA) from 1961 to 2021. Data from 38 INMET weather stations with less than 12% record failures were used, and RClimDex software and Mann–Kendall, Pettitt, SNHT, and Buishand's tests were employed to analyze the data. Results show increased extreme rainfall events, including the annual total rainfall divided by wet days (SDII). More frequent discontinuities were observed in the 1980s (SNHT) and 1990s (Pettitt and Buishand). Extreme temperature climate indicators also significantly increased, particularly in the 1990s. These increases are likely linked to changes in local climate due to agricultural expansion, intensified industrial activities, and regional urbanization. The study underscores the need for proactive measures to curb illegal deforestation and reduce CO₂ emissions and further research to understand and mitigate these changes' adverse impacts on the BLA's environment and local communities.

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Homogenizing machine: the building of voting cohesion in the “rural caucus”

Caio Pompeia¹

Divergences on socio-environmental issues among agribusiness actors operating in Brazil draw widespread attention in the public sphere. However, such divisions have not migrated to the National Congress, where the so-called “rural caucus” usually operates with largely convergent anti-environmental and anti-indigenous votes. This presentation analyzes this contrast, by means of an ethonography of the complex movement of construction of homogeneity in the decisions of members of the caucus. To this end, the research follows the complete legislative processing of a provisional measure related to the Forest Code. The research triangulates data obtained from long-term participant observation in the National Congress and at the *Pensar Agropecuária* Institute, from corporate and state documents and from interviews with congresspeople and business associations. The results evidence a political machine of convergence production related to the representation of agribusiness interests in the Brazilian Legislative.

1. Fundação de Amparo à Pesquisa do Estado de São Paulo.

Conservação colaborativa em áreas protegidas e conservadas: proposta de conceito

Cláudio C. Maretti¹

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Na realidade não existe gestão de uma área protegida apenas por uma única instituição sozinha. Sempre há uma *diversidade de contribuições* para que as áreas protegidas e conservadas sejam geridas e governadas adequadamente. E isso de formas variadas, oficialmente estabelecidas ou mesmo informais. Deve-se reconhecer que há uma grande *diversidade de atores sociais*, com uma multiplicidade de interesses dentro de um contexto de conservação da natureza. A boa governança das áreas protegidas e conservadas (APCs) indica que eles devam ser considerados em processos democráticos e justos, que respeitem direitos humanos, individuais e coletivos. Mais que solucionar todas as questões em um só lugar de uma só forma, a consideração dos *sistemas de áreas protegidas e conservadas* permite *abordagens complementares e integradas*, buscando resultados melhores no conjunto. Eles são sistemas complexos, com multiparceiros, múltiplos interesses, multifunções, multimeios etc., constituindo um em um todo complexo e integrado, interativo, dinâmico e evolutivo, com (esperados) impactos positivos. Considerando os inúmeros serviços e funções dos ecossistemas, os direitos humanos e sociais de acesso aos benefícios da natureza conservada e a pluralidade de concepções do que interessa e de como conservar, destaca-se a necessidade de *áreas protegidas e conservadas* serem mais eficazes e equitativas, ou seja, mais bem governadas e geridas, em seus conjuntos e sistemas, como sistemas complexos. Gerir áreas protegidas e conservadas tem que ser uma ação de *postura ativa*. Elas devem servir à promoção da equidade, inclusive colaborando na defesa de povos e comunidades tradicionais. Ou seja, também devem ser instrumentos de transformação para uma melhor qualidade de vida. A aplicação desse conceito de conservação colaborativa leva a promover *a governança e a gestão mais inclusivas, equitativas, colaborativas...* Uma *gestão ativa*, promovendo que as APCs sejam espaços de resistência contra a degradação, de reconexão da sociedade com a natureza e dos grupos sociais entre si e de transformação para uma sociedade melhor. E isso, até para que a sociedade se engaje na sua defesa. E, assim, que as APCs sejam mais eficazes, inclusive na conservação da natureza.

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Narrative formulations: trajectories in the construction of a historical representation for the Pantanal (1880-1950)

Eudes F. Leite

This project aims to understand the construction of a representation for the Brazilian Pantanal, whose essence recovers the action of the pioneer founders of cattle ranches sub-region of Nhecolândia, located in the current state of Mato Grosso do Sul. This phenomenon has occurred since the 1880s, especially since the creation of a fruitful set of artifacts, mainly books and newspapers, in which the colonizing action of the Gomes da Silva families, migrants from the region of Cáceres-MT to Corumbá, is recorded. , in the post-war period with Paraguay. The importance of researching this phenomenon comes from the need to better understand certain mechanisms that influenced the construction of representations about the Pantanal. Under the focus of cultural history and using various sources, it is expected to historically understand the process of founding farms in the referred region and the consolidation of the image of the pioneer in this event. The Pantanal, both in its rural and urban face, appears contemporaneously as an environment in evidence in the media, in the concerns of NGOs and State agencies, most often due to its exuberant fauna and flora. In this kind of rediscovery of the region, aspects related to history and local culture began to be thematized in some research works. More recent writings have addressed this issue, and in them the Pantanal is directly or indirectly contemplated.

Contribution to the knowledge of geospeleological processes in the sculpture of karst relief modeling in Ituaçu - Bahia

Heleno dos S. Macedo¹

and Fernando N. J. Villela¹

The landscape over the past centuries has been undergoing profound changes. Part of these changes occur due to the innate need for human beings to transform, adapt, create, live together, relate, develop, and seek new tools and new means of production. The realization of studies on environmental dynamics, considering possible transformations due to land use and occupation projects in their various categories, is a requirement that fits as a preliminary measure in view of any policy aimed at environmental planning with the purpose of corroborating with territorial management. Geography, as an area of scientific knowledge, should contribute by signaling proposed solutions or mitigations to problems concerning man and the environment, solutions that are achieved through specific and diverse methodologies, such as the systemic approach and the application of instruments aimed at environmental planning. During the last centuries and the first years of the 21st century, which characterize the process labeled as “civilizing”, negative aspects have marked such process, bringing to the surface the risks of the economic development models adopted, such as the expansion of farming and mining activities over natural areas; intense industrialization; war conflicts on a regional, national and global scale; high consumption patterns; vertiginous demographic growth; large urban agglomerations; the degradation of water, soil and air resources, among others. Among the landscapes in which such events occur are the landscapes developed over carbonate rocks, called karst landscapes. Karst landscapes are among the most diverse and fascinating landscapes in the world. They contain the largest springs and underground water sources on the planet, are unique habitats for rare animals, and their caves have preserved prehistoric material for millennia. Karst, according to Karmann (2003), is a type of landscape where chemical weathering, through the dissolution of the underlying rock, determines the landforms. However, this type of landscape presents significant degrees of fragility due to the geological context that made its formation possible. They are environments that are easily susceptible to environmental impacts and their groundwater is easily contaminated. Unlike other landscapes, in which most processes occur on the surface, many dynamic processes in karst occur underground. Thus, a need arises for monitoring the flow of groundwater and, consequently, the process of exploration and study

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of caves, which go from mere geomorphological curiosities, to recognition as subsurface extensions of the landscape and of relevance to the maintenance of the activities of ecosystems that develop on it. Thus, the main objective of this post-doctoral proposal is to characterize the main geomorphological and geospelological aspects of the karst in Ituaçu.

Influence of macroclimate factors in the mangrove of the Cananéia-Iguape Coastal System, SP

Jakeline B. E. Galvani

Mangrove are important ecosystem for humanity because they produce and provide ecosystem good and services. However, the alteration in rainfall and air temperature can cause changes in the global distribution, diversity and abundance of species. Therefore, this research seeks to understand how changes in air temperature and rainfall interact with the mangrove and the implications of the trend of climate changes in the ecosystem in the Cananéia-Iguape Costal System (SCCI). The objective is to evaluate the relationship between the types of land use an occupation and the macroclimatic repercussions that determine the expansion or retraction in the mangrove Cananéia-Iguape Costal System. Product data from orbital sensors (air temperature, rainfall and surface temperature) and historical data from surface meteorological stations were used in this research. Monitoring of the mangrove was carried out using satellite images and values of vegetation indices (NDVI, EVI and IAF) will also be calculated. Geoprocessing techniques and statistical analysis will be used to process the data and analyze the results. Partial results showed that the rainfall values of the orbital products were satisfactory for the SCCI. The CHIRPS data were the most promising. In the times series, the NDVI, EVI and LAI values did not show significant variations. The coefficients of variation were 10.1% (EVI), 11.6% (NDVI) and 21.1% (LAI) for the period from 2003 to 2022. The NDVI variation showed a delay of 4 months in relation to the volume of rainfall ($r=0.44$). However, the relationships between land cover and land use in the Cananéia-Iguape Coastal System and surface temperature need to be understood. Moreover, the influence of air temperature variation and rainfall on mangrove forest expansion or contraction needs to be established.

The denialism of animal suffering

Mônica F. Corrêa

The present research seeks to philosophically understand the mechanisms involved in the indifferent human posture in relation to the conditions of life and death of animals used for consumption. Animal suffering is, to a large extent, caused by human actions and about this there is an abundant supply of information in the most diverse media. In 2018 alone, about 71 billion land animals were slaughtered in the world, and of this total, Brazil alone sacrificed approximately 39 million head of cattle, rising to the first place in the sad ranking of slaughter of these animals in the world. However, the increase in animal suffering and death to an industrial scale seems not to have sensitized a large part of the world's population. Demonstrations and protests in defense of animals are still timid and of little significance in the face of widespread indifference to the suffering of animals. This indifference has been associated with the concepts of *denial* and *denialism*. In the article "Silence and Denial in Everyday Life – The Case of Animal Suffering" (2011), researcher Deidre Wicks asks about the reasons why we coexist, relatively indifferently, with widespread animal suffering. Wicks and other authors seek to bring the concept of denial to the scope of animal studies, as used by Stanley Cohen (2001) to describe some positions in relation to the holocaust. The aim is to go beyond the relationships already pointed out by scientists and philosophers to provide an understanding of the phenomenon of human *indifference*. How is it possible to silently coexist with the conditions of life and death imposed on animals to serve human interests? I understand that to contribute to breaking the imposed silence and provide elements for human action more consistent with an inclusive ethics, it is necessary to investigate this indifference.

A long non-coding RNA pathway at the onset of sociality evolution in insects

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Insect sociality is a major evolutionary transition based on the suppression of worker reproduction in favor of the queen's reproductive monopoly. Workers and queens are genetically identical, implying that these phenotypes are the result of differential feeding: queen-destined larvae are fed royal jelly, a highly nutritious food, whereas workers are fed worker jelly, a less nutritious food. Although sophisticated insect societies have independently evolved multiple times, how worker sterility evolved via natural selection is not well understood. In particular, there is no molecular pathway underlying worker sterility that is evolutionary conserved in the social insects, environmentally sensitive and operates throughout the worker's life cycle. Here we describe a novel worker-ovary-specific epigenetic pathway underlying the queen/worker dimorphism in the honey bee (*Apis mellifera*). We found that the long non-coding RNA *lncov1* interacts with the Tudor staphylococcus nuclease (Tudor-SN) protein to form a regulatory module that promotes programmed cell death in the ovaries of larval workers. In adult workers, this regulatory module flexibly responds to environmental cues (e.g., queen pheromones and royal jelly) that modulate the workers' reproductive status. Therefore, *lncov1* is an ancestral epigenetic innovation that facilitates caste differentiation and reinforces caste reproductive asymmetries throughout adulthood. As *lncov1* is strikingly conserved in the Apidae family, we propose that the *lncov1*/Tudor-SN module regulates the social evolution of bees over 80 million years ago. Our study provides key mechanistic insights into the evolutionary history of social arthropods.

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Sterilization of yellow-tailed tetra (*Astyanax altiparanae*) and subsequent transplantation of stem spermatogonia of piracanjuba (*Brycon Orbignyanus*)

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Surrogate propagation using germ cell transplantation is an important biotechnique for genebanking and restoration of endangered fish species. Present work was carried out by to transplant spermatogonial stem cells (SSCs) from the endangered piracanjuba (*Brycon orbignyanus*) into the gonads of sterile yellowtail tetra (*Astyanax altiparanae*). Firstly, isolation of SSCs was performed by Percoll density gradient (at 24°C and 30 min x 800 g). The sterile yellowtail tetra was obtained using a combination of triploidization with busulfan treatments. Triploid fish were selected by flow cytometry and then three injections of busulfan at a concentration of 50 mg/kg were applied at 1-week intervals. Spermatogenesis depletion was assessed by conventional histology hematoxylin-eosin staining. In triploid males only a few endogenous spermatogonial cells were observed in the testis after one month after the end of busulfan treatment. The isolated SSCs of piracanjuba were labeled with PKH26 and transplanted through urogenital papilla of the yellowtail tetra recipients (n= 27) previously treated with busulfan. Recipient gonads (n= 6) were evaluated using fluorescence microscopy with a DsRed filter set (554/23 nm). PKH26-positive spermatogonia and spermatocytes were visualized up to 23, 42 and 80 days after transplantation. The combination of sterilization methods using triploid fish and busulfan optimize the success of SSCs transplantation, as endogenous germ cells are eliminated from the recipient testes, permitting the transplanted cells to colonize the recipient gonad. The procedures established in this study can be applied in the future strategies for conservation and reconstitution of endangered fish species.

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Bats as potential carriers of antimicrobial-resistant bacteria and bioindicators of environmental contamination

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Bats have ecological and epidemiological importance, and because of their proximity to humans and other animals, they should be better understood. Here, the preliminary data on the microbiome and resistome of bats from urban–rural regions and the presence of heavy metals in biological samples are described. Bats (N=248) were captured in six locations (rural, forest, residential-A, slum, residential B – condo buildings, and industrial) over four campaigns (one in each season of the year) between 2021 and 2022, using mist nets. Fecal swabs were collected, placed in peptone water and incubated at 37° C–24 hours. Then, 10 µl of the bacterial growth was streaked on MacConkey agar and incubated at 37°C–24 hours. Enterobacteria (N=253) were isolated from 72 bats, mainly *E. coli* (28.4%), *E. cloacae* (12.2%), *S. marcescens* (9.1%), *C. freundii* (8.3%), and *E. hormaechei* (3.9%); other species added up to 38.1%. Shannon diversity analysis revealed differences in sex (higher in males; $P = 0.02$). Of 247 tested isolates, 41.3% were sensitive to all tested drugs, and 47.8% were resistant to at least one drug, mainly amoxicillin + clavulanic acid, followed by cefoxitin, tetracycline, cefotaxime, nalidixic acid, trimethoprim–sulfamethoxazole, ceftriaxone, imipenem, aztreonam, ertapenem, ceftazidime, ciprofloxacin, gentamicin, meropenem, and cefepime. Most resistant isolates were found in adults (51.2%; $P = 0.05$) and were numerically more frequent in males (53.2%; 74/139), in residential area-A (87.5%; 7/8) and during the summer (60.8%) ($P > 0.05$). A better characterization of the microbiome and resistome will be performed using the next-generation sequence. Forty-nine blood samples were obtained, and heavy metals were measured by energy dispersion x-ray fluorescence. Iron was present in all tested samples, with the highest average (161±30 mg/L) (due to hemoglobin), followed by Cr, Bi, Ba, Pb, V, Rb, Co, Zn and Cd. Rubidium and Pb showed the highest values in bats from Residencial B ($P = 0.005$) and the Industrial stratum ($P = 0.05$), respectively. The data suggested that male and adult bats carry the most antimicrobial-resistant bacteria during summer when the reproductive season is more active. Bats may be significant contributors to disseminating resistant bacteria in the urban–rural interfaces in the largest metropolitan region in Brazil and may contribute as environmental indicators of heavy metal contamination in the industrial area.

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Research of pathogens and parasites in seabirds from the coast of Espírito Santo state and oceanic islands

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The collapse of the Fundão tailings dam in Mariana, in the state of Minas Gerais, Brazil, triggered the most serious environmental disaster in Brazil's recent history. The dam contained tailings from the processing of iron ore from mines owned by Samarco, a company controlled by Brazilian Vale S.A. and Anglo-Australian BHP Billiton Ltda. After the incident, approximately 60 million cubic meters of mining waste reached the Doce River and the toxic sludge flow traveled 530 km until it reached the sea off the coast of Espírito Santo some 17 days later. The toxic effects of the heavy metal-contaminated mudflow have been a concern for marine fauna along the coast of Espírito Santo and surrounding areas. Birds are vulnerable to various diseases, and the susceptibility of individuals to pathogens can be influenced by environmental conditions that affect their immunity. They are, therefore, good sentinels of ecosystem health. For seabirds, the environmental factor has a great influence on population health, since the prevalence of diseases for these animals is strongly associated with environmental quality. For this reason, monitoring seabird populations is an important index of environmental response to anthropogenic impacts. The present project, on seabird health, was formulated within the Program for monitoring the biodiversity of the Rio Doce and adjacent coastal and marine regions – Annex 6 – Birds. It intends to evaluate the health of seabirds that have part of their cycle in the areas directly or indirectly affected by the Mariana dam collapse. For this purpose, biological samples of adult individuals of the species *Phaethon aethereus*, *Sula leucogaster* and *S. dactylatra*, which will be collected in the Abrolhos Archipelago, *Pterodroma arminjoniana* on the islands of Trindade, nesting place, and other birds that may contribute to the analysis.

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The contribution of proper solid waste management to the socio-environmental sustainability of the nine Campuses of the University of São Paulo

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Waste management is one of the processes included in the Sustainable Development Goals (SDGs), being explicitly or implicitly included in more than half of the 17 goals. The university campus proves to be a laboratory for practices that seek to improve its socio-environmental and economic sustainability, especially if they are reinforced by adequate administrative management and conducted in an integrated and participatory way. This study aimed to diagnose current situation of the issue of solid waste on the nine campuses of USP (three in the capital and six in the interior of the state of São Paulo), in order to elaborate, propose and assist implementation of improvements in the management of all types of waste generated, with the purpose of contributing to the sustainability of the university, aiming at gains in scale, cost and damage reduction, as well as compliance with current legislation in the environmental, sanitary and worker's health dimensions. It was identified that the 47 Higher Education and Research Institutions HERIs at USP (and other support units and complementary services such as libraries, administrative buildings, restaurants, museums, among others, distributed across the nine campuses, are major generators of recyclable and not recyclable waste. However, 30 of those HERIs also generate other types of waste considered dangerous, such as infectious, animal carcasses, chemicals, radioactive, sharps, which must be disposed of, packaged, stored and forwarded through special procedures and technologies due to the risks involved since they may affect the environment and human health. The diagnosis was carried out through document consultation, semi-structured questionnaires applied to employees, virtual meetings with representatives, and technical visits to the campuses. The analysis of this diagnosis gave rise to a report that pointed out existing structural, managerial, and operational flaws, certain irregularities in compliance with relevant regulations, lack of records and certificates from competent organizations and the need for training of the personnel involved, mainly for the preparation and implementation of management plans. As a constructive point, a support network was formed for the exchange of knowledge and the sharing of successful practices and innovations adopted by some institutions and that could be replicated for others.

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Desenvolvimento de abordagem para a resiliência social em estudos de risco de secas

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A identificação de riscos que secas extremas impõe a sistema econômicos, sociais ou ambientais está fortemente relacionada à construção de índices compostos por diversas variáveis. Apesar de ser uma ferramenta útil para identificação de sistemas mais ou menos suscetíveis às secas, há diversas limitações na construção de tais indicadores e no seu uso prático. Por exemplo, como definir quais variáveis incluir? Que fatores são mais determinantes para o aumento da resiliência de um sistema? Assim, o projeto tem o objetivo de identificar e propor nova abordagem para as conexões entre perigo, exposição, vulnerabilidade e ou indicadores relevantes frente aos eventos de secas, com ênfase nos indicadores de infraestrutura e capacidade institucional. Foram listamos e selecionado indicadores propostos na literatura científica para resiliência à seca com foco no sistema alimentar. Em seguida, foi aplicado o método Delphi online para um conjunto de especialistas das várias regiões do mundo, onde os indicadores foram avaliados em termos de relevância, qualidade e a escala disponível para avaliação da resiliência e vulnerabilidade social das secas. Baseados na pesquisa, serão estimados os pesos que representam a força da associação entre a resiliência e vulnerabilidade dos indicadores os quais darão subsídios para elaboração de uma ferramenta e auxílio à decisão para apoiar políticas públicas. O método será aplicado às cidades brasileiras onde secas são um evento recorrente. Espera-se ampliar o conhecimento sobre a importância dos fatores institucionais e de infraestrutura para o aumento da resiliência aos desastres de secas extremas e ampliar o uso de decisões baseadas em evidências nos processos de decisão em políticas públicas.

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The effect of sunlight exposure on vitamin D status in countries of low and high latitudes

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Menção Honrosa

The findings have demonstrated that vitamin D deficiency is present across all latitudes, at all ages, thus making it a global issue. Interventions have mainly focused on providing vitamin D as oral supplements or in fortified food. Studies have shown a high prevalence of vitamin D deficiency and insufficiency in locations where there is sufficient radiation throughout the year for its synthesis. Few publications recommend more sunlight exposure and that children should spend more time outdoors to benefit from vitamin D synthesis through sunlight. Another important finding is that the prevalence of deficiency/insufficiency is lower in newborn children and increases progressively until adolescence. This may suggest that the habit of staying indoors for a long time develops from an early age due to school and study activities and expands with productive age among some professions due to work responsibilities, lifestyles, physical activity, and diet. With aging, the risks of vitamin D deficiency increase with season, cloud cover and due to a greater difficulty in receiving adequate exposure to sunlight, combined with lower dermal absorption. Currently, the Nature based Solutions (NbS) have gained priority in policies to combat climate change, and nutritional and public health spheres should turn to these solutions and expand interdisciplinarity. There is a growing interest in the association between environment and vitamin D status and research is still looking for increasingly robust methods and ways to understand this association. Research quantifying sunlight exposure necessary for adequate vitamin D synthesis in people with darker skin color and those people living in low latitudes are scarce, as are studies in urban populations that may have limited opportunity for sunlight exposure. Furthermore, there is also a lack of research that consider the habits of everyday urban life as a limiting factor for sunlight exposure, considering the types of housing, work environments, urban design, the presence of green areas and external spaces for coexistence and leisure, safety, and suitable routes for walking and/or riding bicycles. The use of nature-based solutions that can mitigate climate change will become increasingly important for preventing hypovitaminosis D.

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Development of a biolarvicide based on RNA interference technology for the biological control of *Mansonia* spp. larvae

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The control of mosquito vectors and, therefore, of the diseases they transmit has acquired major importance globally, as it is widely accepted that climate and environmental changes and land occupation patterns can favor both the intensification of the transmission of infectious diseases and their expansion to areas where they did not occur before. Therefore, the development of innovative approaches and technologies for controlling mosquitoes and other insect disease vectors are pivotal. Nevertheless, there is a lot of concern about the intensive use of insecticides to control insect vectors, the emergence of resistance to these products and the impacts of these compounds as environmental pollutants. In addition, we must take into account that insecticides and metabolites generated in the decomposition of molecules can affect species that are pollinators or that participate in the food chain and nutrient cycles. These concerns have accelerated the search for ecologically and environmentally sustainable products that affect the target population without polluting the environment and, also, without eliminating species that are important to the survival of human and animals throughout the whole planet. That being said, interfering RNA technology (RNAi) is gaining importance as a species-specific control tool that does not accumulate in the environment due to its short survival time. The successful application of the RNAi technology requires the development of safe and effective delivery systems. The use of viral and bacterial systems for this purpose may present safety risks, which it is not the case for *Saccharomyces cerevisiae*, which is a completely harmless microorganism for humans. In this context, we propose the development of a biolarvicide that uses *S. cerevisiae* as a bio-factory for the production of short hairpins RNAs for the silencing of essential genes in mosquitoes of the genus *Mansonia*, aiming to control larvae of these mosquitoes in areas affected by the construction of the lake of the Santo Antônio power plant in Porto Velho, Rondônia state, Brazil.

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Solid waste management in a higher education institution: from diagnosis to implementation

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Worldwide, the concerns of governments in developing countries, managers of public and private companies turn to issues related to the environment and sustainability. In the quest for compliance with the spheres of sustainability, it is conditioned to deal with different types of waste, such as the management of solid urban waste, which are generated by higher education institutions. Large institutions, such as the University of São Paulo, are considered large generators of urban solid waste, and compared to small cities, generate a high volume of the most different types of solid waste (common recyclable waste, organic waste, waste from health areas, hazardous chemicals, among others). One of the central roles of organizations, and especially of educational institutions, is the promotion of operational and administrative management of solid waste in a participatory and integrated manner, stimulating and delivering policies and practices to society that lead to changes towards sustainability. Based on a diagnosis carried out at USP, it was possible to map the type of waste that is generated on all its campuses and identify current waste management standards that need improvement. Recommendations were made so that managers can develop waste management in an integrated way, aiming at best practices in waste management.

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Plant-computer interface: a case study using water hyacinth as a detector of aquatic pollutants

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With the rise of affordable computing technology, the utilization of interfaces between biological and computational systems has significantly enhanced environmental monitoring. This research focuses on the development of a plant-computer interface to evaluate the effectiveness of water hyacinth (*Eichornia crassipes*) as a detector of pollutants in aquatic environments by harnessing its bioelectricity generated through its electroma. The instrumentation setup comprises a biopotential acquisition system connected to a wireless transmission system employing the Bluetooth protocol. A computer-based data acquisition system, operated by Python software on a Linux platform, controls the overall process. Signals were gathered at a sampling rate of 200 Hz and subjected to analysis using Python-based digital signal processing algorithms. The bioelectrical response of water hyacinth was thoroughly examined across the time, frequency, and time-frequency domains. In the time domain, complexity measures, specifically Lempel-Ziv complexity (CLZ), were employed. The frequency domain involved power spectrum analysis, utilizing spectral entropy (Es). Time-frequency coefficients derived from the Adaptive Gabor Transform (AGR) were utilized for analysis in the time-frequency domain. The results obtained provide compelling evidence of the water hyacinth's bioelectrical response when exposed to the target pollutant, raw sewage. This innovative approach reveals the capacity of bioelectricity to offer crucial insights into the temporal and frequency dynamics of electrical signals in plants, thereby establishing water hyacinth as an exceptional biological system within the plant-computer interface framework. Consequently, it holds immense potential in effectively contributing to the monitoring and preservation of water resources.

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Characterization of the environmental dynamics of the Fernando Costa Campus (FZEA-USP): subsidy for the elaboration of an instrument of orientation for rural producers

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One of the major global concerns focuses on meeting the demand for food, with a view to population growth. In this sense, the Brazilian agricultural sector stands out at the level of world production, and consequently, this reflects positively on the economy. In addition to the economy, it is necessary to consider in the development of this sector: environmental health, social and economic equality, prioritizing achieving sustainability goals. Given the context, this research is inserted in the USP Sustainability Program, whose main objective refers to the development of a guidance guide presenting guidelines and sustainability indicators for rural producers, assisting in the transition to sustainable production systems, in order to meet the second Sustainable Development Goal (Zero Hunger and Sustainable Agriculture) established by the United Nations. The studied area comprises the Fernando Costa Campus (USP), in Pirassununga (SP). For the characterization of its environmental dynamics were used techniques of remote sensing and geoprocessing for the preparation of maps of land use and cover, considering the dry and rainy period of the years 1990, 2000, 2010, 2020 and 2023. For density analysis and Health of vegetation cover were calculated (Leaf Area Index; Ratio Vegetation Index; Soil-Adjusted Vegetation Index; Normalized Difference Vegetation Index; Inverse Ratio Vegetation Index). In addition, maps of real evapotranspiration, rainfall, slope, hypsometry were prepared, as well as the survey of geological and pedological data. The next steps are to draw up a list of sustainability indicators and the orientation guide.

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Study on the reuse of treated wastewater from agroindustries in the Mogi Guaçu River Basin, northeast of the state of São Paulo

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With the increasing world population and the growing need for food and products, natural resources are being increasingly exploited to meet the demands of humanity. Water is one of the main resources that most lacks a management that ensures its use in quantity and quality for different types of users. Given this, the reuse of water in agriculture is one of the thematic axes addressed in the USP Sustainability program, in order to meet one of the goals of the sixth Sustainable Development Goal (SDG) – Water and Sanitation. The objective of the research was to evaluate the potential use of wastewater from an agro-industrial source in the Mogi Guaçu River Basin (MGRB) for irrigated agriculture, through geoprocessing techniques, to subsidize the development of a technical standard on the reuse of treated wastewater from agroindustries, aiming at the rational use of water resources. The methods used were: spatialization of MGRB agroindustries; selection of agroindustries for detailed analysis; request for views and analysis of environmental licensing processes of selected agroindustries; Sample collection and laboratory analysis of wastewater after treatment; mapping of areas unfit for agricultural production in MGRB; preparation of the Land Suitability Chart of MGRB. Were spatialized 299 agroindustries, separated into 12 groups, of which 20 units showed significant flows, suggesting potential for reuse, especially the sectors of slaughter and manufacture of meat, beverages and biofuel, the latter being exceeds the flow rate of $13,000 \text{ m}^3 \text{ day}^{-1}$. The MGRB presents about 22% of unsuitable areas, however, 35% of its area presents high agricultural suitability presenting favorable conditions of the terrain, such as moderate slopes, deep and clay soils, and greater groundwater depth.

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Organic acids chain elongation with agro-industrial residues

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Changing the global economic matrix, currently based on fossil fuels, requires consideration of more sustainable alternatives for supplying the market with energy, fuels and chemicals. The production of carboxylic acids in the adverse stages of anaerobic digestion (fermentation) from residues is a promising alternative not only for the production of valuable chemicals but also for the management of these residues, which are no longer exposed as a sanitation problem, and become a resource from which valuable products can be extracted. Among carboxylic acids, physical properties suggest that medium chain acids – MCA (6 to 8 carbon atoms) would be better precursors to other chemicals and fuels compared to short chain acids – SCA (2 to 4 carbon atoms), main products of fermentation. Due to this, interest in the process of SCA chain elongation increases. Chain elongation of carboxylic acids occurs in reactors where carbon source and reducing agents are present and through a process called reverse β -oxidation, SCA such as acetic (2C) and butyric (4C) are elongated with 2 carbon atoms per time, coming from an external electron donor, such as ethanol, for example. Agroindustrial residues can be excellent substrates for the production process of carboxylic juices. The evaluation of residues and their potential for use in the MCA production process ensures a more energetically and environmentally advantageous management, in addition to reducing dependence on fossil fuels, the main source of these biochemicals today.

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Source apportionment of particulate pollution events in Metropolitan Area of São Paulo

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To investigate the impact of vehicular sources, biomass burning, and secondary formation on air quality impairment, the chemical composition of fine particulate matter (PM_{2.5}) was studied in the Metropolitan Area of São Paulo (MASP) during a dry period. High-volume samplers were employed to collect PM_{2.5}. Extensive chemical characterization was performed (including inorganic and organic species). The optical properties, size, and number concentration of aerosol particles were monitored during the period. PM_{2.5} concentrations exceeded the new World Health Organization's daily recommendations on 75% of sampling days and the benzo(a)pyrene equivalent index for carcinogenicity exceeded the recommendation by the European Environment Agency in one-third of the samples. Biomass burning tracer levoglucosan peaked in some pollution events and back trajectories suggested the transport of plumes from sites located north and northwest of the MASP, where frequent crop burning and wildfires occur. A peak of biomass burning tracer was observed before the occurrence of a phenomenon where darkened rainwater samples were collected and aerosol transported from fires in parts of the Amazon Basin. Iron and copper were among the most abundant elements in PM_{2.5}, these species are associated with vehicular sources in the MASP. It was possible to identify high pollution events in the studied period and observe the influence of biomass burning on those days, summed to the vehicular sources which constitute the most prevalent one.

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Are Cut-off Lows simulated better in CMIP6 compared to CMIP5?

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This is the first study to show the global Cut-off Low (COL) activity in 46 models participating in the Coupled Model Intercomparison Project Phase 5 (CMIP5) and Phase 6 (CMIP6). The COL historical simulations for the period 1979–2005 obtained from the CMIP5 and CMIP6 models and their ensembles are compared with the ERA5 reanalysis using an objective feature-tracking algorithm. The results show that the CMIP6 models simulate the spatial distribution of COLs more realistically than the CMIP5 models. Some improvements include reduced equatorward bias and underestimation over regions of high COL density. Reduced biases in CMIP6 are mainly attributed to the improved representation of the zonal wind due to the poleward shift of the subtropical jet streams. The CMIP5 models systematically underestimate the COL intensity as measured by the T42 vorticity at 250 hPa. In CMIP6, the intensity is still underestimated in summer, but overestimated in winter in part due to increased westerlies. The overestimation is enhanced by the finer spatial resolution models that identify more of the strong systems compared to coarser resolution models. Other aspects of COLs such as their temporal and lifetime distributions are modestly improved in CMIP6 compared to CMIP5. Finally, the predictive skill of climate models is evaluated using five variables and the Taylor diagram. We find that 15 out of the 20 (75%) best coupled models belong to CMIP6, and this highlights the overall improvement compared to its predecessor CMIP5. Despite this, the use of the multimodel ensemble average seems to be better in simulating COLs than individual models.

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Unveiling fungal bioaerosols within Brazil's Atlantic Forest biodiversity hotspot: importance of climatic events, land-use context and the state-of-the-art

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Fungi are a big component of primary biological aerosol particles (PBAPs) and interfere with climate regulation and local-to-regional hydrology, mainly by means of ice nucleation and effects on cloud formation and lifetime. Although research within this topic has increased recently, many aspects are still uncovered and need addressing to boost our understanding of fungi and their role in climate regulation, particularly in face of climate change. To help on this, we are using a range of methods and approaches to investigate how fungal PBAPs impact on climate regulation in the most populated Brazilian biome, the Atlantic Forest, which is also considered as a biodiversity hotspot. In our systematic review of the literature considering more than 200 papers of in situ experiments held in the country, this important biome was only represented in 18% of all cases retrieved, with studies being scarce and scattered. Using a hot-air balloon to perform experimental flights, and a portable Burkard air sampler and a Microbial Air Monitoring System (MAS100) to check on the vertical profile up to 300 m, we have identified that fungal PBAPs are reduced once rainfall events occur (i.e., wet removal). In addition, when examining the effects of land-use context on fungal PBAPs, we have found that forest systems have higher abundance and richness of airborne fungi than maize crops. Moreover, regardless of land-

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12. Institute of BioEconomy.

13. Aarhus University.

14. National Research Institute for Agriculture, France.

use context, altitude (up to 300 m) and diel time (morning vs. afternoon), *Cladosporium* sp. accounts for more than 80% of all fungal spores present in the atmosphere, which makes this morphotype–species relevant for researchers trying to establish links between fungal PBAPs and climate regulation. With a multidisciplinary approach and team, we are unveiling the importance of fungal PBAPs to climate regulation in Brazil, impacting science regarding climate change and its regulation globally.

Estimates of atmospheric columns of CO₂, CO and CH₄ using a portable FTIR in São Paulo: events of atmospheric interest and intercomparisons with equipment on board satellites

Diogo de J. Medeiros

and Marcia A. Yamasoe

Global warming is by far the biggest current environmental concern, being directly related to the effects and consequences of climate change. Taking into account only the gaseous emissions whose origin is related to human action, carbon dioxide (CO₂) and methane (CH₄) are the main greenhouse gases (GHG). Currently, it is estimated that 75 % of anthropogenic CO₂ emissions are derived from the burning of fossil fuels. In Brazil, however, CO₂ emissions are mostly associated with land use change, with fires and deforestation being responsible for 44% of the emissions. Such numbers denote the importance of atmospheric monitoring of such gases in a global context increasingly affected by the effects of climate change. In situ GHG measurement techniques have been widely disseminated in recent decades due to their robustness, low cost and simplicity of operation. Although useful, these techniques alone are not able to provide enough data to allow a robust and consistent modeling of the emission and transport processes of GHGs. This is mainly due to the existence of a significant correlation between (I) the gas exchange between surface and atmosphere and (II) the transport of GHGs in diurnal and seasonal scales. In this context, measurements of atmospheric columns of GHGs appear as an alternative of great utility, helping to reduce the correlation between gas exchange with the surface and the transport/mixing of gases in the atmosphere. Our work is focused on the measurement of atmospheric columns of CO₂, CO and CH₄ using the Fourier Transform Infrared Spectroscopy (FTIR) technique, a robust and well-established methodology for this purpose. The results of unprecedented measurements of atmospheric columns of CO₂, CO and CH₄ in São Paulo between March 2022 and September 2023 will be presented. First, an intercomparison between our measurements and those carried out by equipment on board two satellites whose data are freely available (Tropomi and Gosat) will be presented. The average bias of XCH₄ comparisons between our measurements and those generated by Tropomi and Gosat is less than 1%. While the average bias between XCO_{2,measured} and XCO_{2,GOSAT} is ~-0.2%, the average bias between XCO_{measured} and XCO_{Tropomi} is on the order of -6%. Finally, we will focus on the monthly variations of GHGs, their trends, with particular interest in the impact of the burning event in the Amazon on our measurements of XCO.

Greenhouse gases emissions and waste selective collection of urban solid waste: the case study of the Institute of Energy and Environment of the University of São Paulo

Luciana Ziglio¹

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The generation and disposal of urban solid waste (MSW) are challenges for urban areas. In this scenario, MSW waste sorting practices are associated with treatment possibilities in urban centers with a view to encouraging recycling and optimization of landfills. However, it is necessary to consider in the MSW treatment sphere its generation characteristics observed in the National Solid Waste Policy which proposes the reduction, prevention and non-generation of MSW. Generation sources in urban areas are multiple and express infinite quantities and qualities of MSW. Thereby, although the literature establishes definitions, the complexity of the MSW conceptualization is registered in view of its origin – in other words – materials and/or objects are discarded and, many times, not analyzed in their composition. It constitutes an instrument for MSW analysis the gravimetric characterization studies in universities that allow the quantitative and qualitative classification added to an evaluation of the recycling potential associated with the methodology for quantifying greenhouse gases (GHG) in the generation of MSW. In this context, the Institute of Energy and Environment of the University of São Paulo (IEE/USP), through its IEE–Sustentável program, understands that the MSW generated can contribute to studies of gravimetric composition and GHG emissions. The quantitative and qualitative behavior of MSW, as well as GHG emissions generated at the institute, is verified through the elaboration and installation of the experimental project called gravimetric station. It is concluded that the diagnosis of the gravimetric composition as well as the quantity of GHG emissions from the IEE/USP contribute to the understanding of the generation of MSW at the university, reflecting on the improvement of practices of experiences of waste selective collection of MSW associated with GHG emissions.

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Water and litter VOC measurements from the Atlantic Forest remnants during the BIOMASP+intensive campaign

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Volatile Organic Compounds (VOCs) are key components exchanged in any ecosystem compartment, including lakes, trees, and soils. They play an important role in the interactions between organisms and their biotic and abiotic environments, thus providing a chemical footprint of ecosystem health. VOCs greatly affect the oxidative capacity of the atmosphere, modify the climate, and have sanitary and environmental impacts. The BIOMASP+ project goal is to understand the role of VOC emissions from urban and peri-urban ecosystems on air quality. To achieve this goal, a field campaign was conducted in April–May 2023 in the Reserve of Morro Grande (RMG) and, in parallel, in the Instituto de Astronomia, Geofísica e Ciências Atmosféricas (Matão–IAG–USP). We performed at both sites VOC, particles, and other trace gas (NO_x, O₃) measurements with a proficient setup of online and offline instruments such as proton transfer reaction mass spectrometry or gas chromatography technologies. Additionally, for the first time in the RMG Atlantic Forest, we utilized dynamic chamber systems to measure VOC emissions from lake water, leaves, soil and litter, thus providing comprehensive data for our project. Through these measurements, the objective is to gain a deeper understanding of the contributions of ecosystem compartments to the VOC concentrations observed, as well as their potential health and climate impacts. I present here the first results of VOC emissions from water and litter of the most abundant tree species *Machaerium nyctitans*. We utilized two chamber systems, enabling us to study their emissions under both natural and controlled conditions.

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Study of long-range transport of air pollution to a rural area in São Paulo state

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Nowadays, there are many studies on climate change and atmospheric pollution, but there is still a long way to go around these themes. Research are focused on the behavior of pollutants in large urban centers, but the distance traveled must also be taken into account, since there are no barriers in the atmosphere. Therefore, the present study aimed to analyze the transport of atmospheric pollutants from large urban centers and burning areas (forests and sugarcane) to a rural region of São Paulo state. Sampling occurred during the winter of 2019 (June to August) with hourly temporal resolution. The results showed that NO_x, CO, SO₂, and particulate matter concentrations did not exceed the limits recommended by World Health Organization (WHO). On the other hand, O₃ exceeded this limit in 21 days, while CO₂ showed higher values when compared to other rural areas. The high concentrations of O₃ at the sampling site are the result of long-range transport, with the Metropolitan Area of São Paulo (MASP) explaining 80% of the O₃ found. Understanding the formation of O₃ is very important because, in addition to being a secondary pollutant, it is a short-lived climate pollutant (SLCP), and its reduction associated with the reduction of other greenhouse gases results could improve air quality and contribute to slowing climate change.

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3D extension of the creep tide theory

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The foundations of the hydrodynamical creep tide theory in development at IAG-USP were laid in 2013 (Ferraz-Mello 2013) and different aspects of the theory have been developed since then. The existing results have already been applied to several different problems of tidal evolution (Ferraz-Mello et al. 2020), although there is yet a large number of situations waiting for study. There is an extensive to-do list of topics in need of urgent consideration. This post-doc is open for dedication in the development of one these topics: the extension of the theory to the case where the rotation axis of the tidally distorted body is inclined with respect to the plane of the orbital motion. All results published on the interplay of tide and stellar activity were restricted to the systems discovered during the CoRoT mission (Moutou et al. 2013) and to the cases where the rotation axis of the star is perpendicular to the plane of the orbital motion. However, the observation of the Rossiter-McLaughlin effect (Albrecht et al. 2022) in several of these systems indicates a significant inclination. In order to study these cases, the full theory including the inclination effects, for which only a sketch exists, must be completed, as well as tested long before the launch of the PLATO spacecraft. The PLATO mission (Rauer et al. 2014) will be focused on bright stars (magnitude up to 10), allowing for a high-quality follow-up that will enable the complete characterization of the systems of extrasolar planets (actual mass of the planet, age of the system, star properties, etc.) and also for the determination of the physical parameters necessary for the study of the star-planet tidal interaction.

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Inventory emissions in São Paulo state: basic information for pollution and climate change studies

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The emission of gases and particulates into the atmosphere has numerous health impacts, with local air pollution and global climate change being the main environmental concerns. Studies aimed at understanding and assessing atmospheric composition involve various factors, including quantifying emissions from different sources and comprehending the interactions in the atmosphere. Characterizing emission sources and determining emission factors are crucial for constructing emission inventories, which play a significant role in formulating public policies to reduce air pollution. This issue primarily entails two important aspects: scientific and methodological advancements, and the practical applicability of these advancements through governmental policies. In this study, we explore discussions related to emission inventories, and highlighting the main advances through a case study. Our objective was to analyze emission inventories in São Paulo state, Brazil, from two perspectives: governmental and scientific. To achieve this, we conducted a literature review and analyzed government databases. Through the literature analysis, we observed a lack of standardization in the calculation methods and models used, as well as gaps in the inventory information. Both researchers and the government rely on global inventories to fill these information gaps in the region. Research indicates a growing number of studies and advancements in efficient models within the region, with a focus on encompassing diverse sources, including both anthropogenic and natural emissions. Government data and reports highlight progress in estimation and quantification methodologies, as well as reduction strategies targeting specific sources. Our evaluation reveals a significant gap in basic information on atmospheric emissions and emphasizes the need for greater collaboration between the research and government sectors. This collaboration is essential for supporting research and formulating public policies to reduce exposure to air pollution and mitigate climate change.

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O material como argumento para a História da Arquitetura: um estudo sobre o alumínio a partir das propostas metodológicas de Sérgio Ferro

Raíssa P. C. de Oliveira

and João M. de A. Lopes

O trabalho aqui proposto pretende dar continuidade a uma investigação histórico crítica dentro da linha de pesquisa sobre a produção material da arquitetura, iniciada em minha tese de doutoramento, na qual estudei o projeto e a construção do Parque Anhembi – complexo destinado às feiras de negócios, construído em São Paulo no final dos anos 1960. A ideia, agora, é dar maior relevância na investigação do material alumínio – principal material utilizado na produção da estrutura da cobertura de um dos edifícios do complexo, o Pavilhão de Exposições –, levando em consideração as proposições metodológicas de Sérgio Ferro. Assim, a exemplo dos estudos já elaborados por Ferro (como “Michelangelo – arquiteto e escultor da Capela dos Médici”, publicado no Brasil em 2016), o objetivo do trabalho é compreender os vestígios do trabalho invisibilizado, desde as remotas instalações mineradoras da bauxita, até os processos mais sofisticados de produção de componentes em alumínio para a construção no Brasil, buscando assim, construir uma outra perspectiva histórica sobre o objeto. Para tanto, a pesquisa deverá investigar as bases materiais da produção da arquitetura, percorrendo outros campos interpretativos, reorientando inclusive narrativas até então canônicas, muitas delas focadas inicialmente nas escolhas formais de um determinado produto arquitetônico. Ao procurar as contradições existentes nas dinâmicas da produção do material, será provável compreender a arquitetura e sua construção como uma densa fonte para a investigação histórica social e econômica, e, portanto, entendê-la dentro da lógica mais ampla de reprodução de valor e acumulação. A proposta investigativa percorrerá direcionamentos complementares de pesquisa: a produção, a mineração em si (a exploração da bauxita, matéria prima para a produção do alumínio), a circulação e o consumo (demandas, narrativas, detalhamentos e especificações). Nesse caminho de reexame da história, e dentro das contradições entranhadas no material, também será possível questionar condutas normalizadas ainda hoje sobre o uso do alumínio e sua especificação no projeto.

Educommunication in the promotion of sustainability practices: inclusion of traditional Guarani communities

Carmen L. M. E. Gattás¹

This project is part of a larger proposal, called “Environmental education and Management of Protected Areas in the State of São Paulo: articulation of knowledge in the construction of learning communities”, under development by the Research Group on Environmental Education and Educators Training and financed by FAPESP (Process n. 2019/19528-1 – Aid to Regular Research approved in the Call for Cooperation Agreement/SIMA – FF – BIOTA). In this context, our proposal has a special meaning for working with indigenous knowledge around the Conservation Unit (CU), bringing more elements to the constitution of diverse and participatory learning communities in the conservation and sustainable use of biodiversity. The objective of the Project is, from a collaborative network between the UC Jaraguá State Park (PE Jaraguá), the Indigenous Education and Culture Center (CECI Jaraguá) and the group of researchers from the BIOTA project, to investigate the dialogic construction of intercultural practices of socio-environmental educommunication by the indigenous community around the UC. It is believed that the communicational products, resulting from the educommunicative workshops, offered to the participants, can generate actions for the preservation and sustainability of the local biodiversity. The research has a qualitative approach, using the methodology of action-research, documentary (such as the Management Plan of the Jaraguá PE) and evaluation according to scientific, communicational and perceptive variables of the communicational products developed by the workshop participants. The communication products, after being evaluated, should be publicized on community and local radios (such as CECI Jaraguá) and on institutional websites (such as SME, PE Jaraguá and Fundação Florestal), in order to strengthen communication for preservation and sustainability of the territory's biodiversity.

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Exploring the link between infestation behaviour, host specificity and network structure in plant-parasitoid interactions

Caroline M. Dracxler¹

Parasitoids are known for showing high levels of host specificity: most parasitoid species are dependent on a single or a few host species rather than multiple host species. Yet, some parasitoids can show a wide range of hosts, and it remains relatively unexplored what mechanisms drive specificity patterns in plant-parasitoid systems. One hypothesis is that there is a link between infestation strategy and levels of host specificity. Herein I quantify different aspects of host specificity in interactions between bruchid beetles (Bruchinae, Chrysomelidae) that act as parasitoids of palm seeds (Arecaceae) along the Americas. The goal of the study is to investigate if infestation behaviour variation is a main mechanism underlying host use by bruchids. Specifically, I test if bruchids belonging to three distinct guilds (based on infestation modes) differ in terms of number of hosts (i.e. numerical specificity), phylogenetic and/or functional relatedness of hosts. I expect that specificity will be lower among parasitoids showing less constrained infestation modes than among parasitoids for whose infestation is mediated or temporally restricted. I also investigate whether modules identified in the network show phylogenetic and/or functional structure driven by host specificity. Parasitoid species recorded to interact with a low number of hosts tend to infest hosts that are more phylogenetically distant, while parasitoids with a wide numerical host range interact with closely related hosts. Phylogenetical distance of hosts of each bruchid species did not differ among guilds or among modules, but results show a strong phylogenetical signal of host use within guilds and within most modules of the network. We further found that parasitoids in the same guild and module use hosts that have similar combination of traits and that guilds and modules partially diverge in trait use. Our results suggest that infestation behaviour in parasitoid is an important driver of host range, and that specificity patterns help explaining network structure. Because both guilds and network modules present a phylogenetic and functional structure, suggesting that parasitoids with the same infestation behaviour and/or more interconnected (i.e. modules) show ecological adaptations to overcome specific structural defences in palms, as in an 'arms race' coevolutionary dynamic.

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Post-fire effects on male and female plant reproductive processes: pollen removal and deposition according to biotic interactions

Gudryan J. Baronio¹

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In the Cerrado, most woody plants depend on animals for pollination and seed dispersal. Thus, the interactions between animals and plants play a decisive role in the dynamics of populations and in the structure of communities. Despite advances in understanding the role of fire in plant populations and plant communities, the effects of fire on animal-plant interactions in campo rupestre remains a major knowledge gap. To the best of our knowledge, no study based on field experiments has evaluated the impact of fire on pollination and seed production in campo rupestre and consequent performance of the seed bank. When investigating the balance between costs and benefits of plant-animal interactions, it is necessary to quantify the outcome of these interactions, especially for plants, and reproductive success is an important measure of this effect. However, the operationalization of this response to the effects of ants is commonly associated and verified in relation to female reproductive success (fruiting). However, it is important to emphasize that male reproductive success not only influences evolutionary aspects of plants, but also intrinsically linked to floral visitors, as food resource. Therefore, experimentally verifying how the male (pollen dispersal) and female (fruiting) components of plant reproductive success vary in the different biotic (ants) and abiotic (fire) contexts investigated here is a clear way to understand how interactions between plants and pollinators are mediated by these effects. Additionally, fire affects several mutualistic organisms, such as ants, which show variable colony recovery after fire events. Ants are among the most abundant visitors to plants, as they provide very important resources, such as food and nesting sites. However, ant responses are more evident for arboreal species, consequently making the plant community more susceptible to fire-mediated ant effects. Thus, different frequencies of fire events can select communities with different sets of interactions between plants and these ants and, consequently, the results of these interactions. According to their ability to shelter under the ground, ants may be the first visitors to resume foraging activities after a fire. Also, ants can play mutualistic or antagonistic roles in context-dependent interaction scenario. The negative effect on the plant is caused by the repulsion/reduction of visits by pollinators in the face of the presence and/or aggressive behavior of ants, leading to indirect selection of

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pollinators and triggering negative effects on the reproductive plant success. Accordingly, considering the higher post-fire flowering can be converted into competition through interspecific pollen transfer, it is expected that pollination services will be proportionally altered. We expected some conflicting demands for floral resources by visitors, including on and pollination services a high deposition of heterospecific pollen. With different flowering stimuli by fire, we expected: (i) facilitation, from greater flowering synchrony and consequent superior cross-pollination, or (ii) competition, reducing reproductive success.

Combining RNA sequencing and microscopy techniques to investigate the diversity and evolution of eyes in non-model animals

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One key question in evolutionary biology is understanding how diversity originates and evolves according to different conditions. For example, the interaction with the surrounding environment largely depends on a myriad of organs and proteins. Eyes provide a tractable system to study how molecular and morphological traits can jointly create new functions. For instance, visual adaptations frequently result from a photoreceptor repertoire combined with different optical components. However, our understanding is limited by anatomy and gene expression data, which are missing for many invertebrate visual systems. Bivalve mollusks, such as scallops and clams, display a remarkable diversity of photoreceptor organs, ranging from simple eyespots to complex eyes. While eyes have independently evolved in the group with many subsequent losses, the molecular evolution of the photoreceptors, named opsins, remains largely unexplored. One long-standing question is whether the diversity and evolution of opsins correspond to the morphological evolution of those visual systems. To gain insights into this problem and infer the evolution of light-sensing, we sequenced transcriptomic data (RNA-seq) from the eye, tentacle, and mantle in 15 species of a large bivalve group. We also combined microscopy techniques, such as histology, scanning electron microscopy, and confocal microscopy, to describe the sensory organs. We recovered photoreceptor opsins belonging to six major gene groups, including specific receptors expressed in all eyes. Interestingly, different species and tissue types express different photoreceptor repertoires, suggesting a more complex variation in how bivalves interact with light information. For the first time, we can comprehensively characterize the sensory receptors expressed in this diverse group of marine animals. The increasing knowledge of photoreceptor diversity across organs and species should illuminate the complex evolution of such intriguing visual systems.

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Characterization of different biomasses as an alternative source of bioenergy

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Population growth and climate change demand an increase in the use of land, food, and energy which requires sustainable development to ensure health and well-being for the society. To achieve sustainability the employment of different feedstocks into value liquid fuels and value-added bioproducts are essential. The cell wall is the largest source of terrestrial carbon and can be used for bioenergy. This structure is composed of a cellulose core in which lignin and hemicelluloses are crosslinked to it, and immersed in a pectin matrix. The organization and architecture of these polysaccharides (cellulose, hemicelluloses, and pectins) differ in species and tissues, so the characterization of different agro-industrial wastes allows the study of these biomasses in the circular economy. The present work aims to characterize 19 different biomasses and evaluate their potential as a by-product and in bioenergy. The cell wall of the biomasses was fractionated as pectins, pectins+soluble hemicelluloses, and cellulose by physical-chemical treatments. Its weight balance was estimated and the monosaccharide's fractions composition was obtained after acid hydrolysis. To evaluate its potential for bioenergy its saccharification was performed. The feedstocks corn cob, corn straw, soybean husk, and industry paper residue had higher saccharification capacity despite their low content of lignin and uronic acids, and cell wall composition of 30% glucose and 60% xylose. Therefore, those feedstocks along with sugarcane are more promising for bioethanol production, while duckweed, barley, sorghum, wheat, rice, bean, and coffee residues could be used for other by-products in green chemistry for the generation of value-added products.

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Multiyear retrospective physiological assessment of sei whales (*Balaenoptera borealis*) from the South Pacific

Daniela M. D. de Mello^{1, 2}

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Sei whales (*Balaenoptera borealis*) are one of the least studied species of whales; the combination of elusive behavior, broad home range, and deep-water preferences preclude systematic study for most populations. So far, no studies have been regularly conducted on this species, and its physiological and life history parameters remain obscure. A novel way to circumvent the afore mentioned challenges relies on the collection and analysis of baleen plates of deceased individuals. Baleen plates are continuous growing keratinized structures that constitute the baleen whale filter-feeding apparatus. As the baleen grows, it accumulates hormones and other endogenous circulating small molecules in a serial fashion. Through extraction and quantification of these molecules, one can harvest valuable biological data that can be used to retrospectively reconstruct physiological patterns such as hormonal fluctuations associated with reproduction, metabolism, and stress. In this context, the present study aims to assess reproductive parameters, exposure to intrinsic and extrinsic stressors, and metabolic states of sei whales from the South Pacific Ocean through the quantification of progesterone, testosterone, cortisol, corticosterone, aldosterone, and T3 in baleen samples from 35 individual whales. Baleen plates were recovered in Chilean Patagonia, after the largest ever documented baleen whale stranding event in 2015. The baleen plates will be subsampled along their longitudinal axis and enzyme immunoassay kits will be used to assess expected/natural individual reproductive and metabolic hormone variation in relation to life history stage, as well as to detect potential anthropogenic and natural stressors that may have resulted in increased glucocorticoid hormones. The combination of the rare event of the stranding of hundreds of individual whales along with the recently created and validated technique to assess life histories of great whales through baleen analysis represents a unique opportunity to elucidate aspects of life history and exposure to anthropogenic stressors on this enigmatic and endangered species.

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Investigating cryptic species and their enigmatic traits in aeglids of South Brazil

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Aeglids are the only anomuran crabs with an exclusive freshwater life cycle. The distribution is restricted to South America, occurring in Chile, Argentina, Bolivia, Paraguay, Uruguay, and Brazil. There are 93 valid species of *Aegla*, with several others still awaiting formal descriptions. Recent integrative taxonomy studies have unveiled the presence of cryptic species, previously regarded as species with a wide distribution, underestimating the true diversity of this group. Recognizing the exceptional distinctiveness of aeglids, the thematic project of INTERCRUSTA-BIOTA/FAPESP program has dedicated a subproject exclusively to their study. This undertaking focuses on investigating the populations of *Aegla jarai*, *Aegla odebrechtii*, and *Aegla parva*. These species exhibit a disjunct distribution pattern in south of Brazil and have been identified as a potential species complex in previous phylogenetic studies. Recently, field visits were conducted in Santa Catarina State, including the type localities of *A. jarai* and *A. parva*, employing the most precise data available in the literature. Although the type locality of *A. odebrechtii* remains unknown. Other known fields were visited to gather specimens for morphological examination and phylogenetic studies. In certain locations, no specimens were obtained, while in other areas, we encountered severely degraded or impacted environments, notably pastures and exposed agricultural soil. Aeglids are typically associated with clean, well-oxygenated aquatic habitats, making them less adaptable to cope with anthropogenic stressors. Access to the taxonomic composition of these populations will establish a solid foundation for describing patterns of diversity, distribution, and delineation of occurrence areas, thereby directly influencing conservation policies, lists of threatened species, and related aspects.

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Macroecology of rare species: global phylogenetic and functional patterns

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Global biodiversity estimation largely relies on species number, which offers limited information on their evolutionary history and functions. In this context, rare species are of particular concern because they face higher extinction risks than common species. They are evolutionarily distinct and provide functions that might be irreplaceable in the current biodiversity crisis. However, regional processes maintaining rare species in biological communities are not fully understood. This project will tackle this issue by investigating the evolutionary and functional patterns of rare species globally. We will investigate how the regional availability of lineages and environmental factors influence local evolutionary and functional rarity patterns. We will test five hypotheses related to phylogenetic and functional patterns in forest plant communities. We will show how the regional lineage pool influences the distribution of rare species in forest communities, how rare species are phylogenetically and functionally related to common species, and the contribution of rare species to phylogenetic beta diversity. We will also show how functional diversity varies across latitudes depending on the forest's proportion of rare species. Since rare species are an important component of biological communities and are much more likely to go extinct than common species, this project will expand our understanding of how rare species are maintained and contribute to the overall diversity at local, regional and global levels. By integrating evolutionary and functional information of both rare and common species in biological communities, our results will provide valuable insights to overcome the limitations of traditional species richness measures, which pose significant challenges for biodiversity conservation efforts. Moreover, this project will offer valuable perspectives for the development of conservation and restoration strategies.

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Diversification dynamics of interspecific competition: the role of niche similarity and spatial overlap

Lucas M. V. Porto

Most macroevolutionary approaches designed to study the role of species interactions in diversification dynamics have relied on indirect evidence. Interspecific competition has been the most studied type of interaction. The following patterns are generally interpreted as evidence of competition: a) the statistical association between diversity trajectories of two potential competing clades; b) the inference of diversity-dependent diversification dynamics (within or between clades); c) a statistical association between diversification rates of two clades. Furthermore, the majority of previous studies did not explicitly consider spatial overlap, except perhaps by conducting analyses at the continental level. That being said, the field of macroevolution has recently advanced with the development of new models dedicated to studying interspecific competition. Unfortunately, these models have mostly focused on the use of molecular phylogenies and the effect of species interactions on trait evolution. Here, we propose to develop new models that better capture the nature of interspecific competition and use these models to study the effect of interspecific competition within and between clades on diversification dynamics. Specifically, we will develop and utilize models that take into account niche similarity and spatial overlap to construct time series describing “competition intensity.” Hierarchical Bayesian birth–death models will be used to investigate whether the time series describing “competition intensity” are associated with changes in speciation and extinction rates. Given the lack of such models designed for use with fossil data, they will be developed here. Different lineages of mammals, particularly families within the order Carnivora, will be used as study systems.

Demographic changes or local adaptation? Genomic perspective on how the Atlantic Forest treefrogs responded to past climate changes and their future climate-induced vulnerability

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Populations can exhibit different responses to climate change over time. These responses include range shifts to areas of climate refuges (with possible population reduction), local adaptation to new conditions through natural selection, acclimatization through physiological plasticity, or extinction. Among these, range shifts to refugial areas (“climate tracking”) have been characterized as the main response to the Late Quaternary climate change in the Atlantic Forest (AF). However, the steep climatic gradient in the AF is an ideal system to test signatures of local adaptation, especially in species with widely distributed populations, both in the north and south of the AF, and which seem to tolerate a wide amplitude of climatic conditions. With genomic investigation (RADseq) of three anuran species widely distributed in the Atlantic Forest, we evaluate whether their demographic responses were congruent or not to changes in past climate, and whether we find congruence in local adaptation patterns among species. We found demographic congruence among species, with distinct population responses in the north vs. the south of the Atlantic Forest. We also found that past climate, especially precipitation, best explained adaptive genomic variation across the forest. Finally, we identify the regions of greatest mismatch between past and future climates, where populations will be most vulnerable to local extinction.

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Molecular adaptations to epibiosis and parasitism in Barnacles (Crustacea: Cirripedia)

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Barnacles are a diverse group of arthropods, with around 1,200 species described. They are sedentary and live attached to hard substrate such as rocks and other living organisms (e.g. whales, dolphins, turtles and other invertebrates). Parasite species are members of Rhizocephala and epibiotic species are distributed among Thoracica and their origins are independent. This unique distribution of feeding habits and lifestyles offers an unique opportunity to study the evolution of epibiosis (one organism living on another) and parasitism. Both epibiosis and parasitism require adaptations that allow these animals to live in close association to their hosts, such as adhesive structures and piercing structures to initiate the meal in bloodfeeding species. Similarly to morphological adaptations, molecular adaptations are also expected to be found in both parasite and epibiont species. The present study aims to search for molecular adaptations related to epibiosis and parasitism in barnacles. We hypothesize that genes related to homeostasis in response to change in temperature, hydrostatic pressure, luminosity and oxygen availability are under positive selection, as well as genes related to nutrition and on the interaction with their hosts and their epibiotic community (e.g. genes related to their immune response). To look for candidate genes, we will search publicly available transcriptomes and genomes and evaluate signs of positive selection. To further complement our results, two genomes of epibiont barnacle species are currently being sequenced.

1. Instituto de Biociências da USP.

Pollinating bees of cultivated species of Myrtaceae

Renan K. de O. A. Cardoso

and Isabel A. dos Santos; Clemens Schlindwein¹; Guaraci D. Cordeiro²; Mariana A. Stanton³

Ecosystem services provided by pollinators directly benefit humanity with food, medicines, in addition to maintaining the genetic variability of native plant populations that sustain biodiversity and other ecosystem functions. In Brazil, pollination services economic values are close to 12 billion dollars a year when related to food production. Bees are the main pollinators of angiosperms in areas of natural vegetation and cultivated areas. Many native species of Myrtaceae are of economic importance, their main pollinators are bees, however, few studies focus in the effectiveness of pollinators. In addition, most studies do not record observations of floral visitors during twilight, the period of floral anthesis for many Myrtaceae species. As a consequence, most night and crepuscular bees are not considered. Some Myrtaceae species depend exclusively on specific pollinators such as nocturnal bees, but others are pollinated by diurnal and/or generalist bees. The present project will study the pollination of five Myrtaceae species with economic importance, in a cultivated area, they are: *Campomanesia guazumifolia* (Sete-capotes), *Campomanesia pubescens* (gabirola), *Eugenia brasiliensis* (grumixama), *E. dysenterica* (cagaita) and *E. pyriformis* (uvaia). Fruits of these species are regionally and locally consumed in natura, but are also used in ice cream, sweets and beverages. Our project proposal involves studies of pollination and plant-pollinator communication as well as experiments to increase fruit production and improve the ecosystem services provided by pollinators.

1. Universidade Federal de Minas Gerais.

2. Universidade Federal de Goiás.

3. Universidade de São Paulo.

Marine, freshwater or terrestrial? Understanding habitat shifts using comparative transcriptomics of amphipods (Crustacea: Eumalacostraca)

Tammy Iwasa-Arai¹

and Sônia C. S. Andrade¹

The understanding of invertebrate genomics is crucial for the investigation of main evolutionary questions, such as the evolution of terrestriality. Adaptations to a wide range of habitats in crustaceans are yet understudied, and orders such as Amphipoda, which encompasses species with marine, freshwater, terrestrial and parasite lifestyle might help to unpuzzle the main questions regarding environment shifts. Amphipods are represented by nearly 10.000 described species that have direct development, and the offspring mainly recruit close to the parents, consequently, high levels of endemism are observed among the order. The use of transcriptomic data, therefore, may provide information for gene discovery, phylogenomic analysis detecting selection in closely related species, among other applications. The first goal of the present postdoctoral project is to sequence the transcriptome of two Amphipoda species, the skeleton shrimp *Caprella dilatata* (Caprellidae) and the whale louse *Cyamus boopis* (Cyamidae) and, together with available data from open repositories, to investigate the expression of genes associated to different habitats, such as osmoregulation, salinity adaptation and desiccation. A transcriptome is currently being sequenced and will be used to annotate the genome. New live samples of *C. boopis* will be collected from stranded whales for this purpose. Transcriptomes of >90 species of Amphipoda available from NCBI database were selected and are being annotated. Candidate genes in response to environment-specific factors will be assessed to verify potential habitat adaptation for further discussions on the Crustacea evolutionary biology.

Acknowledgement: Fapesp (2021/06738-8; 2022/13979-4)

1. Instituto de Biociências da USP.

Exploring the biotechnological potential of marine microbiota associated with Autonomous Reef Monitoring Structures (ARMS) from southern Brazilian coast

Bianca del. B Sahlm¹

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Sustainable exploration of natural resources for the development of biotechnological products is an emerging field in the industry, pharmacy, and cosmeceutical markets. Moreover, some biomedical conditions still looking for effective compounds to promote a better life quality to patients, as cancer. Bioactive compounds from natural occurrence have been explored and used in the cancer clinical pipeline since its baby steps and represent the most diverse group of drugs in this field. In the last decades, marine animals and plants arouse interest due to their unique compounds but supply and conservative issues remain a barrier to the development of new anticancer drugs. In the other hand, marine bacteria emerged as a sustainable and very prolific group of natural and renewable bioactive molecules producers. With that said, we explore the biotechnological potential of marine microbiota recovered from Autonomous Reef Monitoring Structures (ARMS) from the Brazilian southeast coast. ARMS structure is a long-term ecological sampling method used to identify the colonization of cryptical and most common benthic species in a marine area. After a year underwater, structures from two different sites were recovery and processed in laboratory. A pool of all colonizing organism from each structure was blended for metabarcoding and metabolomics analysis as well as for cultured bacteria isolation. Using a molecular networking analysis, previous results for metabolomics revealed specialized metabolites that were produced only in a particular region (Ilha de Cabras) suggesting that the environment of the ARMS installation site influences the formation of its biodiversity and possibly its metabolic diversity. Regarding the bacteria isolation, 56 strains of bacteria were recovered and cultivated in different agar media, whereas 59% were isolated from A1, 16% from SWA and 25% from TM medias. A crude extract of each bacteria fermentation was produced using alcoholic solvent (EtOAc). Extracts were tested for cytotoxicity potential against 3 different cancer cell lines – HCT-116 (colorectal carcinoma), 501mel (metastatic melanoma) and MCF-7 (breast adenocarcinoma) – using the MTT

1. Instituto de Ciências Biomédicas da USP.

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assay. After 72hs of incubation, around 25% of tested bacteria extracts presented a high capability in cell growth inhibition (more than 70%) against all cell lines in the concentration of 50ug/mL. Additional experiments are in progress to better characterize the anticancer activity of extracts, as well as chemical analysis and extract fractionation aiming the isolation and identification of the bioactive compound(s) produced by ARMS bacteria.

Image processing for flood detection and prediction

Caetano M. Ranieri¹

and Jó Ueyama

Several regions worldwide have suffered the consequences of flash floods in urban environments. Damage control measures include the deployment of technologies to identify the imminence of floods in critical areas to trigger alerts that allow for the civil defence to anticipate the flooding event and handle it timely. Many flood detection methods have been investigated in the academic literature, including the use of pressure, ultrasonic, and infrared sensors. Images from ground cameras present a cost-effective and practical solution for flood monitoring and prediction. This research presented two innovations over existing literature: (i) proposing novel representations to the deep learning framework, including variations of dense optical flow fields for temporal modelling; and (ii) designing models to discern relative changes in water levels over time, a critical factor in flood risk estimation. The study analysed six types of data inputs derived from ground camera images and processed by a Convolutional Neural Network (CNN). The experiments were performed using sample images from Mineirinho Creek, in São Carlos municipality, manually labelled into four discrete categories (i.e., low, mid, high, and flood) based on landmarks in the images. Results showed that inputting a grayscale pair to the pipeline led to the best results for identifying the absolute water level, with high accuracy for all categories. Nonetheless, the optical flow-based modalities significantly enhanced the results for identifying the relative water level, especially considering the most critical situation in which such a level is increasing. This project addressed the problem of flood detection based only on images obtained from cameras placed beside a creek, considering a real-world environment. Results were promising in detecting absolute or relative water levels based only on ground camera images. Future work might include a multimodal setting in which data from pressure transducers are used as labels for the machine-learning model.

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1. Instituto de Ciências Matemáticas e de Computação da USP.

Challenges to reach water and sanitation for all: case study on the São Paulo Macrometropolis

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This paper intends to expand the knowledge on water and sanitation to Global South metropolis, considering the perspective of the Sustainable Development Goal 6 (SDG 6) and the Human Rights to Water and Sanitation (HRWS). The large cluster of vulnerable communities and the low investment in drinking water supply infrastructure, sewage collection and treatment move global population away from the full realization of human rights and development with dignity. The research aims to discuss the issues and the conflicts about different uses of water in metropolitan urban area of São Paulo, and the impacts of pollution and lack of sanitation facilities on water quality and quantity available for all, in a context of climate changes and social vulnerability. The economic centre, São Paulo, faces serious threats in water supply linked to the combined effects growing poverty of the population and political strength of the real estate market in the predatory construction of the city, without improving infrastructure. The theoretical points explored on the discussion about urban water security and insecurity in multiple scales, will be an important base for analyzing the case of São Paulo Macrometropolis. It is possible to explore social vulnerability aspects, the fundamental water policies and hydro-social practices to reach equity in access to water and sanitary facilities. As a way to expand the projection of the results obtained partially and in the complete research, it will be presented and discussed in technical and scientific events so that it can be shared and improved.

1. Instituto de Estudos Avançados da USP.

2. Instituto de Energia e Ambiente da USP.

Interface and integration of urban and environmental planning instruments at local and regional scales: case study on the North Coast of São Paulo

Marcia R. Itani¹

and Amarilis L. C. F. Gallardo²

The research aims to highlight challenges and possibilities of urban and environmental planning instruments integration at local and regional scales. In Brazil, the various challenges related to constitutional attributions of the federative entities for the formulation and implementation of the instruments and the retraction of public policies to guarantee the improvement of living conditions and urban and environmental quality, require the advance in the integration of urban and environmental planning instruments at local and regional scales. The guidelines established by urban and environmental planning instruments at the regional scale by the State or by a group of municipalities can contribute to local scale planning and, on the other hand, this planning, of municipal attribution, can improve urban and environmental planning at regional scale. To demonstrate this, a case study was chosen, the interface and integration of two instruments, the State of São Paulo North Coast Ecological-Economic Zoning and the Master Plan of two municipalities, Caraguatatuba and São Sebastião. Therefore, the research is based on bibliographical review, secondary data and qualitative interviews with social actors that participate in the instrument's implementation. It is hoped that the research's reflections and results can contribute to the construction of knowledge within the theme of urban and environmental planning and to support evaluations of the analyzed instruments.

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1. Instituto de Estudos Avançados da USP; Secretaria de Meio Ambiente, Infraestrutura e Logística do Estado de São Paulo.
 2. Escola Politécnica da USP; Universidade Nove de Julho.

Advances and challenges in environmental scientific research

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Mapping a university's scientific and technological production is essential both to identify emerging themes and collaboration networks, and to verify the evolution and dynamics of its production. The present study produced an overview of research on the environment in the world, in Brazil and at the University of São Paulo (USP). A mapping and bibliometric analysis of the scientific production in the area "Environmental Science" was carried out in the period between 2012 and 2021 made available on the SciVal platform, which has the Scopus and Science Direct databases as its source. 1,976,926 publications were found worldwide, and the most researched topics within the environmental area were "soil" and "carbon"; on the other hand, topics such as "pollution", "plastic" and "marine debris" showed greater growth over time. Research is concentrated in China (22%) and USA (18%), with Brazil appearing 12th in the world ranking with approximately 3% of publications. In relation to the most discussed subjects in Brazilian articles are "Amazon" and "deforestation". USP is in 16th in the world ranking and is in first place in the national ranking, with 9,525 publications. The most studied themes in this institution were "forest restoration", "biomass" and "ethanol". There is a growing trend in the number of USP publications (153.2% higher than in 2012), with 11.1% among the Top 10% best publications in the world and 26.3% published in Top 10% magazines with the greatest impact. Regarding international collaboration, 41.4% of USP publications were carried out from international co-authorships, above the percentage of 34% in Brazil. It was possible to verify the expressive growth of Brazilian scientific production in the environmental area and the great contribution of USP to this evolution. The expansion of collaboration in research is important for scientific and technological development, given the complexity and the necessary interdisciplinarity to face the challenges related to the environment.

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Mapping of flood-prone areas: a subsidy to management and urban planning

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The problems related to flooding in urban areas are significant worldwide, since many cities have developed their urban networks along the riverbeds, which, naturally, periodically puts the population at risk, as the drainage overflows in consequence of intense and concentrated rains, which have become increasingly frequent in a context of climate change. The urbanization of watersheds increases the frequency and magnitude of impacts, as it makes the soil more impermeable, increasing runoff. In this sense, this postdoctoral research proposes to apply a methodology that associates the results from two different types of modeling: hydrological, which enables the transformation of precipitation events into runoff; hydraulic, which, in turn, allows determining the hydraulic channels that would be necessary to conduct the estimated flows. The mapping of flood-prone areas is, therefore, resulting of combination of several hydraulic modeling results. The proposed methodology, additionally, will allow estimating the impacts of urbanization in runoff increase, which makes more areas prone to flooding and, consequently, could lead to an increase the exposure of the population to the risk of flooding. In this sense, it is possible to use the results of the proposed methodology as subsidy for public policies making regarding to territorial management and planning, since it allows anticipating the consequences of urbanization and, thus, could act as a facilitator of impact mitigation policies adoption.

1. Instituto de Pesquisas Tecnológicas; Instituto de Estudos Avançados da USP.

2. Escola Politécnica da USP; Instituto de Estudos Avançados da USP.

How is the quality of the environmental impact studies of sanitary landfills in Brazil?

Giovano Candiani¹

and Amarilis L. C. F. Gallardo²

The Environmental Impact Study (EIS) is characterized as a set of systematic activities, which make it possible to assess the significance of environmental impacts. A sanitary landfill is a technique for disposing of solid waste in the soil, without causing damage to the environment and public health, minimizing environmental impacts. These are projects developed in several countries, mainly in Brazil, it is a method that uses engineering principles to confine the residues, meeting the legislation and the criteria of the environmental licensing. However, even with all these environmental precautions, landfills have the potential for significant degradation of the environment. Considering the concerns evidenced in many studies about its low quality and weaknesses regarding decision-making regarding its approval. The quality of 18 EIAs from landfills collected in São Paulo, Brazil, was evaluated with CETESB, the agency responsible for environmental licensing in São Paulo, from 2010 to 2022. To assess the relevance of the quality of these EIAs, an instrument was developed with 10 categories and sub-items, totaling 50 evaluation criteria, based on the literature. Each criterion received a score, from 0 to 5, at the end of each EIA, through arithmetic mean, received a concept, being classified as inadequate, regular or adequate. The best evaluated EIAs were: CTR Mauá, CTVA Caieiras and CTL São Paulo, respectively with the following grades: 4.7, 4.6 and 4.4, which were considered satisfactory and very adequate. The worst evaluated EIAs were: Aterro Guarulhos, CGR Terrestre, CGR Presidente Prudente, CTDR Amparo, CTR Caraguatatuba, CGR Araçatuba, respectively with the following grades: 2.5, 2.7, 2.8, 2.9, 2.9 and 3.0, which are considered regular. Overall, 33% of the EIAs were considered fair and 67% satisfactory. It can be said that it is a positive result, as there are many reports in the literature, pointing out EIAs with low quality and many deficiencies. Reporting deficit EIAs is very important, as it makes it possible to improve them, however, quality EIAs can favor the dissemination of good practices. Even if the result is somehow considered good, many studies omit important information and many criteria in several studies are of poor quality, characterizing significant deficit items, such as, for example, in fauna surveys and in the predictions of environmental impacts, an area of fundamental importance for analysis of the environmental impacts of the project. The use of EIA quality assessment criteria can contribute to the assessment of the environmental impact.

1. Universidade Federal de São Paulo; Instituto de Estudos Avançados da USP.

2. Escola Politécnica da USP; Instituto de Estudos Avançados da USP.

Design thinking pedagogical methodology and Brazilian biodiversity conservation: an example of practice within public policy students

Heloisa C. Tozato^{1, 2}

and Ana E. F. Bacellar³; Jorge L. Nascimento³; Danilo P. Sato¹; Alessandro S. da Silva¹

This study aims to present the pedagogical practice of using design thinking methodology combined with problem-based learning in the public policy managers education. It was conducted in a remote synchronous format, from August to December 2021, with 111 students from the Bachelor Program in Public Policy (GPP-EACH-USP). Twenty-two real biodiversity management demands¹, from a current set of documented experiences into different protected areas and contexts across Brazilian biomes, were selected and randomly distributed among 22 groups of students. The undergraduates investigated them in depth in relation to: the problem basis diagnosis, considering the potentialities and weaknesses of the protected area management; the potential solutions to the demand, as well as its associated technologies (social or conventional) considering environmental, social, economic and institutional aspects; the potential contribution of the solution to achieve the SDG of the Agenda 2030; the territorial impact and management instruments related to them; the possibility of replicate the proposed solution in other protected areas, as well as its positive/negative scenarios of application. At the end, the students presented their work in a pitch format to ICMBio managers, professors, and colleagues. It was observed, both throughout the educational process and in the evaluation conversation wheel, that this practice contributed within the critical thinking, problem solving and the ability to innovate (complexity thinking) of students.

1. Instituto de Estudos Avançados da USP.

2. Universidade de São Paulo.

3. Instituto Chico Mendes de Conservação da Biodiversidade.

Environment, sustainability, planetary health, fighting hunger and citizen science: the role of communication as an instrument of scientific dissemination

Maria D. de A. Vianna¹

and Antonio M. Saraiva²

This work will present the results of the development and implementation of the Strategic Communication Plan focused on environmental issues, sustainability, planetary health, and fighting hunger and food insecurity. Through communication-based on scientific dissemination and using media tools, the research aimed to contribute towards promoting the democratization of scientific knowledge and supporting the communication of these projects, aligned with the USPSusten's Environment axis, fostering interdisciplinary and transversal work in the construction of a sustainable and just society.

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1. Instituto de Estudos Avançados da USP; USPSusten – Superintendência de Gestão Ambiental da USP; Instituto de Energia e Ambiente da USP.
 2. Escola Politécnica da USP; Instituto de Estudos Avançados da USP.

Physics-Informed Machine Learning aplicado a previsão de variáveis oceânicas

Marlon S. Mathias¹

and Eduardo A. Tannuri

This work investigated Physics-Informed Machine Learning (PIML) architectures for predicting ocean physical variables. We selected some of these architectures and implemented them to evaluate possible improvements in the predictions of these variables compared to other techniques, either machine learning or physical simulations. Commonly, machine learning algorithms are based on data obtained from the problem to be solved; our goal was to improve the predictive capacity of these algorithms by including physical information, such as governing equations, in their architecture. In some works developed by the research group, we achieved improvements of 20% in the accuracy of current predictions in relation to methods based purely on physics. The postdoc focused on developing methods to solve partial differential equations with PIML. Such equations can be used to model the most diverse physical phenomena, such as, in this case, the movement of the ocean. At first, the focus was on Physics-Informed Neural Networks (PINN). Such networks have been implemented in several scenarios, for example in the modeling of a port channel similar to the channel of the Port of Santos. In addition, we studied the effect of changing the balance between the physics-based part and the data-based part of these models, concluding that the addition of physical knowledge allows us to generate good models even if little data is available. In the final period of the project, there was a focus on the so-called Neural Operator (NO), this model was implemented to make the prediction of the movement of waves on the surface of the water; with this, we have evaluated the capabilities of the model and open the way for more complex cases to be studied with it.

1. Instituto de Estudos Avançados da USP.

USW management tool in municipal consortiums

Pedro L. Filho¹

and Wanda M. R. Günther¹

The management of urban solid waste (USW) is a complex issue and must be framed within the perspective of sustainability. Even sending USW to proper disposal in landfills causes impacts and generates environmental liabilities. This situation must be reanalyzed, since several landfills are already at their limit capacity. Therefore, the search for technological routes is essential, as it's segregation at the source to improve conditions for reuse and recycling, generating jobs and income, and reducing the occupation of areas that are increasingly more distant from urban centers and with more environmental restrictions. Waste valorization processes from the use of biomass, by biological or thermal treatment should follow this flow. On the other hand, there is a strong trend towards regionalized solutions to make the most expensive flows feasible. The objective of this work is to elaborate a management instrument for the diagnosis and proposals for improvements in the management of USW in municipal consortiums in the State of São Paulo, in the search for a model that can be replicated in similar realities. To this end, a survey of primary and secondary data will be conducted, involving: i) oversight instruments, ii) flow of generation, collection, transport, transshipment, and destination according to the functionality applied to the residue, iii) municipal and regional norms and legislation, and, iv) the individual potentiality and that of the grouping of municipalities according to geographical, socioeconomic, and environmental characteristics and the generation of USW. The presentation will be as a panel elucidating the current conditions of the consortium in terms of the regularity of the documentation in relation to the legislation, generation, collection, transport and destination conditions, and possibilities for improvement. As expected results: i) encouragement in obtaining funds and incentives in the federal and state spheres, ii) regularization of the documentation of compliance with socio-environmental legislation, iii) pointing out the individual and consortium potentials and, iv) establishment of lines of common interest for the management of USW regarding its destination and valorization. This perspective promotes the return of residues to the productive processes, providing integration between municipalities and the region, and meeting the Sustainable Development Goals, focusing on SDG 6 – Clean Water and Sanitation, SDG 11 – Sustainable Cities and Communities, and SDG 12 – Responsible Consumption and Production.

1. Instituto de Estudos Avançados da USP.

Quilombola territories and their modes of resistance in the face of mega-mining projects: Afro-Brazilian cosmopolitics in the Anthropocene

João D. D. Ramos¹

By showing how quilombola communities in southern Brazil have created forms of resistance in their territories, based on their knowledge and practices, we can see how these collectivities build their lives in the face of projects such as mega-mining and other forms of extractivism, monocultures and other implications, which occurred, above all, in the last centuries and which are ongoing, seriously impacting the socio-biodiverse territories where quilombolas are inserted. In this sense, I have been using the concept of “plantationocene”, by the Martinican philosopher Malcom Ferdinand, to understand that quilombola communities (whether those from the slavery past, whether the remnants or recreated in the present) build their own ways of life, in an intensive relationship between nature-culture, where we can visualize “decolonial ecologies” (Ferdinand) in his cultivation practices and in his relationship with other entities (animals, plants, spirits, territories etc.).

1. Instituto de Estudos Brasileiros da USP.

Circumscribing limits: ecological economics, the professional qualification of Brazilian economists and the Anthropocene

Beatriz J. Magalhães¹

While the most traditional economic theories were constituted by completely ignoring agencies of nature and the environment, ecological economics admits the insertion of economic activities in the biophysical system, taking into account, therefore, at some level, the environmental conditions that were incorporated into the notion of the Anthropocene. As the economic structures and models are precisely the main determinants in shaping the socio-environmental relations that outlined the current ecological-climatic collapse, it would be appropriate, then, to ask: to what extent economics, as applied social sciences, would be incorporating environmental themes? In this sense, ecological economics can play a key role in trying to bring to light essential factors that are often “abstracted” by traditional theories. Thus, in this research, we try to shed light on reflections on the following questions: Is there, on the part of ecological economics professionals working in Brazil, openness beyond the utilitarian logic that seems to prevail even in some works subscribed to such field? Are there demands for a curricular change on the part of Economics students? Is there a possibility of “de-economizing the fields in which economic logic distorts values and principles (ACOSTA, 2016, p. 205)”? Given the relevance and increasing magnitude of environmental problems, the exhaustion of modern ontology regarding its relationship with extra-human agencies is increasingly evident. Thus, this research intends to address the question of whether the advent of the so-called Anthropocene has caused a turning point in the professional training of Brazilian economists, in the sense of adding reflections that include environmental themes in economics courses, until then absent or, at most, rarefied.

1. Instituto de Estudos Brasileiros da USP.

CO₂ storage options in the complex geological structures of the Paraná Basin, Brazil

Richardson M. Abraham-Adejumo¹

and Colombo C. G. Tasinarri²

The research presents the CO₂ storage efficiency factors considering the complex inhomogeneous and unconventional reservoir systems in São Paulo and Paraná States associated with the Paraná Basin, Brazil. Amongst the rock types within the targeted Irati and Rio Bonito Formations of the Basin are basalts, shales, carbonates, sandstones, and siltstone. Carbonate occurs in alternation with shale and siltstones within the Irati Formation, and sandstones occur in alternation with shales/mudstone and siltstone in the Rio Bonito Formation. The basalt associated with the Serra Geral Formation is widely spread within the region. The portion covered in this research has no hydrocarbon production datasets; therefore, detailed geological/geophysical studies to present the CO₂ storage algorithm within the region are possible. The critical components of the algorithm for CO₂ storage include reservoir porosity (Φ), thickness (h), and area (A) with the associated uncertainties involving the fluid storage efficiency factors (E_a , E_h , and E_Φ) to propose the algorithm for capacity estimation. The study indicates the impact of the magmatic intrusion within the region, which includes modification of the sedimentary units in terms of structure and related physical properties. Each rock unit has its limitations concerning CO₂ storage. However, storage potentials generally match the existing standards and proven atlases. Based on the storage efficiency parameters, the suggested reservoir options Irati Formation could include; the shale–carbonate reservoir, the shale–siltstone reservoir, the carbonate–siltstone reservoir, and the shale–carbonate–siltstone reservoir. Reservoir options within the Rio Bonito Formation could include sandstone and the sandstone–siltstone hybrid. The Serra Geral Formation basalt has promising roles in CO₂ storage potentials in the region regarding suitable CO₂ storage tanks based on the potential for carbon mineralization in basaltic rocks and its ability to serve as overburden based on its low permeability. Hybrid reservoir options within the sedimentary units may increase the CO₂ storage capacities by reducing limitations based on thin beds. Prospects for CO₂ injection wells and storage site monitoring and leakages detection abound, considering existing related programs in Brazil and the proximity of well-equipped institutions with technical expertise. The Research Centre for Greenhouse Gas Innovation and the Institute of Energy and Environment of the University of São Paulo have shown keen interest in CO₂ storage-related research. The findings provide the basis for estimating the CO₂ storage capacity within the study location.

1. Instituto de Energia e Ambiente da USP.

2. Instituto de Geociências da USP; Instituto de Energia e Ambiente da USP.

Favorable area for CO₂ geological storage in the Rio Bonito Formation, Paraná Basin, Brazil

Saulo B. de Oliveira¹

and Colombo C. G. Tassinari

An increasing number of nations have established ambitious climate targets and recognized the potential of carbon dioxide (CO₂) geological storage. Brazil has set its sights on achieving carbon neutrality by 2050. Within Brazil, the Paraná Basin emerges as a highly promising onshore sedimentary basin for CO₂ geological storage. This extensive basin boasts an advantageous position within the southern and southeastern regions, where the largest stationary CO₂ emitters are concentrated. Our findings indicate that the siliciclastic deposits of the Rio Bonito Formation encompass reservoir–seal rock pairs with suitable thicknesses and depths, ideal for stratigraphic CO₂ trapping. Through our screening process, we have delineated a favorability map area that will serve as the foundation for subsequent detailed studies and characterization of the Rio Bonito Formation rocks, as well as the identification of potential CO₂ injection sites. These endeavors aim to contribute significantly to the mitigation of the impacts associated with CO₂ emissions and climate change.

1. Instituto de Energia e Ambiente da USP.

Study of two different podzolized pedological transformation systems on the north coast of the Bahia State

Alisson D. Diniz

The north coast of the Bahia State is known for its beauty and diversity of ecosystems and landscapes. However, these ecosystems, located in dunes, marine terraces and coastal tablelands, are very fragile and targeted by tourist enterprises, making them even more vulnerable to environmental degradation. This fragility comes mainly from the sandy surfaces, covered by pioneer plant formations. Understanding the genesis, control and role of these sandy surfaces in the evolution of the relief is essential for understanding the environmental fragility and maintenance of coastal ecosystems. Thus, the aim of this research is to study the origin of two podzolized sandy covers: 1. Quartzipsamment – Spodosol – Inceptisol and 2. Oxisols – Spodosols. To achieve the results, field studies (preparation of toposequences and description of soils) and laboratory analyzes (physical, chemical and mineralogical) were carried out. From the first results, synthesized in two toposequences, it was possible to arrive at two interpretations about the genesis of these covers: one allochthonous, and the other autochthonous. The first must have allochthonous genesis, formed by aeolian or alluvial sandy deposits that were deposited on the Barreiras Group. Thus, both, Quartzipsamment and the Spodosol, evolved from these allochthonous sediments and have erosive discordance with the Inceptisol, developed from the Barreiras Group. The genesis of the second pedological cover is associated with a pedological transformation system (Oxisol – Spodosol). Thus, the sand associated with this toposequence must come from a podzolization process of the lateritic pedological covers and, therefore, shall be of the autochthonous origin.

Use of mining waste as a way to CO₂ sequestration

Jéssica Weiler¹

Mining activities generate large amounts of mining waste that require adequate final disposal and CO₂ emissions that must be mitigated. Currently, there are options for CO₂ emissions reductions, but many strategies must advance to help limit global warming to 1.5°C. The use of mining waste is an option for CO₂ sequestration with advantageous application to both waste management and emissions mitigation. This work presents an overview of well-established CO₂ sequestration techniques applied to mining waste and highlights some potential we noticed. For this, three categories were considered: 1) mineral carbonation 2) nature-based solution (NBS) 3) carbon capture, utilization, and storage (CCUS). Mining carbonation is the most used technique for mining waste (especially containing Ca- and Mg-rich silicates). NBS explores the reclamation of disposal areas, estimating the C sequestration by topsoil, organic amendments, and revegetation. CCUS is less addressed in the use of mining waste; however, there are some possibilities of storage with CO₂ injection into waste piles and utilization by incorporating waste + CO₂ into cement products. These methods are strategies for mining projects to offset their expected CO₂ emissions (carbon neutrality) or contribute to society by capturing more than mine emissions (carbon negative). It is a sustainable way to combine waste disposal with carbon capture with environmental, economic, and social advantages for the mineral sector.

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Sustainability indicators applied to a local strategy context: proposals to improve selective waste collection systems involving waste picker organizations

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In low- and middle-income countries, urban governance structures integrated with waste picker organizations and cooperatives often have unsustainable selective waste collection systems. Thus, the objective of the present study was to identify the problems that reduce the sustainability of selective collection systems in 12 municipalities in the state of Rio de Janeiro, Brazil, in addition to proposing solutions to these problems. This will enable verifying if the problems identified in these systems (with 10 waste picker organizations) are also found in systems reported in other studies. Problems were identified by means of indicators and an overall index, which was calculated for each municipality. The overall index for the whole region was 0.393, which means that the municipalities' investments in their selective waste collection systems were still low as a result of low collection coverage and recyclable material recovery rates, high cost of selective waste collection, and insufficient number of partnerships and actions oriented toward environmental education and dissemination of selective waste collection. The indicator with the lowest score involved questions about waste pickers' health and safety. We found that the low performance of the municipalities was independent of the existence or not of contracts established with waste picker organizations. We also found that these problems occur in other Brazilian municipalities. In this scenario of urgently needed change, strategies for improving the systems were formulated and validated in a participatory way, for implementation within one year, forming the basis for the establishment of municipal public policies.

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Palaeometry applied to the investigation of biomineralization, environments, and fossil preservation

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The relationship between life and environment offers several perspectives in the study of the geological record. Currently, the most innovative approach to test hypotheses concerning those issues is the use of Palaeometry – imaging, spectroscopic, and geochemical techniques that enable unprecedented fossil and environmental characterisation. The Ediacaran–Cambrian transition (ca. 541 Ma) was characterized by geological changes related to profound transformations in the evolution of the biosphere. Animals capable of synthesizing skeletons made up of minerals (biomineralization), or able to move first appeared. The determination of the original composition of the skeletons, biases imprinted by fossilization, control of biomineralization and biological affinities of these animals are still underexplored. The conditions of oxygenation of their environments are hypothesized to have controlled their distribution and diversity. In the Tamengo Formation (MS), fossils of these animals occur in rocks deposited in a marine environment. The fossils of invertebrates, vertebrates, and plants of the Crato Formation (CE), Cretaceous Period (ca. 110 Ma) are known worldwide for their exceptional quality of preservation, which enables a rare glimpse into the continental life in the Cretaceous. The postdoctoral research has so far advanced the knowledge in biomineralization and fossil preservation, by investigating new biomineralizing animals in the Tamengo Formation, by characterising their environmental oxygenation conditions; and, by advancing the investigation of microbial participation in exceptional preservation using Crato Formation fossils as a model. These investigations were made with cutting-edge palaeometric imaging, spectroscopic and geochemical techniques. In order to attend current demands of a more systematic application of Palaeometry, the research will (1) advance data processing and visualisation, with use of statistical methods, to extract maximum information from acquired data, (2) validate data processing interpretations by other independent analyses, and (3) potentially propose development of instrumentation to test new hypotheses in Palaeontology.

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Multiscale modeling of reactive transport and CO₂ mineral trapping mechanisms at the Rio Bonito geological formation

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The increasing concern over climate change resulting from greenhouse gas emissions, particularly carbon dioxide (CO₂), has prompted the exploration of technologies to mitigate their impact. Among these options, the capture and storage of CO₂ through geochemical trapping, specifically mineralization, has shown promise. Molecular dynamics and reactive transport simulations will be employed to investigate the mineralization process of CO₂ injected into the Rio Bonito formation in the Paraná basin of Brazil. This complex problem requires a multi-scale modeling approach, beginning with assessing fluid-rock interfacial properties at the molecular level, including surface chemical reactions and phase changes of the geological components of the formation. The primary objectives of our research project are to determine (a) equilibrium properties and transport coefficients of the aqueous phases (such as density, viscosity, diffusivity, and solubilities), (b) fluid-rock interfacial properties, and (c) reaction rates associated with chemical processes at the mineral substrate. All these parameters will be evaluated within the range of thermodynamic conditions present at the geological site. Using Density-Functional-Theory (DFT), we assessed the adsorption behavior of CO₂ molecules on selected mineral surfaces, namely feldspar and micas, with and without H₂O molecules. We focused on preferential feldspar's cleavage plane surfaces, {010} and {001}. We quantified and compared the electronic and thermodynamic properties of different adsorption configurations from an energetic and topological perspective. We also explored the determination of preferential adsorption sites and the influence of the aqueous environment on adsorption. Our simulations shed light on significant interactions at complex CO₂-water-mineral interfaces under reservoir conditions.

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Deforestation patterns evolution of the Amazon Basin from 1985 to 2020

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This study endeavors to comprehensively identify and characterize deforestation patterns within the vast expanse of the Amazon Basin while quantifying typical behaviors observed over time. Using accurate mapping data provided by MapBiomas, we conducted an in-depth analysis of individual deforested regions from 1985 to 2020. We delineated and examined four distinct regions within the Amazon Basin by employing advanced machine learning (ML) techniques and leveraging geometric measures such as compactness, equivalent deforestation radius, deforesting rate, and other pertinent parameters. By meticulously observing and documenting these areas for 36 years, we could discern meaningful patterns and draw insightful conclusions. Our findings reveal compelling evidence that increasing compactness is linked to systematic deforestation, specifically substituting forested land with pasture and agricultural activities. Remarkably, we establish that monitoring the evolving compactness metric is a straightforward yet highly effective indicator of ongoing deforestation. Authorities can readily employ this valuable metric as a proactive guide to inform and guide conservation initiatives within regions facing imminent threats. By amalgamating state-of-the-art machine learning techniques with meticulous geometric analysis, our study not only advances the field of deforestation research but also equips policymakers, environmental agencies, and conservationists with a powerful tool to address deforestation-related challenges in endangered areas of the Amazon rainforest. This work underscores the urgent need for swift and targeted intervention and the significance of multidisciplinary approaches in safeguarding this vital ecosystem for future generations.

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Disentangling the influence of deforestation and global climate change on the Amazonian atmosphere

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The Amazon rainforest, one of the planet's most significant and critical tropical forest ecosystems, is pivotal in preserving global climate stability. Nonetheless, over the past 35 years, land cover and pre-industrial climate changes have disrupted this delicate equilibrium, resulting in significant shifts in the Amazon region's water, energy, and greenhouse gas cycles. These disturbances have far-reaching consequences, impacting the Earth's climate system. This study presents a comprehensive quantitative analysis that untangles the individual contributions of deforestation and global climate change to the observed changes in the Amazonian Climate. It specifically investigates the increasing concentrations of methane (CH₄) and carbon dioxide (CO₂), the rising surface maximum air temperature, the declining total precipitation, and the frequency of rainless days in the Amazonian Basin. Moreover, the analysis discerns the seasonal patterns when these changes are observed and determines their significance. The changes in CH₄ and CO₂ concentrations primarily arise from global climate change, with deforestation contributing to less than 3.1% and 0.3% of the increase in CH₄ and CO₂, respectively. However, deforestation emerges as a significant factor when it comes to surface maximum air temperature, rainfall, and non-rainy days. In the past 35 years, deforestation has accounted for 40.9%, 78.1%, and 71.3% of the total increase of 0.41°C in surface air temperature, the decrease of ~84 mm in total rainfall, and the rise of ~9 days without rain during the dry season, respectively. During the wet season, the impact of deforestation on gas concentrations is insignificant, and its influence on other variables is only slight. Deforestation modifies the analyzed variables' seasonality patterns and significantly drives climate changes in the Amazon. Unlike the nearly linear changes caused by global climate change, the effects of deforestation exhibit a logarithmic behavior. This trend has the potential to transform the Amazon climate completely, as well as the global climate, within a few decades.

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Impact of systematics on cosmological constraints: the S-PLUS as a test case

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Observational systematics can constitute a major limitation in the cosmological exploitation of surveys of the large scale structure of the Universe by modulating e.g. the observed numbers of luminous sources. Part of this limitation arises on top of our ignorance on how such systematics actually impact the observed multi-tracer fields. In this work we build a map of different types of galaxies from the Southern Hemisphere for cosmological studies. In particular, we select galaxies that have been observed by the Southern Photometric Local Universe Survey (S-PLUS) to understand how they connect with the underlying dark matter density field and constrain cosmological parameters. The combination of a 12-band (being 7 narrow-bands) photometric system with the instrument's wide field of view potentially poses a unique advantage to the survey in terms of cosmological applications within the Southern Hemisphere. Additionally, we make use of Dark Energy Data data (which comprises a completeness of 80% down to $i=22.5$) to characterize the properties of the S-PLUS selected sample. Such a map is the first of its kind within the S-PLUS collaboration, contributing to broaden both the applicability and visibility of this survey. We also develop a methodology to assess how different potential systematics (e.g. color-magnitude selection, extinction, seeing) impact the completeness of our data. In terms of the Sustainable Development Goals (SDGs), this work contemplates, both directly (via the developed research) and indirectly (via the byproducts, publications and seminars), goals 4 (ensure quality education and relevant skills), 9 (foster innovation) and 17 (strengthen partnerships with international collaborations).

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Coarse-grained modeling of mechanical behavior of mixed-matrix membranes

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Mixed-matrix membranes (MMMs) have emerged as up-and-coming technologies for mitigating CO₂ emissions, offering minimal environmental impact and low energy consumption compared to conventional gas separation methods. These membranes comprise a polymeric matrix reinforced with nanomaterials, which act as fillers dispersed within the matrix to improve selectivity and mechanical strength. Incorporating fillers like carbon nanotubes has shown positive effects on membrane separation performance. However, selecting suitable fillers and polymers remains challenging due to interfacial interactions. Nanomaterials within the 1 to 100 nm size range hold promise as fillers but present additional challenges in accurate description and characterisation. Despite decades of research, CO₂ separation through membranes is still a developing technology. To overcome these challenges, computational modelling plays a crucial role in MMM development. It enables predictions for novel membrane designs, providing insights for experimental studies. A novel simulation protocol utilising Coarse-Grained (CG) molecular simulation is introduced to investigate the mechanical properties of membranes, such as polyethylene and PEBAX-1657. This approach incorporates the statistical associating fluid theory (SAFT- γ Mie) model, which accurately correlates experimental thermophysical properties of small molecules, facilitating the generation of reliable and versatile CG molecular parameters suitable for large polymers. These parameters are directly applied in Molecular Dynamics simulations to study the desired properties. The results demonstrate that CG models effectively replicate experimental density and accurately reproduce the mechanical response of individual polymers, yielding comparable results to atomistic simulations. The findings also show that incorporating long nanotubes in MMMs enhances tensile strength compared to a pure polymeric matrix. In contrast, short nanotubes have a more significant impact on the mechanical response of MMMs under compression.

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Symplectic maps as models for magnetic field lines in confined plasmas

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Thermonuclear fusion is the process which happens when two light atoms with high kinetic energy collide, becoming a new heavier atom and releasing energy and particles as a result. Using fusion as a source of energy would transform our society as we know, once there will be a clean and renewable fuel for the energetic process. Controlled thermonuclear fusion can take place in confined plasmas. Tokamaks are toroidal devices built with this purpose, they generate plasma by the ohmic heating of a filling gas and confine it by external magnetic fields. The efficiency of tokamaks is limited by the turbulence processes and instabilities that occur in the plasma. These processes are depicted, for example, as turbulent transport of particles and magnetic field lines in the interior and in the edge of the plasma. In order to investigate the turbulent process and, consequently, the configurations that may improve plasma confinement, we apply mathematical models that describe these phenomena in plasma in tokamaks. The magnetic field lines can be treated as Hamiltonian trajectories and therefore can be described by symplectic two dimensional maps. In our research, we study the stability of the magnetic surfaces as well as the transport of magnetic field lines by different symplectic maps, such as the standard nontwist map and its variations, the Martin–Taylor map, the tokamap, revtokamap and others. Numerically solving these maps, we obtain information about the transport of field lines and we are able to identify configurations and parameters where the confinement is improved. Our survey reinforces that the inclusion of a non-monotonic safety factor profile creates robust transport barriers, improving the confinement and the efficiency of tokamaks. Our goal is to analyze different configurations of tokamaks by different maps and, consequently, to contribute to the study of magnetic confinement of fusion plasmas.

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A citizen science approach to improving public perception of low-carbon society: a sentiment analysis

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Citizen science is an engaging strategy that enlists the public in gathering scientific information. Internet-based technologies have facilitated large numbers of volunteers to contribute to scientific projects. The general public can contribute by collecting data, mapping how environments evolve, and expressing ourselves as never before. This conversational approach has significantly contributed to developing, establishing and nurturing online communities. Social media can be defined as a set of online tools designed to enable and promote social interactions. This media has revolutionised how we communicate with others and share our daily experiences and opinions. However, there needs to be more understanding of how social media may contribute to citizen science in the context of open data sources such as microblogging platforms. One of the most common is Twitter, an available social media platform. Twitter supports the conversational nature of discussions, providing easy access to a wealth of information and data. These data can be a powerful source of insights on various topics, including specific issues like climate change. In recent years, Twitter has gained significant interest from the research community. Sentiment analysis of tweets has emerged as a hot research topic. However, analysing sentiment with multiple classes has proven to be a challenging task. This is mainly because a tweet often contains not just one but multiple sentiments. This work uses Twitter data to map the public perception of climate change and energy transition issues. We introduce a novel approach for automatically classifying the sentiment of Twitter messages in Portuguese. Machine learning techniques and tools for sentiment analysis are applied to unveil the social pressure and tendencies on the public perception towards low-carbon technologies. This project is part of the Advocacy program at the Research Center for Greenhouse Gas Innovation.

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Study of the elastic scattering and one-neutron stripping from ^8Li projectile to ^{58}Ni target

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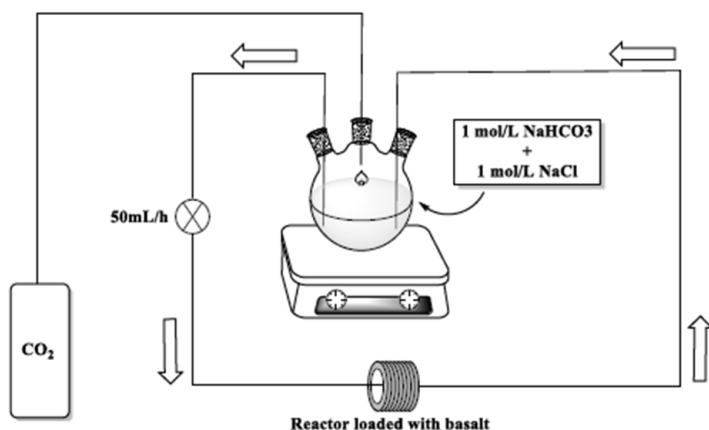
Recent experimental measurements have been conducted on the $^8\text{Li}+^{58}\text{Ni}$ system at bombarding energies of 23.9, 26.1, 28.7, and 30 MeV using the RIBRAS facility. These measurements have revealed a significant production of ^7Li particles through two processes: the breakup of ^8Li into $^7\text{Li}+n$ and the transfer of one neutron from the ^8Li projectile to the ^{58}Ni target. The angular distributions of the ^7Li particles have been analyzed using the Coupled-Reaction Channels (CRC) formalism, which takes into account the coupling of the elastic channel to the $^{59}\text{Ni}=^{58}\text{Ni}+n$ states both below and above the neutron threshold. The CRC calculations have successfully provided a simultaneous description of the angular distributions for both the ^7Li particles and the elastic scattering. Moreover, the angular and energy distributions of the ^7Li particles have been effectively described by employing a combination of the Ichimura-Austern-Vincent (IAV) model and the Continuum Discretized Coupled Channels (CDCC) methods. The IAV model has been utilized to account for the inelastic breakup, while the CDCC method has been employed for the elastic breakup. This combined approach has yielded a simultaneous and accurate description of the angular and energy distributions of the ^7Li particles.

Enhancing carbonate mineralisation in basalts of the Serra Geral Formation

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Introduction. One of society's significant challenges is finding ways to reduce atmospheric CO₂ emissions. An excellent way to mitigate this problem is to sequester this molecule, storing it permanently in geological media, for example: storing this carbon dioxide in sedimentary basins or transforming it into carbonate minerals. Many studies are focused on the above example since gaseous CO₂ can be chemically transformed into carbonates relatively simply through a spontaneous and exothermic chemical reaction. This elegant approach mimics natural weathering reactions, i.e., chemistry reactions between CO₂ and alkaline earth-containing silicates. **Methodology.** The apparatus necessary for preparing carbonates through the cation exchange process can be seen in Scheme 1. First, 100 ml of 1M NaCl and 10 ml of NaHCO₃ solution mixture will be injected into a reactor containing basaltic samples with a peristaltic pump. Simultaneously, CO₂ gas was injected under the control of a flowmeter. The precipitates will be filtered, washed, and characterized. A comprehensive methodological study is essential to investigate the formation mechanism, encompassing the control of reaction conditions such as time, temperature, pressure, and reagent concentration.



Scheme 1. Experimental setup on mineralisation reactions.

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Conclusion. We aim to gain valuable insights into the CO₂ mineralisation process in basaltic rocks using various experimental techniques. Our methodological study explores temperature, pressure, alkali metal sources, and CO₂ quantities to establish optimal conditions for maximising mineralisation reactions. We will delve into the mechanisms underlying carbonate formation and dissolution in basaltic rocks through a combined theoretical and experimental approach.

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Study of scattering and reactions induced by light radioactive nuclei

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In this work, angular distributions of the elastic scattering of the radioactive ^8Li , $^{7,10}\text{Be}$ and $^{8,12}\text{B}$ cocktail beams on ^9Be and ^{197}Au targets have been measured, at energies above the Coulomb barrier, using the RIBRAS system and the electrostatic accelerator Pelletron-USP. The angular distributions were analyzed by optical model formalism, that provided the interaction potentials that best reproduce the data as well as the total reaction cross-sections. In the $^8\text{B}+^9\text{Be}$ case, long-range real nuclear potential was obtained, different to the long-range imaginary potentials obtained for the neutron-rich projectiles. Furthermore, the strong cluster structure present in most of the projectiles studied here suggests that the coupling to the inelastic excitation, projectile breakup and transfer reaction channels could have some effect in the angular distributions. In addition, the low lying bound excited states of some projectiles associated with our limited energy resolution requires an estimation of the effect of an inelastic contamination in the elastic scattering peaks (quasi-elastic scattering). All these effects were investigated by the Coupled Channels Method: CC calculations for the inelastic scattering, CDCC for the projectile breakup and CRC for stripping reactions.

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Hydrogen peroxide preoxidation as a pretreatment for photodynamic inactivation of microorganisms

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Photodynamic inactivation (PDI) of microorganisms is a process based on the excitation of a photosensitizer (PS) molecule by light at a specific wavelength, in the presence of molecular oxygen. It is a promising method for advanced treatment of water and wastewater, particularly targeting fecal coliforms and antibiotic resistant bacteria (ARB). These, however, are challenging contaminants for PDI, mostly considering PS uptake. Recent research has focused on new PS materials, their delivery mechanisms, and additives to PDI in general. Hydrogen peroxide (H_2O_2) is a common disinfectant, mostly in clinical settings and in the food industry, and its residuals are environmentally negligible at the applied concentrations. In this sense, we aim to assess the effects of including and incubation step with H_2O_2 prior to PDI using with curcumin (a vegetal-based PS) against *Escherichia coli* and methicillin-resistant *Staphylococcus aureus* (MRSA), to determine if sequential treatment is synergistic. Our preliminary results indicated that low concentrations of standalone H_2O_2 lead to some log-reductions in the tested organisms. We hypothesize that the decrease in the concentration of colony forming units, along with cell damage to the remaining ones, will enhance the performance of standard PDI. Possible cooperative effects may assist further research and implementation of PDI-based tertiary treatment against bacterial pathogens and ARB for water reuse and safe wastewater discharge.

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Al-doped ZnO: development and characterization of targets and thin films deposited via sputtering for applications in energy converters and gas sensors

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The production of ceramic targets for film deposition via sputtering has been widely studied in order to reduce costs in the production process. Al-doped ZnO (AZO) targets, with semiconductor characteristics, are important for the deposition of thin films that can act as transparent conductive oxides (TCO). AZO thin films have optical and electrical properties that allow them to be used in functional devices such as gas sensors and energy conversion. In this work, AZO targets were prepared with dopings ranging from 0 to 3 mol% of Al in the ZnO network using two different processes. In the first process, the targets were prepared by solid-state reaction using commercial ZnO and Al₂O₃. In the second process, targets were prepared using ceramic powders obtained through the Pechini method. The 2-inch targets were uniaxially pressed with a pressure of ~60 MPa and sintered at temperatures of 950 and 1050°C. The targets were characterized by X-ray Diffraction, followed by structure refinement using the Rietveld method, X-ray Fluorescence, and Apparent Density determined by the Archimedes method. The results show that the targets prepared by both methods are single-phase, whose stoichiometric composition agrees with the initial calculations. The apparent density of targets prepared by solid-state reaction is higher compared to those prepared with ceramic powders obtained by Pechini. However, in both cases, the Apparent Density values were above 98% of the theoretical density. The targets were used to deposit AZO thin films via sputtering, with the deposition time varied. The films are being characterized in terms of thickness, crystallinity, morphology, band-gap, optical and electrical behavior, and sensitivity to the presence of specific gases. The results must be ready to be presented on the date of the event, considering that the postdoc is in progress.

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Controlled release of curcumin in the photodynamic inactivation of *Aedes aegypti* larvae

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Aedes aegypti is responsible for the transmission of several arboviruses that cause diseases, including Dengue, Chikungunya and Zika. Although insecticides are the main controlling method for this vector, aiming to reduce the spread of virus transmissions, it lacks efficiency. This motivates the search for new vector control tools that, along with integrated strategies, meet public health demands. Curcumin is a photosensitizer (PS) inspired by a vegetable and has shown great potential for application in the photodynamic inactivation (PDI) of *Ae. aegypti* larvae. The PS molecule was encapsulated in microcapsules (MPs) based on biopolymers, using the spray dryer technique to improve active bioavailability. Release kinetics was investigated to understand the release mechanism of curcumin from MPs as a function of pH, fundamental in PDI. Release data were adjusted using the Korsmeyer–Peppas¹ model to calculate release constants (k) and R^2 . There was a good fit to the experimental curves, resulting in R^2 from 0.96 to 0.98. The kinetic constant k is characteristic of a given system considering structural and geometric aspects; n is the release exponent representing four different mechanisms (*Fickian diffusion*, *anomalous transport*, *Case-II transport*, and *Super Case-II transport*)² considering spherical particles, and t is the release time. Results showed that curcumin was released by different mechanisms depending on the pH of the medium: at pH = 3 and pH = 11, by the Super Case–II transport mechanism $n = 1.19$ and 1.0 , respectively, while at pH = 7 ($n = 0.79$) the anomalous transport mechanism was observed.

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Occurrence of per- and Polyfluoroalkyl substances (PFAS) in groundwater contaminated by domestic effluents

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Leaded by the great advancement of technology driven by the growing demand for good-consumering, new substances are generated containing organic and inorganic chemicals to enhance some of their properties. However, in some cases, there is insufficient characterization regarding its interactions within several environmental matrices, as well as, their toxic potential effects on humans. Consequently, these substances or their metabolites might reach the environment through different pathways, contaminating soils and water (on surface and groundwater). Considering the consequences approached previously, it becomes necessary to identify, quantify, and predict possible impacts on both, the environment and human beings. Among these substances, we highlight the Emerging Contaminants (EC), which are define as a microorganism and, as natural or synthetic chemical substance which aren't monitored, but that may emerge in the environment and cause both, known or unknown adverse effects on ecosystems and/or human health. Therefore, it is presumed that cases of contamination that have been observed in recent years are derived from contamination occurred several decades ago, such as per- and polyfluoroalkyl substances (PFAS). These substances might be consider endocrine disruptors, which means they are chemical substances that may interfere with the natural functioning of the endocrine system in animal species, including humans. PFAS initially were produced in the 1940s and have received global attention due to their persistence, potential for bioaccumulation, and possible adverse effects on living organisms. Additionally, they might be transport over long distances when present, in groundwater, for example. PFAS are organic and inorganic aliphatic substances characterized by having a fully (per-) or partially (poly-) fluorinated alkyl chain, which leads to variations in their physical and chemical properties, as well as the presence of a terminal functional group such as carboxylates, sulfonates, sulfonamides, phosphates, alcohols, among others. Due to the strong bond between fluorine and carbon, these substances are not easily degrade by physical and chemical mechanisms when they enter the environment. Briefly, it becomes necessary to conduct specific studies on groundwater in urban environments, which are liable to the contribution of those substances, for example, from domestic effluents that can limit their usage for water supply. In addition, the industrial effluents contribution that contaminate groundwater can lead to the emerging of contaminated areas.

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Vegetational and climate changes in Eastern Amazonia during the last 600 kys

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This project proposes to reconstruct vegetation and climate of eastern Amazonia by examining pollen, spores, Carbon, and N isotopes in sediments deposited in the Marajo sedimentary Basin during the last 6 glacial cycles by addressing various vegetational, climatic, and biogeographical hypotheses that have been proposed to the last 40,000 years. The Trans-Amazonian Drilling Project will allow, for the first time in the history of Brazilian science, quaternary palynologists to extend our understanding of vegetational and climatic changes in the Amazon beyond the LGM and extend its history into the last 6 glacial cycles. One central question regarding the future of Amazonia is: how resilient is the Amazon biota under multiple phases of global climatic change? The proposed analyses will also shed light, not only on resilience aspects, but also on the ecological processes that must have taken place on the Amazonian section of the Brazilian continental shelf as it became exposed during glacial phases by reducing global sea levels. A total of 10 hypotheses, concerning climatic, vegetational, ecological, and biogeographical aspects are proposed with their corresponding testing methods. This study will provide scientists a unique opportunity to find out if our current and partial understanding of the last glacial cycle of the Amazonian landscape, known in the Northern Hemisphere as the Würm/Wisconsin glaciation, has a correspondence in other glacials of the neotropical region.

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Managed aquifer recharge: increasing the water sustainability in São Paulo state, Brazil

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Groundwater is an essential source of water supply in Brazil, and the state of São Paulo is currently the largest user, causing problems associated with intense exploitation. Although groundwater resources are under such increasing pressure, little has been done to protect them. Managed aquifer recharge (MAR) can improve water security, recover storage, or reduce environmental impacts. Although using the MAR has been employed as a suitable strategy in many regions of the world, there is still a gap in the scientific, technical, and governance dimensions in many countries, including Brazil, where it is still in the early steps. It is detected that the resistance to adopting it goes beyond technical or legal issues but is much more related to sociocultural acceptance or the insecurity of technicians due to their lack of knowledge. This work aims to evaluate the opportunities for MAR adoption in the state of São Paulo and how to make it an ordinary strategy for managing water resources. Therefore, it is necessary to create simple documents showing the advantages and risks associated with its adoption for policymakers, water resource managers, and technicians, supported by examples of success abroad, and which, in addition, providing the necessary steps for its implementation, the monitoring of its efficiency and the reduction of risks applied to São Paulo aquifers. Furthermore, it is essential to identify the locations in São Paulo where MAR could recover aquifers, evaluating the technical, social, and institutional aspects. The results of this study shows that in critical regions such as Ribeirão Preto and Bauru, where the Guarani Aquifer System has experienced potentiometric water level drops of more than 50 m, or even in São José do Rio Preto, where thousands of private wells compete for the water of the Bauru Aquifer System, the adoption of MAR could prolong and sustain the exploitation of groundwater.

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From lava to fossils: exploring the organic record in wet peperite rocks of the Paraná Basin

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Large igneous provinces (LIPs) have significant global environmental and biospheric impacts, including triggering mass extinctions. While LIPs offer valuable sedimentological and geochemical records of intense geological activity in deep time, their igneous origin limits their contribution to understanding ancient life. In this study, we present the first paleontological evidence of organic walled microfossils extracted from wet peperites. These peperites were found in the early Cretaceous Paraná–Etendeka (PE) intertraps of the Paraná basin in Brazil. The PE LIP was a continental flood basalt formed approximately 132 million years ago in South America and Namibia, releasing large quantities of sulfur dioxide, methane, and hydrogen fluoride into the atmosphere. The recovered microfossils (OWM) from the wet peperites include pollen grains, spores, acritarchs, and other unidentified organic remains (possible tardigrade eggs). OWM were also discovered in volcanoclastic sandstones and interpillow sandstones. Most microfossils exhibited pale yellow to dark colors and exhibited two degrees of preservation potential. Some microfossils displayed ornamentations such as ridges or saccis, while others had iron oxide inclusions or coverings identified as hematite. The distribution and preservation of OWM varied with wet peperites containing better-preserved specimens compared to heterolithic sandstones, dry peperites, and interpillow deposits. Our findings provide the first view of the extinct biodiversity of the Paraná basin during the early Cretaceous, a period characterized by intense magmatism. The microfossil assemblages support a regional paleoclimatic transition from arid to more humid conditions likely influenced by volcanic activity. This study highlights the potential of wet peperite rocks as valuable sources of paleobiological data and underscores the importance of sampling volcanoclastic units previously considered unfossiliferous due to their igneous origin.

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Modes of sediment preservation in active channel bars and terraces from the Purus River (Amazon Forest)

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Qualitative sedimentological models are based on modern small rivers that flow across large temperate alluvial plains and have low discharges and sediment fluxes, which are incomparably different from poorly understood large rivers in tropical regions. Despite that and the developments in sedimentology of processes, current models are still based on last century facies models to interpret ancient river deposits preserved in sedimentary basins, which are used to understand oil and groundwater reservoir geometry, ignoring the nature of other modern alluvial plains. The rock record, current facies models, and tropical river deposits like the Amazon differ greatly. Current facies models interpret prevalent end-members and neglect depositional processes that create bars and periodically flood areas. In order to address that issue, we used facies and architectural element analysis on large Amazonian meandering rivers like the Purus River. Results show that large dune-shaped bedforms, medium-scale dune cosets superimposed under the river's high flow stages, and aeolian climbing ripples at the bar top are the main deposits of mid-channel bars. Contrary to current facies models, thick mud layers often cover the leeside and the trough of dunes. Seasonally flooded areas like midchannel bars preserve that fraction in active bars, at the bar head and tail, which are surprisingly both likely to preserve mud deposits, and in older terraces adjacent to the main active channel. Preliminary results should help build more accurate facies models that take into account both the variance of scales and discharge flow regimes.

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Defination of geoindicators for public use management of geosites: application to the geological heritage inventory of São Paulo State

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The characterisation of the elements of Geodiversity, through different inventory and quantitative evaluation methods, in the last decades, has allowed the identification of the most representative sites of the regional geological evolution of the State of São Paulo. Between the years 2013 and 2016 the first phase of the inventory of the geological heritage of São Paulo state was carried out. At the end of this stage, 142 geosites integrated in 11 geological categories were defined, which were characterized and quantitatively evaluated according to their scientific value and degradation risk, to establish future management priorities. Between the years 2017 and 2019, in the second phase of the research the data obtained in the inventory was submitted to an analysis aiming at the diagnosis of use and protection and the proposal of strategies for management and public use of these geosites. Currently, the inventory of the geological heritage of the state is composed of 143 geosites, of which, based on the scientific value, 57 were evaluated as potential candidates to integrate the inventory of the national geological heritage. Despite this, there are still few works that systematically apply the stages of conservation and monitoring of geological sites. In this context, this work presents the initial phase of the definition of a methodology for the assessment of the evolution of the state of conservation of the geological heritage and its application in the state of São Paulo, to subsidise future actions of management and preservation of this heritage. In this stage 129 state geosites were evaluated based on 3 defined criterions. This evaluation resulted in the identification of 25 priority geosites, which were defined a set of geoindicators and will be covered in the subsequent stage.

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The materiality of things: spectrometric and spectroscopic studies of rare and common minerals in refuges with rock art in São Paulo and Paraná

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Among many causes, minerals can be formed by anthropic action and this action is contained within a geological period called Anthropocene. Among the various causes of mineral formation are anthropogenic or biological. Some cases are known as the formation of bütschliite $K_2Ca(CO_3)_2$, formed in clinker from wood ash fused from partially burned trees (MILTON & AXROLD, 1947). Of anthropic origin, atacamite stands out, $Cu_2Cl(OH)_3$, first identified in the 19th century in the Atacama desert in Chile, and which in the mid-20th century was also located in crusts of bronze statues in the city of Alexandria, thanks to corrosion caused by sea water in the last 2,000 years. . It was also used as a pigment in sculptures, manuscripts, maps and frescoes (FROST et al, 2002). the chalconathronite, $Na_2Cu(CO_3)_2 \cdot 3H_2O$, can crystallize on the surface of copper archaeological objects (artifacts) that have been treated with an aqueous solution of Na_2CO_3 to stabilize them (POLLARD et al., 1990). In the case of rock supports, a highly highlighted feature is moisture in its various forms, which intervenes in almost every type of chemical change as a solvent or carrier (moving items such as salts or acids) or as a direct agent (hydration) so that rain washes the rock surface and the water from the pores acts physically and/or mechanically, as in the swelling or shrinkage of minerals, hydraulic pressure and removal of surface grains and paints (FORD et al., 1994). Mineral accretions often reported in rock art sites are little studied and so far refer to calcium oxalates and amorphous silica, both ubiquitous in sandstone environments. Their origins are not well understood, but they are known to be linked to humid atmospheric conditions and metabolic activity (biofilms) (AROCENA et al., 2008). Another impact factor of light is the heating of the rock face, enhancing the growth of photosynthetic plants (EPPES et al., 2010). In this sense, rocks can be colonized by many types of bacteria, algae, fungi and lichens, as well as by mosses, ferns and flowering plants (BREHM et al., 2005)). The study area is located in the region of Itapeva, state of São Paulo and Piraí do Sul, state of Paraná (figure 1).

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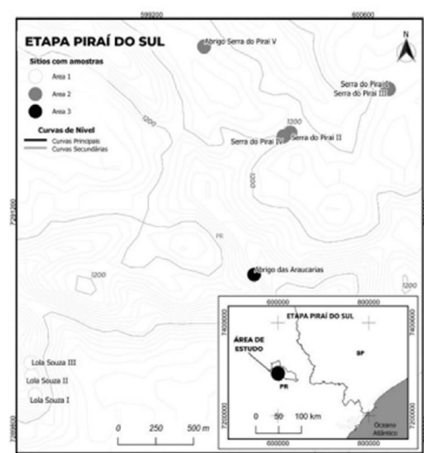
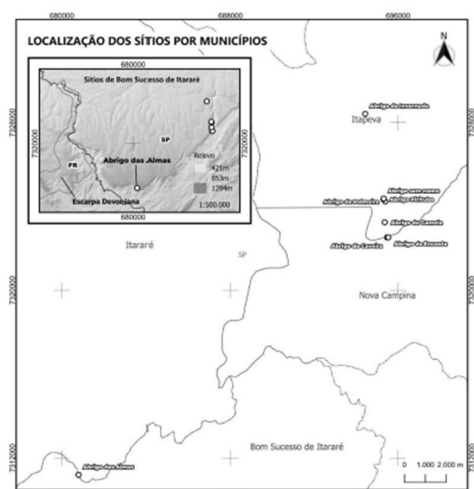


Figure 1 – Study locations in the two states.

Parallel-in-time integration of atmospheric circulation models: challenges and perspectives

João G. C. Steinstraesser¹

In several application domains, the search for a trade-off between accuracy and computational cost of numerical simulations lead to constant investigation and development of new and more efficient methods and approaches. Atmospheric circulation modelling is an example of such application domains, with accurate simulations in the context of climate modelling and weather prediction often having prohibitive computing times. With the advent of massively parallel computing, mostly over the past two decades, parallel-in-time (PinT) methods have been seen as an promising approach to reach this trade-off, by replacing the traditional serial time stepping approach by the simultaneous computation of several time steps iteratively. The main idea of some of the most popular PinT methods, such as Parareal and MGRIT, is to use simultaneously two or more discretizations of the problem: a fine one, which provides an accurate solution but requires a too high computing time, and one or more coarser discretizations, which provide much faster, but less accurate approximations. The expensive serial integration of the fine discretization is replaced by an iterative predictor-corrector procedure, which should provide accurate solutions compared to the fine one within smaller computing times. However, despite their relatively simple implementation and successful application in various contexts, PinT methods usually present stability and convergence issues when applied to hyperbolic or advection-dominated problems, such as those arising in atmospheric models, which creates a barrier to their operational application. Therefore, an important part of scientific research around temporal parallelization focus on understanding and proposing alternatives to overcome these difficulties. In this work, we discuss the challenges for the temporal parallelization of atmospheric circulation models and some approaches for improving its performance. We begin by a brief presentation of the main PinT methods; then, we illustrate and discuss their stability convergence issues when applied to hyperbolic problems and which features are desired for their successful operational application. Finally, we present some alternatives for improving the temporal parallelization of hyperbolic problems; more specifically, in the context of atmospheric models, we present results from a recent work in collaboration with Pedro da Silva Peixoto (IME-USP) and Martin Schreiber (Université Grenoble Alpes, France), showing that, under proper parametrization and use of artificial viscosity and hyperviscosity approaches, cheaper, accurate and stable solutions can be provided by PinT methods combined with time-stepping schemes used in operational weather prediction and climate models, which provides guidelines and indicates promising perspectives for the application of temporal parallelization in the context of atmospheric modelling.

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Sustainable flexible job-shop scheduling problem, incorporating sequencing flexibility and learning/deterioration effects

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The flexible job-shop scheduling problem (FJSSP) stands out as a significant challenge extensively explored in the literature, particularly in the field of manufacturing systems within the industry. Concurrently, sustainability has gained paramount importance over the past few decades, becoming a top global objective. Energy, in particular, has been a focal point in the 2030 Agenda for Sustainable Development, adopted by the UN General Assembly in 2015 (Assembly, 2015). As a result, considerable research has been conducted in the past five years to integrate sustainability considerations into the FJSSP (Destouet et al., 2023). We explore a sustainable flexible job-shop scheduling problem (SFJSSP), incorporating sequencing flexibility and learning/deterioration effects. This problem involves scheduling a set of tasks across multiple processes and heterogeneous machines, considering dependencies between these processes represented as a directed graph. Our primary objective is to optimize energy consumption, while also considering the machines' deterioration over time and their potential for performance improvement as more work is accomplished. Addressing the SFJSSP is a complex task, as it falls under the category of NP-hard problems, indicating that finding an optimal solution is computationally challenging. To address this challenge, we formulate the problem using an integer programming model. Additionally, we investigate the development of constructive heuristics, local search algorithms, and metaheuristics to derive solutions that are close to the optimal solution within an efficient time-frame.

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Integrated ecosystem assessment around islands of the tropical South Mid-Atlantic Ridge

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The South Mid Atlantic Ridge comprises three main oceanic islands in the equatorial and tropical portions of the Atlantic Ocean. These islands are isolated from each other and equidistant from both the continental margins of South America and Africa, sharing common patterns but with different types of human use and pressures. Moreover, the areas beyond national jurisdiction between those islands are visited and exploited by distant fishing fleets and include large areas of shipping activity for commodities. Here, a pioneering integrated ecosystem assessment (IEA) process is constructed for the region among Saint Peter and Saint Paul's Archipelago (Brazil), Saint Helena Island and Ascension Island (UK overseas territories). For that, we used a qualitative assessment of risks arising from anthropogenic activities, representing a novel contribution to the field. The Options for Delivering Ecosystem-Based Marine Management (ODEMM) approach was applied to trace sector–pressure–component pathways. A 'linkage framework' was outlined including pressures affecting each ecosystem component, and supported a process of knowledge attributions that scored the impact risks. All results were validated with regional stakeholders through workshops, including local and international management bodies, non-governmental organizations (NGOs) and scientists. The approach focused on a significant area among the islands encompassing the open ocean, shallow and deep-sea biomes, analyzing the main sectors and pressures affecting the ecological components. Our results identified 14 sectors and 16 key pressures associated with 23 ecosystem components, totaling 780 impact chains. Fishing, shipping, wastewater, and tourism/recreation appeared as the top impacting sectors. Fishing and shipping were the most connected with ecosystem components links. Litter, species extraction, contaminants, and bycatch were the pressures that had the highest risk of impact values. Lastly, demersal and pelagic fish and pelagic and demersal elasmobranchs were the groups with the highest risk related to overall impacts, which were supported by local and

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regional evidence from long term monitoring programs and local studies. Our study demonstrated that these seemingly pristine islands and oceanic waters are already experiencing human impacts that should be addressed by both local conservation measures and international agreements. We also highlight the pressures that should be prioritized for better monitoring and policy, as well as those linkage components that have been less investigated.

Anthropogenic reach registered by Cs-137 on mud depocenters of the southeastern Brazilian shelf

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Well-defined stratigraphic evidence of anthropogenic action is necessary to formally define the Anthropocene. ^{137}Cs is an artificial radionuclide formed as a subproduct of ^{235}U fission, and it enters the environment of the Southern Hemisphere exclusively from anthropogenic actions, a result of nuclear weapon tests initiated in 1945 with maximum fallout in 1962. The scarce knowledge about the presence of this radionuclide in the SE South American continental margin motivates this study to first, provide an inventory of ^{137}Cs in the mud deposits of the southeastern Brazilian shelf, then to evaluate the trapping potential of anthropogenic materials. Seven small cores were collected in 2017 and were analyzed through high-resolution gamma spectrometry. It was possible to designate the maximum values of each sedimentary column to the year 1963 through the study of the vertical presence of this element considering that the atmospheric fallout from global nuclear weapon tests is the only source of ^{137}Cs to the Southern Hemisphere. This study was also able to conclude that layers younger than 1963 correspond to direct anthropogenic influence, and older layers to indirect influence based on ^{137}Cs vertical migration. Besides being a fingerprint of anthropogenic influence and a chronographic marker, ^{137}Cs is useful to evaluate the trapping potential of sediments. When the sedimentary column is remobilized, ^{137}Cs can be removed or it can undergo horizontal advection, which can alter the presence of the 1963 maximum. Thus, using ^{137}Cs , it was possible to conclude that human influence reached mud depocenters on the southeastern Brazilian shelf and, even though dilution and dispersion can occur, these deposits can also trap elements/substances from human sources.

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Paleoceanographic evolution of the western South Atlantic Ocean circulation: a hotspot of evidence for global climate changes

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The South Atlantic western boundary current system is strategically embedded in the general framework of the large-scale ocean circulation. The anticyclonic South Atlantic subtropical gyre (SASG) provides the means by which the upper limb of the Atlantic Meridional Overturning Circulation (AMOC) is advected northward, up to the point where the flow at its northern boundary (represented by the southern South Equatorial Current, sSEC) meets the South American coast and is forced to bifurcate either southward – recirculating in the SASG – or northward, continuing the AMOC upper-limb path. The resulting three-dimensional flow pattern is characterized by a multi-layer system of inversed-flowing currents, where the sSEC bifurcation sets the interplay between both dominant circulation features – the SASG and the AMOC. This post-doctoral project aims to reconstruct the sSEC bifurcation index for timescales ranging since the Last Glacial Maximum and a special focus on the past 2000 years with available paleocean model simulations, using it as a fingerprint for low-frequency variations in the AMOC and the large-scale South Atlantic circulation. By monitoring the spatio-temporal evolution of the bifurcation and the generated western boundary currents along depth, it is possible to make associations with the general circulation and infer periods of stronger/weaker meridional overturning associated with AMOC modes as well as periods of spun-up/slower subtropical gyre circulation. A mechanistic understanding of AMOC variability is currently a high priority for the climate science community. In this context, paleocean circulation states hold lessons for the future of our warming world, as anthropogenic emissions rapidly alter Earth's climate.

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Evolution of radiometric signature and sedimentation rate models in the mud shelf depocenters of the SE South Atlantic continental margin

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and Rubens C. L. Figueira¹; Michel M. de Mahiques¹; Bianca S. M. Kim¹; Márcia C. Bicego¹

This study examines the impact of the constant sedimentation – CS premise in sedimentation rates, mass accumulation rates, and age–depth results obtained from unsupported ^{210}Pb models. This investigation was based on vertical profiles of ^{210}Pb , ^{226}Ra , ^{228}Ra , ^{40}K , and ^{137}Cs measured through gamma spectrometry from seven sediment cores sampled along the coast of southern Brazil, region known to harbor mud shelf depocenters. The analysis of the natural radiometric signature confirmed existing knowledge about the region, including the presence of multiple sediment sources, with detrital matter originating from the nearby coastal systems, and high grain–size dispersion. The geographic distribution of the sampling sites allowed for the identification of sedimentological features corresponding to a northernmost middle shelf depocenter, a more coastal depocenter, and a region with sandy sediments deposited by wave–driven dynamics. The mean sedimentation rate of the study area was estimated to be between 0.33 and 0.58 cm yr⁻¹. It was revealed that the decision to consider the CS premise met or not can be determined by discussing the vertical profiles of activities and conducting robust statistical analysis of outliers in the vertical profiles of mass accumulation rates. These considerations can guide the selection of the most appropriate approach to investigation of sediment cores.

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Reservoirs of the state of São Paulo: a multiproxy perspective in the reconstruction of environmental impacts

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Paleoenvironmental reconstruction studies are relevant both from the point of view of theoretical and applied science as well as from the regional point of view, providing important information to managers once it allows to reconstruct the history of environmental impacts and establishment of reference conditions. The present research intends to carry out a paleolimnological study through a multiproxy approach in the reservoirs for public water supply: Atibainha-At (Nazaré Paulista-SP), Rio Grande- RG (Complex Billings- São Paulo-SP), Itupararanga (Sorocaba- SP) and Igaratá (Igaratá-SP). We propose to analyze changes in sedimentation patterns and other proxies such as Carbon and Total Nitrogen contents, Total Phosphorus and metals (Cu, Cr, Ni, Pb, Zn, Mn, Fe and Al) in the dam areas of these reservoirs. Three papers have already been published. In one of them, we established the ultraoligotrophic state as a reference condition for the study reservoirs. We also identified an increase in environmental degradation directly and indirectly associated with the eutrophication process. In RG the Cu contents exceeded the reference values up to 412 times, due the application of algacides based on CuSO₄ to control algal blooms. In the At reservoir, we observed that the sediments deposited between 1993 and 2015 recorded the highest levels of the pigments lutein, zeaxanthin and fucoxanthin, together with total nitrogen and sedimentation rate, suggesting changes in the phytoplankton community composition probably associated to the intensification of eutrophication and erosion processes. This is an important contribution to paleolimnology developed in reservoirs in tropical environments. The data collected are, therefore, an important tool for the establishment of public policies with the possibility of strengthening the dialogue between the scientific community and the managers to guarantee the sustainability of the water bodies.

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Recognizing (micro)plastic deposits on sandy beaches based on geotechnologies and stable isotopes ($\delta^{13}\text{C}$) techniques

Anderson T. da S. Ferreira

In coastal areas, the presence of plastic waste is notably the result of poor management of the disposal of this material, either by direct disposal on the high seas from ships, from transshipment in adjacent ports or industries, as well as from being brought by sea currents and winds, urban or river drainage. From the second half of the last century until today, an exponential global proliferation responsible for 80% of all the garbage accumulated in the oceans due to its characteristics, such as high volume of production, low cost, and, mainly, durability. Although there are several studies on a regional and local scale, understanding the factors that control the deposition of microplastics on sandy beaches on a systematic and large scale remains a challenge. In this context, the proposed research seeks an unprecedented assessment of areas with greater or lesser susceptibility to the deposition of this pollutant on sandy beaches across the coast of São Paulo. Analyzing the relationship of these areas with the geomorphological aspects (long-term accretion and/or erosion rate, morphodynamic stage, and aspect), meteoceanographic (wave and tidal range). Combining Big Data Remote Sensing techniques, cloud computing, GIS, and stable isotopes ($\delta^{13}\text{C}$).

Promoting participative governance processes to combat marine litter in Brazil

Carla I. Elliff¹

and Alexander Turra

Recognized as part of the triple planetary crisis (along with climate change and biodiversity loss), pollution is a major threat to ocean sustainability, though the causal pathway for marine litter may appear simple at first. Among the root causes for the leakage of litter to the marine environment are issues of general waste mismanagement, lack of stakeholder involvement, and few public policies that include marine litter in their actions and goals. In the present project, we have sought to address these issues through the Clean Ocean Network. We co-constructed the São Paulo Strategic Plan for Monitoring and Assessment of Marine Litter, an innovative public policy launched in 2021 and incorporated into the state's solid waste management plan. The process was carried out in partnership with the Secretariat for Infrastructure and Environment of the State of São Paulo, within a collaborative governance framework that valued science-based decision making and stakeholder engagement. Once the plan was published, three main goals were set: i) facilitate the implementation of the plan in São Paulo; ii) co-construct a marine litter combat plan for the same state; iii) mobilize the states of Amapá, Ceará, Rio Grande do Norte, Bahia, Rio de Janeiro, and Paraná to also begin the participatory construction of their own marine litter policies in alignment with global agreements (e.g. UN 2030 Agenda, Decade of Ocean Science for Sustainable Development, UN plastic pollution treaty). Parallel to this state-scale action, a municipal-scale diagnosis took place regarding hotspots for plastic pollution leakage to the environment and risk of reaching the ocean. This is the most refined panorama produced for the country, including all 5,570 municipalities, indicating that Brazil has an estimated 3.44 tons of plastic waste/year that is lost to the environment. Lessons learned during the project are also being shared with federal agencies, aiming to resignify the current National Plan to Combat Marine Litter, and with international organizations, particularly in view of the Intergovernmental Negotiating Committee on plastic pollution at the UN Environment Programme. Results so far have shown positive impacts and we expect to reach our goals by late 2024.

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Environmental reconstruction study of the Linguado Canal in Babitonga Bay - Santa Catarina - Brazil

Cláudio R. Tureck¹

and Bianca S. M. Kim²; Tailisi H. Trevizani³; Paulo A. de L. Ferreira³; Rubens C. L. Figueira³

Coastal and estuarine regions suffer from diverse anthropogenic pressures, such as urban occupation, industrial, agricultural, fishing and port activities, which disposes contaminants to the environment. In Brazil, estuaries are historically affected by these activities, particularly Babitonga Bay (SC). It is recognized for its ecological and economic importance and for the major environmental impacts resulted from the Linguado Canal closure in order to build a rail access to São Francisco do Sul Island in the 1930s. In this context, the aim of this work to carry out assess a spatiotemporal environmental reconstruction of Babitonga Bay using trace elements (Al, As, Cd, Cr, Cu, Fe, Hg, Ni, Pb and Zn), natural (^{210}Pb e ^{226}Ra) and artificial (^{137}Cs) radionuclides in sediments samples. Thus, it will be possible to estimate de regional background and verify the enrichment of metals in Babitonga Bay, allowing the assessment of the past anthropogenic impacts and assist a sustainable management of this ecosystem, taking into consideration the Linguado Canal reopening and the port and industrial expansion in the region.

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Historical mercury contamination in a major Latin American industrial and port complex: the case of the Santos estuary, Southeastern Brazil

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and Juliê R. Sartoretto; Bianca S. M. Kim; Paulo A. de L. Ferreira; Beatriz Benedetti; Michel M. de Mahiques; Rubens C. L. Figueira

The present study determined total mercury (Hg) in four ²¹⁰Pb dated sediment cores to assess the historical anthropogenic Hg accumulation in the Santos estuary, Southeastern Brazil. Background levels were identified using the deepest sections of the cores, corresponding to pre-industrial ages. Mercury distribution in the sediment cores (0.02–2.64 mg kg⁻¹) presented a large spatial and temporal variation. Contamination is highest in the upper estuary and indicates that the industrial hub, especially a chlor-alkali plant is the primary source of Hg. A contaminant trap effect is observed in this area associated with high fine sediment accumulation and Hg fluxes. The contamination pattern indicates that the regions not affected by direct inputs are influenced by reworking, resuspension, and transport of contaminated sediments by tidal flows. The Hg enrichment in the upper layers of the sediment cores demonstrates that the environmental actions fulfilled in the 1980s were insufficient to control Hg pollution in the Santos estuary.

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Evolução de filtros fluorescentes em fotóforos de Stomiiformes

José R. L. Paitio¹

and Marcelo Melo¹

O mar profundo é o *hotspot* de bioluminescência do planeta, sendo este um dos meios de comunicação principais neste habitat. Stomiiformes é a ordem mais antiga e diversa de peixes bioluminescentes e possuem diferentes tipos de fotóforos para funções ecológicas inter e intraespecíficas. O espectro de luz produzido para diferentes sinais comunicativos requer modulação através de filtros pigmentados. Pigmentos variam entre espécies e até entre diferentes tipos de fotóforos do mesmo animal. Alguns destes pigmentos emitem fluorescência laranja – vermelha ao absorver luz de comprimentos de onda curtos. Os estudos dedicados a estes pigmentos são quase inexistentes, apenas dados dispersos de espécies e tipos de fotóforos, e não tendo sido ainda precisamente identificados ou compreendida a sua função na emissão de luz. O objetivo principal deste projeto é o estudo da evolução destes pigmentos em fotóforos de Stomiiformes e o seu papel na emissão de luz. Através de análises de espectrometria e bioquímica dos pigmentos, e molecular dos mesmos (transcriptomas) e espécies (DNA barcoding), pretende-se a identificação dos pigmentos, o mecanismo biológico de modelação de luz nos fotóforos e sua distribuição filogenética.

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Sources of sedimentary organic matter in the Río de la Plata estuary: a molecular and compound-specific isotope approach

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Estuarine and coastal sediments serve as important reservoirs for organic matter, playing a significant role in the global carbon cycle. These sediments accumulate a variety of lipids, including straight chain alkanes (n-alkanes), which originate from different sources such as terrestrial plant waxes, marine phytoplankton, bacteria and anthropogenic inputs. The Río de la Plata (RdLP) estuary, the second-largest fluvial system in South America, contributes a substantial amount of sediment annually to the ocean, impacting the southeastern coast of Uruguay. In this context, the present study aims to characterize n-alkanes in surficial sediments to estimate the sources of organic matter along the RdLP estuary. Sediment samples collected from the RdLP estuary were analyzed for their n-alkanes concentration and stable carbon isotope ratios. The total concentrations of n-alkanes in the sediment samples ranged from 1.35 to 12.20 $\mu\text{g g}^{-1}$. Generally, higher n-alkane contents were observed in samples from the upper estuary. Terrigenous organic matter, characterized by the presence of odd and high molecular weight n-alkanes (n-C₂₉, n-C₃₁, and n-C₃₃), was found in all samples. Throughout the Río de la Plata estuary, the lack of dominance of odd n-alkanes over even ones suggests the recent introduction of petroleum-derived products. Some samples exhibited higher concentrations of medium-chain n-alkanes (n-C₂₃, n-C₂₄, and n-C₂₅), indicating the presence of petroleum-derived products with a higher degree of degradation. The stable carbon isotope analysis of n-alkanes (n-C₂₇ to n-C₃₃) ranged from -33.3 to -26.9‰. These values are typically associated with odd n-alkanes of high molecular weight derived from C₃ plant sources. However, the influence of anthropogenic input may have resulted in depleted $\delta^{13}\text{C}$ values, as anthropogenic organic matter often exhibits lower $\delta^{13}\text{C}$ signatures. Samples from the upper estuary displayed the most depleted values, with $\delta^{13}\text{C}$ values below -31‰. These samples, likely experienced greater input of petroleum-derived products. Anthropogenic contributions and terrigenous organic matter were evident in most samples. The $\delta^{13}\text{C}$ values indicated a primary origin from C₃ plants; however, petrogenic inputs may have influenced the $\delta^{13}\text{C}$ values, making it challenging to distinguish natural sources.

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Exploration of deep-sea coral reefs through 3D reconstruction

Linda G. Waters

My work has centered around the analysis of deep sea imagery originating from periodic surveys conducted by the petroleum industry. I am assessing the current state of deep sea coral reefs through 3D reconstruction, GIS overlay of organisms recorded through video, physical oceanographic data, and current flow direction assessment using biological indicators. I am also working on the development of a deep-sea imaging and instrumentation observation platform, deploying and recovering this at sea to conduct long-term observations of coral and associated organism behavior in deep-sea reef areas in the Bacia de Campos region off the coast of Brazil. From this observation platform, we hope to gain and understanding of coral behavior in relation to the physical environment. In conjunction with this, I am analyzing sediment core profiles of nearby deep-sea sediments to detect changes in the particles that the corals receive as food during the observation period. Coral bank structures observed in the study regions vary from <2,700 to >10,000 square meters, with higher variations in temperature and current velocity at some sites partially explaining bank size differences. Accompanying sediment core samples indicated through higher chl a levels 1–2 cm below the surface than at the surface that deeper sediments are being resuspended and deposited over more recent nutrient-rich recent deposits, indicating an alteration in the particle nutrition that coral polyps encounter in these deep reef environments. These environments are being monitored over a longer time period than previously possible, allowing new insights into deep-sea coral reef ecology.

A new perspective into the discovery of diversity of sea cucumbers (Echinodermata: Holothuroidea)

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and Karen B. Costa^{1, 3}; Felipe Toledo^{1, 4}

The study of disarticulated ossicles of recent sea cucumbers from Campos Basin, Rio de Janeiro, Brazil, from various Holocene strata, obtained by micropaleontological methods, resulted in the identification of at least eight holothurian taxa, belonging to the four of the seven orders of Holothuroidea: Apodida (Synaptidae, Chiridotidae), Dendrochirotida (Psolidae and Cucumariidae), Holothuriida (*Holothuria*) and Molpadiida (Molpadiidae, Eupyrgidae). Our paper endorses the importance of studies of recent fauna based on isolated ossicles for taxonomy, biostratigraphy, and ecology. This study represents the first effort at the study of recent fauna of sea cucumbers based on the analysis of preserved ossicles in marine sediments.

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Challenges and opportunities for sustainable ocean science: the quest for a transdisciplinary approach

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To face the complex challenges related to ocean sustainability, the United Nation's Decade of Ocean Science for Sustainable Development (2021–2030) invites academia to rethink and transform ocean science toward a more inclusive, democratic, and accessible one. In other words, it is necessary to craft the path to more transdisciplinary ocean science and strengthen the science–society relationship. We understand the path for transdisciplinarity as a strategy to approximate science and society in knowledge production and application through a dialogical and collaborative approach that reflects on the desired future and ways to promote the needed transformations to achieve it. Achieving transdisciplinarity for policymaking, though, is not an easy task. It faces obstacles related to how science and politics are conceptualized, funded, and practiced, and a common understanding of what is desired in shaping such relations is necessary. To discuss the issue in practical terms, we ask marine protected area coastal managers in Brazil what are the opportunities and challenges related to the practice of transdisciplinarity. By applying the evaluative scheme of 'Sustainability Transition Experiments, 'we investigate the perception of the managers on the required conceptual elements and programmatic indicators in the promotion of an agenda that reconciles science and management for ocean sustainability. By identifying the necessary inputs (e.g., trust, support, and commitment) and process characteristics (e.g., collaboration, reflexive learning, and transparency) to achieve the desired outcomes (e.g., social–ecological integrity, democratic governance, and resource maintenance and efficiency) and outputs (e.g., capacity building, actionable knowledge, and social changes), we analyze and discuss ongoing science–policy interaction process on the management of the protected areas to identify where energy should be focused to transform and build new relationships between academia and managers.

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Paleoichthyology applied to otoliths in marine sediments of the continental margin of the São Paulo state (Brazil)

Natasha T. Hoff¹

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Brazilian paleoichthyological studies are restricted to demersal species and coastal zones, such as the Miocene Pirabas Formation and Quaternary shell mounds. Here, we evaluated the occurrence of otoliths' morphotypes in marine sediment cores of the continental margin of the São Paulo state (Brazil) in the coastal zone of Cananeia (n = 81) and in the continental slope (n = 37). Samples were sieved (mesh size: 0.350 mm) for subsequent picking of specimens in a stereomicroscope. Each otolith was photographed, characterized through morphometrics measures, and visually classified into the morphotypes, described according to shape indexes. Significant differences among morphotypes were tested using uni- and multivariate analyses. Otoliths were not found in the Cananeia samples. From the 294 otoliths found in the continental slope, 189 were classified among six morphotypes. The most abundant morphotypes were B (29.9%) and C (24.6%). Significant differences between C, D, and E from other morphotypes were detected for roundness, ellipticity, and aspect ratio indexes. Most otoliths belong to the Myctophidae family, the main mesopelagic fish group that presents a worldwide distribution, great abundance, biomass, and diversity. Their otoliths predominate in marine sediments collected at depths greater than 200 m, which justifies their greater abundance. Once Myctophidae fossil otoliths are of difficult identification and present a large lack of knowledge worldwide, shape morphometry may be a good possibility for this kind of analysis and comparison with recent otoliths.

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Sediment-water fluxes and the nitrogen cycle in two estuarine systems of São Paulo

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A combination of laboratory sediment incubations were done to unravel sedimentary processes magnitude involved in the nitrogen cycle in two São Paulo coastal areas. The aim was to highlight how natural conditions and anthropogenic activities affect the sediment metabolism and the N cycle. The use of traditional flux measurements associated with isotope technics allowed the measurement of different nitrogen metabolic pathways to be followed in the incubated sediments. Simultaneous analysis of sediment–water fluxes, microbial activity rates and macrofauna composition were realized. Intact sediment cores were sampled in different nutritional environments (freshwater to marine), with different degrees of preservation (Santos–São Vicente estuarine complex and estuarine–lagunar complex of Cananéia–Iguape) at different times of the year (spring, summer, autumn and winter). Laboratorial dark incubations were performed to measured flux of dissolved gases and inorganic nutrients. A second incubation was performed with stable isotope paring techniques, to observe the effects on the benthic nitrification, denitrification, anammox and DNRA rates. In general, we founded that the presence of macrofauna is the most important factor affecting the benthic metabolic characteristics of the systems. Macrofauna affects fluxes directly, via respiration, excretion and ventilation of their burrows. On the other hand, the processes related to the nitrogen cycle presented more varied results, depending on the conditions of the environment of each studied time and location. The results founded will bring an improvement in the knowledge of the benthic metabolism and in the nitrogen cycle in tropical coastal regions, not only in Brazil but also on a global scale.

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Distribuição espacial e sazonal da comunidade de nematódeos de vida livre do Platô de São Paulo (Bacia de Santos)

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No âmbito do Projeto de Caracterização Ambiental da Bacia de Santos (projeto PCR-BS/PETROBRAS) o objetivo deste estudo foi caracterizar a distribuição espacial da comunidade de meiofauna e gêneros de nematoda do Platô de São Paulo (Bacia de Santos) comparando com a área adjacente no talude, avaliando se há diferenças entre essas regiões. Além disso, foram avaliadas as diferenças sazonais na comunidade de meiofauna e gêneros de nematoda do Platô de São Paulo (Bacia de Santos) e área adjacente em duas épocas de coleta, verificando se há diferenças entre essas regiões. O foco foi nas amostras mais profundas do PCR-BS, separadas em três classes de profundidades (de 1300 a 1450 m; de 1700 a 1950 m; de 2140 a 2400 m), em duas áreas (Platô de São Paulo -Platô e a Área Adjacente -Ad)) e em duas campanhas de coleta. As amostras foram coletadas em triplicatas a partir de amostra de box-corer, com auxílio de um corer de 5 cm de diâmetro e 10 cm de altura (19,63 cm² de área). O processamento das amostras de meiofauna em laboratório consistiu em quatro etapas principais: peneiramento e elutriação dos organismos, contagem e identificação dos organismos meiofaunais, montagem de lâminas de Nematoda e identificação dos gêneros do filo Nematoda. A densidade da meiofauna, de Nematoda e a diversidade de Nematoda foi mais alta na C1 do que na C2 e nas profundidades mais rasas, sendo que na C1 também foi mais alta na área adjacente do que no platô, confirmando que a região estudada não é homogênea, sendo que diferenças espaciais e sazonais foram encontradas, além das diferenças batimétricas que já são esperadas. A estrutura das associações de Nematoda foi caracterizada pela predominância dos gêneros *Acantholaimus*, *Monhystrella* e *Halalaimus*, com *Sabatieria* ocorrendo nas profundidades mais rasas e sedimentos mais finos. As variáveis relacionadas à quantidade (TOC, P_Org, feopigmentos) e à qualidade da matéria orgânica (CBP), que, como esperado, foram importantes estruturadores da densidade e diversidade da meiofauna e Nematoda, tiveram valores mais altos na área adjacente em comparação com o platô e nas profundidades mais rasas, explicando as diferenças espaciais observadas na densidade. A alta concentração de sedimentos carbonáticos, originados da deposição de detritos biogênicos, nas maiores profundidades e principalmente na região do Platô de São Paulo afeta fortemente a estrutura

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do sedimento e contribui para um maior desvio padrão do tamanho do grão e menor capacidade de adsorção das partículas orgânicas, sendo a principal variável explicativa para a diferença entre as áreas. As diferenças sazonais, contradizem o esperado, já que na C1 (coletada no inverno), apesar os valores mais baixos de TOC, P_ORG e feopigmentos e do sedimento mais grosso, a densidade da meiofauna foi maior que na C2 (coletada no verão).

The role of Brazilian Southeast Continental Margin and the South Atlantic in the oceanic biological pump

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The ocean plays a major role in regulating Earth's climate. This is one of the reasons Unesco proclaimed this as the '*United Nations Decade of Ocean Science for Sustainable Development (2021-2030)*', a practice that highlights not only the importance, but also the urgency to understand current and future processes in the face of climate change. Among the main oceanic mechanisms that regulate carbon dioxide concentration in the atmosphere and, consequently, climate itself, is the biological pump. This process represents the transport pathways in which organic carbon reduced in oceanic upper layers is transferred to deep waters. Understanding local and temporal variability, its main components and response to climate change is crucial to realize the biological pump role in present and future scenarios. In this context, this work has sought to expand our current knowledge about this matter in the Brazilian Continental Margin and the South Atlantic Ocean, regions still poorly studied. Based on biogeochemical analyzes of vertically exported particles, collected by eulerian sediment traps, it was possible to investigate seasonal patterns in the magnitude and quality of carbon flux and other elements, as well as to analyze the main planktonic taxonomic groups responsible for exportation. For example, during summer periods, when there are favorable conditions to formation of productive subsurface maximums, there were peaks in organic carbon export ($8.3 \text{ mg m}^{-2} \text{ d}^{-1}$), an increase of about 125% of the flux average. The N^{15} isotope analyses revealed the important contribution of nitrate based production to the export of particulate organic material. In this scenario, the carbon transfer efficiency can increase by an order of magnitude when there is a predominance of biogenic silica in the flux, ie diatoms and silicoflagellates. During late autumn and winter, calcium carbonate becomes the main ballast mineral, represented by dinoflagellate cysts and coccolithophorid, the result of a regenerated production regime in the euphotic zone, with a smaller and less efficient export. The use of satellite data (SST and chlorophyll-a) was used to complement the study in order to create a regional export model [$F(z) = 3.7(z/750)^{-1.4}$, RMSE = 2.5]. The next steps of this research consist of new deployments, since the low sample number is the main limitation of the study, and the development of expanded ecological models taking into account new measurements, such as biomarkers and hydrocarbons.

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Integrative approach to identifies a new species of deep-sea lantern shark (Etmopteridae: Squaliformes) in the Southwest Atlantic: preliminary results from *Etmopterus lucifer* clade

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Etmopterus Rafinesque 1810 is a genus of small to medium sized (mostly below 800 mm TL), bioluminescent, deep-sea sharks, commonly known as lantern sharks. Among the 43 valid species recognized nowadays, five were previously recorded in the western South Atlantic, *E. bigelowi* Shirai & Tachikawa 1993, *E. gracilispinis* Krefft 1968, *E. granulosus* (Günther 1880), *E. hillianus* (Poey 1861), and *E. lucifer* Jordan & Snyder 1902. Despite the records, *E. lucifer*, which for a long time was considered a shark with wide distribution in temperate and tropical oceans, had its area of occurrence limited to the Pacific Ocean recently. The correct identification of species and their respective geographic distributions are hampered by the great overlap of morphological characters and the scarcity of molecular data originating in the Southwest Atlantic. Thus, the present proposal aims to carry out an integrative taxonomic analysis to identifies a putative new species of deep-sea lantern shark of *E. lucifer* clade in the southwest Atlantic Ocean. The material used in this description includes 32 specimens (158–470 mm TL) collected on board the R/V Alpha Crucis, as part of the DEEP-OCEAN Project; 36 specimens (293 – 495 mm TL) obtained from commercial fishing bycatch landed at Santos Fishing Terminal (State of São Paulo, Brazil), and one specimen from the Museu de Zoologia da Universidade de São Paulo – MZUSP (398 mm TL). All samples were collected from the continental slope of southeastern and southern Brazil (24°37'53''–28°31'17''S, 44°08'42''– 46°51'31''W), at depths above 200m. The new species, as a member of the *E. lucifer* clade, diagnosed among its congeners by the patterns of photophores on flank, dermal denticles pattern and number of tooth cupids. Prospective work includes sequencing of mitochondrial genes (COI) as part of an integrative taxonomic of the WSA species.

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Chemical characterization of deep-sea corals from Southwest Atlantic

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Pockmarks and Carbonate mounds are geologically important features distributed worldwide in the oceans. In this study, we present a chemical characterization of deep-sea scleractinian coral skeletons collected in these geomorphological areas at the southeastern continental margin of Brazil. These organisms are known as archives of climatic variations, serving as indicators of changes in salinity, temperature, and contaminants in the marine environment. Corals preserve information about past physicochemical alterations and the properties of the seawater in which they grew within their skeletons. This information is stored as geochemical signals, through changes in the concentration of metals related to environmental parameters. Coral samples were collected in ten sampling stations (588, 589, 591, 592, 593, 681, 683, 684, 685, and 687) during cruises aboard the R/V Alpha Crucis in 2019. Three species of scleractinian corals were studied: *Enallopsammia rostrata*, *Solenosmilia variabilis*, and *Desmophyllum pertusum*. Metals, phosphorus and stable isotopes of carbon and oxygen ($\delta^{13}\text{C}$ and $\delta^{18}\text{O}$) present in the coral carbonate skeletons were analyzed, and the Element/Ca ratios and $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ allowed the characterization of the studied areas. The results were indicators of the dominant spatial distribution and influence in the studied areas. Area 1 (681, 683, and 684), which has pockmarks, and station 687 (Alpha Crucis Carbonate Ridge, area 2), showed an affinity with particulate materials and terrigenous input (Ba/Ca, Fe/Ca, Mn/Ca, Li/Ca, and Mg/Ca). Greater availability of nutrients and anthropogenic materials is also likely to occur in this region (Pb/Ca, Cd/Ca, Zn/Ca, and P/Ca). These seamounts can act as barriers for metals from land flows and are associated with particulate material incorporated into corals. These corals benefit from a higher food supply due to stronger currents and are biodiversity hot spots in the deep sea. The corals that are at the top of the Alpha Crucis Carbonate Ridge (area 2 – 588, 591, 592, and 593) show changes in temperature since their formation, receiving more significant marine influence. Most coral samples have carbonate of aragonitic origin, with a single exception, a specimen of *D. pertusum* from station 681, which presented carbonate of mixed origin (biogenic calcite and aragonite). The formation temperature was estimated through the relationship between $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$, allowing us to speculate that *S. variabilis* and *E. rostrata* were formed in periods of lower sea level due to the

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higher formation temperature compared to the current one. The Ba/Ca, Mg/Ca, and Sr/Ca ratios showed levels similar to those found in corals around the world, but higher values of Cd/Ca, Fe/Ca, Pb/Ca, P/Ca, Li/Ca, Li/Mg, Zn/Ca in corals in the present study concerning relation to other oceans, point to a higher supply of terrigenous, compounds of anthropogenic origin and nutrients in the Southwest Atlantic. The results demonstrate the potential of scleractinian corals in the chemical characterization of the deep ocean and the need for further investigation of carbonate mound areas from the SW Atlantic.

Early development of sexual behavior in wild infant capuchin monkeys

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The diversity of sexual behaviors in non-human primates is remarkable, including courtship displays, manual-genital, oral-genital, and genital-genital stimulation, as well as mounting interactions between same-sex or different-sex partners. However, the developmental pathways of sexual behavior during individual ontogeny are relatively understudied. Generally, sexual behavior prior to sexual maturation in primates is interpreted based on the need-of-practice hypothesis. In this study, we investigated the development of sexual behavior in wild infants of two species of capuchin monkeys (*Sapajus libidinosus* and *S. xanthosternos*). The gradual acquisition of adult patterns of sexual behavior may indicate a process of learning. Sixteen individuals, 8 males and 8 females, were the subjects of focal-follow observations and weekly filming. The recorded behaviors were transcribed using specific software and analyzed across the first 12 months of life at 4 developmental points (1st–3rd, 6th, 9th, and 12th month of life). In both species, males exhibited sexual behaviors earlier than females (during the second month), such as immature mounting attempts and genital inspections. Furthermore, males predominantly initiated sexual interactions while females received them. More than 50% of the observed sexual interactions occurred between two males. The most frequent context for sexual interactions between infants was social play. Complete mounts only occurred after previous mounting attempts, supporting the need-of-practice hypothesis. However, it remains unclear why males would require more practice than females, given that in *Sapajus* spp., females usually take the lead in courtship and reproduce earlier than males. Studying the early stages of sexual behavior contributes to the understanding of sexuality development in our own species and of its flexibility throughout the lifespan.

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Biofragmentation of polystyrene microspheres by the amphipod *Hyaella azteca*

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Microplastics (MPs) are a pervasive form of pollution in the environment, posing a significant global problem. These particles are mainly originated from the breakdown of larger plastic debris and undergo continuous fragmentation. It is crucial to comprehend the pathways of fragmentation since they affect the fate of the particles and their toxicity. Amphipods have been suggested to play a role in inducing the fragmentation of plastic debris. To investigate this further, we exposed *Hyaella azteca* to different concentrations (540, 2700, 5400 items/L) of 24.5 µm polystyrene MPs (PS-MP) for seven days and observed particle size reduction and mortality rates. Exposure via food was prepared with a 5 g/L suspension of flaked fish feed (TetraMin). The fish feed suspension (100 µL) was added to the MPs suspension at each of the concentrations tested, and the resulting mixture was dried in porcelain containers to form a pellet. The porcelain container was placed on the bottom of each test flask. After each time point, the medium was completely filtered through a vacuum system in glass fiber filters. The filters were investigated under a stereomicroscope to measure particles (n = 20 per replicate) and to check if there was a reduction in mean size. During exposure, the flasks were monitored for amphipod mortality at 48, 96, and 168h. While we observed successful ingestion of the particles, we did not find any negative effects on *H. azteca* survival. However, we noted that the PS-MP underwent intense fragmentation throughout the ingestion and egestion processes, resulting in a final size up to 25.3% smaller than their initial size. This fragmentation was observed over different timepoints (24, 72, 120, 168h) and showed a constant reduction in average particle size, indicating that *H. azteca* can indeed induce PS-MP fragmentation. Scanning electron microscopy analysis of the exposed samples revealed visible signs of physical changes such as cracks, fissures, and irregular edges on the PS spheres. These modifications in the MPs morphology suggest that the organisms are interacting with the particles and causing damage to their structure. The changes in the surface and structure of the particles may have occurred due to the exposure to mechanical forces, gut enzymatic processes, the intestinal microbiome, or a combination of all three. The reduction in particle size over time could potentially represent a significant route for trophic transfer.

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Solid phase extraction on a porous polymer monolith decorated with dithizone for greener visual and spectrophotometric detection of Hg(II)

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Menção Honrosa

Mercury and mercurial species are highly toxic and bioaccumulate in the food chain, causing several health problems for living beings at low concentrations. Spectroscopic techniques for determining Hg involve high instrumentation and operation costs. UV-vis measurements are simple and robust, relying on portable instrumentation widely available in research and industrial laboratories, but reaches satisfactory sensitivities for Hg(II) if liquid-liquid extraction (LLE) procedures are undertaken, that use toxic solvents, are laborious and time-consuming, not being compatible with field analyses. As an alternative, this work proposes the fast preparation of a dithizone (DTZ) modified C18 polymeric monolithic column synthesized inside polypropylene ink-pen tubes by photo copolymerizing stearyl methacrylate (SMA) with ethylene glycol dimethacrylate (EDMA) in the presence porogens solvents. The resulting poly(SMA-co-EDMA) monolith retains DTZ, which concentrates mercury from aqueous media, followed by spectrophotometric detection of the mercury-dithizone complex at 460 nm after elution with ethanol. Limits of detection (LOD) and quantification (LOQ) were 7.9 and 26 $\mu\text{g L}^{-1}$, respectively. The adsorption capacity for a 40 × 2 mm column was 7.8 $\mu\text{g g}^{-1}$, able to perform ten cycles of SPE with recoveries of about 100%. The enrichment factor was about 10-fold was estimated. EDTA circumvented potential metallics interferences, with a variation less than 6.8%. Chloride, humic and fulvic acids caused variations of -3.3%, +2.5% and - 7.5% in the Hg(II) measurements, respectively, suggesting a greater affinity between Hg(II) and dithizone than the other complexing/chelates species. Samples enriched with 30, 60 and 90 $\mu\text{g L}^{-1}$ Hg(II) exhibited recoveries greater than 90%, whereas samples analyzed without enrichment had Hg(II) concentrations lower than the LOQ. The poly(SMA-co-EDMA) column was of rapid preparation (20 min) and exhibited permeability ($2 \times 10^{-13} \text{ m}^2$), enabling the sample loading (12 mL) at 1.0 mL min^{-1} assisted by a syringe pump. The proposed methods have the potential for field analyses, given the procedures simplicity and the instrumentation portability. It attends to the demand for cleaner analytical methods using reduced amounts of dithizone (6.8 nmol per column) and ethanol for elutions, thus avoiding toxic solvents such as the CCl_4 classically used in ancillary dithizone-based spectrophotometric methods for Hg(II).

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Bioluminescence of fungi, millipedes, and marine organisms: chemical and biological aspects

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Bioluminescence is the light emission phenomena by certain organisms as result of the oxidation of a substrate (luciferin) by an enzyme (luciferase). In bioluminescent (BL) fungi, the light emission is the result of enzymatic reactions in the so-called Caffeic Acid Cycle (CAC). About 20% of all species of BL fungi known in the world were described by our research group in collaboration with fungal taxonomists from Brazil and USA. Over the last three years, we have been working on field collections at the Atlantic Rainforest and Palm Forest biomes for the taxonomic identification and isolation of pure cultures. More than 90 BL fungi specimens, some of them potentially new species, are under morphological and genetic characterization for their proper taxonomic classification. Recently, we obtained the *de novo* genome assembly from *Neonothopanus gardneri*, a Brazilian BL fungus with intense green light emission used as a model-organism to understand the molecular regulation of the fungal BL. We also identified and validated reference genes to normalize the data of the transcriptional expression of both CAC and clock-genes from the mycelium cultivated under circadian conditions. Regarding the marine BL organisms, we have characterized a new class of calcium-regulated photoprotein (Cestidin) from the ctenophore Venus girdle (*Cestum veneris*), related to its green light emission. Other new luciferin-luciferase systems are also under investigation, including a new luciferase and GFP from the sea pen coral (*Anthoptilum sp.*). During the current research internship abroad, we collected the Californian bioluminescent millipedes (*Motyxia sp.*) and we are conducting biochemical assays to explore the components of this new system. In this scenario, this project contributes with valuable information required for the comprehension of biodiversity, evolution, and the molecular mechanisms behind the light emission systems in nature. Besides, this research paves the way for the development of new bioluminescent-based applications, including bioassays, reporters for genic expression, and bioimaging.

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Toxicological effects of silver nanoparticles (AgNPs) under localized surface plasmon resonance (LSPR) stimulation

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The widespread use of AgNPs inevitably results in AgNP pollution in aquatic ecosystems because these environments are the final destination of industrial, domestic, and agricultural residues. The entry of AgNP in aquatic environments can represent a risk to the inhabiting organisms. A particular characteristic of AgNPs is their sensitivity to plasmonic stimulation. The LSPR promote a collective oscillation of electrons on the interface of AgNPs after the incidence of light on their surface in a specific wavelength. The present study aimed to investigate the potential of plasmonically stimulated AgNPs to induce mortality and oxidative stress on *Daphnia similis*. AgNPs of two shapes (sphere and triangle) were synthesized using chitosan as the coating material. Neonates (6–24h) were exposed to different concentrations of AgNPs (0, 5, 10, 20, 40, and 80 $\mu\text{g}\cdot\text{L}^{-1}$) and different light conditions (dark, white, red, green, and blue) for 48h at 22°C. The results demonstrated that under light conditions that promote plasmonic stimulation on the AgNPs, the mortality was significantly increased. For both tested AgNPs, spherical and triangular, the plasmonic stimulation increased the toxicity by 61.45 and 45.45%, respectively, compared with dark condition. The treatments using white light conditions showed an increase in the mortality for both AgNPs, compared with dark conditions, displaying higher values for the spherical ones. The results demonstrate the toxicological potential of AgNPs and the increase of this potential under specific plasmonic stimulation conditions. Particularly, under white light conditions we can obtain information about the impacts of the presence of these nanoparticles in natural environments. Also, the present work brings a new perspective on the luminosity adopted in regular studies investigating the effects of metallic nanoparticles sensitive to plasmonic stimulation. Additional laboratory studies will be carried out to investigate the sublethal effects on biomarkers of oxidative stress.

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Feasibility of sugarcane bagasse/polydopamine as sustainable adsorbents for Cr(VI) with reusability in cement composition

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This poster aims to present the results obtained after 1 year of postdoctoral studies. It was developed a chromium (VI) adsorbent with a second possible application after its exhaustion. Below is presented a short description of the main results: (I) *Chromium (VI) adsorbent with cement-based application*: Sugarcane bagasse/polydopamine (SB/PDA) adsorbents were employed in batch and column adsorption studies aimed to remove Cr(VI) ions from wastewater. The utilization of these adsorbents demonstrated their exceptional capacity for adsorption, making them a promising solution for water treatment applications. A second step examined the long-term stability and performance of the cement/spent adsorbent samples to ensure their practical second-application. No leaching of Cr(VI) was detected from the cement/adsorbent samples, and any potential negative impact was observed on mechanical properties after the incorporation of the spent adsorbents. The remarkable efficacy demonstrated by the excellent adsorption capacity coupled with their successful incorporation into cement, underscores their potential as a sustainable solution for the effective treatment of contaminated water and the responsible management of both liquid and solid waste streams.

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CO₂ valorization into fuels

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Transforming our society, which is currently reliant on petroleum derivatives, into a green and sustainable economy is one of the most crucial challenges of our generation. Mitigating air pollution and climate change caused by greenhouse gas emissions through their conversion into relevant chemicals is an interesting path to explore in the field of green chemistry. One of the possible strategies is the hydrogenation of CO₂ into value-added products. Due to growing concerns about climate change and fluctuating oil prices, more and more efforts are being directed towards making synthetic fuels a reality. Synthetic fuels can be even greener if derived from CO₂ because, although CO₂ is emitted during combustion, the carbon cycle of the fuel would be closed as CO₂ is used again in the fuel's manufacturing process. Therefore, the life cycle of a fuel synthesized from CO₂ would be more sustainable than that of fossil fuels in all environmental aspects. The valorization of CO₂ through its hydrogenation into alcohols is quite challenging due to the thermodynamic stability of the CO₂ molecule. The use of high pressures has been one of the most successful approaches in tackling this challenge. Additionally, the development of a catalyst for the conversion of CO₂ into alcohols under high pressure is essential. The catalyst should contain active sites designed to favor C–C coupling, thus enabling the growth of the carbon chain and facilitating the production of higher alcohols. In this project, some successful examples of converting CO₂ into value-added products, such as methanol and ethanol, will be presented. The use of rhenium-based catalysts and supercritical CO₂ shows promise as a tool for obtaining combustible alcohols from CO₂.

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From CO₂ and Brazilian biomass to renewable copolymers for coating and flexible materials

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Renewable polymers from maleinized or carbonated oils are well known in the literature [1]. However, for the first time a copolymer was synthesized using both oil derivatives and five different amines as cross-linkers (Hexanediamide-HDA, Lysine-LYS, 4,4'-Diaminodiphenylmethane-DAM, Melamine-MEL, and Tris(2-aminoethyl) amine-TAA). The macaw palm oil (*Acrocomia aculeata*) is part of Brazilian biomass and was selected due to its higher production when compared to soybean oil. Macaw palm produces 4,000 L of oil per hectare of crop; this is much higher than the soybean, which produces only 500 L per hectare [2]. The copolymer was cured for 24 hours at 110 °C, it is observed a reduction of time and temperature when considered the polymer using only carbonated oil (72 hours at 140 °C). The copolymer from HAD is flexible and presents a hydrophobic feature; therefore, can be used as coating. All polymers presented hydrolysis in basic solution. Each property regarding mechanical and thermal analyses can be seen in Table 3. DSC, relaxation measurement, stress x strain curves, and cross-linking density are found in Figure 1.

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Table 1. Thermal, mechanical and cross-linking properties of the polymers

	P-HDA	P-LYS	P-DAM	P-MEL	P-TAA
T_g - TG (°C)	173.66	138.43	162.06	162.71	170.35
T_g - DSC (°C)	3.63	4.47	-5.18	-15.05	5.07
$Tan-\delta$ (°C)	4.22	14.69	-	-9.99	6.94
Stress (MPa)	0.07	0.06	0.13	0.04	0.09
Strain (%)	34.73	73.75	43.38	74.75	66.37
Cross-linking Density (mol m ⁻³)	32.4	73.8	-	50.3	30.6

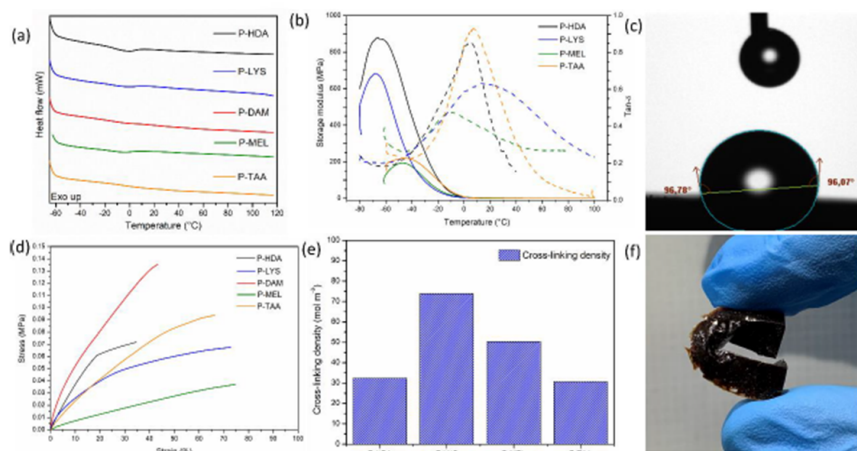


Figure 1. a) DSC curves b) DMA relaxation results showing storage modulus – E' (solid line) and $\tan-\delta$ (dashed line); c) contact angle measurement, d) stress-strain results; e) cross-link density results and (f) P-HAD image.

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Effective photoelectrocatalysis of levofloxacin antibiotic with Ti/IrO₂-Nb₂O₅ in environmental samples

Carlos H. M. Fernandes

This work presents a high-efficient catalyst based on IrO₂ and Nb₂O₅ for the degradation of the antibiotic Levofloxacin (LFX) in simulated and real surface water samples. The IrO₂-Nb₂O₅ films were obtained by the modified Pechini method and deposited on a titanium substrate, producing the Ti/IrO₂-Nb₂O₅ electrode. After the morphological, structural and electrochemical characterization, the Ti/IrO₂-Nb₂O₅ electrodes were applied in the degradation of LFX by different processes, such as electrolysis (EC) and photoelectrolysis (PhEC) and the results were compared to photolysis using irradiation UV-Vis light. The PhEC process showed greater and faster removal of the antibiotic in the different water matrices compared to the individual *photolysis* and EC processes, reaching 100% degradation and about 70% mineralization at the end of 1.5 h of treatment. Quenching tests showed that LFX degradation during PhEC may be associated with the presence of active radicals, such as HO•, SO₄^{•-} and O₂^{•-}, in addition to the e⁻/h⁺ pair formed with the incidence of light during treatment. In addition to excellent photoelectrocatalytic activity and high stability, Ti/IrO₂-Nb₂O₅ showed high electrochemical active surface area (ECSA). The excellent results of TOC removal by PhEC and the remarkable catalytic properties of Ti/IrO₂-Nb₂O₅ show that the system proposed here promotes a highly efficient treatment in the removal of organic pollutants from real water samples.

Synthesis of bio-based polyurethanes with simultaneous film formation using nanocellulose as additives

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The study of biopolymers, particularly cellulose, has gained significant attention in recent years due to the growing demand for materials derived from renewable sources and with reduced greenhouse gas emissions. Polyurethanes (PU) play a significant role in the plastic market, making the exploration of bio-based approaches for PU production crucial in the pursuit of a more sustainable future. This research focuses on the synthesis of PU films without the use of solvents, employing castor oil (CO) and microcrystalline cellulose (MCC) as polyols, along with an aliphatic polyisocyanate resin based on hexamethylene diisocyanate (HDIr). Various amounts of cellulose nanocrystals (CNC) and nanofibers (CNF) were incorporated into the reaction mixture to form the films. The findings revealed that the CNC and CNF films exhibited homogeneous structures and displayed low surface roughness. These characteristics influenced the mechanical properties, with the CNC and CNF films demonstrating higher elongation (~50%) and tensile strength at break (~5 MPa) compared to the neat PU film. Thermogravimetric analysis indicated similar degradation patterns for cellulose and PU bonds across all the films. The contact angle measurements suggested a slightly higher hydrophilicity in the CNF films, as they exhibited slightly lower angles. Furthermore, the inclusion of nanocrystalline cellulose particles in the films reduced the permeability of oxygen by three-fold, with slight variations depending on the amount of additive used. The ongoing study aims to explore the coating of bacterial cellulose film with the reaction mixture to produce composite-type bio-based PU films with desirable tensile and oxygen permeability properties. The properties exhibited by the CNC/CNF films make them appealing for applications such as packaging.

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Synthesis and characterization of a ternary hybrid catalyst ($\text{Nb}_2\text{O}_5\cdot\text{La}_2\text{O}_3\cdot\text{CeO}_2$) supported on graphene to act as a cathode in the removal of endocrine disruptors by advanced oxidative process electrochemical (AOPes)

Thays de S. Lima¹

and Mauro C. Santos²; Artur J. Motheo¹

Many chemicals, natural or synthetic, can interfere with the hormonal system, these substances are called endocrine disruptors (EDs). These chemicals are linked to developmental, reproductive, brain and immune problems, making these compounds very harmful and dangerous to animals and humans. In this sense, this work aims to develop a viable alternative to treat effluents contaminated by EDs using several electrochemical advanced oxidative processes (POAEs), which present a good efficiency in the removal of emerging pollutants. This project also aims at the synthesis and characterization with a ternary hybrid electrocatalyst of niobium oxide, lanthanum oxide, and cerium oxide ($\text{Nb}_2\text{O}_5\cdot\text{La}_2\text{O}_3\cdot\text{CeO}_2$) supported on graphene for the manufacture of gaseous diffusion electrodes (EDGs), to act as a cathode in the electrogeneration of hydrogen peroxide (H_2O_2), and as an anode the boron-doped diamond electrode (DDB) will be used in anodic oxidation processes, electro-Fenton, Photo electro-Fenton and Solar Photo electro-Fenton simulated (homogeneous and heterogeneous) aiming at the degradation of EDs (imazethapyr, temephos, triazophos) in aqueous medium. In the heterogeneous Simulated Fenton Photo Electro Fenton process, it is intended to add cerium mesostructures to the solution, innovating in the application of the catalytic effect of cerium. Thus, it is believed that with these studies it is possible to develop a way to remove these compounds in aquatic matrices, in order to minimize their harmful effects on the environment.

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Sustainability in Fashion: preservation and cultural heritage

Anthoula Fyskatoris

The study intends, primarily, to evaluate the synthetic polymers that make up the textile objects of plastic materiality, that is, those that have synthetic fibers as raw material – manufactured fibers produced from a polymer constructed with chemical elements or compounds –, in the fashion collections present in two museological institutions in the city of São Paulo – Museu Paulista-USP and Museu de Arte Moderna de São Paulo (MASP). Likewise, the objectives of this research are to draw an overview of the fashion sector, especially in Brazil, and its interrelationships with sustainability, a theme that, day by day, gains importance and is the focus of concerns not only in the country, but in the world which, by extension, leads us to another problem, no less relevant, which concerns the excessive amount of plastics (and microplastics) and their socio-environmental impacts on the planet, an adversity that supports and motivated the choice of the central objective of this study. In this sense, in this research, we privileged, on the one hand, the reading, systematization and evaluation of the bibliographic production, which dialogues with numerous primary and secondary sources regarding sustainability in the fashion industry and, on the other hand, through physical-chemical, non-invasive and non-destructive methods, with emphasis on X-Ray Fluorescence, FTIR (Fourier Transform Infrared) and Raman Spectrometry methods,), examine the aesthetics and morphology of these synthetic polymers with the aim of proposing a policy of preventive conservation that can minimize the degradation of the plastics pertinent to these cultural goods, in this case, mostly, garments and, in this way, make a contribution to the preservation of the cultural heritage.

Museomics of the Brazilian ornithological collections: unraveling hidden and lost biodiversity

Fernanda Bocalini^{1, 2}

and Luís F. Silveira¹

The emergence of DNA massive parallel sequencing in the past decade has enabled the use of historical specimens from biological collections for genome sequencing (Museomics). Biological collections have now evolved into repositories of genetic information and this potential remains largely unexplored in Brazil. Numerous specimens have been collected in areas in which they no longer exist or where present-day collecting is not possible, such as the Brazilian Atlantic Forest (AF), where numerous taxa are presently rare and endangered. Now these taxa can have their genetic data accessed and included in taxonomic and systematic analyses providing support for conservation. Here, we sequenced ultraconserved elements of 58 bird museum specimens housed in the Museu de Zoologia da Universidade de São Paulo from 16 different taxa restricted to the AF to: infer population structure, genetic diversity, and effective population size; and compare current and historical data to calculate the extent of genetic diversity loss over the past century. Our results support the effectiveness of using DNA from museum skins as a reliable source of genetic information for diverse studies. Sequence assembly generated a mean of 2,852 contigs with a mean length of 335 base pairs and a mean coverage of 15.7X. Final SNPs matrices had a mean of 2482 SNPs and 8.5% of missing data. We inferred the genetic structure and could validate the taxonomic status of species on the brink of extinction. Population genetics indexes revealed low effective population sizes and genetic diversity in numerous populations, underscoring the urgency for conservation efforts.

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Amphipoda (Crustacea) from the remote oceanic archipelago Trindade and Martin Vaz, South Atlantic Ocean

Elkênita Guedes-Silva¹

and Marcos Tavares

The Trindade and Martin Vaz Archipelago (TMV) are volcanic in origin, having emerged about 3–3.5 mya from the sea floor, 5500 m below sea surface. Trindade Island and the much smaller Martin Vaz are relatively close to each other (49 km), but almost 1200 km away from the continental coast of Brazil and about 4200 km from the nearest African shore. The archipelago is mainly under the influence of the Brazil Current, which runs south along the Brazilian coast from about 10°S to 38°S. Knowledge about amphipods' taxonomic diversity in TMV is largely limited to a few studies. This study aimed was to investigate the amphipoda taxonomic composition in TMV. The specimens were collected over a 10-year period (2012–2022) under the Protrindade–CNPQ project. Various collection methods were employed, including scuba diving, snorkeling, suction pump, artificial reef substrates and baited traps conducted at different locations and depths. The collected material is deposited at the Museum of Zoology, University of São Paulo. Amphipoda were found in all years during the collection period totaling 1,890 specimens. So far, 11 amphipod families have been identified, which is approximately 2.5 times the number of families previously reported from TMV. The previously registered families include Ampithoidae, Hyalidae, Maeridae, and Pontogeneiidae, all of which were also found in the present survey. The following families are newly recorded from TMV: Caprellidae, Colomastigidae, Lysianassidae, Phliantidae, Melitidae, Leucothoidae and Photidae. Despite the dominance of the westward flowing trans-Atlantic South Equatorial Current), which brings warm waters from the western shores of Africa and should therefore facilitate the migration of the eastern Atlantic species westward to TMV, we expect that the insular amphipod fauna will prove to have a strong western Atlantic component as for other crustacean taxa.

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Tempo and mode of diversification in *Adontosternarchus* (Gymnotiformes, Aptereronotidae): exploring the origin of species diversity in Neotropical River channels

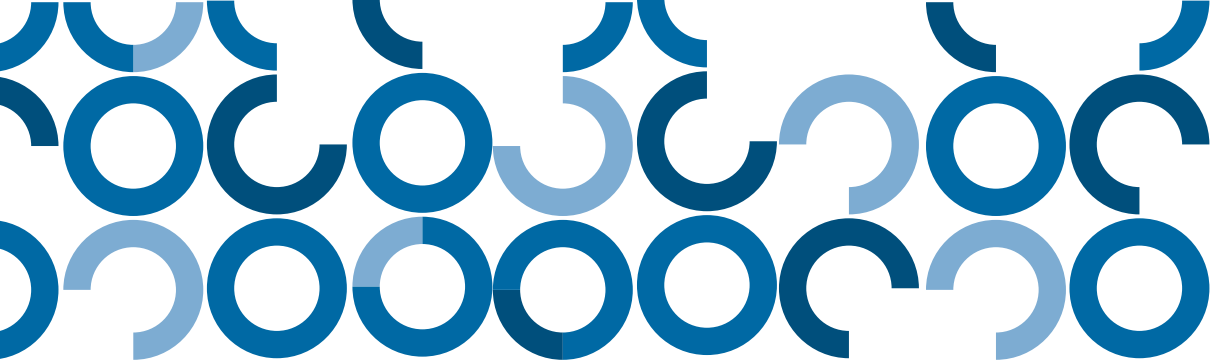
Marina V. Loeb¹

and Naercio A. Menezes

The Neotropical region harbours the largest taxonomic diversities for several aquatic and terrestrial faunal groups in the world, with the most updated number of fish species registered of about 8,000. Based on this massive diversity, reflections about tempo and mode of diversification in the group are justified, however, interpret tempo and mode of evolution in the Neotropical fauna constitutes a big challenge for researchers in the area due to: 1. Poorly resolved taxonomic and phylogenetic relationships; 2. Inadequate data about habitat, ecology, and geographical distribution; 3. Absence, or incomplete data on fossil records; and 4. Insufficient knowledge on the geological history of hydrographic basins development in the Neotropical region. *Adontosternarchus*, a genus of Gymnotiformes, has unequivocal data in literature on its monophyly, phylogenetic positioning in Aptereronotidae and interspecific taxonomic limits. In this scenario, *Adontosternarchus* becomes a target group for studying tempo and mode of species diversification in the Neotropical ichthyofauna, with six currently recognized species, preferentially distributed in the channels of the largest rivers in the lowlands of Amazon and Orinoco basins. Hypotheses of phylogenetic relationships will be generated for target populations and species based on Sanger and Next Generation sequencing data to obtain: 1. Gene flow between population and species; 2. Morphological disparity (measured with anatomical markers); 3. Taxonomic boundaries of species; 4. Biogeographical patterns; and 5. Diversification rates in *Adontosternarchus*. This research proposal is linked to the thematic project “Diversidade e Evolução de Gymnotiformes”.

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