Congreso Interpolitécnico de Investigación para Alumnos de Posgrado

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Miguel Antonio Domínguez Crespo
Jorge Roberto Vargas García
Luis Gerardo Zepeda Vallejo
Humberto Ríos Bolívar
Aidé Minerva Torres Huerta
Martha Leticia Vázquez González
(Coordinadores)

Instituto Politécnico Nacional

— México —

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(coordinadores)
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Prólogo

It is an honor to present the Second Edition of the Inter-Polytechnic Research Congress for Graduate Students 2025, a space designed to promote the talent, innovation, and scientific collaboration that distinguish the National Polytechnic Institute (Instituto Politécnico Nacional, IPN).

From September 22 to 26, 2025, researchers, authorities, companies, and special guests will share the same goal: to strengthen postgraduate research as an engine of transformation for Mexico.
The response from our community has been exceptional. In this edition, we received 575 abstracts from the four areas of knowledge, of which 439 research papers were accepted, distributed among 198 oral presentations, 38 virtual posters, and 203 in-person posters. Participation includes 48 IPN schools and centers, as well as 35 national universities, reflecting the academic richness and diversity that characterizes our Institute.

The quality and relevance of the papers presented were guaranteed by our Scientific Committee, which included 89 experts from the IPN and 10 external academics from renowned national institutions. Moreover, the presence of companies and invited institutional areas strengthens the ties between academia, society, and the productive sector, which are essential to achieve real impact.
This Congress has been enriched by pre-congress workshops, in which more than 200 attendees participated, and has a solid academic program consisting of three plenary conferences, three keynotes, and a round table, addressing topics ranging from contemporary scientific challenges to the importance of entrepreneurship, emotional management in academic life, and the impact of artificial intelligence.

The abstracts collected in this book are a reflection of the work ethic, passion, and creativity of our graduate students, who contribute to IPN's mission through their contributions.

I am certain that this Congress will not only improve polytechnic research as a national benchmark, but it will also open up opportunities for collaboration and create new opportunities for our country's scientific and technological development.

I am deeply grateful to those who have made this second edition possible: the members of the scientific committee, the participating institutions and companies, and above all, our students, who are at the heart of this effort.

I invite you to browse these pages with the certainty that each contribution presented here represents a seed of innovation, a step towards excellence, and a sign of the IPN's commitment to Mexico's future.

ATENTAMENTE
“La Técnica al Servicio de la Patria”

Dra. Martha Leticia Vázquez González
Secretaria de Investigación y Posgrado
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Editorial

El equipo editorial del Congreso Interpolitécnico de Investigación para Alumnos de Posgrado se complace en presentar estas memorias, fruto de un esfuerzo colectivo que reúne investigaciones de alta calidad, innovación y relevancia para las diversas áreas del conocimiento. Esta publicación es un reflejo del compromiso del Instituto Politécnico Nacional con la excelencia académica y la difusión de los avances científicos generados por sus estudiantes de posgrado y académicos nacionales e internacionales.

Expresamos nuestro agradecimiento a todos los participantes, autores y revisores por su colaboración activa en este proceso. Su contribución es vital para consolidar este congreso como un espacio académico de referencia que fomenta la investigación, la innovación y el desarrollo de redes de colaboración interinstitucionales para continuar posicionando al IPN en el plano nacional e internacional.

Confiamos en que estas memorias serán una herramienta de consulta y un referente para estudiantes, académicos y profesionales, promoviendo la integración del conocimiento en beneficio de la sociedad.

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I. PHYSICAL-MATHEMATICAL SCIENCES AND ENGINEERING

I.Engineering and Physical-Mathematical Sciences

13-I–PO Efecto de la reología no newtoniana sobre la fuerza de compresión oscilatoria de un fluido viscoelastico considerando efecto de deslizamiento en superficies curvas

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In this study, we examine the oscillatory squeeze flow of a viscoelastic fluid confined between two hydrophobic spheres of differing radii. The fluid flow is generated by the harmonic motion of an upper sphere, while the lower sphere remains stationary. We have considered that the gap between the spheres is much smaller than their radii and that the oscillation amplitude of the moving sphere is small compared to this gap. Under these conditions, the curved surfaces can be approximated by quadratic functions of the radial coordinater. We consider a quasi-dynamic slip model, employed to describe the hydrophobic boundary condition at the fluid–solid interfaces. In this model, a critical interfacial shear stress is defined, where slippage occurs only when the shear stress exerted by the fluid on the spheres' surfaces exceeds this limit; otherwise, a non-slip region is maintained. Given the dominance of viscous over inertial effects, the convective terms in the momentum equation were neglected, and the analysis was carried out in a strictly periodic regimen. An analytical solution of the governing equations is derived, where the following parameters control the phenomenon: the Deborah number De, the Womersley number, the Navier slip length N and critical shear stress at the fluid–solid interface C. Our findings indicate that, relative to flat surfaces, when curved surfaces are assumed, the zone of the non-slip region decreases. Additionally, incorporating viscoelastic fluids results in a diminished compression force, and lower mechanical power is consumed by implementing hydrophobic surfaces, high oscillation frequencies, and viscoelastic fluids.

14-I–PO Análisis de la interacción fluido-estructura en un microcapilar deformable para un fluido viscoelástico

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In the present study, the structure-fluid interaction was analyzed, where the microcapillary has viscoelastic properties, which affects the hydrodynamics of the flow. The flow conditions at a low Reynolds number are considered, as well as the aspect ratio of the microcapillary, a-l., which is much smaller than unity, where a is the radius of the undeformed tube and l is its length. The lubrication theory approach was implemented to simplify the Navier-Stokes equations that govern fluid motion. For structural mechanics, the modified Donnell-Mushtari theory was used, which considers the mechanical response of the soft material of the microcapillary. In addition, an axisymmetric deformation of the microcapillary is assumed and displacements in the circumferential and axial directions (in the direction of flow) are neglected. The structural mechanics of the tube with viscoelastic behavior and the fluid mechanics were coupled by the displacement of the thickness of the microcapillary in a radial direction, which is caused by the effect of the hydrodynamic force of the fluid on the envelope of the viscoelastic structure of the tube. The governance equations were analytically simplified by applying asymptotic methods and solved numerically by the Crank-Nicolson method to determine the pressure in the fluid as well as the displacement of the microcapillary caused by the fluid.

16-I–PO Modelo cognitivo de disección creativa para el análisis de procesos creativos en el proyecto arquitectónico

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Despite outstanding attempts in literature to describe the architect's creative processes, a certain mystery remains about what they do when they create. In general, the thinking of Mexican architects boils down to the need to find an order that responds to the requirements of the architectural problem to be solved, but there is nothing beyond this point. This means that the research problem is not at the level of design methods, but at the level of the creative phase. In other words, there is a need to adequately describe creative processes and to appropriate these concepts so that they can be used in the practice of architectural projects. The cognitive model presented here is the result of applying various theories, such as the theory of cognitive development, theories of cognition theory and abstract mathematics, to the processes of conception and synthesis present in architectural project creative processes, with the purpose of achieving the appropriate level of abstraction where it is possible to represent the processes of transition processes from thought to its graphic representation on paper. To order and explain these transitions from abstraction to synthesis, the DREIC methodology of Critical Realism and a second-order cybernetics approach were used. The application of the cognitive model is demonstrated in the analysis and description of the creative process of a prominent Mexican architect for the project of his house-studio located in Mexico City.

17-I–PO Degradación de carbamazepina en agua mediante ozonización catalítica con espuma de níquel-hierro bimetálica sinterizada in situ mediante pirólisis por pulverización ultrasónica

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The pharmaceutical industry is one of the most profitable sectors, producing valuable products for human health, but it generates various toxic and recalcitrant wastes. The most common sites of pharmaceutical waste are hospitals, pharmaceutical factories, and some domestic areas, which release medications and other waste into wastewater, groundwater, and surface water. It is important to highlight that the progressive accumulation of these pharmaceutical compounds, including carbamazepine, has lacked regulations and final disposal rules in Mexico for several years. In the case of pharmaceutical compounds, they are highly persistent, especially antibiotics, which are very difficult to biodegrade using conventional treatment methods and therefore remain in the environment for a long time. Hence, an alternative is advanced oxidation processes (POAS), among which is heterogeneous catalytic ozonation (HCO), which combines the oxidizing power of ozone and the presence of a catalyst in the form of powder, film or membrane that allows increasing the generation of oxidizing agents such as the hydroxyl radical (•OH) to decompose these persistent pollutants rapidly. Considering the above, it is necessary to encourage the study of toxic waste treatments using AOPs in wastewater containing antibiotics and pharmaceuticals that are difficult to biodegrade, which can become long-term environmental liabilities because of their presence in various water resources. The degradation of the pharmaceutical compound carbamazepine (CBZ) at a concentration of 20 mg/L in model water was achieved by catalytic ozonation in the presence of nickel foam support, modifying the catalyst surface with metallic precursors. The nickel-iron foam (NiFeF) was used as support in the synthesis of decorated catalysts NiFeF-Pr1 and NiFeF-Pr2 by Ultrasonic Spray Pyrolysis (USP) where the precursors used were Pr1: FeNO3/N2NiO [0.1M], and Pr2: FeCl3/NiSO4/NaOH [0.1M], respectively. The CBZ compound reacts completely with molecular ozone (O3) by a direct reaction mechanism within the first few minutes due to the high-rate constant reaction with ozone. The catalytic effect of NiFeF-Pr1 and NiFeF-Pr2 is generally observed in the degradation of ozonation intermediates and final products, due to the formation of reactive ozone species (ROS) output by ozone decomposition on the catalyst surface. The catalytic effect was demonstrated by high-performance liquid chromatography (HPLC) analysis during ozonation times of 60 and 120 minutes, as well as by the degree of mineralization, determined by Total Organic Carbon (TOC) measurement, which exceeds 52% for both catalyst systems, and the 36% obtained in corresponding conventional ozonation.

18-I–PO Reducción electroquímica de nitratos sobre electrocatalizadores basados en Bi2O3-Cu2O-ZnO/C

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Nitrogen oxide (NOx) emissions from industrial processes and internal combustion engines pose a serious threat to human health and the environment. Electrochemical nitrate reduction (ERN) represents a promising alternative in the transformation of these pollutants into value-added products such as nitrogen, ammonia, and hydroxylamine. In this work, electrocatalysts based on Bi, Cu, and Zn were developed using the precipitation method due to the chemical affinity of their components toward nitrogenous species capable of catalyzing and modifying the selectivity of the reaction toward products of interest. Optimization of the Bi2O3-Cu2O-ZnO electrocatalytic matrix requires precise control to obtain the desired morphology and composition (1:1:2). Morphological and structural characterization was performed using XRD and SEM-EDS. The electrochemical evaluation was performed using CV, CA, EIS, and Tafel techniques, allowing the production of AC faradic currents. -4 mA, exhibiting considerable electrocatalytic activity to reduce various forms of NOx (nitrites and nitrates), in addition to demonstrating good electrochemical stability for the model reaction.

23-I–PO Evolución de las rocas plutónicas del arco cordillerano del cretácico tardío-eoceno en su sector Tijuana-Mexicali, B.C. y Puerto Lobos-Moctezuma, Sonora

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Geologically, Mexico is composed of a diverse array of rocks of varying ages and formed in different environments. Areas that exhibit similar characteristics have been defined as tectono-stratigraphic terrains, based on differences in Nd (neodymium) model ages in igneous rocks, the surface distribution of basement rocks (older crystalline rocks), and the tectonic affinity of their formation. As a result, three main provinces have been proposed: Laurentian, peri-Gondwanan, and Pacific terrains, whose boundaries are diffuse or inferred. The study focuses on granitic rocks within two profiles: from Tijuana to Mexicali (T-M) in Baja California, and from Puerto Lobos to Moctezuma (PL-M profile) in Sonora. These rocks are products of the orogenic system resulting from the subduction of the Farallon plate beneath the North American plate during the Triassic to Eocene periods. The interest lies in their affiliation with the Peninsular Batholith system (T-M profile) and the North American Cordilleran Batholiths (PL-M profile), respectively. Based on petrographic studies of granitic rocks, U-Pb geochronological analyses, and hafnium (Hf) isotopic ratios in zircon crystals, the aim is to reconstruct the magmatic evolution of the arc and its interaction with different basement rocks. The petrography of the T-M profile shows mineralogical similarity, with samples classified as quartz monzodiorite, granodiorite, hornblende gabbro, leuco-gabbro, and quartz monzonite. The main minerals are plagioclase, K-feldspar, quartz, hornblende, and biotite. Accessory minerals include zircon, opaque minerals, and occasionally apatite and allanite. In contrast, samples from the PL-M profile are classified as quartz monzonite, monzogranite, granodiorite, and quartz monzodiorite. The main minerals are plagioclase, feldspar, quartz, biotite and/or muscovite; accessory minerals include zircon, opaque minerals, and occasionally allanite. In these zones, the samples exhibit signs of tectonic deformation (quartz with undulatory extinction and bent twinning in plagioclase). In the U-Pb geochronological study of zircons, ages decrease from west to east along the T-M profile, ranging from ~113 to 97 million years (Ma), with an unusual age found at the Ferri locality in western Baja California. For the PL-M profile, ages are more scattered, ranging from 71 to 49 Ma. In both zones, some inherited zircons were found, resulting from assimilation of the host rock. Hf isotopic studies in zircons will help delineate the interactions between the provinces where these granitic phases were emplaced.

33-I–PO Sistema de inteligencia artificial para el manejo sustentable de inventario

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The environmental crisis generated by global warming is one of the problems afflicting the modern world, with factors such as the excessive use of raw materials and the overproduction of products that influence its progress being. This work seeks to predict the footwear sales behavior of a producto base d on a predictive artificial intelligence model that allows improvement in decisión-making for inventory management to reduce overproduction and therefore, only the required amount of raw material is used, using an experimental methodology with a user-centered approach to service design. The resulting artificial intelligence model is expected to be highly efficient in predicting sales and achieving a satisfactory service percentage.

34-I–PP Síntesis y estudio de materiales halogenados X-Bi_2MoO_6 (X: F, Cl, Br, I) aplicados a la oxidación avanzada de rodamina B bajo irradiación visible

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This work describes the preparation of X-Bi_2MoO_6 catalysts using two synthesis methods. In the solvothermal method, a surfactant agent (CTAB) and a solvent (ethylene glycol) were employed, while in the hydrothermal method, the pH was adjusted to 10 using NH_4OH. The halogen doping and surfactant use were characterized by X-ray diffraction (XRD), confirming that both pure Bi_2MoO_6 (BMO) and the doped compounds exhibit an orthorhombic crystal structure. Diffuse reflectance spectroscopy (DRS) showed maximum absorption in the visible range (400 nm), with band gap energies between 2.84 and 2.70 eV. Fourier-transform infrared spectroscopy (FT-IR) and Raman spectroscopy identified bending vibrations and stretching modes of Bi–O and Mo–O octahedra. Scanning electron microscopy (SEM) micrographs revealed a “nanosheet” morphology in all samples. Photocatalytic activity was evaluated through the degradation of Rhodamine B (RhB, 5 ppm, pH 10) under visible light irradiation ($\lambda > 400$ nm, 50 W lamps), using 50 mg of catalyst. Photolysis (without catalyst) and adsorption (darkness, 30 min) controls were considered. RhB concentration was determined by UV-Vis spectroscopy (553.27 nm), observing significant variations in degradation efficiency depending on the dopant and synthesis method, reaching values above 80% in the most active catalysts. Halogen doping modifies the optical and morphological properties of Bi_2MoO_6, enhancing visible light absorption and photocatalytic performance. The results indicate that synthesis conditions and dopant selection are key factors in increasing efficiency in the degradation of organic contaminants such as RhB, constituting a viable strategy for wastewater treatment.

38-I–PP Evaluación de metales pesados en los sedimentos del lago del bosque de San Juan de Aragón, Ciudad de México

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The San Juan de Aragón Forest Lake is an artificial lake. An artificial lake refers to excavations lined, in this case, with masonry and without a bottom cover. They are artificially filled with water from treatment plants. The San Juan de Aragón Forest, inaugurated in 1964, is located northwest of Mexico City, in the Gustavo A. Madero borough. The forest was declared an Area of Environmental Value (AVA) in 2008. It is the second largest green area in the city and acts as an important green lung, as its trees filter tons of pollutants annually. The objective of the research is to evaluate heavy metal concentrations in the sediments of the San Juan de Aragón Forest Lake, Mexico City, to document potential environmental risks. The concentrations of heavy metals found in the lake sediments are (all values in mg/kg): Cu (11.35) > Cr (9.18) > Pb (7.83) > As (6.03) > Ni (5.98) > Cd (5.04) > Zn (4.90). Being an artificial and urban lake, the concentrations of heavy metals do not have a natural origin, but anthropogenic, since factors such as traffic, proximity to industries and, being a park, solid waste are the main source of these high concentrations.

43-I-PO La huella de la migración transnacional en el patrimonio cultural edificado de la CDMX

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My research focuses on exploring how the arrival of upper-middle-class international migrants to Mexico City's historic center is significantly transforming this area. In the last decade, the search for new lifestyles and the rise of luxury tourism have driven the renovation of traditional buildings, which are now converted into vacation apartments, boutique hotels, art galleries, and restaurants focused on attracting tourists. These changes not only drive up housing prices and displace local residents but also alter the physical, social, and symbolic environment of the neighborhood. Long-time residents experience a disconnect with their surroundings, feeling that their neighborhood loses authenticity. In addition, urban renewal policies, driven by the government together with the private sector, prioritize profitable projects over the preservation of cultural and historical heritage.

Based on an analysis of more than 190 documents and studies by key authors such as Víctor Delgadillo, David Navarrete, Michael Janoschka, Ibán Díaz-Parra, Mathew Hayes, and Ernesto López Morales, I examine concepts such as transnational gentrification, heritage touristification, and the “rent gap”. However, I found that there is a lack of research on the architectural impacts, community resistance, and cultural effects of these processes. The project that I propose to develop during the next semesters of the PhD program focuses on addressing a gap in the academic literature. This approach will consist of analyzing various factors, such as the proportion of foreign residents, the influence of state incentives, fluctuations in rental prices, and transformations in the use of real estate. In addition, I will explore residents' perceptions of authenticity and sense of belonging in their communities. Through this analysis, I seek to offer a comprehensive perspective on how Mexico City can foster economic development without compromising the preservation of its cultural heritage and the quality of life of its inhabitants, especially in the post-pandemic context.

44-I–PO Impact analysis of a gondola for suborbital flights using the finite element method

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The NASA suborbital balloon program enables near space scientific research using gondolas that carry experimental payloads, such as the Experimental Module for Iterative Design for Satellite Subsystems (EMIDSS), developed in collaboration with IPN, ITESO, and NASA. These structures experience significant mechanical, thermal, and aerodynamic loads during descent, requiring designs that ensure structural integrity to protect onboard systems. This study assesses the impact performance of the current gondola design against alternative structural concepts through finite element method (FEM) simulations. From the modal analysis of three proposed models, natural frequencies are obtained between 17.4 and 36.3 Hz, with shifts observed as internal components, such as batteries and CubeSats, were integrated. Explicit CAE simulations of varied landing scenarios, including different impact angles, revealed that while the baseline design may suffice under moderate static loads,the fall from stratosphere involve severe dynamic conditions, The FEA analysis compares the advantages of design modifications, such as reinforced side, plates or corners, that improve stiffness and impact resistance. The results provide a framework for optimizing future gondola designs, integrating computational simulations early in development to improve reliability and reduce costs.

45-I–PO Design of a production planning manual for Steel flats in the steel industry

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This project was carried out in a national company dedicated to the manufacturing of steel parts. located in Guanajuato, specializing in the manufacturing of electroforged grating. Its products are intended for key sectors such as construction, automotive, agro-industrial, energy, and mining, and are characterized by their strength, durability, and high quality. The company has 148 employees, and the Planning department plays a strategic role, as it determines which pieces are to be manufactured through the electroforging process. The raw materials used include steel coils (sheet metal in coil form), flat bars (soleras) obtained through a slitter (flat bars cut from steel strips), wire rod (thick wire coil), and round steel (cylindrical bar). The final product consists of electroforged gratings, classified for light or heavy traffic. The production process is divided into three main stages: a) The steel coils are cut into strips using a slitting machine, which are then transformed into flat bars. b) The wire rod is transformed into round steel using a wire drawing machine c) The flat bars and round steels are assembled into electroforging machines to form grating panels, which are then stored and distributed both nationally and internationally. Proper planning of activities both in the plant and across the supply chain enables a more agile, safe, and efficient production sequence. Then, the project aims to design and implement a production planning manual for the flat bar cutting area, as well as train personnel, considering operational restrictions per machine and production times by size. Through this tool, the goal was to standardize planning, improve workforce rotation, and assess actual monthly schedule compliance with reliable data that excludes scrap. This project was developed through the implementation of the PDCA (Plan-Do-Check-Act) continuous improvement cycle, to design and implement a production planning manual in the flat bar area.
During the initial assessment, inconsistencies were found in the compliance values for October 2024 between planned and produced pieces, with values exceeding 100%. This was due to an operational practice of counting both conforming (OK) and non-conforming (NOK) pieces in the total production. Overestimating production not only creates a false sense of compliance but also hides the true scrap making it difficult to implement preventive actions. Additionally, the machines' technical specifications were not updated to reflect their actual operational restrictions, limiting effective production planning. In response, a Gantt chart was developed to schedule activities from data collection through validation of technical specifications, ultimately supporting the creation of a technical-operational manual for production planning in the flat bar area. After developing this continuous improvement project in the flat bar area, the established objectives were successfully achieved through the standardization of production planning and improved operational performance. Accurate scrap measurement, along with personnel training and technical updates to the machines, significantly contributed to greater efficiency, reliability, and control of monthly production schedule compliance.

54-I–PO evaluación de las implicaciones ambientales de las concentraciones de tierras raras en los sedimentos de la laguna de mar muerto Oaxaca-Chiapas, México

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Rare earth elements (REE) are considered emerging micropollutants in aquatic systems and mainly consist of (La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu). Recently, REE have gained importance because they are used for high technology, agriculture, and medicinal purposes. They are also widely used as tracers in earth system sciences to understand their distribution, sources, and potential environmental and human health risks. In this regard, the present study aimed to assess the concentrations of REE in thirty-six sediment samples collected from the Mar Muerto Lagoon on the Oaxaca-Chiapas coast, Mexico, using an ICP–MS following the aqua regia digestion method. The average concentrations presented an order of (all values in mg kg^{-1}) Ce (21.374) > Nd (10.728) > La (9.622) > Pr (2.678) > Sm (2.219) > Er (0.808) > Yb (0.628) > Eu (0.492) > Dy (0.303) > Ho (0.303) > Gd (0.283) > Tb (0.283) > Tm (0.126) > Lu (0.111) The normalized REE distribution was homogeneous with the North American Shale Composite, indicating that REEs in sediments were sourced from regional geogenic sources. The calculated indices, namely the enrichment factor and pollution load index in sediments, suggested that the enrichment of REEs in the sediment resulted from additional REE input from human sources, including artisanal fishing and discarded batteries (Nd, La, and Ce) that were dumped into the lagoon. Henceforth, the results of this study provided baseline data on REE distribution and characteristics, which constitute a typical case study on the environmental implications in a lagoon system.

68-I-PO Sistema de captación de agua pluvial doméstico en edificaciones verticales en la Ciudad de México

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Water scarcity drives the search for solutions to ensure access, with rainwater harvesting being a key option. Rainwater harvesting systems help conserve water resources by reducing aquifer exploitation but require public policies for implementation. Rainwater samples were analyzed during different seasons to assess their quality. During heavy spring rains, several parameters exceeded the limits of NOM-127-SSA1-2021: pH of 9 (allowed range 6.5–8.5), COD of 60 mg/L, turbidity of 55.3 NTU (limit 4 NTU), and hardness of 100 ppm. Although dissolved solids were within the permitted range, the water was not suitable for human consumption. Therefore, a harvesting system with a three-phase filter, accessible and easy to use, was designed to comply with NOM-127-SSA1-2021. In a summer analysis, a sample filtered with a commercial filter showed parameters within limits: pH 6.7, COD 0 mg/L, turbidity 0.85 NTU, and hardness 0 ppm, demonstrating high efficiency in removing turbidity and hardness. In Mexico City, regulations such as the Construction Code and NOM-127-SSA1-2021 present limitations for promoting the use of these systems in vertical buildings.

73-I-PO Convertidor buck síncrono con MPPT para la carga de baterías en sistemas fotovoltaicos

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The developed system implements a synchronous Buck converter as part of the MPPT controller, designed to charge a 12 V lead-acid battery. The tracking algorithm is managed by an STM32F411CU6 microcontroller, where the Perturb and Observe (P&O) technique is programmed. This algorithm has been optimized to operate in two charging modes: standby and maximum charge, depending on the battery conditions. Additionally, an irradiance detection logic is incorporated to ensure the system only operates when solar radiation is sufficient, which helps preserve the system's lifespan and improves energy utilization. Under optimal conditions, the system can deliver up to 150 W of charging power with a conversion efficiency of 92%, demonstrating its effectiveness in standalone solar energy applications.

78-I-PO Circulador de ferrita de tres puertos en microcinta para la banda S de baja potencia: Teoría y modelado

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This paper presents a comprehensive theoretical framework and an electromagnetic simulation of a microstrip ferrite circulator with three SMA ports on a substrate with a dielectric permittivity of 2.2, optimized for low-power operation at a center frequency of 3.1 GHz. The design employs impedance coupling theory and magnetostatic analysis to determine critical parameters such as the ferrite saturation magnetization (4Ms), the bias magnetic field strength, and the geometrical dimensions. The methodology involves the development of simulation in specialized electromagnetic design software, considering the material properties, device geometry, and operating conditions. The simulation conditions consider an input power of -10 dBm, plane-wave excitation, static magnetic field biasing, and 50 matching. The results show an isolation greater than 15 dB, an average insertion loss of 1 dB, and a return loss below -10 dB over a 400 MHz bandwidth around the center frequency. This work establishes a solid theoretical and simulation foundation that will serve as a direct reference for the construction and experimental characterization of the prototype in future works.

82-I-PP Potential applications of MXene materals synthesized with deep eutectic solventsi

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MXenes are a big family of two-dimensional materials (2D) that have demonstrated immense potential in different applications, from capacitors, hydrogen storage media, catalysis, and the environmental sector. These characteristics are a function of their structure, high thermal and electrical conductivity, and high chemical stability and adsorption capacity. This work presents the synthesis of MXene using Deep Eutectic Solvents (DES) as exfoliation and selective remotion, with the aim of developing a more sustainable and efficient method compared to traditional method, in which strong acids. The synthesis was conducted by immersing the precursor (Ti_3AlC_2) in Deep Eutectic Solvents, specifically Reline (choline chloride and urea) and Oxaline (choline chloride and oxalic acid), with ball milling in periods from 3 to 6 days, respectively. The objective was to promote the selective remotion of aluminium ions and the modification the lamellar structure of the precursor. The material was characterised with Scanning Electron Microscopy (SEM) with Elemental Analyst (EDS) to evaluate the morphology; and X-ray Diffraction (XRD) to confirm not only the formation of MXene. The X-ray diffractograms show a decrease in the intensities of the characteristic peaks can be seen, which indicates a decrease in the size of the particles as reported in the literature. Examining the micrographs, it is possible to see the differences between the precursor and after DES treatments, as well as flaking and particle size decrease. This work opens new perspectives for the eco-friendly and functional fabrication of MXenes, encouraging their integration into technological strategies for environmental conservation and the development of more sustainable process.

92-I–PP Comparison of nimo catalysts supported on γ-AL_2O_3 AND ZSM-5 zeolite during co-processing: effect of support composition

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In this study, NiMo catalysts were synthesized using γ-Al_2O_3 and a mixture of γ-Al_2O_3 with ZSM-5 zeolite (in a 1:1 weight ratio) as supports. The materials were prepared by the successive wet impregnation method, using aqueous solutions of ammonium heptamolybdate tetrahydrate and nickel nitrate hexahydrate. The catalysts were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), and nitrogen physisorption. Prior to catalytic evaluation, the materials were sulfided under an H_2S/H_2 flow at 400 °C for 2 hours. Catalytic activity was evaluated in a batch reactor under typical hydroprocessing conditions (T = 360, 380, and 400 °C; P_H_2 = 1000 psi), using a feed composed of heavy fuel oil and castor oil in a 3:1 weight ratio. Finally, both the feed and the liquid products were characterized by determining their API gravity (ASTM D7042), sulfur content (ASTM D7039), and yield of typical distillation fractions (ASTM D86), as well as by Fourier-transform infrared spectroscopy (FTIR). The results show that the addition of ZSM-5 zeolite to the NiMo/γ-Al_2O_3 catalyst led to a 115 % increase in specific surface area, from 120 to 258 m^2/g. This increase is attributed to the high surface area of the zeolite, characterized by its microporous crystalline structure. Additionally, an increase in the catalyst's acidity was observed, which promoted cracking reactions, enhancing performance at 360 and 380 °C compared to the catalyst supported solely on γ-Al_2O_3. However, at higher temperatures (400 °C), the performance of the NiMo/γ-Al_2O_3–ZSM-5 catalyst decreased, while the NiMo/γ-Al_2O_3 catalyst exhibited the best performance, achieving a 107.7 % increase in API gravity. Moreover, increasing the reaction temperature improved the quality of the liquid phase, due to the formation of lighter compounds through cracking, deoxygenation, and heteroatom removal reactions. The addition of ZSM-5 zeolite to the NiMo/γ-Al_2O_3 catalyst resulted in a synergistic effect between the two supports, combining the higher acidity and specific surface area of the zeolite with the larger pore size of γ-Al_2O_3. This synergy was reflected in improved catalytic activity at moderate temperatures. However, at 400 °C, a decrease in performance was observed, possibly associated with partial pore blockage caused by the formation of byproducts such as coke or water.

99-I–PO Pruebas de desempeño basado en RFC 2544 en redes definidas por software (SDN)

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Software Defined Networking (SDN) is a concept that aims to simplify the creation and management of computer networks. It allows operators and administrators to establish and manage new resources virtually. In Software Defined Networking, the data plane and the control plane are separated. Both planes are now programmable, leading to the concept of programmable, adaptive networks that optimise processes dynamically and automatically. The advantage of Software Defined Networks over traditional networks is that traditional networks are managed and supported at the hardware level, which leads to the installation of new hardware technologies to give scalability to the networks. With Software Defined Networks, on the other hand, scalability is at the software level. The Software Defined Networking scheme has Northbound (northbound) and Southbound (southbound). Northbound: Communication between the APIs and the controller for dynamic and automatic processes. Southbound: Application of the APIs in the network devices through the controller (Opendaylight, ONOS, among others), in which the control and administration of the network is centralised. In this research paper, titled "Performance Testing Based on RFC 2544 for Software-Defined Networking (SDN)," two computer network scenarios were created: 1. In the environment or within the concept of Software-Defined Networking. Here, the data and control planes are separated. 2. A scenario with a traditional network topology, that is, without a controller to centralize network management. Here, both the data and control planes are present in each device (router and switch). In scenario 1, the Software-Defined Networking concept, Mininet (data plane) and Opendaylight (control plane) were used to emulate a layered network: the access, distribution, and core layers. There are two networks, RED 1 and RED 2, connected by a VPN link. Mininet and Opendaylight are interconnected with two virtual machines (emulating a real PC) to inject traffic (no traffic, HTTP and RTP) into the network. For scenario 2, traditional networks, GNS3 was used to emulate a layered topology: the access, distribution, and core layers. Similar to SDN, there are RED 1 and RED 2, except here, four virtual machines are connected, two per RED, to inject traffic (no traffic, HTTP and RTP) into the network. With the creation of both scenarios, link performance tests are being performed, as outlined in RFC 2544, which allow for the observation of the following parameters: bandwidth, latency, jitter, and packet loss. By performing the tests recommended in RFC 2544, the objective is to verify that the aforementioned parameters are improved in the design of Software-Defined Networks by separating the control plane from the data plane. Finally, a comparison will be made between the results obtained in both scenarios, based on the performance tests, which will seek to demonstrate improved performance of Software-Defined Networks versus traditional networks.

100-I–PO The influence of magnesium content and aluminum doping on the characteristics of MgxZn1-xO films produced through spray pyrolysis

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The influence of magnesium (Mg) content and aluminum (Al) concentration on the electrical, structural, and optical properties of $Mg_xZn_{1-x}O$: Al samples was investigated. The samples were doped with Al at concentrations varying from 0 to 6 atomic percent (at%) and were synthesized on silicon and quartz substrates using the spray pyrolysis technique. Following synthesis, they were annealed at 350°C for three hours in a horizontal furnace. Structural characterization was conducted using X-ray diffraction (XRD), scanning electron microscopy (SEM), and Energy-dispersive X-ray spectroscopy (EDS). Optical properties were examined through transmittance and photoluminescence measurements, while electrical properties were assessed using the four-point probe method. The findings for both sets of samples revealed seven primary peaks, corresponding to the hexagonal phase identified in previous studies of $Mg_xZn_{1-x}O$. An increase in the optical band gap alongside a high transmittance was noted. Additionally, both groups of samples exhibited significant photoluminescence intensity attributed to Near-Band Edge (NBE) emission, as well as green and orange band emissions in the undoped samples. These emissions are linked to defect states within the films. These outcomes hold significant implications for the advancement of the next generation of optoelectronic devices.

108-I-PO Cinética de engrosamiento de precipitados β´ en aleaciones Fe-Ni-Al-Cr-Ti modificadas con V

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This research investigates the effect of vanadium on the coarsening kinetics of coherent β´ (NiAl) precipitates in Fe-Ni_{10}-Al_{15}-Cr_{10}-Ti_1-V_x (x = 1 and 3 at %) alloys. The samples were melted in a mini electric arc furnace, homogenized at 1250 °C for 12 hours, and subsequently subjected to isothermal aging at 800, 850, and 900 °C for various durations. X-ray diffraction confirms the presence of the β´ phase within an α-matrix. High-resolution scanning electron microscopy (HR-SEM) images reveal that the morphological evolution of the precipitates during aging treatments follows this sequence: interconnected and spherical, spherical and cuboidal, cuboidal and parallelepiped, globular. Although the alloy with higher vanadium content exhibits the same transformation process, it occurs more slowly. These results show that as aging time increases, the number of precipitates decreases while their size increases. Vickers microhardness tests confirm that hardness decreases with aging due to precipitate coarsening, leading to the degradation of mechanical properties. The alloy with higher vanadium content displays slightly greater hardness compared to the alloy with lower vanadium content. These findings underscore the role of vanadium content in microstructural control, as vanadium reduces lattice mismatch between the precipitate phases and the matrix, slowing the coarsening kinetics of β´ precipitates. This enhances microstructural stability and mechanical performance in Fe-based alloys, making them suitable for applications requiring high-temperature resistance and long service life.

111-I-PP Estrategias bioclimáticas para confort térmico en viviendas rurales

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Bioclimatic strategies are capable to reduce greenhouse gases, which generates global warming. These gases are produced during energy generation that supplies other things, such as mechanical systems these lasts provide the proper temperature and humidity conditions for user´s comfort.
These strategies are the resulf of different configurations (size, location, quantity, etc.) of passive systems (windows, doors, materials, etc.). These systems don't use external energy to operate. Thermal comfort is a neutral thermal state where neither cold nor heat is perceived.
Bioclimatic strategies can be developed from empirical knowledge of the population and also from technical scientific knowledge in educational institutions. The combination of both types of knowledge in bioclimatic strategies are able to lead to a greater community adoption of these approaches. The first step presented in this work, is to explore population's understanding about bioclimatic strategies. For this analysis it was selected the town of Altamirano, Chiapas. In this place over 97% of its population is classified live in extreme poverty. A desk research which consist in: urban layout, average temperature, bioclimatic strategies in the population, urban-architectural configuration, and population statistics. The results revealed a reticular urban layout and a warm, dry bioclimate. The annual average temperature is 24°C,shown the month of April as the warmest month (29°C on average, with a maximum of 36°C), followed by December for being the coldest month (27°C on average, with a minimum of 22°C). The strategies found include the use of central courtyards, vegetation as sunscreens, openings with a 40% area ratio relative to the wall, the use of pitched roofs, and natural material colors (grey tones from unfinished construction). Housing configurations feature elongated facades, rectangular plots of 10 m x 20 m, the use of industrial materials with an exposed finish on walls (thermally massive construction systems), and zinc sheeting for walls or roofs. Based on this, a first-contact survey and a knowledge exchange workshop will be conducted.

117-I-PO Efecto de la absorción de hidrogeno en la tenacidad a la fractura en un acero bainítico, ASTM A 106 grado A, sometido a envejecidos isotérmicos

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This investigation will evaluate the individual and combined effect of isothermal aging and hydrogen absorption phenomena on the fracture toughness of a bainitic pipe-grade steel, ASTM A 106 Gr. A. Bainitic steels are commonly used for the transportation and distribution of hydrocarbons, due to their desirable combination of mechanical properties, strength, and ductility due to the bainitic microstructure. On the other hand, fracture toughness is a crucial mechanical property due to its ability to measure resistance to crack propagation under loads. However, exposure to acidic media that generate hydrogen absorption and natural aging due to prolonged use in pipe-grade steels can significantly affect fracture toughness individually and collectively. Steel in as-received condition will be artificially aged through isothermal treatments. The material will then be cathodic charged to induce hydrogen uptake for the time required to reach saturation, which will be determined by measuring hydrogen uptake over time using the glycerin test. The steel will be mechanically characterized in its original state, isothermally aged, and then cathodically charged using Charpy impact fracture testing.

120-I-PO Alerta temprana de plagas agrícolas: una herramienta IA para la protección fitosanitaria de México

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An automated phytosanitary monitoring system was developed, which employs natural language processing (NLP) techniques, named entity recognition (NER), Transformers models (RoBERTa), machine learning models for classification, and data visualization, with the goal of supporting SENASICA in the early detection of news about agricultural pests worldwide. The tool uses web scraping to gather information from specific websites. Once the information is collected, relevant news for Mexico is selected. Subsequently, all downloaded content is processed using artificial intelligence (AI) to extract specific information from each news article. Additionally, the severity of the detected event is assessed. However, the use of AI to process large volumes of data involves challenges related to infrastructure and processing times. To ensure the relevance and authenticity of the news, the system only downloads information from trusted sources previously provided by SENASICA, searching for keywords in the news titles that may indicate relevant information. This approach allows distinguishing between authentic news and those that do not meet the relevance criteria. All processed information is stored in a database and presented in an interactive visual interface, enabling SENASICA specialists to better visualize the data. With this comprehensive approach, the system significantly improves the response capacity to phytosanitary threats and is consolidated as an innovative tool in the service of food security and agricultural protection in the country, as currently, Mexico does not have a tool like this.

141-I-PO Segmentación de Instrumentos Quirúrgicos Mediante un Modelo Modificado de Red Neuronal U-Net y Rama Siamesa

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Laparoscopic surgery offers significant advantages over laparotomy, such as shorter recovery times, reduced post-hospital complications, and lower infection risks. However, in Mexico, training opportunities for surgical residents remain limited, with only 46% participation as principal surgeons. This limitation restricts skill development and affects the learning curve of future professionals. To address this issue, we propose a neural network-based segmentation algorithm to accurately identify surgical instruments, even under varying illumination conditions. The proposed approach is based on a u-net architecture with a dual-branch siamese decoder, which optimizes pattern generalization to enhance the detection of regions of interest related to surgical instruments and background differentiation. The siamese structure allows the model to effectively compare feature variations, improving its adaptability and efficiency with limited data. The performance of the model is evaluated using precision, recall, F1 score, accuracy, and IoU, and is benchmarked against state-of-the-art models such as DDANet, SegNet, Hollistic U-Net, and Optical Flow-based methods.

150-I-PP Comparación entre las soluciones de la ecuación libre de Schrödinger, ecuación de calor y ecuación de onda desde el punto de vista del Análisis Funcional

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A review is made of the main elements of functional analysis necessary to pose and formulate solutions to the free Schrödinger, heat, and wave equations with initial conditions defined on Euclidean spaces of dimensions one, two, and three. The solutions to these Cauchy problems are approached from the Fourier transform formalism on the space of Schwartz functions, which are a subset of the functions integrable with respect to the Lebesgue measure in Euclidean space. The existence and uniqueness theorems for the solutions of these equations are presented, and a comparison is made between them from the perspective of functional and physical analysis.

157-I-PO Análisis de distribución de campo en tapers ópticos de índice gradual usando el método SPPS

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When optical signals travel through a taper, they are faced with the reduction of the core diameter, which, under certain guiding conditions, may cause the modes forming the light beam to either exit or remain within the taper. This behavior determines applications in which the modes are intended to leave and interact with the surrounding medium (such as in sensors), those where the modes are confined into progressively smaller effective areas (as in couplers or amplifiers), or where mode output is selective (some modes exit while others remain, as in filters). The simplest models used to study optical tapers lose validity as their diameter decreases, and it is common to assume that the core disappears to simplify calculations. Under these assumptions, the optical cladding becomes the core of the taper, and the surrounding layer (air or a liquid) starts acting as the optical cladding. In this work, the electromagnetic field distribution was studied using the Spectral Parameter Power Series (SPPS) method in tapers made from graded-index fibers, with the goal of controlling their intensity and effective area. Diameter reductions down to 5 microns were considered, without assuming the disappearance of the core, which was therefore included in the analysis. The SPPS method provides solutions to Sturm–Liouville-type equations, one of which are the perturbed Bessel equations, forming the basis of the analysis. The method begins by obtaining a general non-evanescent solution for a fixed value of the spectral parameter, based on the calculation of the coefficients of two formal power series in that parameter through recursive integrations, leading to two linearly independent solutions. The proposed method has been applied to the solution of similar problems, showing suitable efficiency for the analysis of non-homogeneous media in terms of computational requirements and accuracy, when compared to analytical solutions and methods such as the Finite Element Method (FEM). The light-guiding conditions of these devices were determined from the knowledge of the field distributions of all the modes obtained along the graded-index taper. The results can be applied to the design of lasers, optical couplers, amplifiers, and high-sensitivity sensors.

158-I-PP Cerium doped-multiwalled carbon nanotubes for photocatalytic degradation of ciprofloxacin in water

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Antibiotics are widely recognized as emerging pollutants in various ecosystems. They represent a threat to public health because of their impact on the increase of antimicrobial resistance. The doping of carbon nanotubes with ions or molecules has prompted the development of new materials with attractive properties that could be leveraged in catalytic applications. Doped-multiwalled carbon nanotubes (MWCNTs) have therefore been investigated for their potential to degrade antibiotics in wastewater. In this work, cerium doped MWCNTs (Ce-MWCNTs) have been prepared using a liquid phase deposition method, and their catalytic performance has been investigated in the photodegradation of ciprofloxacin. Before doping with Ce, the MWCNTs were functionalized in nitric acid (40% vol) at 90–110 °C for 24 h. Doping effects on photocatalytic activity were investigated by varying the doping time (3, 30, 50, 60 min). The Ce-MWCNTs were analyzed by XRD, SEM, XPS, and Raman spectroscopy. The photodegradation of ciprofloxacin was investigated under UV radiation (365 nm). The results suggest that Ce^{3+} ions interact with oxygen functional groups throughout the multiwalled structure of carbon nanotubes, forming Ce carboxylate coordination complexes. In addition, Ce^{3+} was found to act as an electron-donor dopant in MWCNTs. Photocatalytic evaluation revealed that Ce-MWCNTs show remarkable efficiency, degrading 83% of ciprofloxacin in 60 min under UV radiation compared to pristine MWCNTs, which degraded only 13% of ciprofloxacin. The outstanding performance of Ce-MWCNTs was attributed to the electron donor role of Ce^{3+} and its coordination with carboxyl groups. The findings on this study represent a significant improvement over conventional MWCNTs. The high activity of the material suggests its potential for mitigating antibiotic contamination in wastewater.

159-I-PP Synthesis of Pt-Mo/MWCNTs electrocatalysts for hydrogen evolution reaction

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Hydrogen production via water electrolysis has attracted significant interest as a renewable alternative to fossil fuels. The water electrolysis requires cost-effective electrode materials to ensure efficient energy conversion. This study focuses on the synthesis and characterization of Multiwalled Carbon Nanotubes (MWCNTs) doped with platinum (Pt) and molybdenum (Mo) to be used as electrocatalysts for the Hydrogen Evolution Reaction (HER) in acidic media. The doping of MWCNTs with Pt and Mo was achieved through the simultaneous thermal decomposition of two metalorganic precursors; Pt acetylacetonate and Mo hexacarbonyl. The metallic content was controlled at 2.0%, 1.0% and 0.5 wt% Pt and 3.0 wt% Mo relative to the MWCNTs. The structural and morphological characterization showed the presence of an amorphous carbon layer on the external surface of MWCNTs. Small Pt particles between 1-2 nm were uniformly distributed on the surface of the MWCNTs. However, Pt was also found to be embedded in the amorphous carbon layer along with Mo. The electrochemical evaluation indicated that at a current density of -10 mA cm^{-2}, the 0.5% Pt-Mo/MWCNTs need the lowest overpotential (0.18 mV) for the HER and exhibit a Tafel slope of 31 mV/decade. Despite the low Pt content, the Pt-Mo/MWCNTs materials exhibit an outstanding performance for HER in acidic media. This could be attributed to the uniform distribution and the small size of Pt particles. Additionally, the influence of Mo doping and the presence of carbon dangling bonds in the amorphous carbon might play a positive role in achieving an exceptional performance.

168-I–PO Reconocimiento automático de gestos quirúrgicos en videos de cirugía robótica mediante módulos de atención temporal adaptativa

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The automatic recognition of surgical gestures in robotic surgery videos is essential for assessing psychomotor skills and the development of collaborative assistance systems. This study proposes a deep neural network-based model to overcome the limitations of classical approaches in the characterization of surgical gestures. An architecture was designed integrating Temporal Adaptive Modules (TAM) and temporal segmentation techniques (TSN/TSM), implemented on 2D convolutional backbones (ResNet18, ResNet50, BNInception). The model was trained in a supervised manner using the JIGSAWS (JHU-ISI Gesture and Skill Assessment Working Set) dataset, a collection of robotic surgery videos annotated with 15 individual surgical gestures. Unlike 3D convolution-based models, this approach uses 2D methods with efficient temporal mechanisms, significantly reducing computational cost without compromising the ability to capture spatiotemporal relationships. For evaluation, a custom script was developed to compare model predictions with the ground-truth gesture labels from JIGSAWS through temporal intersection. The model achieved 90% gesture recognition accuracy during training, and 44% accuracy on individual gesture classification and 65% on full video classification during validation. Currently, the system effectively recognizes patterns during training but remains in an optimization phase to improve generalization in validation. A prior segmentation stage of surgical instruments, developed in previous work, is expected to significantly enhance spatial detection and, consequently, the overall performance of gesture recognition.

170-I–PP Use of plastic materials in the production of carbon fiber: review and perspectives

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Carbon fiber is a material used in fiber-reinforced composites and is widely used in the aeronautical, automotive, medical, and electronics sectors, among others. This is due to its mechanical and physical properties, such as high strength, low weight, thermal stability, and electrical and chemical properties, which depend on the precursor used, which can be PAN, tar pitch, or lignin. Carbon fiber obtained from PAN has the best properties for application in the aforementioned sectors. However, its production has a high environmental impact due to its high energy consumption, in addition to generating waste such as greenhouse gases, and its production cost is high due to the precursor fiber. Recycling these materials is costly and inefficient; in 2020, only 20% of waste was recycled and only 2% was reused. In response to this problem, research is being conducted to propose replacing PAN with recycled plastic materials such as polyolefins (PE/PP) or even lignin. This alternative would not only reduce production costs but also contribute to the circular economy and reduce dependence on petroleum-based products. This paper aims to analyze and evaluate the use and prospects of plastic materials in the production of carbon fiber. This work was developed through a state-of-the-art analysis based on a literature review of scientific and technical articles published between 2015 and 2025. The selection was made based on current relevance, thematic relevance, and focus on the direct application of plastic materials. The findings show that the implementation of recycled polyolefins as precursors represents a technically viable and environmentally sustainable option for obtaining carbon fiber.

171-I-PP Review of the use of cobalt-based perovskites (ABX3) as cathodes in SOFCs

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Solid oxide fuel cells (SOFCs) are currently one of the main alternatives for generating efficient and clean energy to replace fossil fuels. However, full development has not yet been achieved due to the use of very high temperatures to maintain their efficiency, which causes premature deterioration of their components and makes it difficult to obtain materials with good thermal compatibility and chemical stability. The exploration of new materials for the components of these cells, particularly the cathode, is essential for their optimization. This work focuses specifically on reviewing the current state of development of cathode materials, particularly cobalt-based perovskites of the ABX_3 type. A systematic literature review was conducted in the ScienceDirect and Google Scholar databases, considering publications between 2015 and 2025. The search terms included: “SOFC cathode,” “SrxSm1-xCoO3,” “perovskite cobalt base,” “solid state reaction,” and “solid state reaction perovskite cobalt”. Twenty-five articles were selected that evaluated the structural, thermal, and electrochemical properties of materials applicable to SOFC cathodes, with cobalt at site B of the material and different variations at site A, particularly samarium (Sm) and strontium (Sr). The literature review identified that cobalt-based perovskites offer high catalytic activity in the oxygen reduction reaction, high electronic and ionic conductivity, adequate porosity, and good thermal stability. Likewise, modifying site A could generate positive changes such as minimizing the expansion coefficient or reducing the operating temperatures of the material to decrease premature cell degradation. Therefore, the evidence gathered confirms, first, that the use of cobalt-based perovskites are promising candidates as active materials in intermediate-temperature SOFC cathodes thanks to their high catalytic activity, mixed conductivity, and structural adjustability by varying the proportions and materials of site A. Such is the case with the composition Sm0.5Sr0.5CoO3 (SSC) composition, which is presented as a material with very competitive characteristics at intermediate temperatures (500-700°C) and which could overcome its disadvantages by varying the compositions of site A of the structure (Sr/Sm).

174-I-PP Detección y caracterización de microplástico en el aire de la zona metropolitana de Querétaro

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Pollution by plastic microparticles has been a growing problem in developed countries with high industrial activity. Around the world, various studies have addressed the presence of microplastics in bodies of water and soil; however, their presence in the air and the potential risk it represents are rarely considered. In Querétaro, there is significant industrial activity, and human activity is increasing, contributing to the production of plastic waste, which ends up in the environment under outdoor conditions, leading to the formation of microplastics. In this study, their presence in the air was detected, and the collected samples were characterized using IR spectroscopy. PE, PS, and PET were identified as the main polymers present in the air. The application of a standardized protocol based on ISO 24187 allowed the identification of up to 541 MPs/m²-day, with a predominance of plastic fibers between 100 and 500 µm in size, in an urban area with high vehicular and commercial activity. This study is the first of its kind to implement an international standard for air samples, enabling comparison with future research.

177-I-PP Análisis objetivo de la calidad de imagen en CT de planeación y su impacto en la radiocirugía

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Computed tomography is an essential element in radiotherapy, both for treatment planning and execution.Its image quality impacts directly the volume segmentation,and, therefore, efficacy of treatment. Nevertheless, parameter selection that provides optimal image quality is not always clear nor objective, specially the selection of reconstruction kernels. The objective of this work is to design a methodology that optimizes the election of reconstruction kernels on CT images based on segmentation of volumes of interest. The equipment's technical capacity was evaluated retrospectively under different reconstruction kernels, choosing the one that provided the best spatial resolution and noise balance. Subsequently, the therapeutic impact of segmentations of two tumors performed with the candidate kernel was evaluated compared to the standard kernel in a radiosurgery patient's treatment plan. Differences between segmentations were assessed using the Dice index, as well as dose-volume histograms and spatial dose distribution. Results showed a better spatial resolution and noise balance compared to the standard kernel,resulting in softer images. Regarding the therapeutic impact, for the first tumor, the mean Dice index was 0.74 for the candidate kernel, and 0.63 for the standard kernel. The total volume was underestimated (-17.3%) by the candidate kernel as well as the standard kernel (-33.9%). For the second tumor, the mean Dice index was 0.65 for the candidate kernel and 0.69 for the standard kernel. The candidate kernel overestimated the total volume (+ 7.6%), while the standard kernel underestimated it (-23.6%). In conclusion, the optimal kernel selection improved CT's image quality and provided more accurate segmentations compared to the standard kernel, limited by the tumor's size.

178-I–PO Synthesis and characterization of MgZnO thin films with single and dual n-Type doping

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In this work, MgZnO films with 30 % Mg content were synthesized using the spray pyrolysis technique and doped with In (0-4%) and co doped with Indium (2%) and Gallium (0-3%). The samples were deposited on Si and quartz substrates. The characterization of nondestructive techniques includes X-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and photoluminescence (PL) spectroscopy were employed. The results obtained show that all films have a wurtzite structure with preferential orientation along 002 planes. Residual stress was observed due to Mg incorporation into the ZnO lattice, and dual doping was found to reduce this stress. The Pl spectra exhibit different emissions in visible range for low dopant content and Uv emissions, principally the ones due to the near band edge NBE transitions and show evidence of band gap modulation as a function of the contribution of Dopants. This study provides valuable insights for the development of doped MgZnO optoelectronic applications.

179-I–PO Síntesis de nanopartículas de Au sintetizada por química verde a temperatura ambiente y su aplicación en la producción de hidrogeno via water splitting

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The accumulation of greenhouse gases, because of the combustion of hydrocarbons, is reflected in the increase in global temperature. Therefore, obtaining energy from other renewable sources, such as hydrogen, is essential. This work presents the synthesis of Au nanoparticles (AuNPs) at room temperature and with short reaction times, using the concepts of green chemistry. The synthesis was carried out using an ethanolic extract of Brickellia Cavanillesii as a reducing agent, observing the color change from yellowish-green to reddish-violet in a few minutes, because of the reduction of gold ions when passing from Au^{+3} to Au^{0}. The nanoparticles obtained are related to the synthesis time which are 3, 5 and 7 minutes (M1, M2 and M3), achieving sizes of 5 nm, 9 nm and 12 nm respectively. The results of UV-Vis spectroscopy show the characteristic band of the surface plasmon of the Au NPs around 540 nm, whose intensity increased as the synthesis time was longer, confirming its metallic state with XRD analysis with the characteristic reflections of the face-centered cubic structure of metallic gold. The AuNPs were impregnated in TiO_2 to be used in an aqueous solution photoreaction system for hydrogen production via the water splitting route. After 24 h of reaction, the results evidenced the effect of particle size on the catalytic activity, with the following hydrogen production: 1605 µmol L-1 g-1, 1325 µmol L-1 g-1, and 1150 µmol L-1 g-1, respectively, for samples M1, M2, and M3. This indicates that higher activity is obtained at smaller nanoparticle sizes.

183-I–PP Parametrización de procesos multifractales a través de su función de autocorrelación

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Since the seminal work of Benoît Mandelbrot, Uriel Frisch, and the recent Nobel prize laureate Giorgio Parisi, multifractal processes have become the model of choice for both natural phenomena (e.g. in Hydrometeorology) and human activity (e.g. financial markets), in a variety of cases where multi-exponent scaling is exhibited. The main problem, however, in the design of such models, has been caused by their lack of ergodicity in the underlying processes, which complicate their parametrization from a single realization (which is almost always the case in the real world). To mitigate the aforementioned situation, various descriptors have been proposed, such as e.g. breakdown coefficients, in order to facilitate the estimation of parameters of the underlying process, even if it is not ergodic. The present work focuses on analytically calculating the average autocorrelation function of the measure generated on its support by a binary multiplicative cascade, expressed in terms of the cascade generator, which wood allow for parameter estimation from a single time series, in practical applications. A validation of results by simulation is also offered.

194-I-PO The dougong's structural properties

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Wood's construction is as old as humanity and in all ancient civilizations it has been a fundamental element of homes even to the present day. In occident, there are different structures built from wood, however, none with the structural characteristics of the Dougong, whose construction system of Asian origin consists exclusively of wooden assemblies joined together without any type of adhesive or additional element such as nails or screws. The architect Liang Sicheng (1901-1972), better known as "The Father of Modern Chinese Architecture" born in Tokyo, Japan, dedicated his life to documenting and studying each of the temples and pagodas throughout China, Japan and Korea, writing several books dedicated to the classification of the elements of each construction depending on the era and dynasty in which they were built. Together with his wife Lin Huiyin (1904-1955), they made a translation and interpretation of the architectural treatise written in 1103 called Yingzao Fashi (Construction Procedures) written by General Construction Supervisor Li Jie (1065-1110) at the height of the Song Dynasty. Its content consists of 34 chapters in which architectural terms are defined, the methods and measurements for construction are described, the materials for each construction element are detailed and the proportions of each piece that makes up the Dougong are illustrated, including a chapter on the pictographic elements and its meaning. This research focuses on the study of Dougong's study through the architectural treatise called Yingzao Fashi, making a reinterpretation of the wooden assemblies capable of supporting themselves without affecting the property using 3D models; considering that one of the most important conditions is reversibility and minimal detriment to the property in interventions carried out in heritage buildings, as well as the use of materials as close as possible to the originals; an affordable option is proposed with shorter execution times, all of which is a heritage property located in the Historic Center of Mexico City on República de Uruguay 77 street.

199-I-PP Modelación matemática de crecimiento de bacterias en aguas residuales

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This study proposes a mathematical model based on the mass-action law to describe the growth dynamics between two bacteria in biological wastewater treatment: *Candidatus Microthrix parvicella* (*M. parvicella*), associated with bulking sludge problems, and *Zoogloea spp.*, which benefits floc formation. The model was developed using bacterial filamentous growth data reported by Niansi et al. (2018) and incorporates substrate consumption interactions through a system of coupled non-autonomous differential equations. Numerical simulations were performed under two operational conditions: sludge loading rates of 0.07 kg COD (Chemical Oxygen Demand) (kg MLSS·d)$^{-1}$ (stage 1) and 0.04 kg COD (kg MLSS·d)$^{-1}$ (stage 2). The results capture the trend reported in literature, where low loading rates (<0.1 kg COD (kg MLSS·d)$^{-1}$) favor *M. parvicella* growth and process destabilization. Furthermore, the substrate uptake rate was consistently higher for *M. parvicella* than for *Zoogloea spp.* under the established parameters in the system, consistent with the bacterial behavior described in the literature. A qualitative model analysis is also presented, discussing the advantages and limitations of this mathematical modeling approach.

208-I-PP Uso de redes neuronales para resolver problemas físicos

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Inspired by the functioning of the human brain, physics-informed neural networks (PINNs) have established themselves as a powerful and versatile tool for solving ordinary and partial differential equations that govern the evolution of physical systems. This emerging technique incorporates the laws of physics into the training process by modifying the loss function, incorporating both the differential equation and the associated boundary conditions. In this work, we solve the Poisson equation for the electric potential with Dirichlet boundary conditions using this method, which exhibits fast and effective convergence, with excellent agreement with the traditional numerical solutions, such as those obtained by using the variational method, the finite differences method, or the spectral method. Moreover, PINNs show the ability to generalize solutions over continuous domains without the need for meshing, highlighting their flexibility to adapt to different physical problems without relying on rigid discretizations. Additionally, we explore their application in solving differential equations that naturally arise in the perturbation theory of relativistic gravitational systems and we compare with the results produced by the asymptotic iteration method and the pseudospectral method.

209-I-PP Modelado de susceptibilidad volcánica basado en redes neuronales artificiales: Campo volcánico monogenético Chichinautzin Ciudad de México, México

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The research project involves modeling volcanic susceptibility using artificial neural networks within the Chichinautzin Monogenetic Volcanic Field, located in the southern area of Mexico City. Its main objective is to define the zones with the highest susceptibility to the development of new eruptive centers, as well as to identify the characteristics and eruption patterns within the volcanic field. The Chichinautzin Monogenetic Volcanic Field is one of the largest active volcanic fields in Mexico and is situated near major cities, which are built on the deposits left by the field's most recent eruptions. Currently, the southern part of Mexico City is built on the eruptive events of the Xitle volcano, which covered the Cuicuilco area approximately 2,000 years ago. A future eruption in or near Mexico City could have a significant impact due to the area's dense population, making studies on volcanic prediction and susceptibility highly important for risk mitigation and prevention. The research is based on the correlation of various variables that allow for the estimation of likely areas for the emergence of a new volcanic structure. These studied variables include: the distribution of volcanic cones, the age of eruptive activity, seismicity within the field, characteristics of groundwater, and structural geology.

212-I–PP Analysis of the durability of polymethyl methacrylate and polyurethane polymers incorporated with cellulose derived from single-use cups for use in automotive headlights

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The automotive industry continually explores environmentally friendly raw materials for its production processes to meet the demands of today's market. As a result, there is a strong focus on using sustainable components that not only reduce ecological impact but also provide high performance and durability. A notable example is the automotive headlights, which must withstand various environmental conditions. This project focuses on examining the application of transparent polymers for automotive headlamp purposes. Initially, it presents a study on the use of single-use, laminated cups for extracting crystalline cellulose using environmentally friendly raw materials such as hydrogen peroxide and sodium hydroxide. Techniques such as Fourier transform infrared (FTIR) analysis, X-ray diffraction, and optical microscopy are employed to assess the functional groups, structure, and morphology. Subsequently, the synthesis of a bio-based polymer, poly (methyl methacrylate) (PMMA) and poly(urethane) (PU), is discussed. Interpenetrating polymer networks with PMMA/PU ratios of 50/50 and 80/20 are synthesized through condensation and free radical polymerization processes, respectively. Prior to polymerization, crystalline cellulose particles are dispersed in the PMMA/PU raw chemicals mixture at a concentration of 0.1 wt.%. The resulting products are analyzed using laser scanning confocal microscopy (LSCM) to study the dispersion and emission of crystalline cellulose in PMMA/PU, as well as transmission electron microscopy (TEM) to evaluate dispersion at the nanometer level. Finally, mechanical tension and compression tests are conducted to assess durability before and after exposing the materials to environmental degradation. The results indicate that the addition of crystalline cellulose in a 50/50 PMMA/PU ratio leads to less mechanical damage compared to 80/20.

218-I-PP Uso de herramientas de inteligencia artificial y modelación matemática en modelos murinos bajo tratamiento para control de la depresión

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This work focuses on the analysis and mathematical modeling of experimental data obtained from murine models subjected to treatments aimed at controlling depression. A mathematical model is proposed to describe both qualitatively and quantitatively the evolution of certain physiological indicators associated with anxiety, taking into account the biological dynamics observed in the experiments. Based on the proposed model, a parameter estimation process is carried out to adjust the system's dynamics to the experimental data. Once calibrated, the model is used to generate simulated data that complement the experimental records and expand the dataset available for analysis. This enables the application of artificial intelligence tools for data classification. A key contribution of this work is the implementation of a classification neural network, trained with both the simulated data generated by the model and the real experimental data. The goal of this network is to classify individuals according to their response to treatment or to the experimental group to which they belong. This artificial intelligence tool is validated using the original experimental data.

225-I-PO Análisis Comparativo de Diferentes Técnicas de Medición para Evaluar la Calidad de Servicio de una Red Móvil

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This paper presents the results of a comparative analysis of two different quality of service measurement techniques for a 4G LTE mobile network. The first is based on a walk test, and the second on the use of network crowdsourcing data. This analysis is based on the methodology established by the Federal Telecommunications Institute (IFT) to evaluate the performance of a nationwide LTE network, created solely to assess the compliance obligations of the Wholesale Shared Network (Red Compartida Mayorista), which is based on the application of international recommendations such as E.806 of the International Telecommunication Union, in addition to all the technical specifications stipulated in pift081117684, the resolution document of the so-called Methodology of the Federal Telecommunications Institute (MIFT), such as ramp times, test times, guard times, FTP protocol, outdoor, among other elements that are exclusive to the walk test. This article presents the results of the application of the methodology using the two measurement techniques, and an analysis is made to identify the advantages and disadvantages that include criteria of geographical representativeness, network performance statistics, and other evaluation criteria related to the practical execution of the measurements which could be impacted in time and cost of execution through crowdsourcing and thus, seek the optimization of the MIFT and even its restructuring so that it is applicable to more than one mobile network service provider.

249-I-PP Análisis de la transferencia de calor en un motor stirling de carrera variable con la implementación de aletas circulares

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This research focuses on improving the efficiency of a Stirling engine by analyzing the equations governing heat exchange within the system. The study assumes constant temperatures at both the hot and cold ends, and a regenerator with a linear temperature profile between them. To ensure adequate airflow, circular fins were incorporated as part of the cooling system. Given the small size of the engine, the fins needed to be as light as possible and designed to fit within strict spatial constraints. The objective of this theoretical analysis is to enhance the performance of a small-scale Stirling engine. By accurately modeling heat transfer within the engine cylinder, we can estimate heat losses and propose appropriate design improvements. The study began with an analysis of heat transfer at the hot end, where maximum temperatures of 1345.59 K were recorded. The regenerator was modeled with a linear temperature gradient between the hot and cold ends.
For the cold end, forced convection was assumed, using the Churchill–Bernstein correlation with air as the working fluid. Fins were then implemented at the cold end, with dimensions determined to account for the engine's variable stroke length—up to five times the nominal stroke. For each of the five cylinder and fin configurations, the heat dissipated by the fins was calculated. In conclusion, a comparison was made between the heat rejected with and without fins for each configuration. The results show that the system can dissipate up to three times more heat when fins are used, preventing engine overheating and demonstrating this modification as a viable approach to improving overall efficiency.

252-I-PP Clasificación de rostros: Un análisis comparativo entre SVD y redes neuronales

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Automatic face classification is a central problem in computer vision and machine learning, which consists of mapping high-dimensional image vectors to a discrete set of identities. This work compares two representative approaches: (1) Eigenfaces using Singular Value Decomposition (SVD), a classic linear dimensionality reduction technique, and (2) Convolutional Neural Networks (CNNs), capable of learning hierarchical and non-linear visual features. A common preprocessing pipeline was implemented: grayscale conversion (SVD), RGB normalization (CNN), resizing to 128×128 pixels, and a stratified split (70). Face classification is a fundamental problem in computer vision and machine learning, formulated as a classification task in high-dimensional spaces. Each image is represented as a vector $\mathbf{x}_i \in R^d$, and the goal is to assign it to one of C possible identities. This work compares *Eigenfaces* via Singular Value Decomposition (SVD) and Convolutional Neural Networks (CNNs). Preliminary results show that the CNN outperforms SVD in accuracy and macro F1- score, although the CNN achieves better separability in the latent space, SVD remains com petitive in resource-constrained scenarios due to its smaller model size and faster inference speed. Future work includes facial alignment, the use of pre-trained deep embeddings, and margin-based loss functions to improve inter-class separability.

259-I-PO Authentication in LiDAR data using a Spatial Domain Technique

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Ensuring the authenticity of LiDAR data is essential to prevent manipulations that could affect decision-making in critical applications. This work presents a watermarking technique that embeds and extracts digital marks directly onto a luminance map generated from the RGB channels of LiDAR point clouds. The method operates in the spatial domain and uses the zero-frequency (DC) coefficient in 4 x 4 pixel blocks to embed watermark bits, avoiding the need to compute the full Fourier transform. A quantization strategy is employed to adjust pixel intensities and embed the information imperceptibly. The effectiveness of the technique is evaluated in terms of imperceptibility and robustness, using the Peak Signal-to-Noise Ratio (PSNR) metric. Simulations demonstrate that it is possible to maintain a balance between visual imperceptibility and resistance to tampering under various quantization step values, offering a lightweight and practical solution for LiDAR data authentication.

262-I-PP Modelo dinámico de efecto de radiación en la línea celular MIA PaCa-2

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According to data from the World Health Organization (WHO), cancer is the leading cause of death. Ionizing radiation is one of the most widely used options in cancer treatment; however, its use involves risks to non-cancerous tissues. For this reason, optimization criteria based on tissue sensitivity to radiation (radiosensitivity) are employed to minimize the potential adverse effects caused by ionizing radiation treatments. Currently, various in vitro studies are being conducted on cancerous and non-cancerous tissues to determine their radiosensitivity. The most widely used model today to parametrize radiosensitivity is a data-driven mathematical model known as the Linear-Quadratic (LQ) model. This model proposes a linear behavior for cell death due to a “single hit” and a quadratic behavior for cell death from “multiple hits.” Although the model fits the data well, it lacks a biological foundation, and its parameters are interpreted only after data fitting. In this work, a biologically based model was proposed to describe the behavior of cells in response to radiation. It was found that the value of the cost function used to fit data from the MIA PaCa-2 cell line could be reduced from 2.4029 (as obtained with the LQ model) to 0.3817 using the proposed model. These results suggest that a biologically grounded mathematical model more accurately reflects the dynamics of cell population proliferation in response to radiation when compared to the LQ model.

278-I-PO Modelado del consumo de agua residencial mediante técnicas de aprendizaje de máquina en un sistema IoT

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Sustainable water management is a matter of global concern established under Sustainable Development Goal 6 (SDG 6) of the United Nations, which promotes the responsible and equitable use of this vital resource. In residential contexts, substantial challenges emerge in the domains of water usage monitoring and optimization. This work proposes an intelligent residential water management system based on the Internet of Things (IoT), using machine learning algorithms for water consumption modeling. Real-time data were collected through a water flow sensor using LoRaWAN wireless communication technology, installed in a household located in northern Mexico. Occasional data transmission gaps were encountered during the process of data analysis and preprocessing. To address these issues, linear interpolation techniques were employed. To classify water consumption patterns as either typical or atypical, three supervised machine learning algorithms were applied: Random Forest, SVM, and KNN. The K-means unsupervised algorithm was employed to analyze water consumption data groups and patterns. The classification models demonstrated shifting levels of performance, with the best case achieving 94.74% accuracy, 97.44% precision, 92.68% recall, and 95.00% F1-score. Results obtained from data analysis facilitate strategic decision making regarding cost-effectiveness of sustainable water resource management, the detection of atypical events, and the creation of personalized recommendations displayed through a residential water consumption visualization dashboard.

282-I-PO Mechanical mixing synthesis of CuO/TiO_2 composites: Impact of CuO content on their catalytic behavior

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The effect of CuO content on CuO/TiO_2 composites synthesized by high-energy mechanical mixing and their application in the photocatalytic reforming of ethanol for hydrogen production was studied. The CuO content was varied from 0.5%, 1%, 3%, 5%, and 7% by weight, with a milling time of 15 min, using ZrO_2 beads and a bead-to-powder ratio of 30:1. The samples were characterized by X-ray diffraction (XRD), temperature-programmed reduction (TPR-H2) at 25-600°C, and diffuse reflectance UV-Vis spectroscopy (UV-Vis DRS). XRD analysis revealed the presence of only anatase and rutile phases in the samples with 0.5% and 1% CuO, with no evidence of crystalline copper species. In contrast, in samples with higher CuO contents, signals corresponding to the tenorite phase (CuO) were observed. The TPR profiles showed reduction peaks around 260°C and 325°C, associated with the partial reduction of CuO to CuO. Additionally, a decrease in the band gap of the reductively treated materials was observed, suggesting structural modifications induced by the heat treatment. The photocatalytic performance was evaluated in a semi-continuous reactor under UV irradiation (375 nm) during the reforming of ethanol (CH3OH + 3H2O → 6H2 + 2CO). The catalysts evaluated without reductive treatment did not show hydrogen production; however, in the reduced catalysts, the amount of hydrogen was on the order of 5–8 mmol/g h after 3 h of reaction, while in the reference catalysts, i.e., CuO and TiO, hydrogen production was negligible. The results obtained demonstrate that the reductive treatment plays an important role in the photocatalytic efficiency of the CuO/TiO_2 catalysts, due to the formation of reduced copper species (Cu2O/Cu°) and the presence of oxygen vacancies generated on the TiO_2 surface during the reductive treatment at 600°C.

284-I-PP Desarrollo de un sistema de adquisición y almacenamiento de las señales ECG utilizando el ESP32, con electrodos de contacto de tres derivaciones para el procesamiento de las señales en MATLAB

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In this research work, we present a electrocardiogram (ECG) data acquisition device capable of recording the lead-3 ECG signal through the right- and left-arm and right or left leg. The proposed device is high-sensitive, wet-contact, portable, inexpensive with wet adhesive electrodes. One of the other advantages of this device is to make it possible to record and use the lead-3 ECG signal easily in any condition and anywhere incorporated with any platform to use for advanced applications such as biometric recognition and clinical diagnostics. It is proposed to convert the ECG signal from analog to digital, with the help of the ESP32, the acquired data will be sent to MATLAB to characterize the P, Q, R, S and T parameters of the signal, in order to authenticate people or monitor the patient's signal.

289-I-PP Aerodynamic optimization of blades for horizontal-axis wind turbines: a comparative study between General Electric Vernova and Siemens Gamesa

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This work evaluates the aerodynamic performance of blade profiles used in horizontal-axis wind turbines installed in Mexico. Specifically, the GE 2.5-120 model from General Electric Vernova and the SG 4.5-145 model from Siemens Gamesa are analyzed. Both companies are leaders in the wind energy sector, both in Mexico and globally. For this reason, a comparative analysis is considered essential to identify key design variables for optimization in future research. Based on a technological inspection and the proposed models, the blades were modelled using computer-aided design (CAD) software. Parameters such as chord, twist angle, and profile variation were considered. Subsequently, numerical simulations were carried out using computational fluid dynamics (CFD) to analyze the flow behaviour around each profile. This allowed for the determination of characteristic parameters such as the lift and drag coefficients. Derived from these analyses, an optimized profile is proposed based on the comparative results of both commercial models. This design includes morphological adjustments aimed at maximizing lift and improving overall blade performance. The validation of this profile was performed through CFD simulations, which allowed for the evaluation of its viability for future applications in commercial wind turbines. The contribution of this project lies in the efficient design of wind turbines and the development of sustainable technologies, utilizing advanced modelling (CAD) and numerical simulation (CFD) tolos.

294-I-PP Un enfoque perturbativo para las oscilaciones cuasinormales de agujeros negros

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In the present work, we study and calculate the quasinormal frequencies of black holes by using a perturbative method and a pseudospectral method. Based on a recently published procedure that allows us to obtain higher-order expansions and improves the convergence of the perturbative series, we generate expansions for the quasinormal frequencies of various black holes and analyze the conditions for which we can calculate them with this methodology. This perturbative method allows us to determine the quasinormal frequencies with fewer computational resources compared with other procedures and this fact allows us to find the perturbative expansions for a larger number of modes. The perturbative results are compared with those obtained numerically with the pseudospectral method implemented in Mathematica.

295-I-PO Análisis de datos de un sistema inteligente de monitoreo y control basado en el IoT para el consumo energético en un edificio

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The efficient and sustainable use of electrical energy in conventional buildings has become of great interest due to the need to properly manage energy consumption. This paper presents an analysis of electrical energy consumption in operational areas of a building that identifies patterns and trends, allowing a manager to make decisions and take actions aimed at making efficient use of the energy resource. For the analysis, preprocessing techniques and machine learning (ML) models based on time series and regression were applied. The results obtained generated recommendations to make energy consumption more efficient in the areas under study, with the opportunity to extend their scope to different scenarios.

304-I-PV Análisis modal y redes neuronales para la detección de daño estructural

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This study integrates modal analysis with neural networks to detect structural damage, modeling a four-degree-of- freedom system and generating samples through random reductions in the stiffness matrix to simulate damage. Two feedforward neural networks, each with six hidden layers, were designed to predict the modal and stiffness matrices from the first 1 to 4 values of the modal matrix's first row. The predicted modal matrices exhibited high accuracy, with minimal errors compared to the actual ones. The stiffness matrices showed principal diagonal elements with relative errors below 0.3%, but larger deviations in off-diagonal elements. The original, test, and predicted modal and stiffness matrices are presented, demonstrating the feasibility of the proposed approach.

308-I-PP Determinación de la acumulación de daño por fatiga en un acero ASTM A572

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ASTM A572 Grade 50 steel is a structural material widely used in components subjected to cyclic loads, such as bridges, buildings, and industrial structures. Under these operating conditions, a progressive degradation phenomenon known as fatigue damage occurs, posing a critical risk by compromising the material's integrity and significantly reducing its service life. This work is part of a research project aimed at establishing an experimental methodology capable of correlating the effects of fatigue damage accumulation with changes in the mechanical and electrical properties of the steel. The strategy is based on the systematic acquisition of data derived from destructive testing, as well as the in situ measurement of electrical resistivity using the double Kelvin bridge method. This combination of techniques seeks to identify degradation patterns that may be associated with the internal damage evolution, even before the appearance of visible failures. Based on these measurements, a database is being constructed that integrates structural and electrical information of the material under controlled conditions. This dataset constitutes a reliable reference point that will subsequently allow the evaluation of the integrity state of steel components subjected to cyclic loading in service conditions. The ultimate objective of this work is to move toward the development of a non-destructive monitoring tool capable of detecting significant alterations in the material's behavior based on its electrical properties. This approach has potential applications in the predictive maintenance of critical structures, where anticipating failures is essential to ensure operational safety and optimize resource management. Furthermore, the proposed methodology contributes to the strengthening of structural diagnostic strategies aligned with principles of reliability, innovation, and sustainability.

312-I-PP Desarrollo de un software empleando Deep Learning para la caracterización de precipitados β’ en aleaciones FeNiAl

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In the present work, a software was developed using the Python programming language and techniques known as Deep Learning. This software was capable of quantifying the radius of precipitates as well as the area fraction present in micrographs obtained through high-resolution Scanning Electron Microscopy (HR-SEM). To ensure optimal image processing, a convolutional neural network was implemented and trained on a database of pre-labeled images, with the purpose of automatically segmenting the precipitates in each micrograph. The software was designed to detect these precipitates, highlight them with a user-defined color on the original image, label them, and display relevant information required by the researcher in a table. The graphical user interface was built using a specialized Python library, providing an intuitive and accessible user experience. The software was applied to experimental results from an alloy with the nominal composition Fe-10Ni-15Al-4Ti. The alloy was fabricated in a mini arc furnace under an inert argon atmosphere. It was homogenized at 1250 °C for 12 hours and quenched in water at room temperature. Subsequently, phase precipitation was induced through aging treatments at 800 °C for 1, 5, 10, 25, 50, 100, 250, 500, and 1000 hours in order to observe the morphological changes of β’ precipitates via HR-SEM. To validate the software’s performance, measurements were compared using a publicly accessible image analyzer. The results enabled the application of the software for precipitate quantification in FeNiAl-based alloys modified with Cr, Cr-Ti, and Cu additions, which have been reported to exhibit percolated structures, spheres, cubes, parallelepipeds, plates, and irregularly shaped particles. It is important to note that these morphological changes allow the neural network to learn to identify various geometries. Finally, under the different aging conditions of the Fe-10Ni-15Al-4Ti alloy, Vickers microhardness tests were conducted in accordance with ASTM E92 to assess the effect of the precipitates and their morphology on the material’s hardness.

318-I-PO Red Neuronal Spiking para la clasificación de frutas

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The Spiking Neuronal Networks (SNN) are a model of artificial neurons that simulate the functioning of the human brain using hardware of software. Because of their generally parallel structure and pulse train operation, they are able to significantly reduce the processing time and power consumption of the neuronal network. The agricultural industry has implemented machine vision systems utilizing neural networks for food quality inspection and control. However, the United United Nations Environment Program (UNEP) recorded an estimated waste of more than 20 million tons of food throughout the supply chain in Mexico in 2022. For this reason, the following procedure is proposed, which consists of implementing two neuronal networks for fruit recognition, a Deep Neuronal Network with the Torch Library and a SNN with “Leaky Integrate and Fire” (LIF) neurons based on the Brian2 Library. Under the same conditions, topology and Fruit 360 Database; the accuracy, classification time and energy consumption of the Network during training are compared, searching for superior efficiency. The preliminary results on apple identification shows that the performance during training of the Deep Neuronal Network is 2.37 sec with a power consumption of 1390.85 mW, in contrast, the Spiking Network shows a learning time of 1.74 sec with a power usage of 88.5 mW. Finally, it is preliminary observed that the proposed SNN has an energy consumption up to 15 times lower and a reduction in learning time of 0.6 seconds compared to the Deep Neuronal Network with perceptron’s, this opens a window of opportunity in the investigation and implementation of SNN in systems for fruits classification.

319-I-PO Identificación mineralógica y análisis de tierras raras en salares continentales al norte de la Mesa Central

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Within the northern Mesa Central, between San Luis Potosi and Zacatecas, 38 continental salars have been identified of which seven of these have been prospected in the interest of the studying the origin and distribution of the clayey sediments that may contain lithium, potassium, boron, and magnesium. In this region, the salars are distributed in endorreic basins where the arid to semi-arid climatic conditions with little rainfall in summer allow the evaporation of water creating temporary reservoirs where sediments from different surrounding lithologies accumulate that represent metamorphic rocks, sequences of carbonate rocks, volcanic rocks of varied composition from basalts, andesites, to rhyolites as well as a granodioritic intrusion. These salars have been classified as “immatures salars” due to their higher clastic sediment to halite content. X-ray diffraction analyses were performed on the <180µm y <75µm fractions of sediments to obtain representative mineralogy. Minerals identified included quartz, calcite, dolomite, muscovite, albite, and orthoclase minerals were obtained. Clay minerals illite, montmorillonite, hectorite, kaolinite, and saponite; zeolites clinoptilolite, heulandite, and analcime; and micas lepidolite and silinaite. The minerals of interest and concentrated in these continental salars are hectorite, lepidolite and silinaite. ICP-OES+MS analyses for Rare Earths were also performed. This analysis allows us to infer the origin of the sediments in terms of their depositional environment and weathering. It was found that the sediments were deposited in an alkaline and non-oxidative environment. An alkaline environment allows the mobilization of Rare Earths in clays without being transported. Being non-oxidative, negative Ce-anomalies, together with positive Y/Ho radii indicate that the weathering process is from a continental source that was deposited and recycled in the continental salars. Both techniques must allow us to vectorize the sources of the minerals that may contain lithium.

324-I-PO A systemic model for a small-satellite constellation focused on rural Mexico applications

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This study presents the design and the visualization of an integrated model for a small satellite constellation intended to deliver combined telecommunications and earth observation services to rural communities in Mexico that remain affected by technological marginalization. In the proposed systemic model the initial area of interest is the south of Mexico where limited infrastructure restricts agricultural potential, hinders environmental monitoring, and limits access to essential services such as healthcare, education, and social participation. The proposal centers on a dual-use satellite platform that merges connectivity and remote sensing capabilities into a single, adaptable system. The research follows a systems engineering methodology, beginning with a user-focused assessment that identifies the relevant stakeholders and the specific needs of the intended beneficiaries. It also includes an analysis of the current landscape of space technologies, giving special attention to the global movement toward hybrid architectures that integrate communications and observation functions. To support this approach, the study reviews international experiences, including combined missions developed by agencies such as ISRO and NASA. The main aspects to be determined involve: the choice of orbit and its corresponding Keplerian elements; the design of an overarching system architecture aligned with mission objectives; operational feasibility in light of Mexico's current aerospace infrastructure; and the definition of initial technical and functional requirements. These will be assessed through simulations and scenario-based modeling, with the goal of determining feasibility, adaptability, and relevance to rural needs.

326-I–PO Comparación técnica entre el uso de baterías de Ion-Litio y hidrogeno para la industria automotriz

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This article compares lithium-ion batteries and hydrogen fuel cells used in electric vehicles, considering energy efficiency, costs, service life, environmental impact, and water consumption, with an emphasis on Mexico. In the short term, lithium-ion batteries are more viable thanks to their technological maturity, decreasing costs, and expanding charging network. Their advantages are high efficiency and availability; however, they have disadvantages such as high water consumption in extraction and challenges in recycling, which have significant environmental and social consequences. The main challenge will be to implement sustainable material recovery and management systems. In the medium term, hydrogen is emerging as a strategic option for heavy and long-distance transport. Its advantages include greater autonomy and reduced refueling times, while its disadvantages are low full-cycle efficiency, high costs, and lack of infrastructure. Adopting it prematurely could lead to technological and energy dependence. The key challenge is to establish a national production, distribution, and regulation network that ensures competitiveness.
In the long term, both technologies should be considered complementary: lithium in urban and light mobility with improvements in recycling, and green hydrogen as a pillar for freight transport and decarbonization. The greatest challenge for Mexico will be to articulate policies that balance environmental sustainability, energy security, and industrial competitiveness, promoting an orderly transition to sustainable electric mobility.

334-I-PP Análisis de la generación de ondas acústicas en la descarga de un medio granular contenida en un silo

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This work aims to identify acoustic attractors associated with specific dynamic regimes of granular flow, which manifest as cyclic trajectories or nonlinear structures in phase space diagrams constructed from recorded acoustic signals. These patterns support the proposal of a phenomenological model based on a forced nonlinear oscillator, capable of qualitatively describing the observed dynamics during discharge. The experimental parameters obtained allow for the evaluation of existing models or, if necessary, their modification to accurately represent the phenomenon. This characterization of the coupling between granular dynamics and acoustic emissions is essential not only for understanding the behavior of complex physical systems but also for the design and optimization of industrial silos, enabling early blockage detection, improved operational monitoring, and the development of structures with enhanced acoustic and structural performance.

337-I-PO Caracterización integral de las unidades estratigráficas del cretácico y jurásico con interés petrolero en el Golfo de México

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The purpose of this work is to study the Cretaceous and Jurassic chronostratigraphic units to identify the probability of becoming new feasible prospects to propose drilling points and maximize hydrocarbon recovery in existing fields. The characterization of these geological formations is based on a multidisciplinary integration methodology, that is, a correlational and descriptive study is applied between geological, geophysical and petrophysical factors for the construction of a 3D static model. Therefore, it is based on geological and geophysical information from 15 wells located in the submarine extension of the Yucatan peninsula known as La Sonda de Campeche, in the southern Gulf of Mexico. The Gulf of Mexico is one of the main oil basins in the world and of great importance in the Mexican oil sector. During the Cretaceous and Jurassic periods, the study area experienced intense tectonic and sedimentary activity, which generated the accumulation of carbonate rocks that today are of great interest to the industry as they have served as hydrocarbon reservoirs, thus becoming a productive and strategic region in the country. The motivation for the development of this topic arises primarily from the nation's need to increase hydrocarbon reserves and extraction, since the National Development Plan 2019-2024 has as its objective the “rescue of the national energy sector”, through the State Productive Companies such as Petróleos Mexicanos (PEMEX). Therefore, it is considered as the fundamental basis to achieve energy self-sufficiency according to the Energy Sector Program 2020-2024. On the other hand, there is a need to generate new geological knowledge in oil fields, caused by a marked lack of exploratory activities, to restore production by new discoveries as a result of an administration focused on extraction since the discovery of the Cantarell field.

346-I-PP Sistema de adquisición de electromiografía basado en tecnologías IoT

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Electromyography (EMG) is a technique used to record the electrical activity of muscles during muscle contractions. Two methods are typically used for this technique: the invasive method, also known as needle EMG, and the noninvasive method, called surface EMG (sEMG), which involves placing electrodes on the skin. sEMG is characterized by its ease of implementation, reduced discomfort, and low risk, making it a fundamental tool in rehabilitation, neuromusculoskeletal system analysis, prosthesis control, and telemedicine for remote patient monitoring. Furthermore, the development of portable and wireless technologies based on the Internet of Things (IoT) has helped reduce problems in healthcare systems, such as the high demand for medical services, the need for human and material resources, and poor access to services. Despite the significant advantages of these devices, the local manufacturing of new biomedical technology has been a challenge. Procurement of these devices from other countries is prevalent, which limits access to quality services, results in high costs, and leads to fluctuations in exchange rates and taxes. Given this, a portable, wireless EMG acquisition system based on IoT technologies is presented. The system consists of eight adjustable EMG modules, which can amplify signals in a range of 150 to 1100. It also incorporates wireless communication via Wi-Fi to ensure portability in different environments. The system features software that enables parameter configuration, including the application of digital filters and gain adjustment; it also facilitates online visualization, data processing, and cloud storage. To demonstrate the system's usability, a set of signals from different subjects was acquired and used in an identification algorithm to monitor the movement of a virtual biped during the gait cycle. During the system evaluation, it presented an autonomy of at least two hours, a maximum sampling frequency of 4,700 Hz, and data loss of less than 1%.

351-I-PP Interacción del campo escalar de k-esencia con neutrinos

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In this work, we present a preliminary theoretical analysis of the interaction between the k-essence scalar field and massive neutrinos, based on a density-dependent coupling. Unlike traditional dark energy models, k-essence allows for richer dynamics due to its non-canonical nature, leading to the activation of a fifth force at late times in the universe (around z~0.5). This attractive force, stronger than gravity, plays a significant role in the formation of large-scale structures. Furthermore, the model offers a natural approach to the cosmological “why now?” problem by linking the beginning of cosmic acceleration to the transition of relativistic neutrinos and non-relativistic. We derive and analyze the dynamical equations of the coupled system, including stability conditions for the joint evolution of the scalar field and neutrinos. Additionally, we identify how the model modifies the evolution of matter perturbations and its impact on the matter power spectrum in both the linear and nonlinear regimes, compared to standard quintessence. These results represent a first step toward more advanced numerical simulations aimed at exploring the model’s relevance to current and future cosmological observations, such as those provided by DESI (Dark Energy Spectroscopic Instrument) and Euclid missions that map the distribution of galaxies with high precision to study the accelerated expansion of the universe and the nature of dark energy.

352-I-PV Estudio del band gap de películas semiconductoras de CuO sintetizadas por el método SILAR con y sin procesos de enjuague

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The continuous technological development worldwide has demanded constant study and search of new materials that allow the solution to current technological problems and needs. Second-generation solar cells manufactured based on antimony selenide [$Sb_2(S, Se)_3$] have promoted the development of photovoltaic technology and have become an alternative to solve the energy problem caused by the excessive use of non-renewable energy and the deficiencies presented by first-generation solar cells. Although one of the limitations they present is the low density of charge carriers, which causes a low efficiency in energy conversion. In the study of semiconductors, an important parameter is the band gap, which refers to the minimum energy necessary to promote an electron from its state bound to the nucleus in the valence band to a free state in the conduction band that allow it to participate in the energy conversion process, for a semiconductor, this value must be in the range of 0.3 to 4 eV. CuO thin films have aroused great interest in the scientific world due to their optical and electrical properties, so in this work the fabrication of p-type CuO semiconductor films is proposed to be applied as charge-carrying layers in $Sb_2(S, Se)_3$ solar cells. CuO semiconductor films were synthesized by the SILAR method (Adsorption and Successive Reaction of Ionic Layers) with and without rinsing process, the band gap was calculated through the TAUC method from transmittance spectra obtained by UV-vis (Figure 1), extrapolating the linear region of the spectrum to the horizontal axis of the TAUC graph, it was found that the films synthesized with 60 SILAR cycles with rinsing process, presented a better quality and a band gap of 2.24 eV (Figure 2) which makes them a suitable semiconductor for the second-generation solar cells.

363-I-PO Hacia una estrategia nacional de reserva: Seguridad energética mediante rehabilitación y almacenamiento de gas natural

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This work presents a proposal to strengthen Mexico's energy security through the implementation of a national reserve strategy based on two main pillars: the rehabilitation of thermal power plants removed from the National Electric System and the development of underground natural gas storage. The initiative seeks to recover up to 5,000 MW of currently restricted installed capacity and to establish gas inventories sufficient to cover at least thirty days of national consumption, thereby mitigating risks associated with the country's high dependence on imported fuel. The methodology is based on the construction of operational scenarios, characterization of the national thermal fleet, and a comparative analysis of international experiences in Germany, Texas, France, and South Korea. The results indicate that combining strategic generation and underground gas storage significantly enhances the resilience of the National Electric System against supply interruptions or extreme events, without compromising the goals of energy transition. Key regulatory elements for its potential implementation in Mexico are also identified.

365-I-PP Degradation of CE by means of a continuous flow packed bed reactor

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Emerging Contaminants (ECs) are pollutants that persist after wastewater treatment processes. They remain in solution due to the presence of aromatic rings in their molecular structure, which makes them difficult to degrade. In response to this challenge, materials engineering has employed techniques such as advanced oxidation processes, which have proven effective in the removal of these contaminants. Catalytic oxides such as SnO_2–Sb_2O_3 have demonstrated high efficiency in the degradation of ECs; however, a new challenge arises from the persistence and subsequent recovery of powders in the photocatalysis process. To address this, various techniques for supporting catalytic powders have been investigated. The present study identifies the optimal conditions for the analysis of heterogeneous photocatalytic activity as follows: a concentration of 200 µM, a flow rate of 0.43 mL/min, and a temperature of 55 °C, achieving a degradation efficiency of 96%. These optimized parameters were subsequently applied to the degradation of ibuprofen (IB), resulting in a 76% efficiency. In both cases, the degradation kinetics were consistent with the Kröger–Ziegler model. Fourier-Transform Infrared Spectroscopy (FT-IR) was employed to confirm bond coupling, while X ray Diffraction (XRD) was used for phase determination and identification.

371-I-PP NiCuFe catalyst for OER and HER in alkaline medium for possible application in an AEM electrolyzer

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Despite extensive research over the past two decades regarding environmental issues and the use of non-renewable energy sources, many countries continue to rely on fossil fuels, which produce harmful byproducts such as COx and NOx gases, major contributors to the greenhouse effect, water pollution, and overall ecosystem degradation. Studies conducted in laboratories and industries across both developed and developing nations have focused on renewable energy sources as viable alternatives, given the finite nature and environmental impact of fossil fuels. Significant efforts have been made to develop and integrate renewable energy into power grids without compromising operational stability, by controlling energy generation and consumption. One key strategy is energy storage, which involves retaining surplus energy for later use during periods of high demand. Hydrogen has emerged as a versatile energy carrier capable of generating electricity, heat, and serving various applications. Green hydrogen—produced via water electrolysis using renewable electricity—can be stored and later supplied to the grid as needed. Among the most widely studied electrolysis technologies are Proton Exchange Membrane (PEM), Alkaline, and Anion Exchange Membrane (AEM) electrolysis. There are three main water electrolysis processes: alkaline, proton exchange membrane (PEM), and anion exchange membrane (AEM) electrolysis. PEM water electrolyzers use membranes such as Nafion™ due to their high conductivity, reliability, and superior performance. Alkaline water electrolyzers, on the other hand, use less expensive catalysts compared to PEM systems and offer a longer operational lifespan, making alkaline electrolysis a more cost-effective option for hydrogen production in fuel enrichment and combustion applications. Currently, AEM technology is under development. This emerging approach, which combines features of both alkaline and PEM electrolyzers, has not yet been industrialized but offers greater flexibility and does not require the use of noble metals. This project explores the use of nickel-based catalyst, which are inexpensive and abundant. Furthermore, nickel can be alloyed with iron and copper to enhance performance in green hydrogen production, a sustainable energy alternative aimed at reducing greenhouse gas emissions [3]. In this work, cyclic and linear voltammetry were carried out to calculate the Tafel slope, obtaining a value of 101 $mVdec^{-1}$, where the predominant stage of the mechanism is the volmer. In addition, electrochemical impedance spectroscopy tests were carried out.

372-I-PP Valoración del espacio patrimonial en la colonia Santa María la Ribera

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The population values heritage space to the extent that it experiences and interprets it. However, this appreciation does not emerge immediately; it is a continuous process juxtaposed in the inhabitants' ways of life. This is where the question of: What heritage valuation is and how it is redefined arises? To this end, a study of the Santa María la Ribera neighborhood is proposed, with the aim of understanding the neighborhood's heritage values and their significance for its inhabitants. Information was gathered from a survey conducted between May and June, applying the Régnier Abacus method, which measures agreement and disagreement in residents' identification with the values proposed in the conceptual and historical framework of heritage. Considering current interests and adaptations, some conclusions were reached, which include new activities implemented using heritage public space, as well as the uncertainty surrounding possible changes with the addition of new inhabitants and the probable disappearance of old buildings.

380-I-PP Diseño de una sembradora automática monograno de maíz

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This work aims to design an automatic single-seed maize planter tailored to the needs of smallholders who cultivate less than 5 hectares and account for around 40% of national production. In addition, low mechanization in the field and manual sowing among small producers create ergonomic burdens, particularly back strain from prolonged work. The study integrates mechanical design, automation, and materials selection with manufacturability and low-cost criteria. The Quality Function Deployment (QFD) methodology was applied to identify and translate user needs into technical specifications, allowing key features to be prioritized such as seed dosing, ease of maintenance, and system robustness under field conditions. Local farmer interviews and a competitive analysis focused on accessibility and the automation of small plots helped establish important characteristics of the planter. The system controls seed dispensing and release while the machine is in motion; the metering unit is triggered at 15 cm intervals, with a sowing depth between 5–7 cm and a speed of 3 km/h. The proposed planter represents an affordable solution to improve sowing efficiency and precision for smallholders, reduce waste, and offer a compact, easily transportable implement suitable for irregular and hard-to-access terrain, thereby contributing to the modernization of Mexican agriculture at the local level. The current stage is TRL 3-4.

385-I–PV Desarrollo de un sistema inalámbrico de electrogastrografía con interfaz de visualización para monitoreo ambulatorio

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Electrogastrography is a non-invasive technique that allows visualizing the gastric myoelectrical activity through electrodes placed in the abdominal surface and results in a signal called electrogastrogram (EGG). Despite its potential utility in clinical diagnosis and research, available acquisition systems are expensive, not portable or not optimized specifically for gastric signals, with low frequency and amplitude. Additionally, there is a lack of public databases that would allow comparative analysis, validation or diagnostic tools development. In this project, a four-channel EGG acquisition system was developed and implemented. It is focused on accessibility, precision and ambulatory monitoring. The proposed system is composed by four main stages: acquisition analogic circuit design, integration with an embedded system (ESP32), graphical user interface development for real-time visualization and functional validation of the system. The electronic design contemplates preamplification, active filtering and amplification stages that cover the interest frequency range, from 2 to 12 CPM (Cycles Per Minute). INA122 Instrumentation amplifiers and ADS1115 16 bit analog-to-digital converter, communicated by I^2C, were used. The PCB (Printed Circuit Board) design was made in EasyEDA®, focusing on the prototype portability.
Graphical User Interface was developed in MATLAB App Designer, allowing storage and visualization in real-time for the four acquired channels. Preliminary tests have been done using a generated input signal and a functional electrode configuration. The system fidelity was verified by the frequency spectral analysis, using the FFT (Fast Fourier Transform). Results show the system capability to catch EGG signals in the expected range, with acceptable SNR (Signal-to-Noise Ratio). It is concluded that the system represents a viable and accessible alternative for experimental research of gastric activity, with possible clinical applications.

392-I-PO Effect of dielectric barrier discharges on the dynamics of turbulent instabilities during combustion

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Current regulations in combustion systems have promoted the use of lean mixtures, which present greater challenges for ignition and flame stability. In this context, Dielectric Barrier Discharges (DBD) and Nanosecond Repetitively Pulsed (NRP) discharges, have emerged as promising techniques to enhance combustion process efficiency due to their ability to generate reactive species, provide localized thermal energy, and modify mass and heat transport. DBD and NRP discharges have been applied to ignition enhancement, extension of lean blowout limits, and mitigation of instabilities. However, most studies in realistic configurations have been experimental. Understanding the complex interactions between flow, heat, and plasma-generated chemical species, as well as developing accurate and computationally feasible numerical simulations, is essential for applying this technology under real operating conditions.

Nevertheless, existing numerical analyses have been mainly limited to zero- or one-dimensional detailed kinetics studies. This work presents a three-dimensional numerical analysis of the effect of plasma discharges on turbulent instability dynamics during combustion. The study evaluates the impact of a sequence of discharges on an air–methane mixture in both quiescent and turbulent flow configurations, as well as the characteristics of the thermal field and system behavior in the absence of the plasma actuator. A dual-domain solver was developed, in which the electrohydrodynamic force is calculated and heat transfer, species transport, and coupled chemical reactions are modeled within the Navier–Stokes equations. The turbulent flame is modeled under the Large Eddy Simulation (LES) framework. Results show a significant stabilization effect when applying repetitive discharges, which effectively mitigate flame lift-off. Furthermore, the plasma generated in the recirculation zone enables lean flame stabilization and reduces the lean extinction limit while using only a small amount of energy.

398-I-PP Sistema asistivo de rehabilitación para adultos mayores con enfoque en control basado en modos deslizantes

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This work presents the development of the ArMexo, an upper limb assistive rehabilitation system with four degrees of freedom (DoF) to assist the user in wrist radial/ulnar deviation, flexion/extension, pronation/supination, and elbow flexion/extension movements. The ArMexo is a self-designed exoskeleton manufactured mainly using a tridimensional printing system with polylactic acid (PLA) as the primary manufacturing material. As part of the actuation system, the proposed device considers four brushless motors model AK-60 of CubeMars coupled to a microcontroller Launchpad F28379xD of Texas Instruments, where a first-order sliding mode (FOSM) serves as the control algorithm to regulate the trajectory tracking of each DoF of the ArMexo. A proportional-derivative (PD) controller was also implemented as part of the obtained results to prove the proposed FOSM's superior performance. Then, the experimental results show that the proposed controller guaranteed the trajectory tracking of reference trajectories with an error norm of less than six degrees.

399-I-PV Design of an automatic venipuncture robotic prototype with vein detection using NIR vision and U-Net

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Venipuncture is one of the most common medical procedures, mainly used for the administration of medications and blood components. However, it presents a high error rate, ranging from 35% to 50%, which can cause harm to both patients and healthcare personnel. Given the high frequency and clinical relevance of this procedure, the present work proposes the development of an automatic robotic venipuncture prototype. This system implements the use of a near-infrared (NIR) visualization device that enables the detection of veins not visible to the human eye. This is achieved by leveraging the light absorption property of hemoglobin, which differentiates it from surrounding tissues. The prototype integrates image processing algorithms together with a U-Net neural network trained to accurately infer the location of veins and generate spatial coordinates that serve as reference for the control of the robotic system. This robotic system has six degrees of freedom (DoF), where the first three DoF allow for general positioning movements, and the remaining three DoF are responsible for the fine alignment of the catheter with the vein. The prototype design considers both young and adult populations, establishing design criteria based on anthropometric dimensions and characteristics of the needles used. It is important to note that, as this is an early stage of development, tests will be carried out on a test arm specifically designed to evaluate the performance and precision of the robotic system.

402-I-PO Diseño de una celda de carga multiaxial para ensayos estructurales

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Mechanical strength tests on aeronautical structural elements require specialized devices for measuring the applied force, circumstance that involves installation of these devices on test benches and positioned in critical regions where force measurement in various directions is required. Such devices are called multiaxial load cells. Taking this into account, this work presents the design of a multiaxial load cell with a capacity of one ton. This device can be installed on a structural test bench and allows the fastening of a structure not large but representative in dimensions. So, when a force is applied over the load cell, a combination of six electrical signals is generated, each corresponding and proportional, in terms of voltage drop, to each of the six components of the force vector: three forces and three moments. The development of the multiaxial load cell started with collecting requirements with the objective of transforming them into a list of design goals through the quality function deployment (QFD) technique. These new expressions allowed the functional decomposition to facilitate the identification of global and basic functions. Subsequently, technological solutions were generated and evaluated with the intention of selecting the best with each function. Then they were integrated into a drawing called the global concept, and materials, dimensions and fabrication processes were assigned during an iterative process denoted as detailed design. Iterations stopped when the design goals were analytically achieved as well as engineering drawings created. As a result, the fabrication of technological solution was done. Finally, not only fabrication as result of designing a multiaxial load cell is presented, but also the strategy for acquiring the response of the device in each measurement direction, as well as the procedure for signal conditioning and the store data for processing subsequently. Therefore, developing a device for measuring six force parameters involves activities that motivate to create technology for the validation of structural components in aeronautical and other disciplines.

410-I-PP Estudio comparativo de la dinámica de percolación en redes bidimensionales

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Percolation is a physical phenomenon consisting of the movement of a fluid through a porous medium. It is a fundamental concept in diverse areas of science, with importance in disciplines such as physics, geology, biology, engineering, and social sciences, among others. Percolation theory provides a mathematical framework for understanding and modeling how connectivity affects processes in these systems, which is crucial for technological innovations, environmental management, and the resolution of complex problems in these scientific disciplines. Therefore, this work aims to perform a comparative analysis and classification of the different two-dimensional percolation models and their practical applications in different contexts. To achieve this characterization, Peter Checkland's methodology is used, and a compilation and classification of the different known models is made. We focus on their fundamental parameters such as their construction method, their critical exponents, their percolation threshold by sites and by bonds, and briefly mention their applications in different branches of science. Guidelines are provided for the proper application and use of the models in their different areas of knowledge.

426-I-PP Question–answer methodology for vulnerable source code review via prototype-based model-agnostic meta-learning

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Given the current scenario and the study of persistent breaches in the traditional methods for static analysis of vulnerabilities in source code (SAST - Static Application Security Testing) and dynamic (DAST - Dynamic Application Security Testing) often present drawbacks such as outdated databases, false positives and require high maintenance costs, while classic Machine Learning solutions present other disadvantages such as the need for large volumes of data, requiring secure life cycles in code development (DevSecOps) where tools capable of adapting to rapid changes in the detection of new threats with dynamic architecture and flows are needed. To overcome these challenges we present this methodology that seeks to be interpretative, resource-efficient and adaptable for the review and detection of vulnerabilities in source code in languages such as PHP, Java, C and C++, oriented to a model of “questions and answers” (QA - Question Answer) to detect vulnerabilities and to make corrections on the source code analyzed, based on prototypical networks such as Proto-MAML (Proto - Model Agnostic Meta Learning) with the BERT model in a few-shot scheme, with few examples of new threats, allowing a great adaptability to future new zero-day threats, where the number of example samples is limited. Where the results evaluated with the SARD (Software Assurance Reference Dataset) dataset obtained from NIST (National Institute of Standards and Technology) is around 98.5% accuracy, 98.5% recall and 98.8% F1, demonstrating accurate and contextualized responses allowing better maintenance and easy feedback on a continuous basis on the model to detect current and new vulnerabilities.

431-I-PP Efecto de la clinoptilolita cálcica natural sobre la cinética y formación de hidratos de CO_2 en un sistema isocórico

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This study evaluated the potential of natural calcium-clinoptilolite as a promoter for CO_2 hydrate formation in an isochoric reactor system. The effect of zeolite mass (0.1, 0.5, and 1 g) and initial pressure (20, 40, and 50 bar) on the formation kinetics was investigated. The results demonstrated that the addition of clinoptilolite significantly reduced the induction time and increased the gas consumption rate compared to the baseline system (water + CO_2). The promoting effect showed a direct dose-dependency, with a more pronounced kinetic enhancement observed at 0.5 and 1 g of zeolite. Furthermore, a synergistic effect with pressure was identified, where the promoter's efficacy was notably greater at 40 and 50 bar. This behavior is attributed to a mechanism of heterogeneous nucleation, facilitated by the zeolite's surface, which provides active sites for the formation and growth of hydrate crystals. It is concluded that natural clinoptilolite is a promising, low-cost, and efficient material for optimizing CO_2 capture and storage processes via hydration.

443-I-PO Efecto del tratamiento con plasma no termal en soluciones poliméricas, y su impacto en el proceso de electrohilado

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Today, nanofibers are cutting-edge materials that can be obtained with specific properties for certain applications, such as biomedicine, catalysis, sensors, controlled drug release, and more. The most widely used technique for their production is electrospinning, which critically depends on the physical properties of viscosity and electrical conductivity of the solution to be electrospun. Atmospheric pressure plasma treatment of polymer solutions emerges as an alternative to chemical treatments to improve their physical properties. This work investigates the effect of plasma treatment applied to polymer solutions. The main objective is to analyze the reactive species generated in the dielectric barrier plasma (DBP) at the air-liquid interface by optical emission spectroscopy (OES) and their interaction with the solution (solvent-polymer). It also determines the impact on their physicochemical properties and the improvement in the electrospinning technique. Plasma treatment was performed on the solution at different times, and temperature, pH, conductivity, and reactive species analysis by OES were measured during the plasma treatment, first using the solvent (water) in the solution. Subsequently, the polymer solution of polyvinyl alcohol (PVA) (10% w/v) was treated. This is a biodegradable, biocompatible, water-soluble polymer widely used in the formation of nanofibers. The PVA solutions treated with plasma at different times were analyzed by ultraviolet-visible spectroscopy, and their conductivity, pH, and viscosity parameters were measured. In addition, the impact of plasma treatment on the solution was analyzed using the electrospinning technique, comparing the non-industrial and plasma-treated solutions. The homogeneity of the Taylor cone was monitored using images captured at different time intervals. The results showed that plasma treatment significantly modifies the physical properties of the solutions, which directly impacts the stability of the Taylor cone during the electrospinning process. These changes directly influence the efficiency of nanofiber production and the improvement in morphology homogeneity.

450-I-PV Desarrollo e implementación de un sistema de producción estandarizado para obtener un fotoprotector de ZnO/Aloe vera

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Nanotechnology is the science of using materials on the nanometric scale to obtain properties that the macro scale does not have to make a profit. Furthermore, the rise of green chemistry enables the creation of products from sustainable agents, thereby reducing waste and costs. This study focuses on the green synthesis of a nanocomposite of ZnO/Aloe vera varying aloe gel broth concentration 20% and 50% beside temperature of 120°C and 150°C to assess both influence in the particle diameter with multivariable regression with transmission electronic microscopy, spectroscopy UV-VIS and X-ray Diffraction (XRD) to confirm verify nanoparticle presence and morphology characterization. Outcomes show temperature and gel concentration play an important role in the efficiency of synthesis, as well as its size and morphology. A yield of 90% was obtained with 50% gel concentration and 150°C of temperature synthesis and 54 ± 7 nm of size distribution. In addition, UV-vis analysis showed a sun protection factor (FPS) greater than 20 under these conditions. This configuration was thus identified as the most suitable for use as photoprotective agent.

467-I-PP Modeling and control of electro-hydraulic blade pitch actuation in wind turbines

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Accurate modeling of electro-hydraulic systems can increase the precision of blade pitch control, which is essential for maintaining optimal aerodynamic efficiency and reducing structural loads during fluctuating wind conditions. While electro-hydraulic pitch systems are useful for blade positioning in wind turbines because of their high force capability and fast response, existing models either oversimplify the coupled dynamics or treat the hydraulic actuation and aerodynamic loading as separate subsystems, which can restrict their applicability for integrated control analysis. This study presents a detailed aerodynamic analysis of a 9-meter wind turbine blade model, and the dynamic model of an electro-hydraulic servo system which incorporates the valve spool dynamics, actuator pressure response, and mechanical motion as foundational component for understanding blade pitch positioning. The blade geometry was developed using OpenVSP and the model incorporate the spanwise mass and chord distribution analysis. The aerodynamic torque components such as propeller moment (PM), lift-induced torsional moment (LITM), and torsional resetting moment (TRM) were simulated and analyzed across varying wind speeds, rotor revolution per minute (RPM), and pitch angles. Furthermore, the actuator dynamic response was validated through MATLAB simulations, and the effects of the aerodynamic loading and actuator input on torque demands are highlighted. At the rated wind speed of 12 m/s and 40 RPM, the blade active pitching experienced a maximum aerodynamic torque demand of approximately 12,000 Nm, occurring at a pitch angle of 50°. As wind speed increased toward the cut-out threshold of 24 m/s, the torque demand rose significantly, peaking at around 25,000 Nm at the same pitch angle. These results show that the pitch system is most heavily loaded during mid-range pitch adjustments under high wind conditions, which demonstrates the importance of robust actuator sizing and control strategy at critical operating points.

469-I-PP Hash perceptual para la verificación de integridad y localización de alteraciones en archivos de voz cifrados empleando análisis espectral

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With the advancement of technology, digital voice files are particularly vulnerable to tampering, which is carried out using existing applications such as Audacity, Ocenaudio, AudioDirector, etc. These applications allow any inexperienced user to easily manipulate these digital files by modifying the original context of the information. In response, recent research has proposed hashing methods to verify the integrity of ciphered audio, ensuring its authenticity without revealing its content. However, these approaches are limited to global tamper detection, without identifying the specific time segments where the audio has been modified. Furthermore, their thresholds for tamper detection are empirical and fixed, leading to false alarms or detection failures in noisy and/or compressed environments. Additionally, these methods are limited to discarding or accepting the entire audio signal as authentic, an insufficient solution for practical applications where partial audio integrity verification is essential. Taking in account these limitations, the development of a perceptual hash method is proposed to verify the integrity of ciphered digital voice files, which introduces several significant advances compared to state-of-the-art, since it integrates a division of the perceptual hash into eight equidistant segments, which allows correlating the alterations with approximate temporal intervals, reaching a detection accuracy of 94% for different audio modifications such as muting, content replacement, etc. Additionally, it is possible to identify with a 98% recall the temporal zone with several modifications (up to 20% and 30% of the audio content). Moreover, it is complemented by a chaotic scheme based on the Duffing map and an XOR operation, which allows maintaining the confidentiality of information by increasing its sensitivity to the encryption key to 99%, surpassing conventional chaotic systems. Finally, to ensure the robustness of the method, the detection threshold has been adjusted to 0.2 using a FAR-FRR analysis, drastically reducing false positives in scenarios with Gaussian noise, volume adjustments, MP3 compression and resampling.

470-I-PO Evaluación mecánica de la pasta cementante modificada con concha de ostión tratada térmicamente: método estándar

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Currently, the construction sector is exploring new alternatives to reduce the environmental impact of its activities, particularly in cement production, the primary material used in this sector. Consequently, various investigations are being conducted to substitute one component in base cement mixtures to obtain a more sustainable material. Oyster shells, a waste material, are notable for their high $CaCO_3$ content (>90%). Efforts have focused on leveraging this waste, which shares the main compound (limestone) used in cement production. Untreated oyster shells have been widely studied as substitutes for fine and coarse aggregates. This research studied the effect of partially substituting Portland cement with thermally treated oyster shell powder (900 °C to obtain primarily CaO) at different percentages (10%, 15%, 20%, 25%). The composition of the resulting material was characterized using X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR). Mechanical properties were evaluated via standard compressive strength tests at various curing ages (0, 7, 14, and 28 days). Results indicate that treatment at 900 °C reduces compressive strength when substitution exceeds 10%. At this concentration, compressive strength remains comparable to the reference, with a difference of 5.29 MPa. The elastic modulus exhibited a similar trend. This demonstrates a viable alternative for utilizing aquaculture waste to produce more environmentally friendly cementitious materials.

481-I-PO In silico analysis of bacterial enzymes associated with plastic degradation

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Polyethylene (PE) is the world's most widely produced synthetic polymer and remains highly recalcitrant, posing significant environmental concerns (Bardaji et al., 2020). Microbial biodegradation offers a promising solution through the catalytic action of key enzymes such as alkane monooxygenases and multicopper oxidases (MCOs). However, the diversity, catalytic mechanisms, and evolutionary patterns of these enzymes remain underexplored at the genomic level. This study aims to systematically identify, annotate, and characterize bacterial enzymes linked to PE degradation using a robust in-silico pipeline combining database mining, profile Hidden Markov Models (pHMMs), and metagenomics screening. A systematic review across PlasticDB, PMBD, and PAZy identified 12 core enzyme families, with alkane monooxygenases and MCOs being most prominent. *Rhodococcus opacus R7* was chosen as a model organism due to its reported PE-degrading capacity. Seed protein sequences were retrieved and expanded with BLAST, then aligned using MUSCLE. Phylogenetic trees generated in MEGA12 grouped MCOs into three clades, each used to build initial pHMMs in HMMER3. Although the models showed low entropy (~0.58 bits/position), they reliably detected conserved domains when screened against the UniProt_SPROUT microbial database. Hits are now being re-aligned to refine the pHMMs for greater sensitivity. The integrated pipeline successfully identified bacterial enzymes associated with PE degradation. Database mining confirmed *Rhodococcus opacus* R7 MCOs as consistent key targets, despite variations in bacterial diversity across resources. Multiple sequence alignment and phylogenetic clustering grouped MCOs into three distinct clades for pHMM construction. Despite low sequence diversity (effective sequence ~0.4; entropy <0.6 bits), conserved catalytic features were retained. Hmmsearch against UniProt retrieved high-confidence homologs, including known MCOs from *Mycobacterium tuberculosis*, *Prescottella agglutinans*, and other *Rhodococcus* spp., all with strong domain matches (E values <1e-100). This study demonstrates that a combined *in-silico* workflow of database mining, alignment, phylogenetic, and pHMMs is effective for discovering and modeling bacterial enzymes involved in PE biodegradation. Although the MCO sequence groups used to build the models were limited in diversity, the pipeline reliably recovered strong homologs, highlighting the potential of conserved oxidative enzymes for sustainable plastic degradation solutions.

483-I-PO Lyapunov-driven parameter optimization of a memristor-based chaotic system using metaheuristic algorithms

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This study presents a Lyapunov-driven parameter optimization framework for a memristor-based chaotic system, employing advanced metaheuristic algorithms to enhance its dynamical complexity. Chaotic systems based on memristive elements exhibit rich nonlinear behavior and memory-dependent dynamics, making them highly suitable for applications in secure communications, cryptography, and bio-inspired computation. However, their performance critically depends on optimal parameter selection to ensure robust chaos and high sensitivity. In this work, we formulate the optimization problem as the maximization of the system's largest Lyapunov exponent (LLE), which serves as a quantitative measure of chaos. Two metaheuristic algorithms namely: Particle Swarm Optimization, and Teaching-Learning Based Optimization, are systematically evaluated for their effectiveness in tuning the parameters of the memristor-based chaotic system. The optimized systems are analyzed using phase portraits, bifurcation diagrams, and Lyapunov spectra to confirm the emergence of chaotic and structurally rich dynamics. Results demonstrate that the proposed approach not only enhances chaoticity but also ensures stability under a wide range of initial conditions and system perturbations. The findings contribute a robust methodological foundation for the design of chaos-based systems with tailored dynamical properties.

485-I–PO Prototipo para ensayo Jominy con diferentes geometrías

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A new Jominy end-quench test device was proposed for estimation of heat response of square-cross-section steel samples. Developed as part of a Master's research project, this prototype enables the characterization of cooling rates in geometries that better reflect cross sections derived from flat steel products, in contrast to the traditional cylindrical samples machined from round bars. 2 steel grades were quenched and cooling rates measured across the specimen, tracing partial sections of the CCT curves; temperature ranges of phase transformation were determined after curve fitting and confirmed with metallographic analysis. Despite the dimensional differences, the thermal behavior observed in the square specimens showed a high degree of similarity when compared to that of the cylindrical ones. This indicates that the prototype maintains the reliability of the standard test and provides unique advantages in sample preparation and in the ability to test industry standard material. The results indicate the possibility of applying the end-quench tests to other geometries without affecting the general response of both the system and the specimen.

489-I-PP Estado del arte en la síntesis sol-gel de óxido de zinc - óxido de cerio con futura aplicación en dispositivos semiconductores optoelectrónicos

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The high demand for optoelectronic devices, along with the monopolization of semiconductors, has led to their scarcity and increased production costs**.** This represents a large-scale problem that can be addressed by promoting the development of alternative materials, prioritizing those that offer properties similar or superior to conventional ones. For this reason, the materials selected in this research are advanced ceramic oxides in a homogeneous mixture (zinc oxide–cerium oxide), which present favorable characteristics for future applications in electronic components, especially those based on light interaction, such as LEDs and solar panels. The benefits are significant, with the adjustment of the band gap energy being one of the most outstanding features, as it enhances charge carrier efficiency and improves the material's response to optical stimuli. In other words, it allows an adjust of the band gap to 2.8-3.0 eV, which increases the absorption of visible light. Other relevant improvements include thermal and chemical stability, essential for the proper functioning of devices by maintaining stable temperatures and improving durability. CeO_2 contributes resistance to UV degradation, while ZnO maintains good performance at high temperatures. Structural defect control is also notable, as these materials tend to form vacancies that positively influence electrical conductivity by enhancing electron mobility. The sol–gel synthesis process plays a fundamental role in obtaining the nanopowder, as it generates minimal contamination, is a simple synthesis method, and produces materials with superior homogeneity, uniformity, and purity compared to other methods. Furthermore, material characterization techniques provide essential information to support these benefits: UV-Vis spectroscopy is used to obtain absorbance indices for band gap calculation; dynamic light scattering allows for determining the average particle size (10–50 nm) and visualizing powder distribution and uniformity; X-ray diffraction reveals the crystalline structure, phases, and crystallite size; and scanning electron microscopy provides information on surface structure and particle size.

501-I-PO Implementación de una red de balanceo en sistemas de almacenamiento a base de celdas de batería LiPo

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This work presents the implementation of a balancing network for a medium power Lithium Polymer (LiPo) battery bank, composed of 16 modules of 6 cells for a total of 96 cells connected in series, in order to extend the life of the batteries and their correct operation. A battery balancer was implemented in order to equalise the voltage in each of the cells before starting the charging process and after finishing the charging process, this ensures a uniform and controlled charging cycle for each cell. The balancing strategy employed was Passive, which works with a switching resistor that transforms the excess voltage of each battery, in the form of heat, being the resistor controlled by a microcontroller while the balancing is performed in a simultaneous process of one module of the battery bank, that is 6 cells at a time. Due to the heat produced by the resistors, it was necessary to implement work modes at the balancer interface to avoid wasting excess energy from the cells.

508-I-PP Synthesis of CeO2-C cloth and its evaluation for the photodegradation of ciprofloxacin in wáter

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The increasing problem of resistance to antimicrobial agents poses a worldwide health emergency. The aim of this investigation is to design photocatalysts with superior efficiency that promote the degradation of antibiotics, which are responsible for the rise to antimicrobial resistance. Cerium oxide (CeO_2) has been extensively investigated for the photodegradation of antibiotics due to its intrinsic abundance of oxygen vacancies associated to the Ce^{3+} / Ce^{4+} transition. On the other hand, carbon based materials are widely employed in the water treatment processes due to their high adsorption capacity and porosity. Here, we present a novel strategy for synthesizing CeO_2-C cloth via topotactic transformation. Results revealed that the surface region of each carbon fiber was modified with uniformly distributed CeO_2 nanosheets. Despite the surface modification, the carbon cloth fabric was preserved. The photodegradation of ciprofloxacin was investigated by UV-Vis spectroscopy using aqueous solutions (10 mg/L) under UV radiation (365 nm). It was found that photocatalysis was the main mechanism for the degradation of ciprofloxacin in water. The CeO_2-C cloth exhibit superior performance for the photodegradation of ciprofloxacin (73 % max. in 135 min) in comparison with CeO_2 nanoparticles (61 % max. in 165 min).

509-I-PO Desarrollo e implementación de un sistema de estimulación magnético transcraneal con nueva geometría de bobina de plata "Doble D" con alta uniformidad y área efectiva de campo magnético

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In this work, a proposal for a transcranial magnetic stimulation (TMS) system is presented, designed to achieve high magnetic field uniformity and an effective stimulation area for evaluation using a phantom model. A new coil geometry, referred to as the “double D” shape, is proposed. Its construction includes the use of silver (Ag) conductor wire with 99% purity and a rectangular cross-sectional area. As a result of this design, the coils were made 40% more compact while maintaining the same number of turns, thanks to the geometric optimization of the conductor wire. To evaluate the magnetic field uniformity and effective area of the TMS coils—built using both copper (Cu) and silver in the traditional “figure-eight” shape and the newly proposed design—an XYZ positioning machine was used along with a Hall effect sensor with a 5% uncertainty to map the spatial distribution of the field. By optimizing the TMS coils with silver, electrical conductivity increased by nearly 20%, allowing a greater current flow from the low-voltage DC power supply, which generated magnetic field intensities of up to 800 Gauss within an effective area of 3×3 cm^2 for the “double D” coil. To evaluate the interaction of TMS with the human skull, a phantom model was simulated using four layers containing liquid solutions that emulate the electrical conductivity and thickness of the scalp, cranial bone, cerebrospinal fluid, and cerebral cortex. The simulation results showed that approximately 90% of the magnetic field is attenuated as it passes through these layers before reaching the cortex. Currently, the physical phantom model is being developed to compare and validate the simulation results. This is particularly important in the field of neurotherapy, as it aims to more precisely define the levels and targeting of the applied field in specific brain regions for stimulation.

515-I-PO Análisis de la influencia espaciotemporal del estímulo magnético transcraneal en la actividad eléctrica de una red neuronal biológica con arquitectura de rejilla rectangular

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This work analyzes the impact of Transcranial Magnetic Stimulation (TMS) on the electrical activity of a two-dimensional biological neuronal network. The main objective is to develop a model that examines the influence of the electric field induced by TMS on a neuronal network arranged in a rectangular grid, taking into account both the spatial and temporal contributions of the stimulus, as well as the intrinsic ionic currents of the network. To achieve this, the discretized form of the cable equation is used, allowing the incorporation of the physical characteristics of the axon and the induced electric field. Preliminary results, obtained through simulations that consider only the temporal variation of the field, show that TMS promotes the synchronization of action potentials among neurons, especially in the direction of the induced field. This synchronization could explain the effect of TMS on biological neuronal networks, with potential applications in neurotherapy and clinical research. The model is currently being optimized to improve its accuracy by adjusting boundary conditions and incorporating spatial variations of the electric field along the axon. This will enable the simulation of more complex scenarios and allow for a more detailed study of how these variations influence the electrical activity of the neuronal network.

523-I-PO Obtención de fracciones combustibles verdes a partir de aceite de palma y palmiste a través de hidrotratamiento usando un catalizador selectivo

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Hydrodeoxygenation was carried out on palm oil and palm kernel oil, both derived from the fruit Elaeis guineensis, which were obtained at an oil extraction plant located in southeastern Mexico. This hydrotreatment process was conducted at temperatures from 350 to 380 °C, with a reaction time of 3 hours, employing agitation at 800 rpm and maintaining a hydrogen pressure of 75 bar. Sulfided nickel and molybdenum phases were used as catalysts, at a ratio of 4 g catalyst per 100 g of oil. The liquid reaction products were separated from the gas phase at room temperature, and once the catalyst was removed, they were characterized by Nuclear Magnetic Resonance, Simulated Distillation, and Fourier Transform Infrared Spectroscopy. Triglyceride conversion was similar when using palm oil or palm kernel oil as feedstock (Conversions: 90–98%). In both processes, a low concentration of intermediates such as free fatty acids was observed, which decreased in concentration as temperature and reaction time increased. The selectivity of the hydrodeoxygenation process favored the formation of green naphtha, kerosene, and diesel fractions when palm kernel oil was used as feedstock, while the use of palm oil resulted in a higher concentration of green diesel fraction, regardless of the reaction temperature. The impact of this work is to demonstrate an alternative application of palm oil as a biofuel in Mexico and, especially, to highlight the potential of palm kernel oil, which is not fully utilized within the value chain of the Elaeis guineensis fruit.

529-I-PO Determinación de la evolución de la línea de costa mediante imágenes satelitales multitemporales: caso de estudio costa de Tabasco

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The coastline of the state of Tabasco has undergone significant changes over the past 50 years. This region is highly vulnerable due to the constant erosion of its beaches and, being a low-lying coastal plain, is prone to flooding from sea level rise driven by climate change and extreme weather events. In this study, satellite imagery from Landsat and Sentinel missions was processed using Google Earth Engine to identify the coastline position for each year. Spectral index such as NDWI and AWEI commonly used for this purpose were applied, and accuracy was enhanced using the Near-Infrared (NIR) band. A global threshold based on reflectance histograms was used, and resolution was improved through interpolation-based upscaling of the NIR band, allowing for more precise delineation of the coastline vector. Selected images were limited to those with a maximum cloud cover of 20%, and those taken during hurricane season or stationary climatic events were excluded to avoid pixel loss and the averaging effect in mosaic construction. Preliminary results indicate that the municipality of El Bosque presents the highest erosion rate, with an estimated shoreline retreat of 100 meters over 30 years. In contrast, areas within the municipality of Centla showed relative stability or moderate sediment deposition. Generative artificial intelligence was used to develop the Java based code that automated the workflow, significantly accelerating the generation of processing scripts. The same AI technology was also employed to create an interactive web viewer, designed to make the results accessible without requiring expertise in GIS software. This multitemporal and automated approach can be replicated in any coastal region, including those with high cloud cover. It strengthens the foundation for informed decision-making in coastal management and provides valuable data to support climate change adaptation policies, habitat conservation, and urban planning in areas vulnerable to erosion and flooding.

531-I-PO Bioacumulación de metales pesados en cebolla cultivada en el estado de Morelos: Un enfoque para la seguridad alimentaria

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Onion (*Allium cepa* L.) production in Morelos, Mexico started since the 20th century, and it takes part at domestic and international markets until nowadays. However, this vegetable also presents pollution problems related to the presence of heavy metals. This study evaluated the presence of heavy metals in onion agroecosystems cultivated in Morelos during a production cycle in three locations, as well as the impact of their consumption. 15 onion samples were taken from each location: one composed of soil and one of irrigation water. These samples were repeated every two weeks during the seedlings and commercial bulbs production period. To determine the conditions that promote the absorption of heavy metals, the physicochemical properties of the soil are considered, as well as its fertility profile, the quality of irrigation water, the type of inputs used for crop management, and the concentration of heavy metals (Al, As, B, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Se, Sr and Zn) through ICP-EOS. The translocation factor was calculated to determine the distribution of metals in the plant, as well as risk indices. The soils in the study areas had pH 7.2-7.9, CEC 17-40 meq 100g-1, organic matter 1.3-2.7 % and total carbonates 1.2-15.0%, as for heavy metals Fe 2.7-7.1 ppm, Zn 0.7-2.1 ppm, 1.1-1.6 ppm, Cu 0.45-2.2 ppm, 1.3-2.9 ppm; as for irrigation water pH 7.2-8, turbidity 0.5-260 FTU and EC 600-1400 µS/cm. The results showed the distribution patterns and bioaccumulation processes as a function of time. In addition, the risk assessment indices for human health, associated with onion consumption, indicated the possible impact on the population; Therefore, long-term monitoring of heavy metals in onions should be considered, due to the toxic effect of consuming bulbs contaminated with heavy metals, which also impacts food security and sovereignty.

533-I-PP Preparation of $CoHO_2/Co_3O_4$/f-MWCNTs composites for supercapacitor applications

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Recently, researchers have explored the use of transition metal hydroxide-oxide phases in combination with multiwalled carbon nanotubes as potential electrode materials for electrochemical double-layer supercapacitors (EDLCs) and pseudocapacitors. This study describes the synthesis of cobalt hydroxide-oxide/f-MWCNTs composites and their electrochemical performance for supercapacitor applications. The composites were prepared via the liquid phase deposition method using functionalized multiwalled carbon nanotubes (f-MWCNTs) as templates for the growth of CoHO2 and Co3O4 phases. The evolution of hydroxide-oxide phases was promoted by heat treatment from 100 to 500 °C in air. Results revealed that the composites consist of a mixture of rhombohedral $CoHO_2$ and FCC spinel type Co_3O_4 uniformly distributed as fine particles on the external surface of f-MWCNTs ($CoHO_2/Co_3O_4$/f-MWCNTs). The electrochemical evaluation indicated that the CoHO2/Co3O4/f-MWCNTs composites exhibit pseudocapacitive characteristics, which are associated with the redox reactions Co2+/Co3+ and Co3+/Co4+. The CoHO2/Co3O4/f-MWCNTs composites obtained at 200°C exhibit the highest specific electrical current promoting a superior capacitance. In particular, the Co3O4/f-MWCNTs composites exhibit superior performance compared with Co3O4 phases, attributed to their superior electrical conductivity, high surface area, and intrinsic electrical double-layer mechanism of f-MWCNTs.

554-I-PP Estudio de la resistencia a la corrosión del acero API 5L Grado B tras un tratamiento termoquímico de borurado

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API 5L Grade B steel is widely used in pipeline construction for hydrocarbon transportation due to its good weldability and low cost. However, its limited corrosion resistance poses a significant challenge, particularly in aggressive environments. In this study, the surface properties of this steel were enhanced through a solid-state boriding thermochemical treatment. Samples were treated at 850 °C and 890 °C for 4, 6, and 8 hours. The resulting layers were characterized using optical microscopy to assess their thickness, morphology, and Vickers microhardness. Additionally, corrosion resistance was evaluated in a simulated environment using electrochemical techniques, including linear polarization and electrochemical impedance spectroscopy (EIS). The results showed the formation of characteristic saw-tooth boride layers with increasing thickness (97 μm) and hardness at higher temperatures and longer treatment times, reaching microhardness values above 1400 HV. Electrochemical tests showed that boriding significantly modified corrosion resistance. The untreated steel showed a corrosion rate of 99.96 mpy, while the sample borided at 890 °C and 6 h, this value was reduced to 47.04 mpy, along with an increase in polarization resistance and the low-frequency impedance modulus above 3000 $\Omega \cdot cm^2$. These results demonstrate that boriding treatment can be a viable process to improve the surface properties and corrosion resistance under certain conditions of API 5 L Grade B steel subjected to this treatment.

559-I–PP Caracterización nutrimental de la cáscara de pitahaya (H. undatus) y evaluación fisicoquímica en tres etapas de maduración: Implicaciones para su valorización como producto funcional

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The pitahaya peel constitutes a significant portion of the fruit that is generally discarded. However, it represents a considerable fraction with high potential for utilization in functional products. This study aimed to characterize the nutritional composition of the pitahaya peel (Hylocereus undatus) and analyze its physicochemical changes during the maturation process to evaluate its viability as a value-added ingredient. Proximal analyses were conducted following official AOAC methods to determine moisture, ash, protein, fat, fiber, total sugars, and caloric content. Results revealed a notable composition with high fiber content (27.92 ± 0.1%) and protein (4.18 ± 0.5%), total absence of fat (0.0 ± 0.0%), and low caloric value (52 kcal/100 g), along with moisture (8.37 ± 0.1%), ash (6.29 ± 0.2%), and total sugars (4.26 ± 0.3%). Additionally, physicochemical parameters (pH, titratable acidity, degrees Brix, and moisture) were evaluated at three fruit maturation stages: early maturation stage (12 days post-anthesis), physiological maturity (28 days), and advanced senescence (45 days). A progressive increase was observed in pH (from 3.3 ± 0.4 to 4.6 ± 0.1), degrees Brix (from 11.45 ± 0.1 to 15.8 ± 0.3), and moisture content (from 2.78 ± 0.1% to 13.34 ± 0.2%), while titratable acidity varied from 0.58 ± 0.1% to 1.20 ± 0.5%. The physicochemical changes occurring during pitahaya peel maturation may influence its functional properties, making the maturation stage critical for its optimal utilization. These findings support the potential of pitahaya peel as a functional ingredient and its sustainable use in reducing agricultural waste.

562-I-PO Influencia del tratamiento térmico intercrítico en la microestructura de un acero doble fase

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Dual-phase (DP) steels, belonging to the family of advanced high-strength steels (AHSS), have gained significant importance in structural applications within the automotive sector due to their balance between high mechanical strength and good ductility. This work presents an initial characterization of a DP steel in its as-received condition, with the aim of establishing a basis for designing heat treatments intended to modify its microstructure and enhance its mechanical properties. The chemical composition, determined by optical emission spectroscopy, was: 0.0868 % C, 0.0087 % Si, 2.485 % Mn, 0.0195 % Al, 0.05 % Nb, 0.012 % Cu, 0.0288 % Ni, and 0.007 % Mo. The as-received mechanical properties were: yield strength 766 MPa, tensile strength 1042 MPa, and total elongation 11 %. Microstructural analysis, performed using optical microscopy (OM) and scanning electron microscopy (SEM), revealed a ferritic matrix with martensite distributed in island morphology. Using the chemical composition as input, equilibrium diagrams, martensitic transformation curves, and TTT diagrams were generated through Thermo-Calc numerical simulation. These allowed identification of optimal intercritical treatment temperatures to achieve martensite fractions of 20 %, 40 %, and 60 % within a continuous ferritic matrix. Based on this information, treatment windows were defined to control the austenite fraction during heating and transform it into martensite by rapid cooling, thus obtaining tailored ferrite–martensite proportions to optimize the steel's mechanical performance.

570-I-PO Uso de la tecnología y su influencia en el consumo eléctrico en la vivienda

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Technological advances in digital devices used in the home have brought benefits in terms of comfort in users' daily lives. This technological advancement over time has changed users' daily habits at home, creating the need to carry out everyday activities using digital devices and a continuous, uninterrupted internet connection. The National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH) has shown that users with internet Access and digital devices spend more hours per day using a device, consequently, habits in the use of digital technology in the home represent a potential change in residential electricity consumption. This ongoing research is based on a quantitative methodology whose hypothesis posits changes in daily habits related to the use of digital technology, increasing electricity consumption in low-income housing, with a case study in San Miguel Teotongo in the Iztapalapa district of Mexico City with a sample of 250 surveys structured in three sections to test the hypothesis and analyze the relationship between daily habits and the use of digital technologies and their possible increase in electricity consumption.

576-I–PP Infraestructura verde y salud urbana en la Zona Metropolitana del Valle de México del 2013 al 2023

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Worldwide, there are approximately 2,000 metropolitan areas, each with an estimated population of over 300,000 inhabitants, which represents a third of the global population. In Mexico, the Metropolitan Area of the Valley of Mexico (ZMVM) is one of the country's main urban centers and has the largest population, with 21,804,515 people (INEGI, 2020). It's also one of the four most populated metropolises in Latin America, which has led to profound urban changes, including the development of green infrastructure (GI). This GI has been affected by the growth of gray infrastructure (housing complexes, shopping centers, offices, etc.) and the encroachment on public spaces, which breaks the population's connection with health-promoting green spaces. Due to these factors, this research bases its hypothesis on the question: "Does green infrastructure influence the health of the population in the Metropolitan Area of the Valley of Mexico?". This question will allow for a determination, using quantitative processes and a non-experimental design, of the coverage of green infrastructure and health services. This will be done by analyzing data collected from 2013 to 2023 from the Ministry of Health and satellite images of vegetation coverage from Harmonized Sentinel-2 MSI: MultiSpectral Instrument, Level-2A (SR). The goal is to determine if there's a correlation between GI and health in the ZMVM, as demonstrated in Mateo Dennis et al.'s (2020) research, which showed that GI affects population health. The study will be based on the "urban fabrics" theory, which considers cities as fabrics with characteristics, opportunities, and limitations that incorporate natural systems. This allows for the integration of green infrastructure and urban biophilia. This approach promotes the relationship between natural systems and the population's lifestyles and also helps to understand the effects of the ecosystem services provided by green infrastructure on human health.

II. MEDICAL-BIOLOGICAL SCIENCES

II. Medical and Biological Sciences

26-II-PO Manejo de la fertilización y de las variedades, y principales desafíos del cultivo de caña de azúcar en Morelos, México

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In Mexico, the state of Morelos stands out for its agricultural yield of sugarcane; however, information regarding fertilization practices, varietal selection, and the challenges faced by producers is limited. Therefore, the objective of this study was to identify the main problems faced by sugarcane producers and the primary agricultural practices related to fertilization and crop management. To this end, a survey was designed and administered to 195 sugarcane producers from the main producing municipalities in the state, which together account for 74% of the state's total production. The results showed that the main challenge for producers is the use of fertilizers, as they tend to apply them without considering soil analysis or the crop's nutrient demands. Three-quarters of the respondents use formulated fertilizers, while organic fertilizers, beneficial microorganisms, crop residues, and green manures are used less frequently. The most widely cultivated sugarcane varieties were CP 72-086, ITV 92-1424, and MY 55-14. Based on these findings, it is proposed that to reduce chemical fertilization in sugarcane cultivation, it is essential to conduct soil analysis, implement a crop rotation system, use regionally adapted varieties, and incorporate sustainable alternatives such as the application of beneficial microorganisms and green manures. These changes could help reduce agricultural input costs and improve crop yields.

28-II-PP Efecto de suplementación de vitamina D3 en los niveles séricos de miR-223-3p y expresión génica IL-6 en adolescentes asmáticos

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Vitamin D deficiency has been documented as a significant modulating factor in the development and control of bronchial asthma in pediatric and adolescent populations, where contemporary research establishes consistent associations between reduced serum levels of 25-hydroxyvitamin D and increased severity of asthma symptoms, higher frequency of exacerbations, and suboptimal therapeutic response to conventional treatments that can be modulated through specific nutritional interventions. The pathophysiological mechanisms involved transcend the classic functions of bone metabolism to include alterations in immune function, modifications in the inflammatory response of the airways, and changes in bronchial reactivity that demonstrate the active participation of this micronutrient in respiratory homeostasis and the modulation of systemic inflammatory processes.

This randomized, double-blind, controlled clinical trial was designed to evaluate the efficacy of vitamin D3 supplementation in asthmatic adolescents with documented deficiency of this micronutrient, using a protocol that includes loading doses followed by maintenance for a period of 12 months. 16-week follow-up with systematic assessments of inflammatory markers such as IL6 and miR 223-3P, as they are related to the inflammation present in asthma. The study population included 35 adolescents aged 12 to 17 years with a confirmed diagnosis of bronchial asthma and serum 25-hydroxyvitamin D concentrations less than 30 ng/ml.

They were recruited through consecutive sampling in the Pediatric Allergy, Clinical Immunology, and Obesity clinics of the Federico Gómez Children's Hospital of Mexico. Block randomization allowed for the formation of two intervention groups with comparable baseline characteristics.

Participants were randomly assigned to an experimental group that received 50,000 IU of vitamin D3 as a single initial dose followed by 4,000 IU daily for three months, and a control group that received standard doses of 2,000 IU daily for the same period. Continuous monitoring of therapeutic adherence, adverse effects, and primary and secondary outcome variables was performed using a standardized protocol that ensured comparability of assessments between groups. Preliminary results of the study suggest significant improvements in the experimental group regarding reduction of systemic inflammatory markers and improvement in lung function parameters compared to the control group, where high-dose vitamin D3 supplementation proved to be safe and well tolerated with no serious adverse events documented during the follow-up period, findings that support the hypothesis that correction of vitamin D deficiency may contribute to the comprehensive management of bronchial asthma in adolescent populations.

30-II-PP Microsensor label-free for total DNA-Breast cancer based on Bioimpedance Spectroscopy

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Breast cancer remains one of the leading causes of cancer mortality in women worldwide. Electrochemical biosensors are technologies of interest due to their low production cost and ease of miniaturization. They have been used to detect analytes associated with breast cancer, showing high sensitivity and selectivity. These techniques provide quantitative information about DNA, taking advantage of the electronegative properties of the phosphate groups in its structure, which affect its polarity and electrical properties, including Electrical Bioimpedance Spectroscopy (EBiS). The present research was conducted to characterize total DNA concentration in breast cancer. The biosensor has been fabricated by gold micro-electrode array enbibed on a crystal surface. The total DNA was quantified by UV-Vis spectrophotometry, using an optical density between 260 and 280 nm to determine the total concentration of DNA and its purity ratio of 260/280. Subsequently, each sample was subjected to EBiS measurements using an impedance spectrometer in the frequency range of 100Hz to 10MHz. The findings show absolute reactance (Xc) values with significative statistic correlation to DNA concentration at 3.3 MHz ($R=0.821$, $p<0.05$) for concentrations from 0 to 100 ng/µl. The bioimpedance of biological analytes in suspension at frequencies above 1 MHz can be affected by how dipolar water molecules interact with structural environments. Thus, DNA concentration could intensify this interaction as the amount of nucleotide double helix structures increases, which is reflected in the reactive response associated with their electrical properties. The use of a label-free microsensor based on EBiSmeasurement is a feasible technique to estimate BC DNA concentrations, and future research to determine its potential use to detect genetic BC markers is warranted.

40-II-PP Estudio de la susceptibilidad de neutrófilos de pacientes con espondiloartritis para la formación de NETS y su interacción con osteoblastos

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Spondyloarthritis (SpA) comprises a group of heterogeneous diseases that share genetic, pathophysiological, and clinical features. Joint and synovial membrane inflammation leads to osteoproliferation and progressive immobility in patients.
Neutrophils play a key role in the pathogenesis of various systemic diseases by capturing and eliminating microorganisms through neutrophil extracellular traps (NETs), which are web-like structures composed of DNA fibers, histones, and cytotoxic proteins. These cells are abundant in the synovial fluid and peripheral blood of patients with SpA.
To evaluate spontaneous NETosis in neutrophils from patients with spondyloarthritis and determine the osteogenic potential of this mechanism.
Patients with spondyloarthritis show increased spontaneous NETosis, and the interaction between NETs and osteoblasts promotes osteoblast activity and bone matrix production.
Peripheral blood samples were collected from patients and healthy controls. Neutrophils were isolated using a Polymorphoprep density gradient. A total of 500,000 cells were cultured in phenol red-free RPMI medium at 37°C and evaluated at 30, 60, and 120 minutes using fluorescence microscopy with DAPI and an anti-myeloperoxidase (MPO) antibody. Additionally, healthy neutrophils were stimulated with plasma from SpA patients. Co-cultures were performed between NETs and HFOB1.19 osteoblasts to assess proliferation and bone matrix formation using Alamar Blue and Alizarin Red staining.
An increase in spontaneous NETosis was observed in patients with SpA, and this response was further enhanced when neutrophils were stimulated with patient plasma, suggesting the presence of circulating pro-inflammatory factors. Furthermore, NET exposure promoted both osteoblast proliferation and bone mineralization. These findings suggest that neutrophil activity and NETosis may play an important role in the osteoproliferation observed in SpA patients and could help elucidate the mechanisms behind pathological bone formation, offering potential targets for future therapeutic strategies.

42-II-PP Estudio comparativo del efecto antifibrótico de las combinaciones nebivolol-valsartán y sacubitril-valsartán en ratas wistar hembra en el infarto crónico al miocardio

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Cardiovascular diseases (CVDs) are the first cause of death among Mexican women. Most CVDs involve cardiac fibrosis, which over time evolves to heart failure and a reduced life expectancy. Currently, there are no approved antifibrotic treatments; however, the combination of Nebivolol/Valsartan has shown promising results as an antihypertensive therapy by modulating neurohumoral systems involved in fibrosis development. However, a major problem in these studies is the limited information available for the female sex due to their exclusion from clinical trials. Therefore, more studies specifically targeting the female population are needed to develop safe and effective treatments. This study aimed to compare the antifibrotic effect of the combinations Valsartan-Nebivolol and Sacubitril-Valsartan on cardiac tissue in female Wistar rats with chronic myocardial infarction. A total of 30 female Wistar rats, 20 weeks old, were used and distributed into four groups: SHAM, left anterior descendent artery ligation (LADL), Nebivolol/Valsartan (LADL+NV) at doses of 5 and 30 mg/kg/day, and Sacubitril/Valsartan (LADL+SV) at doses of 28 and 30 mg/kg/day, all administered orally. Myocardial infarction was induced in the LADL, LADL+NV, and LADL+SV groups. The LADL+NV and LADL+SV groups received treatment immediately after the infarction, administered orally for two weeks. Cardiac tissue was subsequently analyzed through histological methods to assess infarct area, collagen content, and myocyte size, as well as the condition of lung tissue. Sacubitril/Valsartan treatment showed no mortality, significantly reduced collagen deposition and myocyte hypertrophy, and reversed lung damage. In contrast, the Nebivolol/Valsartan treatment exhibited a high mortality rate, did not significantly reduce cardiomyocyte hypertrophy or collagen deposition in the heart, and failed to reverse morphological changes in lung tissue. The Sacubitril/Valsartan combination proved effective as an antifibrotic treatment, reversing cardiac hypertrophy and pulmonary damage in females. On the other hand, the Nebivolol/Valsartan combination, when administered immediately post-infarction, did not reduce fibrosis, cardiomyocyte size, or lung damage, and therefore is not considered safe for use in females.

46-II-PP Estudio farmacocinético por LC-MS/MS y evaluación in-silico para la predicción del acoplamiento ficocianobilina-albumina

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C-Phycocyanin (CPC) is noted for its antioxidants, anti-inflammatory, and anticancer properties. However, it is a prodrug metabolized to phycocyanobilin (PCB) to induce its pharmacological effect. Yet, the PCB pharmacokinetic and pharmacodynamic profile remains unknown. Following FDA and Mexican guidelines, this study developed and validated a sensitive liquid chromatography-mass spectrometry (LC-MS) method for quantifying PCB. Key findings included a detection range of 5–80 ng/mL PC; meanwhile, the pharmacokinetic results revealed critical PCB parameters after oral administration in mice, including Tmax (0.04 ± 0.01 h), Cmax (40.19 ± 6.35 ng/mL), T1/2 (3.36 ± 0.83 h), and AUC0-t (27.27 ± 2.78 h). Site marker studies and molecular docking identified albumin binding sites with favorable free energy interactions (-8.3 kcal/mol). Molecular dynamics simulations predict the stability of PCB-albumin complexes, highlighting PCB's hydrophobic interactions and limited exposure of ionizable groups. In conclusion, a sensitive and accurate LC-MS method was successfully applied to determine PCB pharmacokinetic parameters after a single dose administration, supported by in-silico studies.

48-II-PO Mapeo de la investigación científica en inflamación de bajo grado y neurodesarrollo cognitivo infantil: un análisis bibliométrico (1922-2025)

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Low-grade inflammation (LGI) represents a subclinical risk factor for cognitive impairment in pediatric populations, yet the structural and evolutionary aspects of this emerging research field remain systematically unexplored. This bibliometric study sought to comprehensively characterize global academic output regarding LGI and cognitive function in children, focused on its thematic trajectory mapping, identification of key contributors, analysis of conceptual trends, and detection of knowledge gaps to guide future neurodevelopment research.

9530 documents (articles and reviews, 1922–2025) indexed in Scopus were analyzed using Biblioshiny (R v. 4.4.5), VOSviewer (v. 1.6.20), and a custom Python-v.3.13.2 web application. Metrics of annual productivity, author, journal, and country impact, collaboration networks, and thematic evolution were evaluated through co-citation and keyword co-occurrence analysis.

Scientific output demonstrated exponential growth across three distinct phases: mechanistic studies (2000-2010), biomarker research (2011-2019) and contemporary investigations of neuroinflammation and gut-brain axis interaction (2020-2025), peaking in 2021 (819 documents) and 2024 (818 documents). Key molecular mediators emerged including IL-6, TNF-α, and oxidative stress pathways. Though a significant decline in the average impact per publication was observed ($r = 0.54$, $p < 0.001$). The United States led the production, accounting for 27.73% of publications (2214 publications) and 577754 citations, with prominent contributions from Harvard Medical School and Howard Hughes Medical Institute. Frontiers in Immunology (248 documents) and Journal of Immunology (216 documents) emerged as the most prolific outlets. Notably, only 12% of studies directly examined LGI-cognition in children. Thematic mapping revealed concentration areas: core population-focused themes (child, adolescent), while basic topics included inflammatory mechanisms (cytokines, blood-brain barrier).

A critical research gap was identified in the lack of a consolidated cluster specifically linking LGI, cognition, and pediatric neurodevelopment. Despite exponential growth in publication volume, a disconnect persists between LGI research and its impact on pediatric cognitive function. The findings underscore the imperative for targeted longitudinal studies and interdisciplinary collaborations to address this crucial gap in understanding subclinical inflammation´s neurodevelopment consequences.

63-II-PP Evaluación de la actividad antitumoral de compuestos heterocíclicos derivados de la hidantoína

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Hydantoin is a privileged molecule with various biological activities, including antitumoral effects. In this study, we evaluate the antiproliferative effect of 25 compounds against different tumoral line cells in vitro. To determine the antiproliferative and resisting cell death effect of derivates, we used MTT assay and clonogenic assay against MDA-MB-231 (Triple-negative breast cancer), A549 (Alveolar carcinoma), HEp-2 (Larynx carcinoma) and Vero (Kidney). Compounds 13, 18, 22 and 25 were identified as potential cell proliferation inhibitors with IC50 values between 0.298-37.08 µM in different cell lines, indicating a broad spectrum of anticancer activity. These findings suggest that hydantoin derivates 13, 18, 22 and 25 present significant antiproliferative effects and can be suitable compounds to be optimized to obtain anticancer agents.

67-II-PP Relación del factor neurotrófico derivado del cerebro (BDNF) con el food craving y la clasificación de comedor emocional en adultos con sobrepeso y obesidad

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The brain-derived neurotrophic factor (BDNF) plays a role in appetite regulation and has been linked to dysfunctional eating behaviors. This cross-sectional study evaluated the relationship between plasma BDNF levels, food craving (state and trait), and emotional eating classification in 31 adults with overweight or obesity. Significant positive correlations were observed between food craving scores and emotional eating. BDNF levels were lower in women and individuals over 43 years.
However, no significant associations were found between BDNF and the behavioral scales. These findings highlight the need to consider demographic and clinical variables in obesity-related behavioral research.

70-II-PP Integración de un pigmento bacteriano en tecnologías de conversión y almacenamiento de energía

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The present study introduces a novel an innovative application of organic pigmentary biopolymers of bacterial origin as an alternative energy source. The pigments employed in this research are widely distributed across all biological domains and are collectively referred to as melanins. These belong to a family of natural pigments that have attracted increasing scientific interest due to their remarkable physical, chemical, photoelectric, and biological properties, which position them as promising candidates for the development of sustainable energy technologies.

Their multifunctionality and adaptability across disciplines underscore their value as bioinspired materials in emerging technologies, including biomedical sciences, biotechnology, dermocosmetics, nanotechnology, biomechanics, and bioelectronics. The findings of this study provide a foundation for future research aimed at harnessing the energetic potential of these biological compounds.

71-II-PP Respuesta inmune protectora de largo plazo en ratones inmunizados con la banda de 100 kDa en el modelo de la meningitis causada por *Naegleria fowleri*

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Naegleria fowleri is an amphizoic amoeba and the etiologic agent of Primary Amebic Meningoencephalitis (PAM), an acute and fatal disease with a case fatality rate exceeding 95%. Currently, there are no vaccines that can prevent PAM. Therefore, our working group has proposed the 100 kDa polypeptide band obtained from the total extract *of N. fowleri,* which has been shown to be immunogenic, as a candidate vaccine against PAM. Therefore, the aim of this study was to evaluate the long-term protective immune response in BALB/c mice immunized intranasally with the 100 kDa band of *N. fowleri*. For this purpose, the 100 kDa band was obtained by electro-elution. Three groups of mice were immunized four times every seven days with the 100 kDa band; one of these groups received a boost at one month and another group at three months. All mice were challenged with the lethal dose of *N. fowleri* trophozoites. Groups were immunized in duplicate for survival assessment and another for immune response. Antibody levels were determined by Enzyme-Linked Immunosorbent Assay and specificity by Immunoblot. Cellular phenotyping was assessed by flow cytometry. Results showed that the highest survival rate was in the group that received a boost at 3 months which presented 60%. In all immunized groups, IgG and IgA antibodies in sera and nasal washes increased significantly and recognized the 100 and 50 kDa bands. An increase in the populations of IgA+ B lymphocytes was observed in the NALT and nasal passages (NP), as well as in IgG+ B lymphocytes. Furthermore, changes in the populations of IgG+ and IgA+memory B lymphocytes in the NALT and NP were observed in all groups. These results suggest that the immunization regimens implemented induce a long-term, protective immune response, which represents a fundamental step toward the development of a vaccine against PAM.

76-II-PP Identificación de antígenos de *Naegleria fowleri* reconocidos por anticuerpos en suero de personas originarias del Valle de Mexicali

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Naegleria fowleri is a free-living amphizoic amoeba that is the causative agent of primary amoebic meningoencephalitis (PAM), an acute, hemorrhagic, and necrotizing disease with a mortality greater than 97%. PAM is associated with a recent history of domestic or recreational aquatic activities in water that harbors *N. fowleri* trophozoites. Based on this premise, recreational aquatic activities are common among the local population in the Mexicali Valley.

Although warning signs are located in various channels regarding the presence of this amoeba, people continue to engage in these activities for recreational purposes. There have been cases of PAM reported in the region, but not everyone who comes into contact with the water gets sick, making the factors influencing the immune response against *N. fowleri* still not well understood. Therefore, this study aimed to analyze the humoral response against *N. fowleri* in two groups: individuals from the Mexicali Valley and a group of participants from Mexico City (CDMX) who work with *N. fowleri* in a laboratory setting. For this purpouse, a single serum sample was obtained from each participant. For both groups, antibody levels were tested by the ELISA assay, and for specificity, Western blot and immunocytochemistry were carried out.

The results showed the highest levels of IgG antibodies in the residents of Mexicali. In both groups, the IgG antibodies recognized in the total extract of *N. fowleri* bands of 19, 50, and 100 kDa. Also, the antibodies immunolocalized specific structures in the trophozoites of this amoeba, including the membrane, food cups, and extracellular vesicles. In conclusion, the antibody-specific recognition of these polypeptide bands and the structures of the trophozoite may be factors that could contribute to the protection of these individuals against *N. fowleri*.

79-II-PO Efficacy of insecticide chalk for the control of triatoma longipennis, vector of *Trypanosoma cruzi*

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Chagas disease, caused by the flagellated protozoan *Trypanosoma cruzi* and transmitted by insects of the subfamily Triatominae, remains as a public health issue in Mexico. Triatoma longipennis is considered one of the most important species due to its geographical distribution, peri- and intradomiciliary colonization, and high infection rates. Vector control relies on the application of residual insecticides such as cypermethrin, whose high cost limits its use in fumigation campaigns. For this reason, more affordable alternatives are being explored, such as insecticide chalk—an economical product widely accepted for domestic use. To evaluate the insecticidal activity, repellency, and residual efficacy of commercially formulated cypermethrin in a product known as insecticidal chalk for the control of triatomine bugs. To assess insecticidal activity, repellency, and residuality, fourth- and fifth-instar nymphs and adult specimens of *T. longipennis* were tested on wood, cement, and handcrafted tile surfaces. A standard (non-insecticidal) chalk was used as a negative control. For insecticidal activity, triatomines were exposed to the chalk-treated surfaces for 60 minutes, and mortality was recorded at 8, 12-, 24-, 48-, and 72-hours post-exposure. Repellency was assessed immediately after application, while residual efficacy was measured at 15-, 30-, 45-, and 60-days post-treatment. The control group was treated under the same conditions using regular chalk. The insecticidal chalk demonstrated significant efficacy: mortality rates ranged from 20–30% on wood, 70–80% on cement, and 100% on handcrafted tile. No repellency was observed on any of the tested surfaces. Residual activity, measured as the percentage of mortality over time, was 0% on wood and 60% on both cement and tile at 60 days post-application. The control group (regular chalk) exhibited no mortality, repellency, or residual effects. Insecticidal chalk showed insecticidal activity against both nymphs and adults of *T. longipennis* but exhibited no repellency. Residual efficacy was absent on wood, while moderate residual effects were observed on cement and tile up to 60 days after treatment.

88-II-PP Antihyperglycemic effect of petroleum ether extract from the leaves of Annona cherimola Miller

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Type 2 diabetes mellitus (T2DM) is a chronic disease characterized by hyperglycemia due to insulin resistance and β-cell dysfunction. Globally, 589 million people are affected, and in Mexico, it impacts 13.6 million individuals, being the second leading cause of death. Although current treatments are effective, their adverse effects limit long-term use. This has prompted the exploration of natural alternatives such as Annona cherimola Miller, a plant used in traditional Mexican medicine, with previously reported antidiabetic properties in its aqueous and ethanolic extracts.

This study evaluated the effect of a petroleum ether extract from the leaves of A. cherimola (EEPAc-H) in BALB/c mice with streptozotocin-induced type 2 diabetes. Its acute oral toxicity was assessed, as well as its impact on blood glucose levels, glycated hemoglobin (HbA1c), lipid profile, and urinary parameters, under both acute and subchronic administration.

Results showed that EEPAc-H did not induce signs of toxicity and was classified as "relatively non-toxic" (LD50 ≥ 2000 mg/kg) according to OECD guideline No. 423. In acute administration, it significantly reduced blood glucose levels in male diabetic mice starting 4 hours post-treatment. Under subchronic administration, a progressive decrease in glucose levels was observed in female mice from week 4 onwards. In both sexes, the extract reduced HbA1c levels, with efficacy comparable to that of acarbose. Additionally, it improved urine test parameters associated with diabetes, without affecting normoglycemic animals.

In conclusion, EEPAc-H exhibits antihyperglycemic activity in female mice and demonstrates a favorable safety profile, representing a promising natural alternative for the treatment of T2DM. Its effect, comparable to that of acarbose, along with the absence of hypoglycemic action in healthy animals, supports its therapeutic potential.

91-II-PP La biopelícula de las macroalgas alberga bacterias con potencial actividad antibacteriana

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Macroalgal surfaces are rapidly colonized by planktonic microorganisms, forming complex and dynamic co-aggregates known as biofilms. Several studies have reported variations in attributes of the associated microbial epibiotic community, such as the density of cultivable bacterial colonies in different regions of the thallus, as well as the presence and diversity of bacteria with inhibitory activity against others. However, no such interactions have been documented for *Gracilaria* species distributed in Mexico. This study aimed to assess, using traditional isolation techniques, the identity and antibacterial activity of bacteria associated with different thallus regions of *Gracilaria apiculata*, *G. blodgettii*, and *G. flabelliformis*. Results showed that colony density decreased from the apices toward the base in *G. flabelliformis* and *G. apiculata*, with significantly lower values at the base compared to the apical and middle regions ($p < 0.0001$). A total of 21 bacterial strains were isolated and preserved, with Gram-negative bacilli being the most abundant. Phylogenetic analysis of partial 16S rRNA gene sequences revealed a dominance of Gammaproteobacteria and Alphaproteobacteria, with *Alteromonas* as the most represented genus. Antibacterial activity was observed in isolates Gf25, Gf8, and Gf2, all affiliated with the genus *Bacillus sp.*, showing inhibition against *Staphylococcus aureus* subsp. *aureus*, with inhibition zones averaging 7.7 ± 1.1 mm. These findings highlight macroalgal biofilms as promising reservoirs of bacteria with antibacterial potential, which may contribute to addressing the global challenge of antibiotic resistance."

97-II-PO Evaluación de CD147, MMPs y TIMPs en receptores de trasplante renal con rechazo agudo mediado por anticuerpos: producción de MMPs mediada por CD147 en macrófagos

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Antibody-mediated acute rejection (AMR) is one of the leading causes of renal allograft dysfunction. Current diagnostic methods, primarily renal biopsy, are limited by their invasive nature, cost, and low sensitivity. Therefore, the identification of noninvasive, specific, and reliable biomarkers is a clinical necessity. Recent evidence suggests that CD147 (EMMPRIN), metalloproteinases (MMPs), and their inhibitors (TIMPs) play key roles in graft injury due to their involvement in inflammation, fibrosis, and glomerular dysfunction; however, their usefulness as a biomarker has not been explored. Furthermore, macrophage infiltration is associated with poor AMR outcomes, but the specific role of CD147 in facilitating infiltration through MMP production remains unclear. This work will allow us to explore new molecules with noninvasive diagnostic capacity for the early diagnosis of AMR and potential therapeutic targets. The work was approved by the Bioethics Committee of the National Institute of Cardiology under registration number: 24-1442. To evaluate the levels of CD147, MMPs and TIMPs in transplant recipients and their association with histopathological findings, as well as CD147-mediated MMP production in macrophages. Twenty-seven kidney transplant recipients with and without RAMA were evaluated and subsequently plasma levels of CD147, MMPs and TIMPs were quantified by ELISA. In addition, THP-1 macrophage-like cells were stimulated with patient serum to evaluate MMP production in vitro. Patients with RAMA showed a significant increase in MMP-1, MMP-2, MMP-3. However, TIMP-3 levels were increased in patients without rejection, showing in both cases correlations with the severity of histopathological findings and a good diagnostic ability to discriminate patients with rejection. Furthermore, serum from patients with high CD147 concentrations increased MMP production in THP-1 cells. MMPs and TIMPs are emerging as promising biomarkers. Furthermore, high CD147 levels were associated with increased MMP production in macrophages.

98-II-PO In silico design and evaluation of peptides with antiviral activity against Respiratory Syncytial Virus

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Respiratory syncytial virus (RSV) is a pathogen that infects the respiratory tract, being one of the main etiological agents with the highest mortality in children under 5 years of age worldwide. Currently, there is no specific treatment for patients with RSV infection, which is why it is important to develop specific peptides targeting the structural G and F proteins of RSV. With the aim of inhibiting a key step in the RSV replication cycle, a BLAST analysis of proteins was performed using protein databases (PDB and UniProtKB/Swiss-Prot) in order to generate a database of amino acid sequences corresponding to the G and F proteins. Subsequently, a multiple sequence alignment was performed, which allowed the identification of 17 highly conserved peptide regions in the F protein. These sequences were then subjected to in silico physicochemical studies using the ProtParam, ProtScale, IEDB, and EMBOSS: charge servers. From this analysis, peptide 3.2 was selected for meeting desirable physicochemical characteristics such as having flexible, antigenic (exposed regions), charged, hydrophilic, and stable regions. These characteristics suggest a greater potential for interaction with the viral target in an aqueous environment, as well as the ability to maintain its structural integrity without compromising its biological function. In addition, it was classified as non-allergenic and having a low probability of being toxic. As for protein G, a conserved peptide region was identified, but it was discarded due to its hydrophobic nature and lack of charge. Peptide 3.2 was then predicted in PepFold 3.5 and optimized with YASAR. Its structural quality was evaluated in MolProbity, with the Ramachandran map being the main structural validation criterion, in which the amino acid residues were located in favored regions. This peptide will be used for docking and molecular dynamics studies through the HDOCK server and the GROMACS program, respectively.

103-II-PO Diseño y evaluación in silico de péptidos antitumorales dirigidos a cáncer de pulmón

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Worldwide, cancer remains as one of the leading causes of death. Among it’s different types, lung cancer refers the highest rates of incidence and mortality. This elevated mortality is strongly influenced by the stage at which the disease is diagnosed (typically in advanced stages), directly limiting eligibility for conventional treatments such as surgery, chemotherapy and radiotherapy. The later the diagnosis, the fewer therapeutic options remain available for the patient. As a result, the development of new therapeutic strategies has become increasingly relevant. In this study, a literature review was conducted to identify molecules expressed or overexpressed in lung cancer that are relevant to its progression, resulting in the selection of seven key proteins: VEGFR1, ErbB2, GPR87, EGFR, FGFR1, Biglycan and uPAR. Based on these proteins, physicochemical characteristics such as antigenicity, flexibility, molecular charge and hydropathicity, as well as biological properties, including half-life, stability, antigenicity and toxicity, were assessed. These physicochemical properties were analyzed across the amino acid sequences of each selected protein to identify antigenic, charged, hydrophilic and highly flexible regions, leading to the generation of 98 peptide candidates Each peptide was subsequently evaluated based on its half-life, antigenicity, stability and toxicity, and the two peptides with the most favorable characteristics (long half-life, stability, non-antigenicity, and non-toxicity) were selected per protein. A molecular docking was then performed on the resulting 14 peptide, and the one exhibiting the lowest Gibbs free energy (ΔG), indicative of a spontaneous and stable binding, was selected for each target. To date, it has been concluded that among the 98 modeled peptides, only peptide ANT12 displays the most favorable physicochemical profile, is non-toxic and non-allergenic, and shows the lowest ΔG value, suggesting a spontaneous and thermodynamically favorable interaction.

105-II-PP Evaluation of the effect of SARS-CoV-2 ORF8 protein on superoxide dismutase (SOD) and catalase (CAT) activity in different organs of male BALB/c mice

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SARS-CoV-2, a coronavirus, is the agent responsible for COVID-19. In December 2019, it generated numerous infections in China, and by March 2020, it had spread worldwide, prompting its declaration as a pandemic. It has generated more than 777 million cases and more than 7 thousand deaths worldwide. Some patients have reported symptoms after 12 weeks of disease resolution, which is known as long COVID. This syndrome significantly reduces the well-being and health of patients; however, the mechanisms that cause it have not been well established. The main difference between SARS-CoV-2 and others coronaviruses are the spike (S), ORF3a, and ORF8 proteins, the latter being the least similar and of most significant interest as it is responsible for evading the immune response, endoplasmic reticulum stress and alteration in glutathione equilibrium, but little is known about how it can affect other regulation points in the redox system. Therefore, in this study, we evaluated the effect of intranasal administration of the ORF8 protein on the activity of two oxidative stress-regulating enzymes, superoxide dismutase (SOD) and catalase (CAT), in different organs of male BALB/c mice. The groups were exposed for either two weeks (short-term) or eight weeks (long-term). At the end of each exposure period, SOD and CAT enzyme activity were measured in the brain, cerebral cortex, lungs, liver, kidneys, and heart. It was demonstrated that ORF8 did not affect SOD activity either between treatments or across exposure periods. However, this protein decreases hepatic CAT activity in the long-term group. Our results suggest that prolonged exposure to the ORF8 protein leads to decreased hepatic CAT activity, indicating that the ORF8 could play a crucial role in the metabolic dysfunction observed in long-COVID

113-II-PP Isocitrato deshidrogenasa 1 (IDH1) silvestre y mutante como blanco farmacológico en glioblastoma

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Glioblastoma is the most aggressive and the most common form of brain tumour in adults, into 4 groups: Samples were sequenced and grouped Glycolytic/Plurimetabolic (GPM), Mitochondrial (MTC), Neuronal (NEU) and Proliferative/Progenitor (PPR); with GPM and MTC attributed to metabolism, while NEU and PPR attributed to development. Currently, there are no known ways to prevent this disease, its symptomatology is not specific. Geographic origin and gender have been found to affect the incidence and severity of this disease.

The aim of this basic research is to identify molecules with inhibitory capacity against IDH1 enzyme, key in the pathogenesis of glioblastoma. The enzymes isocitrate dehydrogenases (IDH) act in the Krebs cycle and there are 3 isoforms: IDH1, IDH2 and IDH3, IDH1 is found in peroxisomes and cytoplasm.

The in silico methodology includes: IDH1 proteins crystal screening, inhibitor selection, virtual screening, docking and molecular dynamics, screening and selection of best compounds and analysis of ADMET properties. To find the best potential inhibitors that inhibit enzymatic and cellular activity, the in vitro methodology will include the investigation of different parameters: proliferation, migration, differentiation and its quantification, viability assay and cytotoxicity.

The FDA-endorsed inhibitors Vorasidenib, Ivosidenib and Olutasidenib have been found to be effective inhibitors of IDH1 in the R132C, R132G, R132H and R132L variants (associated with a better prognosis), however, they are not effective against Wild-type (nM values). Molecular docking and interaction analysis has been performed to have them as benchmarks for future analysis.

Of the above mentioned inhibitors, 3 pharmacophores have been validated and selected against the R132H variant, which have good values for accuracy, sensitivity, specificity and enrichment factor. The partial findings will allow the selection of new inhibitor compounds with greater efficacy against wild-type IDH1, improving the treatment of glioblastoma.

114-II-PP Correlación entre las estimaciones del modelo BOADICEA y los resultados de secuenciación masiva: un estudio en mujeres mexicanas con riesgo de cáncer de mama y ovario

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In Mexico, breast cancer is the leading cause of death from malignant tumors in women, while ovarian cancer ranks sixth.

Variants in genes such as BRCA1, BRCA2, PALB2, CHEK2, ATM, RAD51C, RAD51D, BRIP1, and BARD1 are key factors in the development of these cancers. Timely identification of pathogenic variants in these genes significantly improves clinical care; however, access to genetic testing remains limited.

Mathematical models such as BOADICEA, which estimates the likelihood of carrying pathogenic variants, are useful tools for identifying high-risk patients. Consequently, they can serve to guide prioritization for genetic testing, optimize healthcare resources, and support preventive and/or therapeutic decision-making. However, the clinical validity of BOADICEA model has not yet been assessed in the Mexican population.

This study aims to evaluate the utility of the BOADICEA model in Mexican women by correlating estimated risk (predicted carriers) with observed data obtained through Next-Generation Sequencing (NGS). This study included 194 Mexican patients with clinical suspicion of hereditary breast and/or ovarian cancer risk, who were evaluated at the Genomic Diagnostic Laboratory of INMEGEN since 2016. The average age was 50 years; 68% had cancer at the time of the study, and 32% had a family history of cancer.

Genetic Variant identification and interpretation were performed through NGS panels of genes and bioinformatic tools such as SOPHiA Genetics, Franklin by Genoox, along with up-to-date databases includingClinVar, gnomAD, Human Gene Mutation Database, to enable clinical classification of variants (benign, likely benign, variant of uncertain significance [VUS], likely pathogenic, or pathogenic).

Pathogenic or likely pathogenic variants were identified in 38% of cases, VUS in 33%, and no variants were detected in 28%.

The most frequently affected genes were BRCA1 (11%), BRCA2 (7%), CHEK2 (6%), PALB2 (2%), and CDKN2A (2%).

The CanRisk web platform, which is based on the BOADICEA model, was used to estimate the probability of carrying pathogenic variants associated with breast and/or ovarian cancer. This model assigns scores to clinical and family history variables and provides both an overall probability (0 to 100) and gene-specific probabilities for BRCA1, BRCA2, PALB2, CHEK2, ATM, BRIP1, RAD51C, RAD51D, and BARD1.

The average risk predicted by BOADICEA was 17.17 in patients with cancer and 8.34 in those without cancer.

Using the clinically accepted threshold of ≥10 as criterion for recommending genetic testing and comparing it with NGS results, 18% of the patients had a calculated risk below 10 but did carry a pathogenic variant, i.e., 18% false negatives.

Lowering the threshold to 5 reduced false negatives to 6%, suggesting a need to adapt testing criteria for Mexican population.

118-II-PO Li-TMS portable device effectively reduces anxiety and anhedonia in a chronic stress model in rats

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Low-intensity repetitive magnetic stimulation (Li-TMS) is a technique proposed for treating various psychiatric and neurological conditions, offering the advantage of requiring less sophisticated and expensive equipment compared to high-intensity stimulation (Hi-TMS); however, its effectiveness is still under investigation. This work explored the effectiveness of Li-TMS using 1 and 60 Hz to reverse the deleterious effects of stress induced by movement restriction.
Sprague-Dawley rats were subjected to movement restriction for 30 days and received Li-TMS treatment for the last 15 days of the restriction period. Symptoms of weight change, anhedonia, anxiety, and locomotor activity were evaluated at the end of the protocol, as well as serum Brain-Derived Neurotrophic Factor (BDNF) levels. We found that Li-TMS can reverse the anhedonia induced by our model, regardless of the frequency used, while anxiety was only reversed at 60 Hz, and the decrease in weight gain was only partially reversed. No effects were found on serum BDNF levels. In conclusion, using the portable device Li-TMS at 60 Hz can reduce the deleterious effects of restraint stress. This finding points to the feasibility of using lower-intensity equipment to treat symptoms associated with anxiety and depression.

119-II-PV Efecto del uso de prótesis plásticas de 10fr vs 8.5fr en el tratamiento de coledocolitiasis de difícil manejo mediante colangiopancreatografía retrógrada endoscópica (CPRE)

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Billiary lithiasis is the main indication for endoscopic retrograde cholangiopancreatography (ERCP). Series have reported that approximately 90% of cases of common bile duct stones can be resolved using conventional methods (sphincterotomy and ballon sweep or basket-assisted stents). However, in cases of multiple stones (3 or more) or stones larger than 20 mm, the probability of success will be lower, necessitating auxiliary methods such as the placement of plastic stents. Studies are needed to assess whether there is a difference in effectiveness with the use of 8.5Fr or 10Fr plastic stents, given that currently the decision on the thickness of the plastic stent depends on the choice of the physician performing the ERCP. Retrospective, analytical cohort study. To quantify the resolution rate of choledocholithiasis in patients who received a 10Fr vs 8.5Fr plastic stent. To quantify the rate of cholangitis with the use of a 10Fr vs 8.5Fr plastic stent, to quantify the change in stone diameter after the use of a plastic stent, to quantify adverse effects such as pancreatitis, post-ERCP hemorrhage, and perforation, in those who did not achieve resolution in a first event and 10Fr and 8.5Fr plastic stents were placed. English: The resolution rate of choledocholithiasis when using 10 Fr stents was 77.9% vs 67% in patients who had an 8.5 Fr stent (p 0.06), while the percentage of cholangitis cases was higher with 8.5 Fr stents 16.2% vs 12.9% in 10 Fr cases without statistically significant differences, the rate of pancreatitis and post ERCP hemorrhage was similar in both groups and no cases of perforation were reported in either group. Preliminary results show that in cases of difficult-to-control choledocholithiasis when 10 Fr stents are used there is a tendency to achieve a higher resolution rate without a statistically significant difference in the preliminary analysis.
While no differences were observed in cholangitis or associated complications in both types of procedures (hemorrhage, perforation, pancreatitis).

121-II-PO Efecto de compuestos flavonoides en la levadura multirresistente *Candida auris*

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Fungal infections, particularly those caused by yeasts of the genus *Candida*, represent a significant cause of morbidity and mortality in immunocompromised hospitalized patients. In recent years, the emergence of candidiasis caused by *Candida auris*, an opportunistic species recently identified as pathogenic in humans, has generated a global alert due to its high resistance to multiple classes of conventional antifungals.

In this context, flavonoids, natural compounds with recognized bioactive properties, have been proposed as potential antifungal Candidates, being of particular interest for their antimicrobial activity. In this study, their effect on growth, viability, pharmacological synergy and toxicity was evaluated in two strains of C. auris, belonging to clades III and IV.

The results showed that the flavonoids evaluated exerted a significant inhibitory effect on yeast growth, with minimum inhibitory concentrations (MIC) lower than those reported for fluconazole. Also, a sustained decrease in cell viability was observed for 24 hours, comparable to that of some reference antifungals. In addition, a synergistic effect between certain flavonoids and conventional antifungal compounds was identified, suggesting a potential combined use.

The toxicity of flavonoids was evaluated using the invertebrate model Tenebrio molitor, in which a lower toxicity to conventional antifungal treatments was observed. This low toxicity was supported by the analysis of petite mutants, generated after exposure to the treatments; flavonoids induce a low frequency of these mutations, indicating less mitochondrial involvement, i.e. lower toxicity.

Finally, the activity of efflux pumps was examined using the fluorescent marker rhodamine, as these proteins contribute to antifungal resistance and virulence in C. auris. The results indicated that a selected group of flavonoids was able to significantly reduce the activity of these pumps, suggesting a possible additional mechanism of action against this highly resistant species.

123-II-PP Aislamiento y caracterización de bacteriófagos líticos contra aislados clínicos de Klebsiella pneumoniae

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According to the 2024 epidemiological report from RHOVE (Hospital Epidemiological Surveillance Network), Klebsiella pneumoniae is the third leading cause of Healthcare-Associated Infections (HAIs) in Mexico. Furthermore, this bacterium is included in the list of priority pathogens for the development of new antibiotic molecules, published by the WHO (World Health Organization) in 2024.

Bacteriophages (viruses that infect bacteria) represent a promising option to aid in the elimination of bacteria with the potential for antibiotic resistance. The objective of this work is to isolate and characterize bacteriophages with lytic activity against clinical isolates of K. pneumoniae.

To achieve this, 10 bacteriophages were isolated from different water sources: n=3 from hospital wastewater, n=9 from municipal wastewater, and n=10 from natural water. The samples were pre-enriched with mixtures of K. pneumoniae clinical isolates.

The isolated bacteriophages underwent phenotypic and genotypic characterization tests. Host range tests, using K. pneumoniae strains and strains from different bacterial genera, revealed that the phages are species-specific.

The viability of the bacteriophages was also evaluated under different pH conditions (3 to 13) and temperatures (4 °C to 80 °C), observing that they remain viable within a pH range of 5 to 11 and temperatures between 4 and 60 °C.The one-step growth curve showed that the phages have a latency period of 15 minutes and burst sizes ranging from 2,500 to 200,000 PFU/cell. Finally, genomic analysis of bacteriophage Kp8 was performed, revealing a genome length of 40,338 bp. No genes related to lysogeny, virulence, or antibiotic resistance were identified.

124-II-PO Synthesis of 2-[(2-arylimidazo[1,2-a]pyridin-3-yl) methylene] malononitriles as building platforms towards chemical structures with pharmaceutical potential

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Research related to azaheterocycles has grown exponentially since the 1950s. By 2025, there are 52 reports addressing various aspects of these compounds. Additionally, their appeal is maximized when they have chemical structures containing two or more fused rings, which typically create synergy in their pharmacological activity. The interest in accessing new compounds whose molecular architecture includes imidazopyridine stems from the fact that this heterobicycle has demonstrated significant biological activity, including anti-inflammatory, anticancer, antiviral, antiosteoporotic, antiparasitic, and antihypertensive properties, among other uses. The methods for functionalizing this bicycle are diverse, some as sophisticated as the couplings promoted by metals such as copper, palladium, and rhodium. The proposal made in this project is based on a retrosynthetic analysis that points to arylimidazo [1,2-a] pyridinylmethylenemalononitriles 9a-h as common reaction intermediates for the synthesis of functionalized chromenes 11a-h and 15a-h, as well as polysubstituted dihydropyrroles 18a-h and 19a-h, all maintaining the imidazopyridine fragment. The synthetic strategy for the generation of compounds 9a-h was achieved through a four-step sequence that included: a) alpha-bromination of acetophenones 1a-h, b) cyclization of products 3a-h using 2-aminopyridine, c) formylation of heterocycles 5a-h by the Vilsmeier-Haack reaction, d) Knoevenagel condensation of aldehydes 7a-h with malononitrile. The syntheses performed in this work involve well-known methodologies, which were adapted at each stage to optimize conditions for obtaining compound families 11 and 15; however, for series 13, 16, 18, and 19, which are groups of innovative molecules, novel synthetic methodologies were established for their generation. Due to the functional groups present in the products obtained, they can be further derivatized into other systems of synthetic and biological interest. It is worth mentioning that, within the scope of this project, a study of the potential pharmacological properties of the products was not conducted; rather, this contribution is exclusively to the synthetic field.

125-II-PO Desarrollo de biosensores tatuados para el monitoreo de diabetes mellitus tipo 2 en un modelo en ratón

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Type 2 diabetes is a global health problem, ranking Mexico seventh in prevalence, and sixth in mortality, due to multiple socioeconomic, cultural and genetic factors that predispose Mexicans to this condition. The main glucose measuring devices are invasive, expensive, and require constant, painful blood extraction, which impacts ongoing monitoring and proper treatment adherence. This project consists in the development of a tattooable biosensor, for real-time monitoring of glucose concentration in interstitial fluid, that changes colour in response to glucose fluctuations, without the need for expensive electrical devices and blood draws. The ink was formulated and standardized, and we conducted in vitro assays with different glucose concentrations representative of hypoglycemic, normoglycemic, and hyperglycemic scenarios, detecting distinguishable chromatic variations. The biosensor ink's performance was then standardized and examined in ex vivo porcine and murine models. Once its functionality in animal tissue was verified, we carried out in vivo testing on mice of the BALB/c and C57bl6 strains, monitoring healing. Once the biosensor's functionality is verified, it will be tested in a model of type 2 diabetes induction using high-calorie intake in mice of the mentioned strains, which will be tattooed and segregated into a control group and a high-calorie diet group. We will record the weight, images of the tattoos will be captured, and capillary blood glucose will be measured to confirm the sensitivity, stability, and feasibility of the biosensor ink as a minimally invasive continuous monitoring tool. This progress symbolizes a biotechnological innovation within everyone's reach, with the potential to increase treatment adherence, reduce complications, and contribute to public policies for the prevention and control of chronic diseases.

126-II-PP Totopos fritos al aire: un snack novedoso evaluado mediante técnicas de microscopia y análisis de imagen para determinar sus cualidades óptimas

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Air frying is an emerging cooking technology that relies on the rapid circulation of hot air through forced convection uniformly around the food, with the aim of producing a product comparable to deep-fat frying but with a substantially reduced amount of oil. The growing popularity and market demand for this technology are largely attributed to its perception as a healthier alternative to conventional frying methods. Recent studies on various popular food products have reported that air frying can reduce oil usage by up to 80% and markedly lower acrylamide content. Nevertheless, the physical properties of foods prepared using this method—particularly their texture and microstructure have not been thoroughly characterized. In this context, the present study aimed to investigate the microstructural and textural properties of air-fried totopos processed at different temperatures, employing microscopy techniques, image analysis, and texture evaluation. Image analysis revealed that air frying promoted the development of surface cracks, apparent roughness (FD), and a loss of homogeneity (ET) in the totopos. These effects were most pronounced at 140 °C, where maximum values of entropy (6.95 ± 0.11) and fractal dimension (2.67 ± 0.08) were recorded. Conversely, at higher temperatures (170 °C), significantly lower entropy (5.73 ± 0.07) and fractal dimension (2.62 ± 0.01) values were obtained.

Scanning Electron Microscopy (SEM) and Confocal Laser Scanning Microscopy (CLSM) provided detailed visualization of the totopos microstructure and the morphological changes in starch across the evaluated temperatures (140, 150, 160, and 170 °C). The formation of surface voids was significantly greater at 140 °C (18.93 ± 0.27%). In terms of mechanical properties, hardness (N)associated with totopo crispness was highest at 170 °C (16.82 ± 0.89) and significantly lower at 140 °C (9.42 ± 0.27).

128-II-PP Evaluación de la respuesta proinflamatoria y degradativa de las células epiteliales alveolares humanas tipo II estimuladas con Streptococcus pneumoniae

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Streptococcus pneumoniae (S. pneumoniae) is one of the main bacteria associated with various pulmonary infections. It has been shown that stimulating alveolar mononuclear phagocytes with *S. pneumoniae* induces the secretion of IL-1β, TNF-α, and matrix metalloproteinase (MMP)-9; however, it has not been demonstrated whether these same proinflammatory and degradative markers are activated in human type II alveolar epithelial cells (A549) when stimulated with *S. pneumoniae*.
To evaluate the secretion profile of IL-1β and the activity of MMP-9 in A549 cells when stimulated with *S. pneumoniae* at different time intervals.
A549 cells were stimulated with *S. pneumoniae* (10^2, 10^4, 10^5, and 10^6 CFU/mL) for 3, 6, and 24 hours. IL-1β in the culture medium was quantified by ELISA assay, and MMP-9 activity was determined by zymography. Six independent experiments were performed in duplicate. Differences were evaluated using one-way ANOVA followed by Tukey's test. A p-value < 0.05 was considered statistically significant. Data are presented as mean ± standard deviation.
The concentration of IL-1β in unstimulated A549 cells at 3, 6, and 24 hours was 0.1557 ± 0.02 pg/mL, 0.1513 ± 0.005 pg/mL, and 0.1453 ± 0.003 pg/mL, respectively. When A549 cells were stimulated with *S. pneumoniae*, no significant differences were found at the different time points compared to the control group (p = 0.8746). MMP-9 activity in A549 cells at 3, 6, and 24 hours was 0.00 ± 0.00 OD at all three time points. *S. pneumoniae* did not induce MMP-9 activity compared to the control group (p = 0.8746).
Streptococcus pneumoniae does not activate IL-1β secretion or MMP-9 activity in A549 cells. It is likely that the capsule surrounding the bacterium evades recognition by Toll-like receptors in A549 cells.

132-II-PP La floración de *Agastache mexicana* favorece la acumulación de metabolitos especializados con actividad farmacológica

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Agastache mexicana (toronjil) is a native plant from Mexico, used in traditional medicine and with pharmacological potential to treat conditions such as pain, anxiety, hypertension, inflammation, and others. *A. mexicana* produce phenolic compounds and flavonoids, such as tilianin, acacetin, as well as ursolic and oleanolic acids, as well as ursolic and oleanolic acids, to which its phytotherapeutic effects are attributed. Considering that, the accumulation of specialized metabolites (SM) in *A. mexicana* depends on the phenological stage of the plant and the extraction solvent. This study analyzes the changes during the flowering of *A. mexicana* subsp. Mexicana and the election solvent affect extract yields and SM accumulation. The plants were grown in the CEPROBI experimental field between March and April 2025. Flowering and non-flowering plants were collected for the fractional extraction of EMs. Dichloromethane was used, followed by methanol in a 1:10 w/v ratio, and the relative abundance of EMs was determined by HPTLC. It was observed that the extract yield in flowering plants was higher than in non-flowering plants, for both the methanolic and dichloromethane extracts, by 3.16 and 2.29 times, respectively. Additionally, the yield of the methanol extract relative to dichloromethane was higher in flowering plants than in non-flowering plants by 16.43 and 11.85 times, respectively. Determination of the content of phenolic compounds in the extracts indicated that flowering plants had a higher concentration of phenolics than non-flowering plants, both in the methanol extract and in the dichloromethane extract, by 1.5 and 1.3 times, respectively. Regarding the tilianin content in flowering plants, it was 1.6 times higher than that obtained in non-flowering plants. In conclusion, ME accumulation in *A. mexicana* subsp. mexicana plants occur during the flowering stage; however, with $\alpha = 0.05$, there is no statistically significant difference between the flowering stages and dichloromethane and methanol extracts.

133-II-PP Efecto de la quercetina sobre la expresión de genes asociados a la modificación N6 metiladenosina y vía de la leptina en hipotálamo de un modelo animal de dieta hipercalórica

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Obesity, a complex chronic metabolic disorder, involves adipose tissue dysfunction and systemic alterations like insulin resistance, adiposopathy, and chronic low-grade inflammation. These conditions impair quality of life and elevate morbidity and associated pathological risk. The hypothalamus is pivotal in centrally regulating energy metabolism, glucose homeostasis, and appetite, making it a crucial therapeutic target for obesity. Quercetin, a well-studied flavonoid, exhibits antioxidants, anti-inflammatory, and metabolic-modulating properties. Given the hypothalamus's role in obesity pathophysiology, this study investigated quercetin's effects on key hypothalamic genes involved in N6-methyladenosine (m6A) modification and the leptin signaling pathway in a high-caloric diet (HCD)-induced obesity model.

An animal model of obesity induced by a high-calorie diet (HCD) was used. The animals were divided into three experimental groups: control (standard diet), HCD (high-calorie diet), and HCD supplemented with quercetin. After a 12-week dietary intervention period, hypothalamic tissue was obtained. Gene modulation analysis by RT-qPCR was performed to evaluate the effects of quercetin on genes related to energy metabolism, the leptin-melanocortin pathway, and insulin signaling.

HCD induced significant Fto gene overexpression; quercetin normalized Fto expression to control levels. HCD reduced Mc4r gene expression; quercetin partially restored it, suggesting positive modulation of the leptin-melanocortin axis and appetite regulation. Additionally, HCD suppressed Irs1, Pi3k, and Akt expression, consistent with cerebral insulin resistance. Quercetin treatment reversed this suppression, restoring gene expression and indicating a beneficial effect on hypothalamic PI3K/AKT insulin signaling.

This study demonstrates quercetin's positive modulating effect on hypothalamic gene expression in a high- caloric diet-induced obesity model. Specifically, quercetin normalizes Fto expression, ameliorates the leptin-melanocortin pathway via Mc4r, and restores Irs1, Pi3k, and Akt-mediated insulin signaling.

134-II-PP Producción científica de la Escuela Superior de Medicina: análisis bibliométrico en Scopus

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Institutional scientific production is a tool for evaluating academic and scientific indicators. This paper presents a bibliometric analysis of the scientific output of the Escuela Superior de Medicina (ESM), aiming to provide an objective assessment of the institution's scientific production.

A bibliometric study was conducted in the Scopus database. Scientometric indicators were calculated using the Biliometrix library in R. Visualization was carried out using Scimago Graphica version 4.2. The analyses focused on temporal publication trends, co-authorship networks, term co-occurrence, and thematic clusters to identify research areas. The impact of citations on scientific production, as well as the identification of the most productive authors and influential works, was also evaluated.

A total of 2,255 documents belonging to the institution were retrieved from the period 1986 to 2025. There was a progressive growth in scientific production, with a marked exponential trend starting in 2000, resulting in productivity exceeding 150 publications per year in the last decade (2019–2024). An increase in collaboration with institutions of high academic and scientific prestige accompanies this increase. Cluster analysis revealed that the center's research aligns with the response to global challenges, as well as a marked mastery of molecular computational methodologies, primarily focused on topics such as oxidative stress, inflammation, and obesity. Production is substantial, reflected in the 31,256 accumulated citations with an average of 14.05 citations per document.

The School of Medicine's research trajectory is robust and strategic, characterized by sustained growth, solid collaborative networks, and a clear focus on highly relevant health topics.

142-II-PP Estudio químico comparativo del metaboloma de Kalanchoe tomentosa y de sus micromicetos endófitos

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The use of fungal microorganisms as a source of new specialized metabolites is a field with great research potential, primarily due to the ease with which they can be cultured on small, medium, and large scales. A large portion of the active ingredients used in the pharmaceutical industry comes from fungal organisms, due to their enormous capacity to synthesize highly specialized metabolites. Given the structural and bioactive importance of these metabolites, all fungal morphotypes present in a plant individual of the medicinal species Kalanchoe tomentosa were isolated. Axenic cultures of each morphotype, presumably associated with a different species, were carried out, and biomass scaling was performed in both liquid and solid media. Additionally, a co-culture of all the fermented strains was made in the same medium to simulate their endophytic interaction. The goal is to use different analytical tools to obtain the chemical profile of the specialized metabolome composition of each species and perform a comparison between them.

153-II-PV Evaluación preliminar de la biocompatibilidad de las parasporinas AX-2 y A34-2 en células sanguíneas humanas

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Bacillus thuringiensis (Bt) is an entomopathogenic bacterium widely used in biological pest control, well known for producing crystalline proteins (Cry, Cyt, and parasporins) during sporulation. Parasporins have gained attention in biomedical research due to their selective cytotoxicity against human cancer cells, whit minimal effects on normal cells, making them promising candidates for anticancer therapy. In the Papaloapan region, two native B. thuringiensis strains, designated AX and A34, were isolated. This study aimed to evaluate the synergistic potential and hemocompatibility of parasporins AX-2 and A34-2 in human cells, focusing on their biosafety and possible application in breast cancer therapy. The AX-2 and A34-2 proteins were produced and purified following the sporulation of each strain. Proteins were washed by centrifugation to deactivate proteases, and SDS-PAGE was used to identify interest bands at approximately 50 and 55 kDa, respectively. Cytotoxicity assays were conducted using the MCF-7 breast cancer cell line. Proteins were tested individually and in combination using the MTT assay to determine cell viability inhibition. Hemocompatibility assays were performed on human peripheral blood-derived monocytes and erythrocytes through MTT and hemolysis tests, using 1 % SDS and 1X PBS as positive and negative controls, respectively. Results showed that AX-2 and A34-2 proteins reduced MCF-7 viability more effectively when tested individually than in combination. Neither individual nor combined treatments caused significant damage to monocytes or erythrocytes, indicating good hemocompatibility. In conclusion, AX-2 and A34-2 proteins demonstrate selective activity against breast cancer cells with minimal effects on healthy blood cells. This work provides preliminary evidence supporting the therapeutic potential of native *B. thuringiensis* parasporinas and establishes a foundation to future research on their molecular characterization and mechanisms of action.

156-II-PO Efecto de dapagliflozina en la presión pulmonar de pacientes con Diabetes tipo 2 evaluada por ecocardiograma a los 6 meses de tratamiento

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Pulmonary hypertension (PH) is defined as a mean pulmonary arterial pressure (mPAP) ≥ 20 mmHg that can predispose to right ventricular (RV) dysfunction, heart failure, and death. Incidence is 14.2 cases per 1000 person-years in patients with T2DM and an approximately two-fold increase in the risk of all-cause mortality. The pathophysiology of PH found in T2DM involves pulmonary endothelial dysfunction related to glucotoxicity and lipotoxicity, increased oxidative stress, and maladaptive vascular remodeling. Based on experimental models of PH, SGLT2 inhibitors are indicated to have therapeutic potential by improvement in cardiac function (decreased oxidative stress, hypertrophy, and inflammation) and pleiotropic effects (improved renal function, erythropoiesis, and reduced sympathetic activity). The concurrent presence of T2DM and PH is a significant global health issue with marked morbidity and mortality. Due to the expensive treatment and the side effects from the existing regimen for PH, it is necessary to assess the potential of treating PH with iSGLT2. We hypothsize that dapagliflozin will induce a statistically significant decrease in pulmonary pressure indices, with a mean reduction of 10.5 mmHg ± 3.9 mmHg (measured by transthoracic echocardiography). This is a prospective, longitudinal cohort study wich aims to enroll 62 participants older than 18 years of age and diagnosed with T2DM, without a previous history of heart disease or PH. This preliminary data from 10 patients show a mean age of 52.8 years and all the patients were females with an average BMI of 30.8 kg/m^2. Echocardiographic parameters at baseline are a left ventricular mass of 79.9 g/m^2, right ventricular basal diameter of 3.7 cm, free wall thickness of 0.55 cm. The left ventricular ejection fraction (LVEF) is 62.7% while the 3D right ventricular ejection fraction (3D RVEF) is 46% and the right ventricular free wall longitudinal strain (SPLVD) is -20%. The first measured hemodynamics are showing an average SPAP of 18.1 mmHg; mPAP 15 mmHg, and PAD 5 mmHg. SPAP decreased to a mean of 12.7 mmHg after 6 months of dapagliflozin treatment, however, the difference was not statistically significant likely attributable to the small sample size.

161-II-PP Immunomodulation by bacterial products promotes innate signatures favorable to tuberculosis host response

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Tuberculosis (TB), a leading cause of infectious morbidity and mortality worldwide, would benefit from novel immunomodulatory strategies. Trained immunity, a form of innate immune memory, enhances macrophage responsiveness through epigenetic and metabolic reprogramming, offering a promising approach to strengthen host defenses against Mycobacterium tuberculosis. This study evaluated the immunomodulatory potential of pharmaceutical-grade bacterial suspensions (BS) and lysates (BL), focusing on features of trained immunity, in human macrophages and their role in innate response to M. tuberculosis infection. MDMs were stimulated with M. bovis BCG, BS, and BL following a training protocol described for BCG-dependent trained immunity. We observed that BS and BL induced sustained cytokine responses and a metabolic transcriptional profile upon secondary stimulation with M. tuberculosis, consistent with a trained immunity phenotype. Notably, BS and BL training promoted increased IL-1β production in M. tuberculosis-infected macrophages. Also, the expression of surface markers was shifted to high HLA-DR, CD80, CD86, CD14, TLR2, and TLR9 expression consistent with an M1 phenotype. Moreover, BS and BL training upregulated the expression of antimicrobial transcriptional signatures, including autophagy-related LC3 and ATG16L1 expression. These findings indicate that BS and BL engage immunomodulatory pathways, suggesting potential for tailored immune activation strategies in trained immunity. Given the central role of trained macrophages in the early containment of Mycobacterium tuberculosis, these immunological signatures may provide new adjunctive strategies to boost innate responses in tuberculosis and other chronic infections.

162-II-PO Edición génica de PLD1 por CRISPR-Cas9 en cultivo primario de astrocitos como un posible blanco terapéutico para Alzheimer

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Alzheimer's disease is a neurodegenerative disorder marked by cognitive decline, functional impairment, and behavioral changes. It involves the accumulation of extracellular β-amyloid plaques, derived from APP, which interact with membrane receptors, inducing inflammation and indirectly activating phospholipase D1 (PLD1). This leads to neuroinflammation, oxidative stress, and synaptic dysfunction—key drivers of disease progression. Current treatments cannot stop Alzheimer's advancement, so we propose CRISPR-Cas9 gene editing of PLD1 as a potential therapy. Using bioinformatics tools (Ensembl, CLUSTAL Omega, BLAST), we designed a guide RNA (gRNA), synthesized it via automated chemistry, and purified it. The gRNA will be tested in β-amyloid-treated rat astrocytes to assess PLD1 mRNA levels (RT-PCR), Cell viability and Inflammatory cytokines. We identified two crRNA sequences (exons 7 and 9) targeting both human and rat PLD1. Preliminary data shows β-amyloid increases inflammation and reduces cell survival, supporting PLD1 editing as a strategy to mitigate neurotoxicity in Alzheimer's models. This study was supported by grants from Secretaria de Investigación y Posgrado del Instituto Politécnico Nacional (Proyectos Insignia IPN-2015 and SIP-IPN: 20250503) and IMR received a master fellowship from CONAHCYT CVU: 1347139.

169-II-PP Evaluación del riesgo sanitario por la contaminación microbiológica en quirófanos diseñados para procesos quirúrgicos sépticos

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The evaluation of health risks in hospitals is essential, as surgical site infections (SSIs) are commonly associated with morbidity and mortality, as well as a significant deterioration in patients', quality of life. The identification of potentially infectious microorganisms and airborne particulate matter in operating rooms has also been recognized as highly important, as it compromises not only patient safety but also the safety of medical staff and the surgical procedures themselves. Therefore, the topic is highly relevant. Therefore, the primary objective of this study is to evaluate the health risks associated with microbiological contamination in operating rooms specifically designed for septic surgical procedures. Sampling was conducted before, during, and after a septic surgical procedure using the passive sedimentation technique on plates, along with the implementation of portable equipment for real-time air quality monitoring. Additionally, surface sampling was carried out using the swabbing method. The results showed a predominance of gram-positive bacteria, followed by fungi and gram-negative bacteria such as Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli. Particulate matter increased during septic surgical procedures; however, recorded values remained within the maximum permissible limits established by ISO 14644 (PM 0.5 µm - 352,000; PM 1.0 µm - 83,200; PM 5.0 µm - 2,930) and NOM-025-SSA1-2021 (PM 10 µm - 75 µg/m^3 and PM 2.5 µm - 45 µg/m^3). On the other hand, surface analysis revealed both fungal and bacterial growth, with the most frequently identified microorganisms being *Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli, Aspergillus fumigatus, Penicillium spp., Aspergillus niger*, and *Fusarium spp.* ANOVA analysis revealed significant differences in the bacterial aerobiome, but not in the fungal component, during septic surgical procedures.

172-II-PP Obtención de extractos con actividad antioxidante de Byrsonima crassifolia con potencial efecto terapéutico frente a adenocarcinoma gástrico

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Gastric adenocarcinoma is one of the most frequent and deadly neoplasms, occupying the fifth place in incidence and third in mortality worldwide. In view of the need to generate new natural and less invasive therapeutic strategies with the organism, this project studied the extract of Byrsonima crassifolia, which has been reported to have an anticancer effect derived from its antioxidant and antiproliferative properties provided by its bioactive compounds. Extracts were obtained from dried, fresh and fresh crushed leaves, using conventional (maceration (AMHS/F/FT) and infusion (AIHS/F/FT) with water) and non-conventional (sonication with 50% and 80% ethanol (E50%HS/F, E80%HS/F) extraction methods. According to the results obtained, pH values ranging from 5.94 to 6.81 were observed, this being the acid pH characteristic of nanche leaves. The total moisture content lost by the fresh leaves after dehydration was between 25% and 32%. After freeze-drying, fresh leaf extracts showed lower yields compared to dried leaves. The determination of total sugars showed the lowest levels in AIHF (1.694 mg/mL), this being an important value, since they act as a nutrient for cancer cells, promoting tumor growth. On the other hand, the extracts obtained from the AMHFT and AIHFT processes showed the highest levels of reducing sugars (0.885 and 0.694 mg/mL), which are associated with antioxidant properties by neutralizing oxidation reactions. As for phenolic compounds, AIHFT (2.00 mg GAE/mL) and AMHFT (1.56 mg GAE/mL) extracts showed higher levels, while E80%HS obtained higher flavonoid content (65.482 µg QE/mL). Analysis of antioxidant activity by DPPH radical revealed that fresh leaf extracts had the highest free radical neutralizing activity. All extracts were characterized by FTIR spectroscopy confirming the presence of functional groups belonging to these bioactive compounds. These results support what is reported in the literature since the selected extracts could have high potential in alternative therapy against gastric adenocarcinoma.

175-II-PP Estudio de la interacción de EPM-06 con el receptor de apelina con modelos in silico y análisis de su efecto en la diferenciación de mioblastos de ratón

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The loss of skeletal muscle mass, strength and functionality in chronic degenerative diseases causes deterioration in patients. Current therapies are limited, so it is necessary to explore new strategies for muscle regeneration. Recently, the apelin receptor (APLNR) has gained relevance as a therapeutic target in the locomotor system, as it increases the number of mitochondria and the formation of new muscle fibers. APLNR belongs to the A family of G-protein-associated receptors (GPCRs), whose endogenous ligand is apelin (APLN) and which is involved in different processes in the body. The APLNR-APLN interaction can activate both the G-protein pathway and the β-arrestin pathway. In this paper we analyze the effects of a molecule called EPM-06, with structural and spatial similarity to flavonoids. The aim of this work was to study the possible interaction of EPM-06 with APLNR with *in silico* methodology and its effect on the differentiation of mouse myoblasts *in vitro*. Docking and molecular dynamics were performed to analyze interactions, affinity and conformational changes of the APLN. Differentiation tests of mouse myoblasts were performed in culture with the C2C12 cell line, quantifying myosin and dystrophin as differentiation markers by qPCR. Results: A □G of -8.3450 +/- 0.0109 was determined, and interaction was found with the amino acids F110, Y35, I109, Y264 and W85 of APLNR, which are related to the power, anchorage, affinity and activation of signaling pathways, the conformational changes suggest a transitional conformation. In the differentiation analysis, it was determined that at a concentration of 0.1 nM the molecule reaches its maximum effect, which was inhibited by ML221, an antagonist of the APLNR.
EPM-06 has a high affinity with APLNR. Interactions with amino acids and conformational changes of APLNR suggest an activation of both G protein and β-arrestin signaling pathways. The differentiation effects shown by EPM-06 are mediated by the APLNR.

181-II-PP Detección de Candidatus Rickettsia colombianensi y Rickettsia amblyommatis en garrapatas duras asociadas al ganado en la Huasteca Potosina

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Ticks are hematophagous ectoparasites widely distributed worldwide that infest a wide variety of vertebrates, including domestic and farm animals. Their impact on public and veterinary health is due to their role as vectors of a wide variety of pathogens, ranging from viruses to certain protozoa, including the bacterial genus Rickettsia. Some of the species in this group are highly pathogenic and associated with severe fever or even more severe diseases, such as spotted fever, so their presence is considered a health and economic risk to the regions where they circulate. Therefore, the detection of these pathogens is very important to prevent transmission, define surveillance programs, and understand control protocols.

In the present study, hard ticks were collected from cattle in the towns of Xilitla and Aquismón, in the Huasteca Potosina region. Using molecular techniques, PCR and sequencing, it was possible to identify the species Rickettsia amblyommatis and Candidatus Rickettsia colombianensi in the analyzed arthropods, which would indicate an active circulation of these pathogens in the livestock region of the state of San Luis Potosí.

182-II-PP Evaluación In-silico, In-vivo y Ex-vivo del extracto hidroetanólico de Zea Mays L. como agente antihipertensivo

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Arterial hypertension (HTA) is a chronic disease characterized by sustained elevation of blood pressure. In Mexico, it affects 30% of the adult population; therefore, it is necessary to evaluate therapeutic alternatives. This study evaluated the potential antihypertensive activity of a Zea mays L. extract using in-silico, in-vivo, and ex-vivo models. The methodology used was extraction through the ultrasound method, using an experimental design considering time, temperature, and solvent concentration. The extract was characterized qualitatively through a phytochemical analysis and quantitatively through HPLC-MS. Subsequently, molecular docking studies explored the interaction of the present molecules with key therapeutic targets in HTA (ACE, AT1, Ca2+L channel). The effect of the extract administration was evaluated in vivo and ex vivo in an L-NAME hypertension model in Wistar rats, recording blood pressure, as well as studying vascular reactivity in aortic rings from animals treated with L-NAME and those administered the Zea mays L. extract. The optimal extraction conditions were establacer, obtaining a maximum concentration of 3.77 □ 0.12 mg/mL of antocininas in the extract. In the in silico study, interactions were found between cianidina-3-glucósido and the ECA and AT1 receptors. Regarding the in vivo study, the comparison of animals treated with L-NAME and Zea Mays L. extract, it was determined that there was a significant reduction in blood pressure in hypertensive rats with respect to the control. Finally, in the evaluation of vascular reactivity, an improvement in acetylcholine-dependent endothelial relaxation and a reduction in the contractility response to angiotensin II were observed. Therefore, this work contributes to the scientific validation that the hydroethanolic extract of Zea mays L. has antihypertensive effects, generating great potential as an alternative in the treatment of the disease.

188-II-PV Evaluation of sHLA-G and KIR2DL4 in women with recurrent pregnancy loss

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Recurrent pregnancy loss (RPL) is defined as the termination of pregnancy before 20 weeks on two or more occasions. This has been associated with HLA-G expression and the role of NK lymphocytes in maternal-fetal immunotolerance. The HLA-G antigen produced by trophoblasts binds to uterine NK cells via the KIR2DL4 receptor, inhibits their cytotoxicity and activates the production of angiogenic cytokines necessary for placentation. In addition to being expressed on the placental membrane, HLA-G is found in soluble form in plasma (sHLA-G). A decrease in these molecules has been detected in patients with implantation failure and RLP, however, further studies are required in Mexican women.

To evaluate sHLA-G concentration and KIR2DL4 receptor expression in patients with RPL. An observational, cross-sectional, and comparative study was conducted in women aged 18 to 35 years treated at the Hospital de la Mujer in Mexico City. Sixty peripheral blood samples (30 cases and 30 controls) were collected to quantify plasma sHLA-G using enzyme-linked immunosorbent assay (ELISA). KIR2DL4 gene expression was evaluated by real-time PCR using ovulo-placental remnants from both groups. Descriptive and inferential statistical analyses were performed using SPSS.

RESULTS: sHLA-G concentrations were significantly higher in the RPL group compared with controls. KIR2DL4 gene expression did not show significant differences between groups.

The increase in plasma sHLA-G levels in women with RPL could be attributed to subclinical infections, possibly to antiphospholipid antibodies, genetic variants that increase its concentration, or other unassessed variables. Regarding KIR2DL4, no changes in its expression were noted, however its function could be affected by genetic variants (polymorphisms).

189-II-PO Caracterización microestructural de la fracción lignocelulósica de Sedum dendroideum L. como material de refuerzo en biopelículas

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Current biodegradable materials have limited mechanical and barrier properties restricting their use indiscriminately. Residual plant fibers, obtained from agricultural by-products, stand out as a sustainable option for reinforcing polymeric matrices due to their mechanical, barrier and ecological qualities. Sedum dendroideum L., colloquially known as everlasting, is a plant belonging to the Crassulaceae family, native to Mexico, which inhabits many climates. It can be reproduced by leaves, stem cuttings or seeds, which makes it an excellent object of study. In addition, it presents antecedents within the medicinal plants. In the case of immortelle, which is used to treat cataracts, fleshiness, redness of the eyes and inflammation, the only part used are the extracts obtained from the leaves. After these extraction processes, a residue is generated which is usually called bagasse, which is no longer taken to another process of importance for research, it is usually discarded or used as a source of nitrogen for compost and crops. In the present work, potato starch biofilms reinforced with residual plant fibers of Sedum dendroideum L. were developed in two variants: whole sample (P-MHE) and post organosolv sample (P-MHO) using the casting method. The plant fibers were characterized by inverse Fourier transform (FTIR) and by microscopic analysis of their morphological characteristics, complemented by Digital Image Analysis (DIA). In addition, the water.vapor permeability (WVP) of the elaborated biofilms was evaluated. The results showed that the conventional organosolv process was the most optimal for the delignification of these fibers, in corroboration with FTIR, in addition, based on the results obtained from the ADI, changes in the surface structure of the biomass were observed microscopically as a result of the Organosolv process, there was a restructuring and, with the support of a texture graph, a greater homogeneity in general. The P-MHE sample stood out for its low water vapor permeability, positioning itself as a sustainable alternative for the formulation of biodegradable materials

195-II-PP Síntesis y actividad antibacterial de nuevos derivados de 1,2,3-triazina 1-óxido (sin sustituyentes en posiciones 5 y 6) contra *Staphylococcus aureus*

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A series of seven 1,2,3-triazine 1-oxide derivatives (1-7) were synthesized as previously reported (De Angelis *et al.*, 2021) and characterized by proton (^{1}H-NMR) and carbon (^{13}C-NMR) nuclear magnetic resonance (NMR) and high-resolution mass spectrometry (HRMS). Subsequently, compounds 1-7 were first screened at a concentration of 100 µg/mL for antibacterial activity against a *Staphylococcus aureus* strain using the microplate Alamar blue assay (MABA). Compound 5 was found to inhibit the growth of S. aureus, so its inhibitory concentration 50 (IC50) was determined using the MABA technique. The IC_{50} of compound 5 was determined to be 138.6 µM. In addition, we performed an exploratory experiment to assess the effect of compound 5 on the staphyloxanthin biosynthesis pathway (specifically on the intermediates: dehydrosqualene, 4,4'diaponeurosporene, 4,4'-diaponeurosporenic acid, Glycosyl-4,4'-diaponeurosporenoate and staphyloxanthin) was analyzed using a methanolic extract of treated and untreated S. aureus cells with compound 5 under different conditions (Xue *et al*., 2019; Askoura et al., 2022). It was observed that compound 5 caused an increase in the production of staphyloxanthin in *S. aureus* as well as its intermediates. Notably, compound 5 causes a threefold increase in dehydrosqualene at 24 h treatment, with respect to untreated cells. It seems to be that compound 5 is inducing oxidative stress in *S. aureus* and in response the bacterium activates staphyloxanthin synthesis to counteract this effect. Further experiments are needed to confirm this, and cytotoxicity studies are needed to determine the selectivity of compound 5 on S. aureus.

196-II-PP Estudio de la participación de las trampas extracelulares en la infección por Nocardia brasiliensis

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Nocardia brasiliensis is an aerobic Gram-positive bacillus with the shape of branched filaments, it is a saprophytic bacterium that lives in soils with putrefactive organic matter, it is usually opportunistic and most frequently affects immunocompromised people through traumatic inoculation, causing actinomycetoma. Actinomycetoma is a chronic granulomatous infectious disease characterized by the presence of fistulas that drain a purulent material corresponding to lesions called "grains", which are bacterial aggregates surrounded by an exopolysaccharide matrix, and by different cell types such as: neutrophils, multinucleated giant cells, epithelioid cells and macrophages. It has been reported that, in the face of certain infections, neutrophils and macrophages can release extracellular traps (ETs). However, it is still unknown whether N. brasiliensis is capable of inducing ET formation and whether these participate in grain development. Understanding this mechanism is essential for designing strategies to prevent their formation and, thus, limit the progression of the infection. The objective of this study was to determine whether N. brasiliensis induces ET formation in neutrophils and macrophages. The murine macrophage cell line J774 A.1 and human neutrophils obtained from peripheral blood were infected with N. brasiliensis CECT3052 using a 1:1 MOI at different incubation times: 30, 60, 90, and 120 minutes. ETs were visualized by safranin staining, and the preparations were observed under a brightfield microscope (Nikon Eclipse E 800). Diffuse red-stained extracellular structures were observed, since safranin is a dye with affinity for acidic structures such as DNA. The aforementioned structures were observed in neutrophils starting 30 minutes post-infection, while in macrophages they were observed starting 90 minutes. The above result allows us to conclude that extracellular traps form in neutrophils and macrophages during N. brasiliensis infection. The ETs will subsequently be characterized by Hoechts staining and immunofluorescence with anti-MPO and anti-Hit3Cit.

202-II-PP Evaluación farmacológica de aductos Diels-Alder con reconocimiento sobre el receptor M1 como potencial neuromodulador

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Alzheimer's disease (AD) is the most common form of senile dementia and presents as the loss of cognitive and memory functions; currently, there is no definitive treatment. Given current demographic trends, this pathology is listed among the ten leading causes of death by the World Health Organization (WHO). The muscarinic M1 receptor is activated by acetylcholine, a neurotransmitter of the nervous system that represents a potential avenue for pharmacological exploration due to its key involvement in learning and memory processes. This study proposes the synthesis of Diels-Alder (DA) adducts with structural analogy to acetylcholine and muscarine, targeting recognition of the M1 receptor. An *in silico* analysis was conducted to explore pharmacodynamics, and docking was used to evaluate the interactions of DA adducts with the M1 receptor. Validation of the PDB: 6OIJ target, retrieved from the Protein Data Bank, was performed, the protein was crystallized with the ligand iperoxo (IXO), and the RMSD value obtained from validation was 1.085. For the exo-DA adduct, the values obtained were ΔG=-9.91 kcal/mol, Kd=54.35 nM, with bond lengths for amino acids showing π-alkyl interactions: tryptophan 378 (4.78 Å), isoleucine 180 (5.08 Å), leucine 183 (4.95 Å); alkyl interactions: valine 113 (5.03 Å), alanine 196 (4.53 Å); and hydrogen bonds: alanine 193 (2.90 Å), alanine 196 (3.14 Å), tryptophan 157 (2.36 Å), and tyrosine 381 (1.68 Å). For the endo-DA adduct, the values were ΔG= –9.89 kcal/mol, Kd = 56.07 nM, with bond lengths for amino acids involved in π -alkyl interactions: valine 113 (5.06 Å), alanine 196 (4.91 Å), tyrosine 404 (4.49 Å), and tyrosine 408 (4.38 Å); an alkyl interaction with cysteine 407 (3.94 Å); and hydrogen bonds with aspartate 105 (3.10 Å) and cysteine 407 (3.69 Å). Control compounds showed the following values: acetylcholine ΔG= –4.27 kcal/mol, Kd= 744.5 µM; donepezil ΔG= –7.48 kcal/mol, Kd= 3.31 µM; and scopolamine ΔG= –9.4 kcal/mol, Kd= 128.01 nM. Scopolamine is a non-selective competitive antagonist of muscarinic receptors and is used to evaluate DA adducts through a cognitive deficit model. A cheminformatic analysis was conducted to predict absorption, distribution, metabolism, excretion, and toxicity (ADME-Tox) properties using the following platforms: Molinspiration cheminformatics, SwissADME, ProTox 3.0 – Prediction of TOXicity of chemicals, ADMETlab 3.0, Molsoft L.L.C., and ADMETSAR. The DA adducts were confirmed to comply with medicinal chemistry rules established by Muegge, Lipinski, GSK, Ghose, Pfizer, Veber, and Egan.

211-II-PO Participación del receptor 5-HT7 sobre las alteraciones en la memoria inducidas por el tratamiento subcrónico de atorvastatina en ratones hembra ovariectomizadas

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During menopause, increased cholesterol levels and decreased estrogen levels generate susceptibility to cognitive decline. Statins, such as atorvastatin, are widely used for the management of dyslipidemia; however, their effects on cognition have been contradictory and poorly studied in female models. The serotonergic system, particularly the 5-HT7 receptor (5-HT7R), has been implicated in processes of synaptic plasticity, learning, and memory, and could represent a relevant mediator of these effects.

The present research evaluated the involvement of 5-HT7R in memory alterations induced by subchronic atorvastatin treatment in ovariectomized (OVX) female CD1 mice. The study was structured in three phases: (1) behavioral assessment of long-term memory (LTM) through the object recognition test; (2) pharmacological treatment with atorvastatin (10 mg/kg) combined with a selective 5-HT7R agonist (LP-12) or antagonist (SB-269970) in OVX animals; and (3) analysis of 5-HT7R gene expression in the prefrontal cortex, hippocampus, and striatum by qPCR in 20 animals (SHAM and OVX).

The results indicated that atorvastatin did not affect memory in SHAM animals but caused significant LTM impairment in OVX animals, which was associated with a reduction in 5-HT7R gene expression, particularly in the striatum. This suggests that hypoestrogenism modulates the serotonergic response induced by the statin. Treatment with serotonergic ligands partially reversed the cognitive impairment induced by atorvastatin.

These findings support the hypothesis that atorvastatin can induce cognitive dysfunction under conditions of estrogen deprivation, partly mediated by a decrease in 5-HT7R signaling. Furthermore, the study proposes that pharmacological modulation, through both agonism and antagonism of this receptor, represents a potential therapeutic strategy to counteract the adverse neurocognitive effects, such as cognitive decline, associated with statins in clinical contexts related to menopause.

220-II-PP Evaluación toxicológica del extracto metanólico de Rhus virens Lindh. ex A. Gray en modelo in vivo

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Rhus virens Lindh. ex A. Gray is a plant native to Mexico, found in 16 states and commonly used by the population to treat conditions such as diabetes and inflammation. Previous studies have confirmed its antinociceptive and anti-inflammatory activity through experimental tests on rodents. The objective of this study is to evaluate the neurotoxicity and possible damage to vital organs from subchronic oral administration (7 weeks) of the methanolic extract of Rhus virens (Rvme) leaves. For this purpose, male mice (CF1) were divided into three groups (n=10): control (5% Tween) and two Rvme treatments (300 and 1000 mg/kg). These animals were kept in animal facility conditions in accordance with NOM-062-Z00-1999. The spontaneous behavioral and physiological status of the rodents was recorded using the Irwin test. At the end of the treatment, the animals were sacrificed, and the liver, spleen, and kidneys were obtained, which were weighed and observed macroscopically. The evaluations did not reveal significant alterations in the behavior or body weight of the mice treated compared to the controls. In the case of the kidney and liver, no significant changes were observed in the parameters evaluated. However, in the spleen, there was a significant decrease in weight ($p<0.05$) in both treatments compared to the vehicle, which could be due to an immune response to the administration of Rvme. In conclusion, Rvme administration does not affect nervous system function in rodents, nor are there any microscopic changes observed in the kidney and liver; however, histological and biochemical studies on spleen function are suggested.

222-II-PO Evaluación del efecto de Aloe vera en el perfil de expresión de receptores huérfanos asociados al proceso de adipogénesis en células 3T3-L1

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Obesity can drives to multiple metabolism defects, among these the principal are low grade inflammation chronic and insulin resistance [1], both are consequence of metabolic dysregulation in energy store. Adipogenesis is the process, which is responsible to differentiate mesenchymal cells into adipocytes, this process can increase when a high energy storage activity is necessary and, at the same time this induces the expression of pro inflammatory cytokines like IL-6, IL-1β and TNF-α which are capable to inhibit adipogenesis [2] in autocrine way [3,4]. On the other hand, the principal factors involved in adipogenesis are the Peroxisome Proliferator-Activated Receptor-gamma (PPAR-γ) which is considered as master regulator, the coactivator CCAAT/Enhancer-binding proteins alpha and beta (C/EBPα y& C/EBPβ) and the Fatty Acid Binding Protein 4 (FABP4) due to the capacity to induces adipocyte differentiation [5]. Adipogenesis is activated at membrane level by extracellular molecules across membrane receptors (ionic channels, transporters and G-Protein Coupled Receptors (GPCR's)). This receptor activation is mediated by endogenous ligands which are able to activate metabolic pathways inside of the cell, however, among this GPCR's exists some receptors who has no endogenous ligand identified and are denominated "orphan receptors", but thanks to the high growth of information due to *in vivo*, *in vitro* and transcriptomics experiments some of this orphan receptors are considered as potential pharmacological target [6,7]. However, there are limited information about the treatments that shows evidence of this regulation and its influence in develop obesity [8]. The aim of this study is to use *Aloe vera*, which has been used in Mexican traditional medicine and has showed anti-inflammatory effect [9] over the expression of inflammatory cytokines associated in adipogenesis, and, at the same time; evaluate the effect over the expression of orphan receptors and transcriptional factors associated to adipogenesis.

Bibliometric assay will be performed using VOSviewer (Universiteit Leiden, Netherlands) software to determinate which are the orphan receptors associated to adipogenesis. From these findings, primer design of every oprhan receptor will be done. Cell culture and *in vitro* differentiation will be performed using the cell line 3T3-L1. Aloe vera (Aloe emodin) stimulation to different concentrations will be determinated by MTT assay for cell viability and according to bibliography. Mature adipocyes will be indentificated by Oil Red staining and RNA extraction will allow to determinate genic expression of genes of interesting by qPCR (two steps method)

From bibliometric assay the findings suggest that the orphan receptors associated with adipogenesis are GPR56, GPR107, NGPR120 y LGR4. In the other hand, cell culture and *in vitro* differentiation were set up at 10 days, with the posibility to expand up 14 days. Aloe vera (Aloe emodin) concentrations were established 10, 20 and 40 μM according to MTT assay cell viability. Preleminar results of qPCR suggest that TNF-α expresión decrease with 20 μM Aloe vera (Aloe emodin) treatment. At the same time PPAR-γ factor transcription and orphan receptor GPR120 were evaluated.

226-II-PP Elaboración y caracterización de liposomas transportando materia insaponificable e hidrolizado de proteínas de amaranto con posible actividad anticancerigena

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Cancer continues to represent a serious public health problem due to its high incidence and mortality rates, as well as the limitations and adverse effects of current treatments. Lunasin, a soy peptide with anticancer properties, has been extensively studied. Similarly, a homologous peptide has been identified in amaranth, called SimLun, with reported anticancer activity. In addition, the unsaponifiable matter (MI) of amaranth, rich in tocopherols and squalene, has biochemical characteristics that make it a useful adjuvant for the transport of bioactive compounds.

This work proposed the formulation of liposomes as a delivery system to combine IS and an amaranth protein hydrolysate containing SimLun, with potential therapeutic application against cancer. IS was obtained by supercritical fluid extraction and the proteins were fractionated by the Osborne solubility method. SimLun was purified by immunoaffinity chromatography. The liposomes were prepared by thin film hydration and characterized by dynamic light scattering and cryogenic transmission electron microscopy.

MI performance was 8.0±0.1%. Albumins showed the highest concentration of SimLun (1.5±0.2 ng/mL), compared to globulins (1.1±0.2 ng/mL), glutelins (0.9±0.1 ng/mL), and total protein extract (0.6±0.1 ng/mL). After purification, 14.9±0.5 ng/mL of SimLun was obtained. Liposomes with MI had a size of 145.43±0.81 nm and a zeta potential of -59.2±1.19 mV. Without MI, they measured 128.43±1.61 nm and -56.7±3.01 mV. With albumin hydrolysate (HA) without MI, they were 138.50±1.20 nm and -73.2±6.56 mV. Finally, liposomes with HA and MI reached 151.73±1.55 nm and -53.2±4.65 mV. Albumins will be used in subsequent formulations to evaluate the cytotoxic effect of the SimLun peptide.

230-II-PO Structural elucidation of novel natural daphnane diterpenoids isolated from Hura polyandra

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Until now, the secondary metabolism of Hura polyandra has remained a mystery. This species has been less studied compared to Hura crepitans, the other species of this genus which possesses compounds with hepatoprotective and anti-HIV properties. These compounds can bind to Protein Kinase C, a widely known protein which plays a crucial role in proliferative, differentiation and apoptotic signaling processes, which makes them strong candidates as chemotherapeutic treatments. The present work describes the isolation and characterization of 4 daphnane diterpenoids obtained from Hura polyandra latex, 3 of them are new compounds, and the remaining corresponds to huratoxin, which has been previously isolated from Hura crepitans. The latex collected from Hura polyandra was extracted with acetone and then purified by combining flash column chromatography and preparative thin layer chromatography, isolating the 4 aforementioned compounds. Their structure was elucidated with 1H, 13C, pure shift and selective TOCSY-1D and NOESY-1D Nuclear Magnetic Resonance (NMR) experiments, as well as two-dimensional experiments such as COSY, HSQC, HMBC and HETCOR. The three new compounds possess the same ring system, and an orthoester group characteristic of daphnane diterpenoids; nonetheless, they possess esters on carbons C12, C20 and C1' with different saturated and unsaturated chains. The 13C spectra, as well as DEPT 90 and DEPT 135 experiments, shows a small group of methyl signals around 14 ppm belonging to chains with lengths of 10, 12 and 14 carbons bonded to the orthoester functionality, quite common in these systems. The presence of esters in positions C12, C20 and C1' makes them unique and novel compounds from the genus Hura. A high-resolution mass spectrometry analysis will provide additional insights into the structure of these compounds.

231-II-PP Diseño, obtención y caracterización de poliésteres dibloque PCL-PDMS y su posible aplicación

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The manufacture and implementation of biopolymers represent one of the most significant advances in material development due to their biodegradability and biocompatibility, enabling their glowing application in the medical field. Among recent advances, biopolymers used in biosensors and tissue engineering particularly polycaprolactone (PCL) stand out. However, certain disadvantages have been reported for this biopolymer, such as rapid hydrolysis. Therefore, incorporating polydimethylsiloxane (PDMS) into the biopolymer could enhance its durability.

The aim of this work was to synthesize polyesters with theoretical molecular weights of 1000, 3000 and 5000 g/mol via ring-opening polymerization (ROP) using 25cSt PDMS and ε-caprolactone as monomers. To study the morphology, microscopy images at different magnifications were obtained, revealing crystalline polymer structures. Similarly, to determine the chemical composition and degree of crystallinity, Fourier transform infrared spectroscopy (FTIR) was performed, showing characteristic absorption bans corresponding to a polyester, namely: 1240cm -1 (C-O ester bond), 1721cm -1 (C=O Carbonyl group), and 3670-3200cm -1 (O-H Hydroxyl group). Finally, X-Ry diffraction (XRD) and differential scanning calorimetry (DSC) were performed, and their results indicate a material with a certain degree of crystallinity and a defined melting temperature, confirming the formation of thermoplastic polyesters.

This result also confirmed the synthesis of deblock polyesters and the influence of molecular weight on the crystallinity percentage for each polyester. Based on these favorable results, it is proposed to continue this line of research, further advancing these materials toward potential applications in biosensors or tissue engineering.

238-II-PP Identification of indoleacetic acid conjugates in dormant seeds of *Pouteria campechiana* using mass spectrometry

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Phytohormones are crucial signaling molecules for plants, as they regulate various metabolic processes, including growth, development, and physiological responses. Indoleacetic acid (IAA) is the main phytohormone in the auxin group of plants. Its primary function is cell elongation, and it regulates tissue growth and differentiation. Indoleacetic acid is the most common auxin in plants. *Pouteria campechiana* is a fruit tree native to southeastern Mexico, a species that has been Little studied and is currently considered underutilized. In the state of Morelos, particularly in the municipalities of Jiutepec and Yautepec, specimens have been observed in backyard crops that exhibit morphophysiological variability, including differences in fruit shape, seed number, leaf size, and the occurrence of early germination. The objective of this research was to identify the presence of indoleacetic acid and its conjugates in dormant seeds of *P. campechiana* collected in two regions of the state of Morelos to relate the content of this auxin to morpho-physiology, using high-resolution thin-layer chromatography (HPTLC) and mass spectrometry techniques. The fruits were collected randomly in a semi-ripe state and then processed to extract the seeds, with the pulp removed manually. The seeds were scarified, frozen, and then freeze-dried. Once dry, they were finely ground using a 500 µm mesh. Methanolic extracts were prepared from the powder obtained for each collection area. The extracts were applied to silica plates for analysis by HPTLC, using an IAA standard as a reference. For the identification of the conjugates, the bands were scraped, dissolved in methanol, and concentrated before analysis by mass spectrometry. IAA was detected in both regions, with Rf values of 0.69 for Jiutepec and 0.64 for Yautepec, matching the standard. In addition, mass spectra revealed the presence of conjugated auxins such as free indoleacetic acid, indole-3-acetyl-valine, and indole-3-acetyl-glutamine. In seeds, IAA conjugates with amino acids are abundant and allow precise control of active auxin levels in plants, influencing processes such as germination and early seedling development.

242-II-PP Micropropagación de fresa a partir de plántulas germinadas in vitro

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As one of the world's largest strawberry producers, Mexico faces challenges, one of which is the production of disease-free plant material, which represents a challenge for innovation and sustainability in the industry. Micropropagation is a tissue culture technique that produces healthy seedlings in controlled environments through shoot regeneration and rooting. The objective of this research was to develop an efficient micropropagation protocol for Fragaria x ananassa using sprouts from in vitro germinated seedlings in a medium with the appropriate concentration of auxin (IBA), cytokinin (BAP), and an antioxidant. For this, strawberry seeds were used, previously disinfested and sown in magenta boxes with Murashige and Skoog (MS) medium, 30g/L sucrose, 2.2g/L phytagel until the formation of shoots, subsequently organogenesis was induced by subculturing young shoots in two formulations with 6 repetitions each, the M1 medium which consisted of the same medium added with Indole-3-butyric acid (IBA) 5µM, 6-Benzylaminopurine (BAP) 10µM and activated carbon (2g/L) and another called M2 added with IBA at 5µM, BAP at 5µM and citric acid (1mg/L). After 20 days of subculture, the M1 growth medium had the highest shoot regeneration rate, 300%, and root regeneration, 22%, while the M2 growth medium had a shoot regeneration rate of 191% and root regeneration, 0%. It was determined that using the M1 medium to subculture strawberry plant shoots produces complete, disease-free seedlings with desirable physiological characteristics. However, further studies are needed to evaluate the seedlings' ability to acclimatize to nursery conditions. This strategy reduces dependence on chemicals for disease treatment and decreases losses caused by diseases in a preventative and sustainable manner.

243-II-PP Disminución de GSK3β-pS9 en hipocampo en un modelo murino de diabetes tipo 3

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An altered state in glucose and lipid metabolism, along with insulin resistance can lead to progressive memory impairment, all of which are related to type 3 diabetes mellitus (DM3), which refers to the connection between diabetes mellitus (DM) and Alzheimer's disease (AD). A 60% increased risk of AD has been reported for a state of DM. In the last decade both diseases have increased worldwide, and recent research highlights the involvement of GSK3β activity and various molecules of the chronic inflammatory process. The aim of this work is to determine the metabolic and GSK3β alteration in a murine model of DM3 using a control group (CG) fed with a standard diet and a DM3 group with a high fat diet (494.9 kcal) and administration of a single dose of streptozotocin (35 mg/kg) for 13 weeks. After this time, glucose level, lipid and liver profile by 24-element blood chemistry analysis, insulin resistance with HOMA-IR index and biomarkers of AD through β-amyloid, Tau-pS396, GSK3β and GSK3β-pS9, BACE1 and proinflammatory cytokines: TNF-α and IL-6 determined by ELISA.

The results obtained show that in the DM3 group there is hyperglycemia (DM3: 514 mg/dL vs GC: 150 mg/dL; $p<0.0001$), hyperlipidemia (DM3: 653 mg/dL vs GC: 133 mg/dL of triglycerides; $p<0.0001$ and DM3: 107 mg/dL vs GC: 82 mg/dL of cholesterol; $p<0.05$), as well as increased levels of TNFα (DM3: 1960 pg/mL vs GC: 915 pg/mL; $p<0.05$) and IL6 (DM3: 212 pg/mL vs GC: 79 pg/mL; $p<0.01$). In addition, a HOMA-IR index greater than 2.9 at the peripheral level and a decreased GSK3β-pS9 in hippocampus and prefrontal cortex (Hippocampus: DM3: 0.036 AU vs GC: 0.055 AU; $p<0.001$ and in cortex: DM3: 0.045 AU vs GC: 0.065 AU;$p<0.01$). Therefore, the metabolic alterations present in the DM3 group suggest the onset of an alteration in the insulin signaling pathways by a lower amount of GSK3β-pS9 and of a chronic inflammatory process.

244-II-PP Identificación, producción de ácido indolacético y actividad antagónica de *Trichoderma spp*. aislada de plantas de caña de azúcar

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Sugarcane plants can be affected by diseases caused by *Fusarium* fungi. *Trichoderma* fungi can serve as a biological alternative for controlling these diseases due to their different mechanisms of antagonistic activity. However, this is not the only benefit that plants derive from *Trichoderma*, as it can also enhance vegetative growth through the production of phytohormones, such as indoleacetic acid (IAA), which is synthesized from the amino acid L-tryptophan (Trp). The objective of this work was to identify and evaluate the production of indoleacetic acid and the antagonistic activity of isolates of *Trichoderma* spp. obtained from plants of sugarcane, finding that, from the *Trichoderma* isolates obtained from sugarcane, isolate R1 of *T. asperellum* demonstrated the best performance in IAA production, and isolate R5 of *T. harzianum* showed the best inhibition activity against *Fusarium* isolates. Plant material was collected in the state of Morelos, from which ten fungal isolates with characteristics similar to those of the *Trichoderma* genus were retrieved. The distribution frequency of the fungal isolates was 50% from roots (R), 40% from stems (T), and 10% from leaves (H). The species of eight of the fungal isolates were determined through phylogenetic analysis, from which six belong to the *Trichoderma* genus and two to the *Aspergillus* genus. The production of IAA from the eight fungal isolates was assessed on a liquid culture medium containing potato and dextrose, with and without tryptophan. For all *Trichoderma* and *Aspergillus* isolates, the production of IAA increased in the presence of tryptophan (Trp). However, the isolates R1 and R2 of *T. asperellum* showed the highest concentration of IAA (2.63 to 2.82 µg/mL of IAA). The antagonistic activity of the six *Trichoderma* isolates and the two *Aspergillus* isolates against three previously recovered *Fusarium* isolates from sugarcane was assessed in dual culture. R5 of *T. harzianum* isolate showed the highest percentage of inhibition of the mycelial growth against the three *Fusarium* isolates (between 24.45 to 49.64%).

246-II-PP Wound-healing and anti-inflammatory effects of an organic fraction from “Hierba del golpe” (Oenothera rosea)

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Damage to skin and tissues triggers natural healing and inflammatory responses, which various factors can cause. Medicinal plants represent an effective alternative for the treatment of such injuries. Oenothera rosea (Onagraceae), “hierba del golpe”, is used in infusions and poultices to treat wounds and relieve pain. Its phytochemical profile includes alkaloids, saponins, and phenolic compounds. In a murine arthritis model, O. rosea was shown to reduce inflammation, which was associated with a decrease in the production of proinflammatory cytokines. This study evaluated the in vitro wound-healing activity and in vivo anti-inflammatory effect of an ethyl acetate fraction from O. rosea (FAcoEt). The fraction was obtained by bipartition (ethyl acetate:water) from the hydroalcoholic extract of the aerial parts. Its chemical composition was analyzed using thin-layer and high-performance liquid chromatography (HPLC). Healing activity was assessed at various concentrations (1.25 a 20 µg/mL) using a scratch wound assay in 3T3-L1 mouse fibroblasts, while the anti-inflammatory effect was evaluated using a plantar incision model. Phytochemical profiling revealed that the main constituents of FAcoEt are phenolic acids and flavonoids, including gallic acid, caffeic acid, quercetin glucoside, and quercetin rhamnoside. This fraction exhibited significant activity in the wound assay. At 8 h, concentrations of 1.25, 2.5, and 5 µg/mL of FAcoEt achieved over 40% wound closure, surpassing the negative control (DMSO) in cell migration. In the in vivo model, FAcoEt (50 and 100 mg/kg) significantly ($p \leq 0.05$) decreased plantar edema starting from day 1, with the effect maintained until the end of the experiment (day 9), compared to vehicle (Tween 3%) and with similar values to the reference drug (diclofenac). The observed pharmacological activities may be attributed to the phenolic acids and flavonoids present in FAcoEt. In conclusion, the organic fraction of O. rosea possesses wound-healing and anti-inflammatory properties. These findings suggest that this fraction could have therapeutic value for treating inflammatory diseases or skin injuries.

247-II-PP Mutantes puntuales en la proteína SicA DE *Salmonella* Typhimurium

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Salmonella enterica serovar Typhimurium is the causative agent of salmonelosis, a global health problem that has been aggravated by the development of multidrug resistance. *Salmonella* Typhimurium has several virulence factors that allow it to colonize, invade and establish itself in the intestinal epithelium. One of these virulence factors is the type III secretion system (T3SS), through which it secretes effector proteins that facilitate the internalization of the bacterium in enterocytes. Components of T3SS as well as the effector proteins are encoded in *Salmonella* Pathogenicity Island 1 (SPI-1), and they are strongly regulated by a complex regulatory cascade involving several transcriptional regulators. The last of these is InvF, which together with the chaperone SicA activate the transcription of genes related to the invasion. In addition to its participation in gene expression, SicA binds to the other proteins involved in virulence, such as SipB and SipC, preventing their degradation before being secreted through T3SS. The dual function of this chaperone plays an important role in the virulence of *Salmonella*, so in this work mutants were generated in the K27A, N70 and D72 residues of SicA by site-directed mutagenesis, with the aim of determining the role of these amino acids by protein secretion assays, observing the change in the secretion of effectors that participate in the invasive process. This will allow us to understand a novel regulatory mechanism and propose possible propaedeutic uses.

248-II-PP Evaluación del efecto preventivo de los frutos de *Opuntia matudae* en un modelo de neuropatía diabética periférica inducida en ratón

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The diabetes mellitus (DM) is a disease characterized by chronic hyperglycemia. In Mexico, 18.3% of adults have been diagnosed with diabetes. DM can lead to macrovascular and microvascular complications, one of the most common of which is diabetic peripheral neuropathy (DPN). The DPN involves progressive damage to the peripheral nerves, primarily due to glucotoxicity, which triggers neuropathic pain and functional impairment. Currently, the pharmacological treatments for DPN are pregabalin and duloxetine. However, these drugs can cause side effects and are not very effective, prompting interest in new therapeutic alternatives. In this context, the fruits of the *Opuntia matudae* Sheinvar have been used in traditional medicine to treat diabetes, a practice supported by scientific studies. However, little is known about their impact on DPN. Therefore, the present study aimed to evaluate the preventive efficacy of *O. matudae* extracts in a murine model of streptozotocin-induced DPN (150 mg/kg). To this end, the methanolic and aqueous extracts of the fruit were administered at doses of 30 and 100 mg/kg for 28 days under a pretreatment regimen. The 50% withdrawal threshold was evaluated weekly using von Frey filaments to assess the development of mechanical allodynia. The results showed that animals treated with the extracts had thresholds between 0.5 and 0.6 g compared to 0.4 g in the untreated group. Both extracts produced similar results, suggesting a potential protective effect against DPN development. A phytochemical analysis of the methanolic extract yielded 62 fractions. The fraction 28 was selected for characterization by nuclear magnetic resonance (NMR) due to its distinctive chemical profile. The analysis revealed the presence of 3-hydroxy-3-(methoxycarbonyl) pentanedioic acid. These results suggest that *O. matudae* extracts could protect against DPN development in a murine model, creating new opportunities to study the mechanism of action and therapeutic potential further.

255-II-PO Desarrollo de una plataforma vacunal basada en nanopartículas de ferritina contra la infección por *Klebsiella pneumoniae*

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K. pneumoniae (*Kp*) is a Gram-negative pathogenic bacterium responsible for various diseases such as pneumonia, sepsis, and urinary tract infections. Due to the emergence and spread of hypervirulent (hv) and hypervirulent multidrug-resistant strains, it has become a significant public health threat. The World Health Organization has designated this pathogen as a critical priority for research and the development of new control strategies (WHO, 2024) It is worth mentioning that in recent years, the use of ferritin nanoparticles (F-NP) as vaccine platforms for antigen presentation has gained relevance (Tapia et al., 2023). Therefore, in this project we propose the rational development of a glycoconjugate-based nanovaccine specific for *Kp* hv and using F-NP as a delivery platform. To predict and identify potential *Kp* vaccine candidates, we developed a reverse vaccinology methodology, which allowed the *in-silico* identification of six vaccine candidates.

Specific oligonucleotides were designed from the selected candidates. The vaccine candidates were cloned into the pJET 1.2/blunt vector and, using the *NdeI* and *HindIII* restriction sites, they were subcloned into the pET28a(+) expression vector. The expression and purification conditions of the OmpK36 porin have been standardized so far. On the other hand, the SpyTag/SpyCatcher system was used to design fusion proteins for the F-NP platform. Through protein engineering, three chimeric sequences were designed and optimized, these nanoparticles are composed as follows: signal peptide–SpyCatcher–linker–ferritin from *H. pylori* and *Aquarana catesbeiana*. These constructs were sent for synthesis to the company GenScript. Additionally, oligonucleotides with recognition sites for the *EcoRI* and *HindIII* enzymes were designed, enabling the subcloning of F-NP into the pET28a(+) expression vector. Currently, the expression conditions for a chimeric nanoparticle in *E. coli* BL21 have been standardized. The F-NP are expected to be expressed in Expi293F cells, followed by functionalization with the candidates. Additionally, a strategy will be implemented to obtain K1 and K2 polysaccharides, which will be conjugated to the nanoparticles. This research project has established a methodology for predicting vaccine candidates, standardized the expression and purification conditions for vaccine candidates, and proposes an optimized, effective, and safe platform against *Kp* infection.

257-II-PP Análisis metabolómico de la espinaca (*Spinacia oleracea* L.) cultivada bajo estrés de hierroen sistemas hidropónicos

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Plant Nutritional stress is a limiting factor that negatively affects metabolic pathways, crop growth, and quality, which can be demostrated using hydroponic technique. Iron is the most important micronutrient for plants, and mainly affects photosynthesis, generating important changes in the composition of primary metabolites like sugars, amino acids, and short-chain amino acids. ^{1}H NMR-based metabolomics is a potential tool for characterizing metabolic changes in response to nutritional stress in plants, because it can allow us to understand stress response processes to development of new crops resistant to abiotic stress. Spinach (*Spinacia oleracea* L.) is one of the most important crops in the world; its leaves are rich in vitamins, minerals, and antioxidants that are produced in response to abiotic stress factors. For this reason, the objective of this study was to determine, using ^{1}H NMR spectroscopy, the key metabolites involved in the tolerance to iron nutritional stress of mature spinach leaves grown in vertical hydroponic systems. Iron deficiency and excess stress treatments were 0.001 and 0.006 gL^{-1}, respectively. These concentrations were based on the control treatment concentration criterion, which used Hoagland's modified standard nutrient solution as a reference. The composition of the solution is: 0.606 gL -1 KNO_3 , 0.945 gL^{-1} $Ca(NO_3)_2$ *$4H_2O$, 0.230 gL^{-1} $NH_2H_2PO_4$, 0.246 gL^{-1} $MgSO_2$*H_2O, 0.003 gL^{-1} $FeSO_4$*$7H_2O$, 0.004 gL^{-1} Na_2EDTA, 3.728 mgL^{-1} KCl, 1.546 mgL^{-1} H_3BO_3, 0.338 mgL^{-1} $MnSO_4$*H_2O, 0.576 mgL-^{1} $ZnSO_4$*$7H_2O$, 0.124 mgL^{-1} $CuSO_4$*$5H_2O$ and 0.120 mgL^{-1} Na_2MoO_4*$2H_2O$. Stress treatments were also evaluated qualitatively using characteristic symptoms of iron deficiency stress conditions like interveinal chlorosis and irregular leaf growth due to excess iron. A multivariate analysis of the 20 metabolites concentrations in each spectrum was performed, and it was concluded that there is a relationship between the iron concentration in the nutrient solution and the previously identified primary metabolites. The multivariate analysis revealed a proportional relationship between the amount of iron and an increase in the concentration of the amino acids aspartate, glutamate, betaine, GABA and alanine, ascorbate, glucose, as well as the nucleosides adenosine, guanosine, and uridine. An inverse relationship will also be observed between the amount of iron and the increase in the concentration of the short-chain organic acids malate, citrate, formate, and succinate, sucrose, as well as the aromatic amino acids phenylalanine and tyrosine. These results may provide sufficient information to determine the iron status of future samples of this spinach cultivar.

261-II-PP Primer registro de los géneros *Simrothula* y *Diplosolenodes* (Gastropoda: Systellommatophora) en Chiapas, México

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The family *Veronicellidae* (Gray, 1840) comprises 24 genera of terrestrial slugs with pantropical distribution, commonly known as “siete cueros” or “cow tongues.” Their species inhabit environments ranging from tropical forests to urban areas and are notable both for their impact as agricultural pests (Rueda et al., 2002; Velázquez-Montes de Oca et al., 2014) and for their role as intermediate hosts of nematodes of the genus *Angiostrongylus*, agents of potentially fatal diseases in humans (Morera, 1987; Caballero et al., 1991). In Mexico, species from three genera have been documented; therefore, the aim of this study is to report, for the first time, *Simrothula prismatica* (Simroth, 1914)—originally described as *Vaginula* and reassigned to the genus *Simrothula* in 1975—whose distribution is primarily concentrated in Colombia, Paraguay, and Brazil, as well as *Diplosolenodes occidentalis* (Guilding, 1824), initially assigned to the genus *Onchidium* and characteristic of the Caribbean. These species were recorded in Tapachula and Huehuetán, localities in southern Chiapas. Identification was based on external morphological characters—such as noto and hyponotum coloration, body size, and sole width—and anatomical traits, complemented by molecular characterization using the mitochondrial markers COI and 16S rRNA. The obtained sequences were compared with GenBank data and analyzed phylogenetically using Bayesian inference with the 16S rRNA marker, confirming the identity of *D. occidentalis* and supporting the morphological assignment of S. *prismatica*. These findings increase the number of *Veronicellidae* species recorded in Mexico and highlight the importance of expanding molecular databases and strengthening the monitoring of this group due to its potential ecological and agricultural impacts.

263-II-PP Diseño racional de nuevos inhibidores anti-HER2 mediante enfoques computacionales

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Breast cancer is one of the most common physiological causes of cancer death in Mexican women. [i] It has been reported that 15-20% of ductal carcinomas overexpress HER2, [ii] in addition to persistent resistance to therapies due, among other oncogenic causes, to T798M mutations in the protein, [iii] causing failure in the treatment of HER2-positive breast cancer. [iv]

A previous structural analysis conducted by our research group allowed us to characterize the orthosteric site of HER2, as well as additional cavities capable of accommodating ligands with competitive inhibitory activity against ATP. [v] The present work aims to describe the rational design of new molecules as potential therapeutic antagonists targeting HER2-positive breast cancer.

Based on the identification of quinazoline and indole scaffolds as pharmacophores in three structural models with known anti-HER2 activity, five new molecular derivatives were designed and constructed *in silico*. These were evaluated using a coordinated set of bioinformatic tools, including ADMET property prediction, molecular docking (both blind and targeted), and molecular dynamics simulations, employing both native and T798M-mutated forms of the HER2 receptor as molecular targets.

Theoretical results founded at current development of the project suggest that compounds and exhibit favorable thermodynamic profiles as potential antagonists of both native and T798M-mutant HER2. However, further steps are needed, including the chemical synthesis of these derivatives and their subsequent in vitro evaluation on a panel of HER2-positive breast cancer cell lines to determine their inhibitory potential.

This work represents the continuation of the master's research project in Health Sciences (A250789), carried out at the Escuela Superior de Medicina, Instituto Politécnico Nacional (National Polytechnic Institute).

264-II-PO Biogenic silicon effect on maize leaves as direct defense against Spodoptera frugiperda Smith larvae

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To increase the agricultural productivity of primary crops like maize, it is necessary to reduce losses caused by insect pests. There are two broad approaches to addressing this control issue: the first, which is the most common worldwide, focuses on using highly polluting synthetic pesticides, while the second is based on agroecological concepts. One agroecological principle involves utilizing local resources to substitute external inputs in order to achieve a balance among populations that coexist in a particular agroecosystem, thereby enhancing crop productivity. This research is focused on supplementing maize plants at their early phenological stages with Biogenic Silicon (BSi) derived from Cyperus rotundus L. (CR) and rice husk (RH; Oryza sativa L.) to induce a direct defense in maize plants. This defense is characterized by a thickened cuticle and increased leaf trichomes due to BSi deposition. Both biological materials (CR and RH) were collected, prepared, standardized, and characterized. The silicon content in these materials was quantified using a colorimetric method following acid digestion. The translocated silicon rate in younger maize leaves was determined, along with its effect on phytolith formation at 10 and 20 days after emergence (DAE), which is a critical period when maize plants are most vulnerable to herbivory by S. frugiperda larvae. Also, it is shown BSi impact on the S. frugiperda biological cycle. The main effects of 1g BSi L-1 on the morphophysiology of maize plants 10 DAE included their height, diameter(cm), and biomass, with the highest Si levels detected in maize plants treated with diatomite. Over 20 DAE, all maize plants treated with BSi exhibited similar effects on their height, diameter, and trichomes per leaf, leading to increases of 20. 2%, 22. 3%, and 69.4% in height, diameter, and trichomes per leaf, respectively, compared to control maize plants. Finally, the S. frugiperda larvae that fed on BSi-supplemented maize plants (CR) gained 42.57. 57% less weight until their last instar (L6) compared to control larvae that were fed maize without Si supplementation.

268-II-PO Grupo sanguíneo e infección por virus de papiloma humano en el cáncer de próstata en población mexicana

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Prostate cancer (PCa) is one of the most common malignancies among men worldwide, with more than one million new cases and more than 300,000 deaths attributable to this disease each year (WHO, 2020). Although the most recognized factors associated with prostate cancer risk and prognosis include age, prostate-specific antigen (PSA) levels, Gleason score, and tumor stage, other additional determinants that could complement clinical evaluation, or potential factors such as ABO blood type, are still being explored.

It has been suggested that ABO antigens could influence processes such as cell adhesion, angiogenesis, or the immune response, which would make them possible biological markers with oncological relevance (Markt, 2015). ABO blood groups other than type O are also at greater risk of developing more aggressive PCa variants (Wang, 2017). or a lower risk of biochemical recurrence after radical prostatectomy, compared to those with type A or AB.

The human papillomavirus (HPV) is an infectious agent implicated in various types of cancer, among which its role in the development of PCa has been studied. Although the biological mechanisms proposed for HPV and ABO blood type in prostate cancer are distinct in origin, they converge in cellular processes that are common to many neoplasias.

No additional publications have been identified in the last five years that update or deepen this relationship, and the influence of human papillomavirus infection and blood type on the development of PCa has not been studied in Mexico. Obtaining information on this subject could highlight the importance of focusing priority care on patients with HPV infection and blood type to provide timely treatment to the at-risk population.

To evaluate the effect of HPV and blood type on the degree of PCa.

Quantitative, cross-sectional, correlational study conducted in a tertiary care hospital in Mexico City.

PCa staging with the Gleason score

Viral DNA analysis for HPV using polymerase chain reaction (PCR) for 23 genotypes in biopsy samples from patients with PCa and benign prostatic hyperplasia (BPH).

ABO and Rh blood typing was performed using the Grifols Wadiana system.

One hundred samples from patients with PCa and 60 samples from patients with BPH.

HPV was present in 93% of samples from patients with PCa and 67% of samples from patients with BPH; most were multiple infections with more than one HPV genotype. Seventy-eight percent of PCa samples showed a Gleason score of 6–7, corresponding to grade 2 PCa.

The most common blood type was O positive; However, 30% had blood type other than O, with Gleason scores of 9 and 10, i.e., PCa with greater aggressiveness, as well as multiple infections with two or more HPV variants.

At the time of the study, two patients had died due to PCa with blood type other than O.

The presence of HPV infection and blood type other than O in the ABO system are risk factors for the development of PCa; however, further research is needed to elucidate the role of HPV and blood type in the development and aggressiveness of PCa.

270-II-PV WNT9B a possible target of miR-3613-3p is silenced in retinoblastoma

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Retinoblastoma accounts for 4.3% of childhood cancers. It is a tumor that develops in the retina and affects 1 in every 16,000 children, making it the most common intraocular tumor in infants. It has two forms, hereditary and non-hereditary, and is clinically important because its timely diagnosis and treatment can not only save a child's vision but also their life.
Through transcriptomic and mirnomics analyses with previous microarrays of tumors and plasma in cases and controls, a differential signature of 19 miRNAs expressed in all cases of retinoblastoma was found, including miR-3613-3p, which is relevant in this and other types of cancer because it is a miRNA with a high number of tumor suppressor target genes.
The objective of this study was to identify miR-3613-3p target genes related to cancer using bioinformatic tools, validate their genes with RT PCR, and validate a protein of interest by western blot. MicroT-CDS v.5.0 and TargetScan v7.0 identified 8,609 target genes of miR-3613-3p, which were then paired with the transcripts obtained from the previous transcriptomic analysis using a Venn diagram, yielding 52 genes in common. KEEG enrichment analysis identified four genes expressed in different types of cancer: WNT3, WNT9B, SHH, and LATS2. For the validation of the genes by RT-PCR, RNA and proteins from the Y79 retinoblastoma and HeLa cell lines were used. The WNT9B and SHH genes are not amplified in electrophoresis with cDNA from the Y79 cell line, and with western blot there not observe the band of interest for the Wnt9b protein with Y79 proteins. These results lead us to hypothesize that WNT9B is a target gene of miR-3613-3p and that in retinoblastoma this protein is being silenced by this or another miRNA. The Wnt-9b protein is one of the least explored members of the WNT pathway responsible for cell signaling in embryonic development and adult tissue homeostasis. Other proteins in the canonical and non-canonical WNT pathway have been found to be deregulated in gastrointestinal cancers, leukemia, melanoma, and breast cancer. In retinoblastoma, the WNT pathway is known to play a role in tumor development and progression, but the role of WNT9B is unknown.

271-II-PP Phycocyanobilin purified from Arthrospira maxima – cisplatin synergism shows cytotoxic effect in a murine glioma C6 cell line

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Gliomas are the most common type of brain cancer showing a prevalence of 7 per 100,000 population, this cancer is typically treated with a combination of chemotherapy, radiotherapy, and surgery, which improves survival but often causes severe side effects such as kidney damage and systemic toxicity. In this context, exploring new therapeutic strategies, such as using phycocyanobilin (PCB) from Arthrospira maxima and its potential to induce cell death in combination with cisplatin (CP) represents a promising approach to reduce drug doses, minimize adverse effects, and improve patients' quality of life. In the murine glioma C6 cell line, we performed the effective concentrations at 50% (EC50) assay for PCB and CP by the 3-[4, 5-dimethyl-2-thiazolyl]-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay. After this, using the isobolographic analysis, mixes of concentrations were established to evaluate the interaction using the same MTT method. To compare the concentrations, dose-response curves were constructed using the theoretical concentrations calculated in the isobolographic analysis and compared with the experimental ones to obtain nested by the mathematical model. The optimal concentrations determine the cell death markers as LDH supernatant activity and the possible cell death mechanisms using annexin V and propidium iodide immunofluorescence by confocal microscopy.

The result of this study demonstrates that CP is 1000 times more effective that PCB based on their EC50 values. PCB has an EC50 = 4.732 ± 0.0474 mM and CP has an EC50 = 13.56 ± 0.9167**µ**M. On the basis of this fact, we demonstrate that the ratios 1:1 CP-PCB, 1:4 CP-PCB and 4:1 CP:PCB has the same cytotoxicity performance and respect to their theorical calculations it demonstrates has an additive effect. Respect to cell death markers, all ratios show a similar LDH activity respect to EC50 values to CP and PCB suggesting a similar effect. Finally, respect to annexin V (AV) and propidium iodine (Pi) immunofluorescence, all ratios and EC50 concentrations suggest that CP and ratio 4:1 CP-PCB induces cell necrosis, in contrast, PCB and ratio 1:4 CP-PCB modulates cell death by apoptosis pathway.

273-II-PP Evaluación de la actividad antinociceptiva de extractos de *Salvia rosmarinus* en un modelo murino de fibromialgia

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Fibromyalgia is a chronic widespread musculoskeletal pain syndrome that affects between 2–8% of the population. It is currently the third most common musculoskeletal condition, and available treatments only help control symptoms.
However, at least 60% of patients report limited efficacy and various adverse effects from these treatments. Meanwhile, the use of complementary therapies such as herbal medicine has increased, although there is a lack of scientific evidence supporting their safety and effectiveness. *Salvia rosmarinus* (rosemary) has shown a broad spectrum of antinociceptive activity in preclinical and/or clinical studies for nociceptive, inflammatory, arthritic, and neuropathic pain, but there is a lack of research evaluating its potential for fibromyalgia-related pain relief.
Organic and aqueous extracts of rosemary were obtained through maceration or decoction of the dried and/or fresh aerial parts of the plant, followed by rotary evaporation or lyophilization, respectively. The essential oil was extracted by steam distillation.
Wistar rats (200–220 g) were divided into groups of six and treated with reserpine (1 mg/kg, subcutaneously for 3 days).
On the fifth day, they were evaluated for mechanical and thermal allodynia and hyperalgesia, which are behavioral indicators of fibromyalgia-type nociception. Extracts of varying polarity (hexane, ethanol, and aqueous) were administered at different doses (10–300 mg/kg, intraperitoneally [i.p.]), and the essential oil was administered at 10 mg/kg (i.p.) 30 minutes before behavioral testing. The results were compared with those from naïve and vehicle-treated control rats.
All extracts, regardless of polarity, significantly reduced both mechanical and thermal allodynia, as well as hyperalgesia.
The essential oil was also effective at a low dose. Among the extracts, the ethanolic extract at 30 mg/kg demonstrated the greatest efficacy across all tests, with no apparent adverse effects observed in the treated animals.
Discussion
S. rosmarinus contains several secondary metabolites that may contribute to its antinociceptive effects. Ursolic and oleanolic acids have demonstrated antinociceptive activity through interactions with opioid and 5-HT1A receptors.
Hesperidin inhibits pain via actions on TRPV1 and 5-HT1A receptors. Additionally, some metabolites may reduce the formation of reactive oxygen species (ROS) and block calcium (Ca^{2+}) influx.
The results suggest that rosemary contains bioactive compounds of various polarities with potential anti-allodynic and anti-hyperalgesic activity, making it a promising candidate for fibromyalgia pain therapy.

283-II-PO Modelado farmacofórico enfocado al reposicionamiento de fármacos, con actividad inhibitoria dual sobre PI3K/mTOR, para el tratamiento del cáncer de mama

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In recent years, breast cancer therapy design has focused on overexpressed therapeutic targets, seeking to generate more selective therapies and reduce adverse effects. One of these targets is the PI3K-AKT-mTOR pathway, which is closely associated with cell proliferation, survival, cell invasion, migration, angiogenesis, and chemoresistance. The design and development of inhibitors of this pathway has yielded promising results, particularly dual inhibitors, which reduce the development of chemoresistance; however, the development of adverse effects has limited their clinical use. The use of bioinformatic techniques and drug repurposing have been proposed as alternative approaches for the search and identification of these dual inhibitors. In this work, a pharmacophore modeling approach based on tertiary structures of the therapeutic targets and co-crystallized dual inhibitory ligands was used. Pharmacophore maps targeting PI3K/mTOR were developed, validated, and refined. Using these models, a virtual screening was performed using FDA-approved drug databases, allowing the identification of drugs with the chemical-structural characteristics necessary for PI3K/mTOR inhibition. Subsequently, molecular docking studies were performed to identify the main binding sites and the binding modes between the targets and the promisin ligands. These studies allowed the identification of drugs that interacted with the catalytic site of PI3K and mTOR, of which, bictegravir was selected for in vitro evaluation. Cell proliferation assays were performed in breast cancer cell lines MDA-MB-231 (triple negative) and MCF-7 (luminal), and in the immortalized cell line MCF-10A, with bictegravir and the positive controls PI-103 (dual inhibitor) and buparlisib (pan-PI3Ki). A more pronounced antiproliferative effect was observed with Bictegravir on cancer lines than in the healthy one (IC50 MCF-7: 30.6 µM; IC50 MDA: 116.6 µM; IC50 MCF-10A: 151.3 µM) at 72 h of exposure, and when calculating the selectivity index, this compound showed greater selectivity towards cancer cells than the reference compounds PI-103 and Buparlisib (4.9, 2.5 and 2.5 respectively).

285-II-PO Evaluación de biomarcadores en la estimación de la función tubular a partir de un ensayo clinico

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Renal function has traditionally been assessed from a glomerulocentric perspective, which overlooks a substantial portion of nephron activity. Tubular function accounts for approximately 50% of the total functional renal mass. Biomarkers such as EGF, UMOD, KIM-1, α1MG, and IL-18 provide valuable information on tubular damage and function, while the evaluation of protein-bound non-uremic toxins allows for a more precise characterization of tubular performance. Recent studies have highlighted that active tubular secretion is independent of glomerular filtration and can be measured through stimulation tests.

To determine whether a correlation exists between biomarkers of tubular dysfunction and exogenous stimulation of organic cation and anion transporters.

A prospective study was conducted in 15 healthy volunteers and 16 patients at different stages of chronic kidney disease (KDIGO classification). After inducing water diuresis, complete bladder emptying was confirmed by ultrasound, baseline blood samples were collected, and participants received 5 g of creatinine PO, 5 ml of iohexol, and 1–1.5 mg/kg of intravenous furosemide.

This protocol stimulated tubular secretion of creatinine (TScr, TOC) and furosemide (TSfuro, TOA). Glomerular filtration rate (GFR) was measured using iohexol, while TScr and TSfuro were measured hourly for 4 hours. During the first hour—when maximum stimulation was achieved—urinary excretion of EGF, NH_4, α1MG, UMOD, KIM-1, and IL-18 was determined.

TScr and TSfuro were independent of GFR. EGF and ammonium excretion correlated positively with the increase in TScr and TSfuro. UMOD showed a positive correlation, and α1MG a negative correlation, with respect to the increase in TSfuro. Urinary
creatinine excretion during the first hour was strongly correlated with TScr.

The function of OCT and OAT can be assessed after the administration of creatinine and furosemide, independently of GFR. Proximal tubule biomarkers correlate with tubular transport, and urinary creatinine excretion during the first hour is useful for estimating OCT function.

286-II-PP Evaluación integral de los riesgos para la salud asociados con la contaminación bacteriana gramnegativa en el personal sanitario y sus batas en entornos clínicos

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In recent decades, healthcare workers' white coats have become potential fomites that act as reservoirs for clinically relevant bacteria, which may be multidrug-resistant to antibiotics, rather than a protective barrier. Microbiological contamination of healthcare workers' clothing is linked to the spread of these bacteria in hospitals, increasing the incidence of healthcare-associated infections (HAIs). This has led to the need for a risk analysis related to microbiological contamination in the gowns of healthcare workers at the Juárez Hospital in Mexico. To evaluate the microbiological risk posed by the presence of Gram-negative bacteria on healthcare workers' gowns and its relationship to antimicrobial resistance. An imprint of the cuffs of the gowns was made on selective culture media for Gram-negative bacteria, and the isolated microorganisms were identified at the genus and species level using MALDI-TOF mass spectrometry. Phenotypic tests were performed to determine the antibiotic susceptibility profile, and genotypic tests were performed to confirm carbapenemases and ESBL. A molecular analysis of the isolates was performed to identify clonality by species using the ERIC-PCR technique. Finally, a Vester matrix was developed to assess the microbiological risk. ESKAPE and non-ESKAPE bacteria were identified on healthcare workers' gowns. The contamination rate was 61.05%, and no association was observed between microbiological load and the gender of healthcare workers. The most frequent microorganism was Pantoea eucrina. The presence of ESBL and carbapenemases conferred by blaKPC-type β-lactamases and blaCTX-M-1-type β-lactamases was detected. No clonal isolates were detected. Finally, the risk matrix revealed four priority problems related to prolonged use and inadequate cleaning of gowns. The findings of this study reinforce the idea of implementing strategies to reduce the risk of bacterial spread in hospitals due to microbiological contamination of gowns.

287-II-PV Efecto del estrés agudo sobre el receptor de glucocorticoides NR3C1 en el pulmón en un modelo murino de asma alérgica

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Asthma is a chronic inflammatory disease that affects millions of people worldwide and is a leading cause of emergency room visits. The disease is characterized by airway inflammation mediated by a Th2 cytokine response (IL-4, IL-5, and IL-13) and a humoral response involving the secretion of IgE.
It has been observed that acute stress can exacerbate asthma symptoms, yet the precise molecular mechanisms behind this interaction, especially regarding treatment effectiveness, are not fully understood. This study focuses on the relationship between acute stress and the glucocorticoid receptor (GR), a key molecule that regulates inflammation and is the primary target of the most common asthma medications. Cortisol, the body's stress hormone, activates the GR to suppress inflammation. However, acute stress may interfere with this function. To test this, a murine model with four experimental groups was used: control, acute stress, asthma, and asthma with acute stress. Asthma was induced with ovalbumin (OVA), and stress was induced via movement restriction. ELISA was used to measure serum and tracheobronchial lavage levels of IgE, as well as serum corticosterone. Flow cytometry was used to determine the percentages of eosinophil and IgE+ plasma cell populations. Gene expression of the GR and cytokines involved in the pathophysiology of allergic asthma (such as IL-4 and IL-13) in the lung was analyzed using RT-qPCR. Our findings indicate that acute stress increases serum corticosterone. The asthma groups showed an increase in the glucocorticoid receptor NR3C1, il4 and il13 genes, IgE-producing plasma cells, and eosinophils in the lung compared to the control and asthma-acute stress groups.
Furthermore, IgE production was lower in the asthma group compared to the asthma-acute stress group. The results of this study could help clarify why stress worsens asthma and why some patients exhibit resistance to glucocorticoid treatments. This could open new avenues for developing more effective and personalized therapeutic strategies to improve disease management.

288-II-PP Obtención de una plataforma vacunal vectorizada basada en el Virus Vaccinia Modificado Ankara (MVA)

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Modified Vaccinia virus Ankara (MVA) is a highly attenuated variant of the vaccinia virus, incapable of replicating in human cells, and widely used as a viral vector for the expression of heterologous genes and the development of recombinant vaccines. Although it contains six major deletions compared to its original genome, it retains the essential genes required for replication in permissive cells, such as BHK-21 (Baby Hamster Kidney) cells, which are well recognized for their high efficiency in supporting viral replication. A key innovation in vaccine vector development has been the use of bacterial artificial chromosomes (BACs), which allow high-precision genome manipulation. Thus, the development of an MVA-BAC system will facilitate the insertion of genes from emerging and re-emerging pathogens without compromising the vector's safety or efficacy. Aim. To establish a vectorized vaccine platform based on MVA for the delivery of antigens against emerging and re-emerging pathogens of clinical importance. Materials and Methods. A recombinant plasmid will be constructed using the pBELO-BAC11 vector, into which the complete MVA genome will be inserted for propagation and maintenance in competent bacteria. The purified recombinant DNA will be transfected into BHK-21 cells previously infected with wild-type MVA to recover recombinant viruses. A transgene will be designed flanked by MVA-specific homologous sequences, containing a promoter region and an expression marker. Recombinant viruses will be identified by fluorescence and confirmed by sequencing. The production of mature extracellular viruses will be promoted through coinfection with a helper virus. Finally, viral replication will be quantified, and the robustness and stability of the system will be evaluated. Results. In this initial phase, the MVA-BAC platform was designed through a literature review and genomic analysis of the virus (GenBank: U94848.1), while also proposing a model of its replication cycle in BHK-21 cells. This analysis enabled the identification of viral expression phases and the rational selection of optimal genomic regions for the insertion and integration of transgenes into the system. Conclusion. Although still at an early stage, this work proposes a transgene insertion strategy based on the proposed MVA replication cycle in BHK-21 cells, laying the groundwork for the MVA-BAC system aimed at developing safe and effective vaccine vectors against emerging and re-emerging pathogens.

290-II-PP Evaluación del efecto de la dopamina en la viabilidad, la citotoxicidad e inducción de autofagia en cultivos primarios de condrocitos humanos provenientes de pacientes con osteoartritis

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Osteoarthritis (OA) is a prevalent degenerative disease in Mexico. Although joint tissue is not vascularized, tissue damage induces pathological angiogenesis, causing irreversible chondrocyte deterioration. Therefore, its inhibition is a relevant therapeutic target. In experimental models, dopamine treatments for cancer and endometriosis have been shown to decrease angiogenesis by activating the DR2 receptor. Since chondrocytes express DR2, it is necessary to demonstrate that it is not a cytotoxic molecule for them to establish its potential therapeutic use. Therefore, our hypothesis is that cells exposed to dopamine would not have cytotoxic consequences.
To determine the effect of dopamine at concentrations of 50 and 100 µM on the viability, apoptosis, necrosis, and autophagy of human chondrocytes with OA obtained from primary cultures.
Human knee cartilage samples with OA collected from operating rooms at the Instituto Nacional de Rehabilitación were used. Primary cultures were then established, and treated with dopamine hydrochloride at concentrations of 0, 50 y 100 µM.
The samples were then incubated for 24 hours, and finally the viability, autophagy, and apoptosis were analyzed using flow cytometry and immunofluorescence.
No significant differences were found between cell viability and early apoptosis after treatment, while autophagy in the cells was also not increased.
Treatment with dopamine at concentrations of 50 and 100 µM does not modify viability, nor does it promote cell death or autophagy.

292-II-PP Estabilidad y variabilidad de betalaínas en variedades de amaranto: efecto del pH en la conservación de pigmentos naturales

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Betalaine is a phenolic compound responsible for the red and yellow colors in some plants, and its stability varies depending on pH, which directly influences its applicability as a natural colorant in the food and cosmetics industries. This study aims to evaluate the stability and characteristics of natural pigments present in different varieties of amaranth, specifically six varieties of Amaranthus hypochondriacus and three varieties of Amaranthus hybridus. The betalains were extracted from the seeds of nine amaranth varieties through a maceration process in distilled water. The extracts obtained were then adjusted to different pH levels (1.3, 3, 4.75, 6.5, 7.9, 9.5, and 11.7) using standard acid and base solutions. The initial colorimetric parameters of the extract (L*, a*, b*) were measured using a PCE-TCR 200 colorimeter in CIELAB space. To evaluate stability, the extract was subjected to light, room temperature, and different pH conditions for 5 days. At the end of this period, color measurements were repeated under the same initial conditions to observe changes in colorimetric parameters over time. In addition, absorbance measurements were performed with a BioTek UV/Vis Tunable Epoch Microplate Reader spectrophotometer in the range of 200 nm to 700 nm, with a scan every 10 nm. This study provides key information on how pH influences the color stability of betalains, depending on the amaranth variety. The results allow us to identify the most favorable conditions for the preservation of these pigments and compare the buffering capacity of amaranth varieties in acidic and basic media. The comparison between A. hypochondriacus and A. hybridus provides a deep understanding of genetic variability in betalain synthesis, facilitating the selection of genotypes with desirable characteristics for future agrobiotechnological applications.

297-II-PP Caracterización de las vías de señalización involucradas en la activación del receptor de apelina por la molécula EPM-06

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The receptor for the endogenous bioactive peptide apelin (APLNR) is a G protein-coupled receptor; its stimulation triggers responses such as vasodilation, metabolic regulation, inflammation, and thermogenesis. It has also been described as potentially playing an essential role in the induction of mitochondrial biogenesis and in the differentiation of satellite cells in skeletal muscle. The study of this receptor will allow the development of therapeutic strategies to regulate skeletal muscle loss (sarcopenia) in conditions such as obesity, diabetes, and aging. Our objective was to study the effects of a molecule called EPM-06 (recently described and potentially activating the APLNR receptor) on mitochondrial biogenesis in myoblasts. To this end, C2C12 cells were cultured for 10 days in DMEM+2% FBS (control) or DMEM+2% FBS+EPM-06 medium. The observation of myotubes in cell culture indicates that EPM-06 promotes myogenic differentiation. Molecular analysis by real-time PCR indicates increased expression of Pgc1α and Ucp1, and decreased expression of Drp1. Based on preliminary results, we can conclude that EPM-06 is involved in myogenic differentiation and mitochondrial biogenesis.

299-II-PO Desarrollo de un biocomposito a base de matrices prebióticas y C-ficocianina

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C-phycocyanin (CPC) is a bright blue phycobiliprotein found in cyanobacteria such as Arthrospira maxima, with antioxidant, antihypertensive, anti-inflammatory, and immunomodulatory properties. However, once purified, CPC exhibits heightened sensitivity to oxygen, pH changes in the gastrointestinal tract, humidity, and adverse environmental conditions. Consequently, a range of technological strategies have been put forth to preserve and enhance its bioactivities. Biocomposites (BC) are materials formed by the combination of two or more components, with the aim of improving their functional properties and obtaining better performance. The objective of this work was to develop a biocomposite based on prebiotic matrices to preserve the biological characteristics of C-phycocyanin. To this end, a matrix composed of agavins, gum arabic, and C-phycocyanin was formulated and spray-dried at inlet/outlet temperatures of 120/60 °C and 180/80 °C. Subsequently, morphostructural analyses were performed using digital image processing of photomicrographs, the antioxidant capacity was evaluated, and the BCs were subjected to in vitro digestion according to the INFOGEST protocol. The results demonstrated an encapsulation efficiency of over 55%, with particle diameters ranging from 4.50 to 4.98 µm, areas between 13 and 14 µm^2, and an average circularity value of 0.89. Furthermore, it was ascertained that the developed BCs maintained their antioxidant capacity, exhibited resistance to simulated digestion, and augmented CPC availability in the intestine by up to 200%. Consequently, the BCs exhibited the capacity to safeguard C-phycocyanin and enhance its controlled release, thereby ensuring its stability and bioactive functionality under simulated gastrointestinal conditions.

300-II-PO Efecto de la Electroacupuntura sobre regulación de factores de transcripción maestros de la respuesta inmune de Th1 y Tregs en pacientes con Neuropatía diabética

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Diabetic neuropathy (DN) is the most common symptomatic complication of diabetes mellitus worldwide, with a particularly high prevalence in Mexico. It results from chronic hyperglycemia, inflammation state, oxidative stress, and lipotoxicity, damaging Schwann cells in distal peripheral neurons. Current treatments focus on symptom management, but not for preventing disease progression. Electroacupuncture (EA) is an alternative therapy using electrical stimulation through a pair of acupuncture needles to relieve pain, improve function, and reduce inflammation. Hypothesis: EA increases the expression of lymphocyte transcription factors with anti-inflammatory activity in patients with DN.

This was a randomized, double-blind clinical trial with 30 patients divided into four groups: axonal EA, axonal sham EA, short fibers with EA, and short fibers sham EA. The intervention consisted of 16 sessions of 20 minutes each over two months, with serum samples collected at three time points: baseline, post-first intervention, and post-second intervention. We extracted RNA with TRIzol method, and we synthesized cDNA with MMLV enzyme, finally we determined the amplification by RT-qPCR with Double Delta CT. Statistical analysis was performed using repeated measures ANOVA with Tukey's post hoc test.

A significant increase in the expression of T-bet and STAT4 was observed over time in axonal patients with EA. Likewise, increased expression of TGF-β and SOCS3 in the same patients, and these transcription factors are key in Treg polarization. These findings suggest that EA might promote a proinflammatory state while simultaneously and the regulatory cytokine expression restoring and promoting the immune balance and promoting a reparative response. In conclusion, EA may modulate key transcription factors involved in immune regulation in patients with diabetic neuropathy, offering a potential therapeutic approach that not only manages symptoms but also influences immunological pathways

302-II-PP Obtención de hairy roots de Tagetes lucida mediada por Agrobacterium rhizogenes

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Biotechnology has focused on developing methodologies that allow for the sustainable and efficient production of specific plant metabolites. Genetic transformation mediated by Agrobacterium rhizogenes to generate hairy roots (HR) represents an alternative for the agri-food, pharmaceutical, and other industries. Tagetes lucida is a species traditionally used to treat human health conditions and in crop rotation, due to the biosynthesis of metabolites with antibacterial, nematicidal, and antioxidant activity. However, research on this species remains limited. The use of Agrobacterium rhizogenes to generate HR is of interest for studying the chemical profile and metabolites in T. lucida roots with commercial value. The aim of this study was to obtain hairy roots from Tagetes lucida through infection with Agrobacterium rhizogenes. In vitro seedling of T. lucida were obtained from seeds germinated on MS culture medium. Stem explants were inoculated with three A. rhizogenes strains (A4, ATCC15834, and K599) by making incisions with a scalpel, and were incubated on MS medium in the dark for 72 hours at 25°C ± 2. Subsequently, explants were rinsed with cefotaxime (350 mg/L) and transferred to MS medium supplemented with cefotaxime (350 mg/L). HR were isolated and subcultured on MS medium with cefotaxime (200 mg/L), and morphological differences between the generated lines were analyzed. HR induction was observed starting on day 14 in explants infected with strains A4 and ATCC15834. The transformation efficiency was 33%. A total of 10 hairy root lines were obtained from the infection of Tagetes lucida. The antibiotic was removed from the culture medium after 56 days. Subcultures were carried out every 28 days on medium without antibiotic. Specific color and growth characteristics were observed among the lines. This is the first study reporting the generation of HR from T. lucida seedling, for further analysis and potential use of the metabolites accumulated in each line.

305-II-PP Obtaining ginger essential oil by two different extraction methods and its antioxidant activity

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Ginger (Zingiber officinale Roscoe) is a herbaceous plant belonging to the Zingiberaceae family. Its rhizome is used in cooking for its characteristic flavor, and it has also been used since ancient times in traditional medicine to treat various ailments. The objective of this study is to perform an effective extraction of ginger essential oil, as well as an antioxidant characterization. For this study, type “D” ginger was used, which was grown in the northern mountains of the state of Puebla. The rhizomes were cleaned, sliced, dried, and ground. Yields were calculated at all these stages, with a yield of 25.03%. The extractions were performed with anhydrous etanol to obtain the bioactive compounds contained in the rhizome, using a common Soxhlet extraction (ASXC). A Soxhlet extraction was also performed with the aid of a sonication probe (ASXM) integrated into the system, using the same parameters as the previous Soxhlet extraction, except that the extraction time was significantly reduced. The extracts obtained were placed in a rotary evaporator to obtain ginger essential oil, with a yield of 4.8% in the ASXC extracts and a yield of 5.4% in the ASXC extracts, highlighting a higher yield and a notable decrease in extraction time. In terms of total phenols, the essential oil obtained by the ASXC method yielded 27.3 mg/g, while the oil obtained by the ASXM method yielded 36.2 mg/g. Antioxidant activity was also quantified by the DPPH method, finding that EC50 was reached in 15 minutes at a concentration of 50 µl for ASXC, and at the same concentration, but in 10 minutes for ASXM essential oil at the same concentration. Thin-layer chromatography was performed for the essential oil, which contained five compounds of different polarities, possibly mostly polyphenols with antioxidant activity. These results contribute to the use of the “D” classified rhizome as well as to the obtaining of the essential oil and its antioxidant activity.

306-II-PO Diseño y evaluación in silico de péptidos vacunales derivados de proteínas virales de SARS-CoV-2

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More than five years after the onset of the pandemic caused by the SARS-CoV-2 virus, over 777 million cases and more than 7 million deaths have been reported worldwide. Along with the continued emergence of new viral subvariants, SARS-CoV-2 remains a persistent public health concern. Although various vaccine platforms continue to be updated and administered, new cases are still occurring. Therefore, this study aims to develop a novel immunization strategy based on peptides derived from conserved sequences of the E, M, N, and S proteins of the virus and its variants. Through multiple sequence alignments of SARS-CoV, SARS-CoV-2, and different viral variants, eight conserved regions were selected: one for E, two for M, two for N, and three for S, with lengths ranging from 22 to 42 amino acids. Their physicochemical and immunogenic properties were analyzed using ProtParam, ProtScale, EMBOSS Charge, and the IEDB server. The peptides showed a maximum molecular weight of 4,500 Da, and at least one region of interest was identified in all models, displaying charge, hydrophilicity, flexibility, antigenicity, and accessibility. The peptides were modeled using PepFold and subjected to molecular docking assays in the HDock server to determine binding to Major Histocompatibility Complex (MHC) class I and II molecules. Docking scores reached up to −200, demonstrating stable binding between the peptide and MHC, indicating that the selected peptides possess the necessary characteristics to induce an immune response in the host.

307-II-PP Evaluación del efecto de la Naringenina sobre la expresión de los transcritos de la vía de señalización de la insulina y del metabolismo de lípidos en hígado y tejido adiposo de ratas Wistar con dieta grasa

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Obesity and insulin resistance (IR) are directly related to a metabolic imbalance that leads to the excessive accumulation of triacylglycerols in hepatocytes and the storage of free fatty acids (FFA), promoting the development of Metabolic Associated Fatty Liver Disease (MAFLD). In this context, the investigation of natural compounds such as flavonoids has gained relevance in the search for new strategies to mitigate the negative effects of IR and MAFLD. In this study, we propose naringenin as a treatment for IR and MAFLD in a murine model. Evaluate the expression of key messenger RNAs in the insulin signaling pathway and fatty acid metabolism in hepatic and adipose tissue, as well as resistin as an inflammatory marker, in a Wistar rat model fed a high-fat diet. Methodology: Twenty-four Wistar rats aged 7–9 weeks were divided into the following groups: HEALTHY (n=8), High-Fat Diet with Fructose (HFDF) (n=8), and HFDF + Naringenin 20 mg/kg/day (n=8). The HFDF group was used as a model for MAFLD. Transcript expression (INSR, IRS1, IRS2, PI3K, AKT, GLUT2, GLUT4, mTORC1, DAG, PKCε, Retn) was assessed by RT-qPCR using genetic material extracted from liver and adipose tissue. Results and discussion: After 15 weeks of treatment, the HFDF + Naringenin group, maintained transcript expression levels of the insulin signaling pathway similar to the HEALTHY group. Interestingly, the inflammatory marker (resistin) was decreased in the HFDF + Naringenin group compared to the HFDF group, indicating that naringenin contributes to the regulation of inflammation during MAFLD.

The administration of naringenin alongside a high-fat diet appears to positively regulate the expression of genes in the insulin signaling pathway involved in MAFLD for the treatment of this disease.

310-II-PO Análisis integral de las propiedades nutracéuticas de los hongos *Agaricomycetes* endémicos

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In Mexico, there is a wide diversity of economically important mushrooms, with wild edible species standing out prominently. These have been consumed since pre-Hispanic times and continue to be part of the diet and commercial trade among various ethnic groups and urban populations. Their use is on the rise, highlighting the need for a comprehensive analysis to establish their nutritional and toxicological classification. This study seeks to fill the existing information gap regarding the nutritional and toxicological properties of wild Agaricomycetes mushrooms marketed in Mexico. *Laetiporus sulphureus* was initially isolated in culture media for the development of fruiting bodies. Nutritional content was assessed through bromatological, metabolomic, and antioxidant activity analyses. The quantification of heavy metals and mineral content will be conducted subsequently. Fruiting bodies of *Laetiporus sulphureus* were successfully obtained, yielding a protein profile consisting of 86.1% crude protein, 3.25 g/100 g nitrogen content, and 57.3 mg of carbohydrates. Metabolomic analyses aimed at identifying nutraceutical compounds are currently in progress, along with the cultivation of additional fungal species.

311-II-PP Diseño de nuevos inhibidores multiobjetivo utilizando herramientas computacionales y análisis de redes funcionales

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The process of designing new drugs is a complex and lengthy endeavor, often taking around 10–15 years and costing between 500 and 1,000 million USD. For this reason, drug repositioning exploring new therapeutic applications for already approved drugs has become an attractive strategy, particularly when combined with computational tools. One of the most recent technologies in pharmacological research is the biological network approach, which proposes that a drug can act on multiple targets. This strategy has not been widely exploited, as single-target drugs tend to produce fewer side effects due to their selectivity. However, in diseases such as cancer, this property can represent a therapeutic limitation. Microarray assays involve the use of a wide range of platforms that enable the comparison of different biological aspects, such as signaling pathways, surface chemistry, or protein–protein interactions. According to the World Health Organization, in 2022, 2.3 million women were diagnosed with breast cancer worldwide. In Mexico, during the same year, 23,790 cases were reported, 99.4% of which occurred in women. The human epidermal growth factor receptor 2 (HER2) is overexpressed in approximately 20–30% of breast cancer cases and is considered a key biomarker for guiding therapeutic decisions. Using the Illumina online platform and Thermo Fisher database, we compared the gene expression profiles of various proteins in healthy and cancerous ductal and lobular cells. The most relevant differences were observed in HER2, integrin β-1, Annexin A, and CD44—all of which are also involved in metastasis. Docking analysis revealed that, in the Enamine allosteric kinase ligand library, ligand 1208 achieved a binding energy of –11.17 kcal/mol with the native HER2 protein, while in the mutated HER2 protein, ligand 4551 showed the best binding energy at –11.45 kcal/mol. In the Enamine kinase hinge binder plate library, the best results were –13.4 kcal/mol (ligand 93) for native HER2 and –12.05 kcal/mol (ligand 97) for mutated HER2. These ligands will be tested in MCF-7 and MDA-MB-231 cell lines, followed by comparison of the expression levels of the genes previously identified in the microarray assay.

316-II-PP Desarrollo de Fármacos/ Docking analysis of non selective beta-blockers compounds on β2-adrenergic receptor, erb-b2 receptor tyrosine kinase 2 and Neuropeptide Y receptor, as a potential repurposing breast cancer treatment

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Breast cancer (BC) invasion, angiogenesis, chemoresistance and, metastasis are linked to a wide number of molecular mechanisms as overexpression of beta-2 adrenergic receptor (ADRB2) and stress-related catecholamine overproduction (norepinephrine and epinephrine) as ligands. The role of adrenergic signaling in tumorigenesis underscores the therapeutic potential of non-selective beta-blockers (nsBB) such as promoters in reducing protumor signaling pathways, related ADRB2, erb-b2 receptor tyrosine kinase 2 (ERBB2) and Neuropeptide Y receptor (NPYR). Different approved nsBB as propranolol has been shown to be an effective adjuvant treatment to reduce metastasis and mortality in patients with BC and its antitumor effect in vitro. **Aim.** To perform an in-silico study by molecular docking simulations and intracellular pathway analysis of different approved nsBB, to identify which one has the highest affinity for ADRB2, ERBB2 and NPYR, which would allow selecting the best possible nsBBs as adjuvants in BC. Docking analysis revealed that the most affinity nsBB was carvedilol (-10.5) followed by carazolol (-9.5), labetalol (-9.2), and propranolol (-8.5) to ADRB2 interaction as main target but interaction detected to ERBB2 and NPYR. Repositioning carvedilol, carazolol, nadolol and labetalol as an adjuvant treatment for BC may be more effective than propranolol, given its greater affinity for receptors involved in protumor pathways (ADRB2, ERBB2 and NPYR).
However, future in vitro studies and clinical trials are needed.

317-II-PP Composición química y capacidad antioxidante de semillas de chía (*Salvia hispanica* L.) por efecto del proceso de germinación

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Chia seed (*Salvia hispanica* L.) comes from a plant native to southeastern Mexico and northern Guatemala, It is an oilseed characterized by its nutritional and functional properties. Germination is a natural process that changes the chemical composition of seeds, including phenolic compounds, which are important as antioxidants in the body. The objective of this work was to evaluate the influence of the germination process on the chemical composition of chia sprout flour and to show the effect on its nutritional composition due to the action of germination. Therefore, seed viability was determined by the germination test and tetrazolium chloride, proximal chemical characterization, total dietary fiber, phenolic compound content (total phenols, total flavonoids and total tannins), antioxidant capacity (DPPH and FRAP). The results showed that germination modified the chemical composition of the seeds, increasing the protein content (from 21.35 ± 0.1 to 27.39 ± 0.96 g/100 g), ash (from 4.09 ± 0.02 to 5.59 ± 0.37 g/100 g), total phenolic compounds (from 8.50 to 24.45 mg GAE/g), total flavonoids (from 0.38 to 4.26 mg QE/g), total tannins (from 19.84 to 50.73 mg CE/g) and antioxidant capacity by DPPH and FRAP assays (from 82.71 to 103.41 and from 34.76 to 70.94 µmol TE/g, respectively), and a decrease in lipid content was observed (from 0.01 to 0.02). 31.15 ± 0.1 to 16.90 ± 0.51 g/100 g); showing a total dietary fiber content of 40.66 ± 1.43 g/100 g ($p \leq 0.05$). The results obtained suggest that germination of chia seeds improves the chemical composition and can be considered a functional ingredient for the development of new food products with high functional value.

320-II-PO Disolventes Eutécticos Profundos Naturales para la extracción de fitoquímicos de diferente polaridad: propiedades fisicoquímicas y antioxidantes

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The replacement of conventional organic solvents with safer and more sustainable alternatives is one of the principles of green chemistry. As a result, the goal is to maximize the incorporation of all materials used into the final product while minimizing waste generation and environmental damage. As an alternative, Natural Deep Eutectic Solvents (NADES) have emerged; these are sustainable, efficient, economical, and composed mainly of natural components such as sugars, amino acids, organic acids, and alcohols, which, in specific molar ratios, make their physicochemical properties adaptable for the extraction of bioactive compounds of different polarities. In this study, the physicochemical properties —polarity, pH, conductivity— and the interaction of the individual components of each solvent by FTIR were evaluated for NADES based on choline chloride and proline as hydrogen bond acceptors, in combination with 1,2-propanediol, 1,4-butanediol, levulinic acid, and lactic acid as hydrogen bond donors. Due to their composition, they characteristicallypresent different biological activities, which is why the antioxidant capacity of these systems was also evaluated. As a result, it was found that proline–organic acid-based NADES were more polar, had an acidic pH, moderate-to-high conductivity, and a high antioxidant inhibition percentage (70–88%) compared to choline chloride–diol-based NADES, which had low polarity, behaved as alkaline systems, showed low conductivity values, and had low antioxidant inhibition percentages (1–8%).Therefore, it can be concluded that proline–organic acid-based systems are suitable solvents for extracting phenolic or glycosylated bioactive compounds, while choline chloride–diol-based systems are suitable for extracting flavonoid- and phytosterol-type compounds. These findings demonstrate that NADES can be tailored for the extraction of bioactive compounds of different polarities depending on their donors and acceptors.

329-II-PP Desarrollo de un bioterapéutico a base de *Pichia kudriavzevii*

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The indiscriminate use of antibiotics, particularly in pediatric populations, has contributed to the development of intestinal dysbiosis, with clinical consequences ranging from mild digestive disorders to severe conditions such as malnutrition, necrotizing enterocolitis, and developmental delays. Although probiotics are used to restore microbiota balance, their availability in Mexico is limited, as they are not included in the national essential medicines list. In this context, a research line was developed focusing on the selection and evaluation of a *Pichia kudriavzevii* strain isolated from kefir, with potential probiotic properties. The strain was identified through molecular sequencing of the ITS1 and ITS4 regions, showing 100% identity with sequences in the NCBI database. Phylogenetic analysis confirmed its classification within the Pichia genus and its close relation to other probiotic species. The selected yeast was encapsulated via spray-drying using a matrix composed of whey protein, maltodextrin, and gum arabic. Morphological and structural analysis of the resulting microcapsules was performed using microscopy. Microbiological safety tests were also carried out to assess the effectiveness of the drying process and ensure the safety of the final product. As a preliminary conclusion, a P. kudriavzevii strain with in vitro probiotic potential was successfully selected, and the encapsulation process proved favorable in preserving microbial viability. Further in vivo studies are warranted to validate its therapeutic efficacy and potential use as a biotherapeutic agent for the treatment of intestinal dysbiosis.

333-II-PP Evaluación del efecto citoprotector de la fase acuosa del extracto metanólico (FA-EM) de Pleopeltis crassinervata en células PC12 bajo estrés oxidativo inducido por H_2O_2

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Oxidative stress is a key factor in the progression of various neurodegenerative diseases. Reactive oxygen species, such as hydrogen peroxide (H_2O_2), can cause significant cellular damage in neurons and neuronal model systems, affecting their viability and function. Polyphenolic compounds, including flavonoids found in medicinal plants, have demonstrated antioxidant and cytoprotective properties. Pleopeltis crassinervata, a fern used in traditional Mexican medicine, contains secondary metabolites of pharmacological interest; however, its cytoprotective potential in oxidative stress models has not been previously evaluated.

This study aimed to evaluate the cytoprotective effect of the aqueous phase of the methanolic extract (AP-ME) of P. crassinervata in PC12 cells exposed to oxidative stress induced by H_2O_2. The methanolic extract was obtained by maceration and subsequent extraction with various solvents, the methanolic fraction was fractionated by liquid-liquid extraction to isolate the aqueous phase. Total polyphenol and flavonoid contents were determined using the Folin–Ciocalteu and aluminum chloride methods, respectively. PC12 cells were cultured in DMEM supplemented with 10% fetal bovine serum, 1% antibiotic/antifungal and pretreated with AP-ME at concentrations ranging from 50 to 800 µg/mL for 24 hours. Cells were then exposed to H_2O_2 at its previously determined IC_{50} concentration for 24 hours.

Cell viability was assessed using the MTT assay in three independent experiments (n = 16). Data were analyzed using one-way ANOVA followed by Dunnett's post hoc test.

Pretreatment with AP-ME showed a progressive increase in cell viability from 50 to 400 µg/mL, with the highest values observed at 200 and 400 µg/mL. At 800 µg/mL, a slight decrease in viability was observed compared to 400 µg/mL.

Microphotographs supported these findings, showing higher cell density and better morphology at 100, 200, and 400 µg/mL, whereas the group treated only with H_2O_2 displayed fewer cells and morphological signs of oxidative damage. In conclusion, the AP-ME of Pleopeltis crassinervata exhibited a cytoprotective effect against H_2O_2-induced oxidative damage in PC12 cells, possibly related to its phenolic compound content.

335-II–PV El estrés crónico modula la expresión del receptor de glucocorticoides NR3C1 y la respuesta inmune innata cutánea

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La piel es la primera barrera física contra agentes externos y participa como un órgano inmunológico, el cual es regulado neuroendocrinamente. Diversos estudios han demostrado que el estrés crónico exacerba los síntomas de enfermedades cutáneas, en donde el receptor de glucocorticoides (NR3C1) actúa como mediador clave de la respuesta al estrés; se ha demostrado que regula procesos como inflamación, reparación tisular y proliferación celular. Sin embargo, parte de la evidencia se ha centrado en modelos de enfermedad y su impacto directo en piel sana ha sido poco caracterizado.
Objetivo:
Evaluar el efecto del estrés crónico en la expresión del NR3C1 y su papel en la inmunidad innata cutánea.
Se utilizaron ratones machos BALB/c divididos en dos: 1) grupo control (CTL) y 2) estrés por restricción de movimiento (ER), el cual se aplicó una hora durante tres días consecutivos. Se evaluaron los niveles séricos de corticosterona por ELISA, se caracterizaron las poblaciones celulares en piel auricular de macrófagos M1($CD14^+CD80^+$), M2($CD14^+CD206^+$), monocitos ($CD64^+Ly6C^+$) y células NKT ($CD3^+CD335^+$) mediante citometría de flujo y la expresión del gen NR3C1 por RT-qPCR.
En el grupo de ER aumentaron los niveles de corticosterona sérica, la expresión del gen NR3C1 y los macrófagos M2 comparados con los M1. En contraste, se disminuyeron los monocitos y las células NKT.
Los hallazgos de este estudio sugieren que el estrés crónico podría modular la respuesta inmunológica innata en piel mediante la regulación del receptor de glucocorticoides NR3C1. Esta posible asociación abre la puerta a comprender con mayor detalle el papel de esta vía en la interacción entre estrés y procesos inflamatorios cutáneos crónicos.
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341-II-PO Intranasal administration of bovine lactoferrin modulates immunology system in upper respiratory tract

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Respiratory epithelium is the first line of defense against any inhaled particles. Therefore, the integrity of the barrier is a process that is highly regulated and is crucial for maintaining interactions between environment and immune system cells. Under normal circumstances is capable to generate a local immune response, but when compromised, activation of immune responses innates, adaptive immune cells and other effector mechanisms involved in conferring this local and systemic reaction might occur. Immunomodulators are substances that can alter the immune response by augmenting or reducing immune system components depending on the stimulus. A clear example is the bovine lactoferrin (bLf) is a glycoprotein it´s known for its immunomodulatory effects, including the respiratory tract.

We investigated the effect of intranasal administration of bLf at 7, 10 and 14 days in BALB/c mice. Multiple parameters were evaluated to determine the concentration of immunoglobulins such as IgA, IgG and IgM in nasal lavages and populations of T CD4 cells, T CD8 cells, regulatory T (Treg) cells and plasma cells. These T cell subsets mediate several immune responses mainly through secreting cytokines such as IL-1β+, IL-10+, TGF-□ + and TNF-α + that were also studied in the nasal cavity.

The results shows that immunoglobulins decrease in nasal lavages, while CD4+ and CD8+ triggers at the 10 day, CD19+/B220 +/IgA+ decrease in all the time evaluated, CD4+/IL-1β+, CD4+/TNF-α+, CD4+/CD25+/TGF-□+ increased only at 14 day in NALT. In nasal passages found the same pattern in terms of CD4+ and CD8+, CD19+/B220+/IgA+, CD4+/IL-1□+ increased only at 14 day, CD4+/TNF-□ + showed increased from the 10th to the 14th . CD4+/IL-10+ was significantly upregulated at 10 days regarding CD4 +/CD25+/TGF-□+ a growth curve is observed, with the 14th being the highest in percentage compared with the controls.

Conclusion: The main characteristic of the pathogenesis of respiratory diseases is the deregulation of immune responses. Despite the development of vaccines, there is no adjuvant available that can be used to prevent such diseases. It has been studied that bovine lactoferrin triggers pro- and anti-inflammatory events, contributing to the restoration of physiological homeostasis. In this study, the change in the secretion of cytokines guides us to the immunomodulatory effect that bovine lactoferrin has on the respiratory system administered on different days. Our findings suggest that treatment with lactoferrin could help develop an effective immune response in an acute form, however, it is associated with immunopathological responses that cause damage in chronic form.

343-II-PP Caracterización morfológica y molecular de *Ornithodoros nicollei* colectadas en el estado de Chiapas, Mexico

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Soft ticks of the genus *Ornithodoros* are nidicolous arthropods that affect fossorial behavior animals such as reptiles and rodents. Additionally, they are vectors of Borrelia species, etiological agents of tick-borne relapsing fever (TBRF). In Mexico, multiple species of *Ornithodoros* have been recorded, and three of them are recognized as TBRF vectors: *Ornithodoros turicata*, *Ornithodoros dugesi* and *Ornithodoros talaje*. Due to the potential risk for human and veterinary health that these ticks represent, the search for TBRF potential new vectors. Moreover, the study of interactions with their environment and with wildlife is epidemiologically relevant. In this study, soft ticks were collected in the reserve of the "Miguel Álvarez del Toro" zoo (ZooMAT) in Tuxtla Gutiérrez, Chiapas, Mexico, from four wildlife burrows using a CO_2 trap. These burrows corresponded to a Central American agouti (*Dasyprocta punctata*) and other not identified rodent species. A total of 34 ticks were collected and identified using a morphometric approach of different stages by light microscope. Molecular and taxonomic analyses were performed through PCR amplification of a ~475 bp fragment of the gene coding for the mitochondrial 16S rRNA. Additionally, we searched for TBRF pathogens using PCR for the gene *flaB* and *glpQ*. Ticks were morphologically and phylogenetically identified, but no evidence of TBRF *Borrelia* sp. Was found. This finding indicates new records of the species *Ornithodoros nicollei* in this southern region of Mexico. The reserve ZooMAT harbors a great diversity of native free roaming species as well as endangered wildlife, and the presence of soft ticks within the reserve poses a potential risk of pathogen transmission to protected species, as well as to zoo caretakers and visitors.

344-II-PV Participación de TAp73 como regulador de genes canónicos de P53 en un modelo de catástrofe mitótica en la línea celular K-562

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Chronic myeloid leukemia (CML) is a type of cancer characterized by uncontrolled proliferation of myeloid progenitors, where leukemic clones may present resistance to apoptosis due to the loss of the tumor suppressor gene P53. Mitotic catastrophe (MC) is a mechanism that promotes the arrest and death in mitosis of tumor cells with mutated P53. In the context of p53 loss, one of its homologs, TAp73, could substitute its transcriptional activity in MC models. This project aimed to evaluate whether TAp73 participates in the regulation of canonical P53 genes involved in cell cycle arrest and apoptosis in a MC model induced with curcumin in a CML cell line (K-562). Cells were cultured and treated with medium, DMSO (0.1%) and curcumin (20 μM) for 12, 18 and 24 h, followed by Western blot and end-point PCR assays. It was found that treatment with curcumin caused a time-dependent reduction in TAp73 protein levels when compared to medium and DMSO controls. Additionally, an increase in the levels of the mitotic arrest marker p-H3S10 was identified in response to treatment with the phytochemical. Furthermore, PCR analyses detected a slight increase in BIM expression and a reduction in 14-3-3σ and PUMA levels when compared to controls, while no changes were detected in P21 and BAX genes. Our data suggests that curcumin reduces TAp73 protein levels and increases BIM expression in the K-562 cell line MC model.

347-II-PP Development of a low-fat fermented dairy product enriched with garambullo (Myrtillocactus geometrizans): Analysis of functional properties and sensorial acceptance

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Nowadays, there is an increasing global demand for fermented dairy products due to their known benefits for digestive health and their pleasant sensory characteristics, including flavor, texture, and ease of consumption. As a result, there is a need to innovate in the development of these products, especially by reducing fat content and adding bioactive compounds with health benefits. Thus, this study aimed to develop a low-fat fermented dairy product enriched with garambullo (Myrtillocactus geometrizans) pulp and to evaluate its functional properties, stability, and consumer acceptance. Fat reduction negatively affected the stability of the gel structure formed during fermentation. Therefore, a Box-Behnken experimental design was implemented to optimize the formulation. Four stabilizing additives (starch, pectin, gelatin, and xanthan gum) were evaluated as factors, with % syneresis and pH as response variables. The optimization process identified the most optimal amounts of additives to enhance product stability and significantly reduce whey separation. The optimal formulation included starch, pectin and grenetin at a high level. At the same time, xanthan gum was excluded due to its lack of positive effect on reducing syneresis or maintaining appropriate pH levels. Then, garambullo pulp was incorporated, and its content of bioactive compounds, particularly betalains, was evaluated, as well as its antioxidant capacity using DPPH and ABTS assays. Additionally, product acceptance was evaluated through sensory testing. The optimized formulation maintained a desirable texture, color, and whey separation while also exhibiting significant functional properties. These results suggest that the product has potential as an innovative functional dairy food aligned with current industry trends.

355-II-PP Evaluación del estrés oxidativo inducido por imidacloprid en estadios de desarrollo de Danio rerio a concentraciones ambientalmente relevantes

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Imidacloprid, a commonly used agricultural neonicotinoid, is detected in water bodies at concentrations ranging from ng/L to µg/L, posing a risk to non-target aquatic organisms such as Danio rerio. This study evaluated oxidative stress induced by imidacloprid in embryos, larvae, and adults of D. rerio exposed to environmentally relevant concentrations (0.10, 0.32, and 38.20 µg/L), considering the ontogenetic variability of antioxidant systems. Oxidative stress biomarkers (SOD activity, lipid peroxidation, and oxidized proteins) were quantified after 96 h exposures in embryos, 48 h in larvae, and 21 days in adults, and data were analyzed using ANOVA. Results showed concentration- and stage-dependent lethality: in embryos it was 21.6%, 10%, and 16.6%, and in larvae 5%, 20%, and 26.6% for the evaluated concentrations, respectively. SOD activity significantly increased in embryos and larvae at all doses, while in adults only a rising trend was observed at the lowest concentration. Lipid peroxidation increased in embryos at 0.32 and 38.20 µg/L, and oxidized protein levels significantly increased in adults and embryos at all concentrations, and in larvae only at 0.32 µg/L. These findings demonstrate that imidacloprid induces oxidative stress and macromolecular damage in D. rerio even at low concentrations, with early life stages being the most vulnerable due to the immaturity of their antioxidant defense systems. The hyperactivation of SOD and increased damage biomarkers suggest a disruption of redox homeostasis, potentially affecting long-term survival and biological fitness. It is concluded that imidacloprid represents a relevant ecotoxicological risk, and it is recommended to incorporate these biomarkers into environmental monitoring programs for the protection of aquatic ecosystems.

356-II-PV La lactoferrina bovina modula el perfil Th2 y macrófagos pulmonares durante el estrés

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It is well established that stress perpetuates a Th2 profile in the lower airways when pre-existing diseases are present. Although there are numerous studies focused on elucidating the effect of stress on other mucosal sites, its role in the lung has not been evaluated in healthy individuals to date. In turn, it has been established that bovine lactoferrin (bLf) is a potent immunomodulator in respiratory pathologies. The objective of the present study was to evaluate the effect of bovine lactoferrin on the Th2 profile (T CD4+/IL-4+, T CD4+/IL-10+), and on lung M1 and M2 macrophages during stress. Four groups of male BALB/c mice were analyzed, divided into: a) control; b) Chronic Stress (movement restriction chamber for four hours for eight days) (ER); c) bLf (administered with 5mg/100µL bLf for 14 days); bLf+ER (administered with bLf six days before and during the eight-day stress period). Lung leukocytes were obtained and analyzed by flow cytometry. Our results show that in the stressed groups, the populations of T CD4+/IL-4+ and T CD4+/IL-10+ lymphocytes increase significantly compared to the control group, whereas in the groups administered with lactoferrin, the percentages remained at levels similar to the control. M1 and M2 macrophages decreased significantly in the ER group, while the percentages remained at levels comparable to the control in the bLf and bLf+ER groups. This allows us to conclude that ER promotes an increase in Th2 lymphocyte populations and decreases the percentages of M1 and M2 macrophages, while bLf prevents the change in populations, keeping them at basal levels. Although more studies are needed to determine the mechanism of action of bLf in the lung during stress, these results demonstrate its immunomodulatory capacity and its potential use as a therapeutic and prophylactic agent in lung diseases.

366-II-PP Síntesis y caracterización de nanopartículas de policosanol y triacontanol de cera de abeja

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Beeswax, secreted by Apis mellifera, is a mixture of lipid compounds, including long-chain aliphatic alcohols known as policosanols, the main component of polycosanol is triacontanol, These compounds have a variety of biological activities, including their potential as anti-cancer agents. However, its low solubility in water limits its bioavailability, which reduces its therapeutic efficacy. To overcome this limitation, in this work the synthesis of polymeric nanoparticles of policosanol and triacontanol was performed as a strategy to improve their solubility, stability and biopharmaceutical profile. The nanoparticles were made by nanoprecipitation, using cholesterol-polyethylene glycol (COL-PEG) 600 and 2000 complexes. Different conditions were evaluated: type and concentration of COL-PEG, synthesis temperature (25°C and 70°C), water ratio: acetone, surfactant type (Tween 20 o Span 80) and its location in the system (aqueous or organic phase). The nanoparticles were characterized by Fourier Transform Infrared Spectroscopy (FTIR), Raman spectroscopy, High Resolution Thin Layer Chromatography (HPTLC), Nano Zetasizer and TEM microscopy to determine their morphology, size, stability and encapsulation percentage. Up to 90.92% encapsulation was obtained, determined by HPTLC. The results revealed that the synthesis of nanoparticles is influenced by multiple factors, including temperature, component concentrations and the nature and location of the surfactant. Specifically, it was observed that working at 70°C, with low concentrations of policosanol and COL-PEG 600, using Span 80 in the organic phase and prolonged stirring at 50°C resulted in smaller and more homogeneous nanoparticles. This behavior is related to the decrease in viscosity of the system, which facilitates the diffusion of the organic solvent into the aqueous phase during nanoprecipitation, favoring a more efficient nucleation. In addition, the lipophilic character of Span 80, when dissolved together with policosanol in the organic phase, reduces interfacial tension and allows a controlled formation of small particles. In conclusion, this formulation of nanoparticle synthesis represents an effective alternative to improve the physicochemical properties of policosanol and thiacontanol, opening the possibility of its therapeutic application in the treatment of diseases such as cancer.

368-II-PP Efecto de la coadministración de estevia-lactoferrina bovina en un modelo de cáncer de colon murino

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Colon cancer is a global health issue, ranking third in incidence and first in mortality in Mexico in 2022. Currently, therapeutic approaches to combat it include colectomy and the administration of drugs such as 5-fluorouracil. However, these treatments can cause adverse effects and compromise the patients' immune response, which has driven the search for less aggressive alternatives. Nutraceuticals have gained relevance because they are naturally found in food, are not aggressive to the organism, and, when administered at doses higher than those present in natural products, can exert beneficial effects on health. For our study, we selected two nutraceuticals with anti-inflammatory, anticancer, and immunomodulatory properties: stevia (Stevia rebaudiana Bertoni) and bovine lactoferrin. Stevia regulates TNF-α and IL-1β cytokines, as well as Bax/Bcl-2 and p53 proteins, and independently modulates caspase-3, playing a key role in apoptosis and inflammation. Lactoferrin is a 77–80 kDa protein capable of reversibly binding ferric ions (Fe^{3+}); in addition, it can regulate cell growth and remove free radicals. It has also been shown to regulate the immune response through IFN-γ–dependent IL-18 production, caspase-1, and to induce apoptosis via IFN-γ and p53. In this study, we evaluated the effect of co-administration of stevia and lactoferrin in a colon cancer model induced in C57BL/6 mice by analyzing histological samples of the large intestine using hematoxylin–eosin staining and immunohistochemistry, as well as the percentage of $CD4^+$ T cells, $CD8^+$ T cells, and intracellular cytokines (IL-1β, IFN-γ, IL-4, IL-10, IL-6, and IL-18). Our results indicate that, in the experimental colon cancer model, we observed shortening of the large intestine, rectal bleeding, weight loss, damage to the colonic tract, polyps in the distal colon, and an increase in inflammatory cytokines. In contrast, in the control and stevia/lactoferrin-treated groups, no morphological changes were observed in the intestinal mucosa, the length of the large intestine remained unchanged, and no inflammation was detected. We conclude that the azoxymethane/DSS model induces damage to the colonic mucosa, while chronic administration of stevia and lactoferrin does not. However, further studies are required to elucidate the prophylactic and therapeutic mechanisms of stevia and lactoferrin co-administration in a murine colon cancer model.

370-II-PP Análisis de la expresión génica inducida por una molécula inmunomoduladora con potencial actividad adyuvante

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Adjuvant comes from the Latin “adyuvare”; meaning auxiliary or help. In Immunology, it is defined as a substance or component that improves the immunogenicity of a vaccine when administered to an individual together with vaccine antigen. Adjuvants are classified according to their function into immunostimulants and delivery systems. The former are characterized by the activation of cellular PRRs, which leads to an upregulation of the expression of cytokines and costimulatory molecules, resulting in enhanced costimulatory signaling. Delivery systems facilitate antigen presentation by prolonging their bioavailability. Triterpenes and their derivatives are natural compounds that exhibit interesting pharmacological activities, ranging from anti-inflammatory, anticancer, antioxidant, antiviral, among others. In this work, the ability of a triterpenoid molecule to induce proinflammatory genes is studied through a relative gene expression analysis. The genes studied were: the cellular receptors FXR, CD36, TGR5 and for the cytokines TNF-α, IL6, IL18 and IL1-β, in macrophage cells (J774 A.1) after treatment with a triterpenoid derivative. The murine macrophage cell line J774 A.1 was exposed to different concentrations (6.25, 12.5 and 25 µg/mL) of the triterpenoid molecule at different times (24 and 48 hours), subsequently RNA extraction was performed by the trizol method, followed by a qualitative RT-PCR, finally the data were analyzed by the comparative CT method (ΔΔCT). The statistical analysis included a 2-way ANOVA test with a p value < 0.01. The results show an increase in IL-6 and TNF-α production from a concentration of 6.25 µg/ml (subcytotoxic concentration) to 24 hours. In conclusion, the analyzed triterpenoid molecule induces the expression of proinflammatory cytokines in murine macrophage cells, showing promising activity as a potential adjuvant.

374-II-PO Arilos y harina de guamúchil (*Pithecellobium dulce*) como inhibidores de α-amilasa y α-glucosidasa

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Health problems related to type II diabetes mellitus have become a transcendental issue for public health in Mexico due to its increasing prevalence. One treatment alternative includes the use of acarbose, an inhibitor of intestinal glucosidases; however, it can have undesirable effects. Studies in vitro and in vivo models of concentrated extracts from the fruit of *Pithecellobium dulce*, which contain abundant secondary metabolites such as polyphenols, point to their ability to inhibit α-amylases and α-glucosidases. Therefore, this fruit could be an adjuvant alternative for the treatment of diabetes. Naturally, it is a seasonal fruit, so transforming it into flour could increase its market availability. The objective of this study was to characterize and compare the inhibitory effect of arils (PDA) and *Pithecellobium dulce* flour (PDF) on α-amylase and α-glucosidase. Therefore, PDF was prepared from the drying and grinding of PDA, a proximal chemical characterization was carried out, total dietary fiber, phenolic compound content (total phenols, anthocyanins and tannins), inhibition of α-amylase and α-glucosidase. The results showed modifications in the chemical composition of PDA when preparing PDF, decreasing the moisture content from 72.62 ± 2.45 to 13.28 ± 0.34 g / 100 g and tannins from 12.24 ± 1.51 to 8.37 ± 1.04 mg Eq catechin / 100 g; increasing ash from 0.70±0.02 to 2.57±0.09g/100g, protein from 0.31±0.01 to 1.14±0.05g/100g, ether extract from 0.23±0.01 to 0.84±0.03g/100g, carbohydrates from 26.13 to 82.16g/100g, total dietary fiber from 4.87±0.11 to 17.77±0.42g/100g and total anthocyanins from 537.81±13.57 to 604.87±15.9mg Eq cyanidin-3-glucoside; and without significant differences (p≤0.05) in the total phenol content with 4797.02±66.08 and 4709.09±135.36mg Eq gallic acid/100g respectively. In the inhibitory effect of methanolic extracts of PDA on α-amylase and α-glucosidase, an inhibition of 35.87% and 27.71% respectively was obtained, against 36.80 and 23.60% of PDF. In conclusion, PDF maintains the inhibitory capacity of PDA and presents improvements in its nutritional profile, which supports its potential as a functional alternative and viable strategy to expand the availability of this fruit as an adjuvant in the management of type II diabetes mellitus.

375-II-PV Efecto inmunológico de la coadministración en liposomas de curcumina-piperina en intestino delgado y a nivel sistémico de ratones

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Curcumin and piperine are natural compounds known for their multiple immune-modulating effects; they have been studied both together and separately in various conditions. A well-known limitation of oral curcumin administration is its low bioavailability. Previous research has demonstrated that coadministration of curcumin with piperine increases the bioavailability of curcumin, as has the use of nanoparticles such as liposomes. As part of preventive medicine and with the aim of finding strategies to strengthen the intestinal mucosal and systemic immune systems, we proposed the objective of this study to evaluate the humoral immune response at the systemic and intestinal mucosal levels following oral coadministration of curcumin-piperine liposomes. Liposomes loaded with curcumin (100 mg/kg) and piperine (20 mg/kg) were produced using the reverse-phase evaporation method. Five groups of male BALB/c mice were formed: control (CTL), empty liposomes (LV), curcumin-containing liposomes (LC), piperine-containing liposomes (LP), and curcumin-piperine liposomes (LCP). Treatments were administered orally for 7 and 14 days, and serum and small intestinal lavage samples were subsequently obtained. Sandwich ELISAs were performed to detect IgA, IgM, and IgG; absorbances were interpolated to standard curves to determine concentrations. Results showed an increase in intestinal and systemic IgA in the LC group at 7 days, and an increase in systemic IgA in the LP group at 7 days. Intestinal IgM concentrations decreased in all groups compared to the control group, while at the systemic level, there was an increase in the LV group at day 14.

Regarding serum IgG, the LV group showed an increase in concentrations on day 7, while local levels remained low in all groups. In conclusion, oral coadministration of curcumin and piperine in liposomes has no significant systemic or local effects on immunoglobulin modulation. While the individual compounds had better effects and showed activation of intestinal mucosal immunity and also a systemic response, this could strengthen the intestinal barrier and prevent disease.

378-II-PP Evaluación de la elicitación con MeJA y H_2O_2 sobre la proliferación celular de callos de *Lupinus bilineatus* para la potencial producción de alcaloides quinolizidínicos

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Lupinus bilineatus Benth. is a wild species endemic to Mexico, known for its ability to biosynthesise quinolizidine alkaloids (QAs), nitrogenous compounds with defensive functions against herbivores and pathogens. However, under in vitro culture conditions, the accumulation of secondary metabolites is affected, which has led to the use of elicitors as a strategy to reactivate metabolic pathways associated with biotic and abiotic stress. The present study aimed to analyse the effect of chemical elicitation on the proliferation and viability of *L. bilineatus* calli, as a preliminary model of a functional in vitro system for the subsequent induction and accumulation of QAs. The seeds were disinfected, scarified and germinated in MS basal medium free of regulators, achieving a germination rate of 96%. From the roots of 45-day-old seedlings, callogenesis was induced by supplementation with 0.5 mg/L kinetin and 1.0 mg/L 2,4-dichlorophenoxyacetic acid (2,4-D), achieving 85% callus induction, with 15% necrosis associated with phenolic oxidation. After a 40-day stabilisation period, viable calli were treated with methyl jasmonate (MeJA) and hydrogen peroxide (H_2O_2) at concentrations of 50, 150 and 250 µM. Dry biomass (DB) was determined and cell integrity was assessed by vital staining with methylene blue. Elicitation with H_2O_2 promoted a significant increase in DB (up to 1.0711 ± 0.1163 g), in contrast to treatments with MeJA (values between 0.8157 and 0.8388 g), with a positive correlation between cell viability and the degree of proliferation. The results obtained suggest that H_2O_2 acts as a positive modulator of cell proliferation in *L. bilineatus* callus cultures, constituting a strategic step in the optimisation of in vitro production systems for specialised metabolites.

383-II-PO Caracterización termo-óptica, por medio de técnicas fotoacústicas, de polículas biodegradables en base a almidón de yuca y goma gellan

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Pollution caused by the excessive use of plastics is leading to the extinction of various species worldwide, affecting our planet. This has sparked considerable interest in research into environmentally friendly materials, such as biodegradable plastics. Examples of these are polymer films made from starch, polyurethane and nanocellulose. The properties of these materials are determined by the proportion of their various components.

Two physical properties that determine the applicability of polymer films and are characteristic of their composition are thermal diffusivity and optical absorption coefficient. Thermal diffusivity determines their ability to transport heat, and for films such as those described, it is a measure of the crystallinity of the material, while absorption coefficients characterise the colour of the materials. The objective of this work was to use the self-normalised photoacoustic methodology reported in the literature to simultaneously determine the two aforementioned physical properties for polymer films with different proportions of blue aniline added. In this way, the optical absorption coefficient was determined at a wavelength of 660 nm as a function of the concentration of this organic pigment. The procedure consisted of recording the photoacoustic signals in the frontal and transmission configurations, in a modulation frequency range of 1 to 31 Hz, obtaining the self-normalised phase, and adjusting to the equations predicted by the applicable mathematical model. There are two limits: the thermal limit, for which only the thermal diffusivity of the material is obtained, and the optical limit, for which both physical properties are obtained.

One of these films, with an aniline content of 0.02 g, reached the thermal limit, obtaining a thermal diffusivity value of 0.0030 cm^2/s. The remaining films, with a lower aniline content, reached the optical limit. For these, the optical absorption coefficients were obtained. A linear relationship was demonstrated between this optical parameter and the amount of aniline, proving that Beer-Lambert's law is satisfied. This is a remarkable result, given that it is not possible to obtain these optical parameters using conventional spectroscopic techniques.

388-II-PV Evaluación histológica del ileón de ratones administrados con Stevia rebaudiana y expuestos a estrés crónico

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Stress activates the hypothalamic-pituitary-adrenal axis, which triggers the secretion of corticosterone, the main stress-mediating hormone. Chronic stress promotes morphological changes in the intestinal mucosa, both structurally and in terms of mucus quantity. Glycosides extracted from Stevia rebaudiana leaves, in addition to being natural sweeteners, have immunomodulatory and anti-inflammatory properties. Therefore, prophylactic oral administration of stevia could be an alternative for intestinal treatment in cases of chronic exposure to stress. To determine the effect of Stevia rebaudiana administration on the morphology of the distal small intestine in a murine model of chronic stress. Four groups of BALB/c mice were evaluated: control (CTL), stress (ER, movement restriction 1h/3d), stevia (ST), and stress+stevia (ER+ST). Steviol glycosides at 95% (12.5 mg/kg) were administered for 10 days prophylactically and therapeutically during stress. Serum corticosterone concentration was determined, and the morphology of the ileal mucosa was evaluated by light microscopy using histological sections stained with hematoxylin & eosin and Alcian blue.
An increase in corticosterone concentration was observed in the ER and ER+ST groups vs. CTL. Regarding villus morphology, the ER group vs. CTL showed a significant increase in villus width and leukocyte infiltrate, decreasing villus length and the number and size of goblet cells at the base and crest. However, when analyzing the ER+ST group compared to ER, serum corticosterone decreased, and with regard to morphological parameters, a decrease in villus width and leukocyte infiltrate number was observed, while villus length, goblet cell size, and number increased, remaining within normal values. These results indicate that prophylactic and therapeutic treatment with steviol glycosides suggests a possible protective effect on the morphology and cellularity of the ileal mucosa in a chronic stress model. However, further studies are needed to elucidate the protective and immunomodulatory mechanisms in the intestinal mucosa.

389-II-PO Intervención educativa a la persona adulta mayor para prevenir el evento cerebro vascular

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Cerebrovascular Accident (CVA) represents a significant challenge to the health of older adults, with prevention being a fundamental strategy to reduce its incidence and associated sequelae. Nursing-led health education interventions are an essential resource to improve adherence to recommendations, promote self-care, and modify risk factors in this population.
To implement nursing health education strategies for the prevention of CVA in older adults.
A qualitative study with an action-research approach was conducted over a four-week period. Two older adults (aged 67 and 65) with cardiovascular risk factors such as hypertension and diabetes participated. Pre- and post-intervention semi-structured interviews were applied and a program of three weekly educational sessions addressing: promotion of physical activity adapted to health conditions, monitoring and control of blood pressure and glucose, early identification of CVA warning signs for timely action, and dietary habit modification. Also, thematic data was analyzed and interpreted through the lens of Dorothea Orem's Self-Care Deficit Theory.
The initial assessment revealed limited knowledge about CVA, its causes, and risk factors, as well as irregular self-care practices and a low perception of personal risk. After the intervention, participants were able to accurately define CVA, identify specific risk factors such as (hypertension, cholesterol, sedentary lifestyle), and describe warning signs precisely.
They also incorporated consistent preventive practices such as regular blood pressure monitoring, adapted exercise, and dietary adjustments, accompanied by improved self-perception of health.
The findings of this qualitative action-research study should be considered as exploratory due to the small sample size. However, they indicate that personalized nursing-led educational interventions, grounded in Orem's theory, can produce tangible improvements in knowledge, attitudes, and preventive behaviors toward CVA, as well as in the perceived well-being of older adults with risk factors.

396-II-PP Estudio de la IL-36 y la proteína VHL en células mesangiales bajo condiciones de alta glucosa como posibles mecanismos moleculares en la producción de VEGF

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Diabetic nephropathy is one of the main complications of diabetes mellitus and is associated with alterations in the function of glomerular cells such as podocytes, endothelial cells, and mesangial cells. In this context, interleukin 36 (IL-36) and Von Hippel-Lindau protein (VHL) could play a key role in the regulation of vascular endothelial growth factor (VEGF), which is crucial for the function of endothelial cells. Increased VEGF has been associated with abnormal angiogenesis in the glomerulus, which could contribute to the progression of renal damage. This study aimed to investigate the possible molecular pathways used by mesangial cells for VEGF production" to understand their involvement in the pathogenesis of diabetic nephropathy. For this purpose, mesangial cells (MES SV40) were cultured in medium with high glucose concentrations. The IL-36, VHL, TGF-β, and VEGF expression were assessed by RT-PCR. Preliminary findings suggested that elevated glucose levels induce IL-36 expression at 24 hours, with a subsequent increase in VEGF expression observed at 25 hours in MES SV40 cells. At the same time, it was also observed that glucose induced TGF-β and VEGF expression, while VHLexpression decreased. These preliminary findings suggest that IL-36 and VHL play a role in regulating VEGF expression in SV40 MES cells at high glucose concentrations.

400-II-PP Silencing of PD-L1 by siRNA: A novel therapeutic horizon in triple-negative breast cancer

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Breast cancer is the most frequently diagnosed malignant neoplasm in women worldwide, with over 2 million new cases reported in 2020. Among its subtypes, triple-negative breast cancer (TNBC) is one of the most aggressive and has the poorest prognosis due to the lack of expression of hormonal receptors (ER, PR) and HER2, which limits current therapeutic options. In this context, immune checkpoints such as PD-1/PD-L1 have emerged as key therapeutic targets in oncology. PD-L1 (programmed death-ligand 1), often overexpressed in tumor cells, interacts with its receptor PD-1 on T lymphocytes, inhibiting their activation and allowing tumor immune evasion. In this study, small interfering RNAs (siRNAs) targeting PD-L1 were designed to block its expression and restore antitumor immune activity in TNBC. The bioinformatic design was carried out using the NCBI database to obtain the PD-L1 mRNA sequence in FASTA format. Clustal Omega was used for sequence alignment and conservation analysis, siRNA Wizard v3.1 was used for effective siRNA prediction, and RNAfold WebServer was employed to evaluate the secondary structure of PD-L1 mRNA to optimize target site accessibility. The selected siRNA was functionally evaluated in cell cultures using the MDA-MB-231 cell line, representative of TNBC. Transfection with PD-L1-specific siRNA resulted in a significant reduction in PD-L1 mRNA levels, as quantified by RT-qPCR. This downregulation suggests efficient gene silencing and a potential reversal of the immunosuppressive phenotype in tumor cells. These preliminary results support the use of siRNA as a novel and specific strategy to inhibit PD-L1 expression, positioning them as promising therapeutic candidates for the treatment of triple-negative breast cancer.

411-II-PO Síntesis total de los carbazoles naturales clausina I, clausenol, clausina G y 1,6- dihidroxicarbazol-3-carboxilato de metilo a partir de dienos exo-heterocíclicos derivados de N-aril-1,3-oxazolidin-2-onas

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The discovery of 9H-carbazole in the anthracene fraction of coal tar gave rise to carbazole chemistry. It has been shown that clausine I inhibit rabbit platelet aggregation induced by arachidonic acid, on the other hand, it has been reported that clausenol has antibiotic and antifungal activity. No biological activity has been reported for carbazoles clausine G and methyl 1,6-dihydroxycarbazole-3-carboxylate. However, only small quantities of these carbazoles are obtained from their natural sources, so it's been decided to develop a synthetic methodology to increase the yield to obtain these carbazoles. In this work, the application of exo-heterocyclic dienes derived from 2-oxazolidinones to the total synthesis of carbazoles clausine I, clausenol, clausine G and methyl 1,6-dihydroxycarbazole-3-carboxylate is described, extending the general scheme of the synthesis of carbazoles proposed by Tamariz et al. and verifying the great versatility that this synthesis route presents. In general, the corresponding diene was subjected to a Diels-Alder cycloaddition with acrolein and methyl acrylate to obtain cycloadducts, which were aromatized using DDQ. Subsequently, alkaline hydrolysis was carried out to obtain the corresponding diarylamines, which were subjected to a silylation process to protect the hydroxyl group. Subsequently, it was subjected to a Pd (II)-catalyzed oxidative cyclization to obtain the silylated carbazoles, which were deprotected using TBAF, thus obtaining clausine I and clausine G with overall yields of 27.3% and 18.7%, respectively. In the synthesis of clausenol, once the catalytic cyclization was carried out, it was subjected to a reduction of the aldehyde group and subsequently the deprotection of the hydroxyl group with TBAF was carried out, thus obtaining clausenol with an overall yield of 24.5%. For the synthesis of methyl 1,6-dihydroxycarbazole-3-carboxylate, a demethylation reaction was carried out on the silylated carbazole, obtaining this carbazole with an overall yield of 12.8%.

415-II-PP Análisis de la variación morfológica de *Pseudoxiphophorus jonesii* (Günther, 1874) entre poblaciones de la cuenca del Pánuco y la población tipo del lago Aljojuca

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Mexico is a country with highly varied topography, shaped by tectonic activity and orogenic processes that have occurred since the Miocene. This has led to geographic isolation and a vast diversity accompanied by taxonomic complexes that have yet to be resolved. Under this premise, the Poeciliidae family has played a prominent role in vicariance biogeography studies. *Pseudoxiphophorus jonesii* is a species with a well-known distribution, but which currently shows evidence of genetic groups within it, proposed in populations from the Pánuco basin. To confirm the presence of this species complex, parametric and non-parametric tests were conducted on variables measured at the body level and at the gonopodium level. Using specimens from the National Collection of Mexican Freshwater Fishes of the Escuela Nacional de Ciencias Biológicas-IPN (ENCB-IPN-P), 10 meristic and 14 morphometric characters associated with the body were recorded, along with 6 meristic and 4 morphometric characters at the gonopodium level, in 156 specimens. For the Pánuco populations, 55 females and 23 males were examined; for the Lake Aljojuca population, 43 females and 35 males were examined. The tests consisted of a Student's t-test for morphometric variables and a Mann–Whitney test for meristic variables. Additionally, a principal component analysis (PCA) and a multidimensional scaling analysis (MDS) were used. Significant differences were found in meristic variables for 80% of those associated with the body, while for the gonopodium differences were found in 4 of 6 variables. In morphometric variables associated with the body, 75% were significant, while for the gonopodia the analysis was significant for 2 of 4 variables.

418-II-PP El uso de miRNAs en la construcción de un biosensor para la detección oportuna del cáncer de próstata

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Prostate cancer represents one of the most prevalent malignancies in men, necessitating the development of innovative diagnostic tools for early detection. In this study, we analyzed the expression of miRNAs associated with key processes such as cellular proliferation, invasion, and metastasis in prostate cancer samples versus benign prostatic lesions. Our primary objective was to develop an optical biosensor capable of differentially detecting the expression of these miRNAs in both urine and prostatic tissue samples from both populations and to evaluate its diagnostic potential.

The methodology included miRNA expression profiling via RT-PCR in transurethral biopsy tissues and urine samples from patients diagnosed with prostate cancer (PCa). We identified miRNAs A and B as specific markers of carcinogenic processes. Using these miRNAs, an optical biosensor was designed by immobilizing sequence-specific anti-miRNA probes on covalently linked self-assembled monolayers deposited on a silicon substrate. Detection was performed using Fourier-transform infrared (FTIR) spectroscopy in attenuated total reflection (ATR) mode, with data processed via bioinformatics tools, including Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA).

Results demonstrated distinct miRNA expression levels in PCa samples compared to benign lesions across Gleason score grades, consistent in both tissue and urine. The biosensor exhibited sufficient sensitivity and specificity to differentiate malignant lesions based on their aggressiveness, establishing it as a novel, non-invasive, and promising diagnostic tool for early clinical management of prostate cancer.

425-II-PP El estradiol reduce la secreción de las proteínas de choque térmico inducidas por *Escherichia coli* en el tejido de la coriodecidua humana en condiciones in vitro.

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Several studies have established that during pregnancy, *Escherichia coli* (*E. coli*) promotes extracellular secretion of heat shock proteins (eHsp), which have been detected in human fetal membranes (HFM) and placental tissue. eHsp have been associated with the development of chorioamnionitis and premature birth. Experimental evidence has shown that estradiol (E2) reduces the secretion of eHsp and IL-1β; however, it has not been established whether this hormone can reduce the inflammatory response, induced by *E. coli,* in human choriodecidual (HCD) tissue.

To determine whether estradiol decreases the secretion of heat shock proteins produced by human choriodecidual tissue after stimulation with *E. coli* under in vitro conditions.

Four HFM were obtained by scheduled cesarean section at term, without infections or active labor and mounted in a Transwell system. HCD were incubated with E2 ($2.5x10^{-7}$ M) for three hours and subsequently stimulated with *E. coli* (10^2 and 10^6 CFU/ml) for 3, 6, and 24 hours. At the end of each time interval, the culture medium was recovered and the secretion of eHsp-60 and eHsp-70 were determined by ELISA. The data of each stimulation condition was analyzed by ANOVA followed by the Tukey's test. A p-value of less than 0.05 was considered statistically significant.

When HCD were stimulated with *E. coli* (10^2 and 10^6 CFU/mL) for 3, 6 and 24 hours, we observed a dose-response increase in the secretion of eHsp-60 and eHsp-70. Simultaneous stimulation of *E. coli* and E2 significantly reduced the secretion of eHsp-60 and eHsp-70 compared to the group stimulated only with 10^2 CFU/mL of *E. coli*.

E2 reduces the secretion of eHsp-60 induced by *Escherichia coli*.

441-II-PP Ácido Elágico regula la expresión del RNAm de Fto, vía Tnf-Nfkb1-Nlrp en hígado y tejido adiposo de rata wistar con obesidad inducida por dieta

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Obese adipose tissue releases proinflammatory cytokines, leading to inflammation and non-alcoholic fatty liver disease (NAFLD), which affects 30% of the world's population. Polyphenols are important components of functional foods, and their regular consumption has been associated with anti-inflammatory effects. Ellagic acid (EA) is a polyphenol, and studies in animal models suggest the use of EA for the treatment of inflammation and NAFLD. The fat mass and obesity-associated gene (FTO) is the gene for demethylase for N6-methyladenosine (m6A) and is a leading candidate for contributing to the development of NAFLD.

In this study, we propose that EA modulates Fto activity not only through its actions on m6A, but also through the depletion of Fto mRNA, which must be mediated by the action of Stat3.

The primary objective of this study is to evaluate the expression of Fto, Nlrp3, Tnf, Nfkb1, Stat3, and Gsdmd inflammasome mRNAs.

A bioinformatic analysis of RNA and miRNA interaction networks was performed. Eighteen male Wistar rats were randomly assigned to three groups: standard diet (SANO), high-fat and fructose diet (HFD), and high-fat and fructose diet with ellagic acid (HFD+EA). A daily intragastric dose of 50 mg/kg of EA was administered. Retroperitoneal and hepatic adipose tissue was obtained, total RNA was isolated, cDNA synthesis was performed, and the expression of Fto, Nlrp3, Il-1β, Il-18, Tnf, Nfkb1, Stat3, and Gsdmd mRNAs were evaluated by qPCR.

Comparing the DAGF and DAGF+EA groups, the DAGF+EA group showed reduced mRNA expression of Fto, the inflammasome Nlrp3, Tnf, Nfkb1, and Stat3. An interaction network of the expressions of the genes Fto, Nlrp3, Il1b, Il18, Casp1, Tnf, Nfkb1, Stat3, and Gsdmd was obtained.

EA downregulates the transcription of Nlrp3, Tnf, Nfkb1, Stat3, and Gsdmd in Wistar rat adipose and liver tissue. EA may have therapeutic effects against NAFLD.

442-II-PP Reposicionamiento de fármacos con potencial anticáncer: análisis de la actividad anti-HER2 en cáncer de mama

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Drug repurposing involves assigning new therapeutic uses to drugs approved by the FDA (Food and Drug Administration). On the other hand, breast cancer is the leading cause of cancer death in women worldwide, where the HER2+ type represents 15-20% of cases.
The aim of this study was to analyze the in vitro antitumor activity of six repositioned drugs (designated A - F) identified through computational molecular dynamics techniques to inhibit the HER2 receptor.
Cell viability was determined by colorimetric assay (MTT) in HER2+ (BT-474 and SK-BR-3) and HER2- (MCF-7) breast cancer cell lines treated with the drugs, and their half-maximal inhibitory concentration (IC50) was calculated. Lapatinib was used as a reference drug. Western Blot was performed to analyze the inhibition of HER2 phosphorylation and its downstream signaling proteins (Akt and ERK1/2), as well as the expression levels of apoptosis-related proteins (Bad, Bax, Bcl-2, caspase 8 and 3). Flow cytometry was used to determine the percentage of cell death induced.
MTT assay data revealed that drug A exhibited the best potential to inhibit cell proliferation in HER2+ lines, with IC50 values of 6.1 µM in BT-474 and 3.9 µM in SK-BR-3, approximately 2- and 5-fold higher than Lapatinib (2.86 and 0.73 µM, respectively), however, in the HER2- line the IC50 of drug A and Lapatinib was significantly higher with 10.31 and 15.9 µM, respectively. On the other hand, Western Blot analysis showed the lack of inhibition of HER2 phosphorylation by all six drugs as well as Akt and ERK1/2 in HER2+ lines. It was demonstrated that drug A induces apoptosis, even though it was observed a decrease in the expression levels of apoptosis-related proteins such as Bad, Bax and Caspase 3.
In conclusion, only drug A demonstrated antitumor efficacy through apoptosis induction, independently of HER2 inhibition and downstream signaling pathway, suggesting the involvement of an alternative molecular mechanism that requires further investigation to be elucidated.

448-II-PP Nanoestructuras como sistemas de liberación de fármacos anticancerígenos, post-tratamiento a tumorectomía

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In Mexico, breast cancer is the leading cause of death in women. In surgeries to remove cancer, there are lumpectomy and mastectomy. According to these procedures, studies indicate that patients who undergo lumpectomy have a slightly higher risk of breast cancer recurrence, with a 15% probability compared to 6% for patients who undergo mastectomy over the course of their lifetime. The risk of malignant tumor recurrence is mainly due to the lack of complete removal of damaged cells during the progression of the cancer, which causes them to continue developing within the breast, putting the patient's health at risk. However, invasive treatments such as mastectomy ultimately generate a higher risk of bacterial infections during surgery and permanent damage to women's emotional health. Therefore, it is necessary to implement post-surgical methods for carcinoma removal based on biocompatible materials capable of releasing active compounds with an anticancer profile responsible for attacking harmful cells without the need for complete breast removal. Electrospun nanofibers have emerged as leading biomaterials for drug delivery due to their high surface area, which allows broad-spectrum drugs to be encapsulated within their fibrous structure. They are manufactured from bioabsorbable and biocompatible polymers that maintain sustained release kinetics and controllable bioadsorption, which could facilitate the development of long-lasting dressings in contact with breast cells after surgery. This paper explores advances in the design, functionalization, and preclinical evaluation of nanofibers loaded with anticancer compounds for the treatment of harmful cells. As a result, multiple fibrous systems have provided a localized and sustained release profile, for example, PLA/PEG/Fe3O4 fibers showed a 5-fluorouracil release of 99% and an anticancer activity of 78%, while PVA/PCL nanofibers released 80% of the active compound (DOX) up to 480 h under physiological pH with a mortality rate of 57% for breast cancer cells; on the other hand, PCL-PIP fibers showed an ability to induce apoptosis in MCF-7 and 4T1 breast tumor cells, reducing their formation. Therefore, post-surgical nanofiber treatments for breast cancer represent an innovation that still requires technologies such as the incorporation of magnetic nanoparticles or precise functionalization in pH-sensitive design to improve localization and reduce adverse effects. It is necessary to develop smarter systems that respond to multiple stimuli from the tumor microenvironment and enable scalable and reproducible production for real-world applications in oncology.

452-II-PO Análisis conformacional y configuracional del α-isopipitzol y el nuevo epímero inverso obtenido desde la ciclación de la perezona catalizada por $FeCl_3$

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Perezone (1) was the first natural product to be isolated in the New World and has since been extensively studied in both chemical and pharmaceutical contexts. Thermal cycloaddition reactions, which convert perezone into α- and β-pipitzol isomers, along with the use of various catalysts, have been well documented. Given this, continuing to investigate the reactivity of 1 is important. To this end, its intramolecular cycloaddition catalyzed by $FeCl_3$ is explored.

This reaction has been previously reported in the formation of natural products and the synthesis of novel bioactive compounds from metabolites bearing homoprenyl and homogeranyl moieties.

In this work, we present the conformational analysis of α-isopipitzol (2) and its previously unreported inverse epimer 3a,7,8a-epi-isopipitzol (3), which are products of the $FeCl_3$-catalyzed cycloaddition reaction of perezone, based on the measurement and calculation of their coupling constants (^3J). Additionally, the absolute configurations of compounds 2
and 3 was assigned using vibrational circular dichroism (VCD) spectroscopy, with special emphasis on the exciton chirality method developed by Kenji Monde and collaborators. This method establishes a relationship between the angle formed by two carbonyl groups and the shape of the resulting bisignate curve in the VCD spectrum.

Comparison of the calculated and experimental 3 J indicates that compounds 2 and 3 exist predominantly as two major conformations in solution, with ratios of approximately 97:3 and 89:11, respectively.

Absolute configuration of 2 and 3 was confirmed as 3R,3aS,7R,8aS and 3R,3aR,7S,8aR, respectively, by the exciton chirality approach.

453-II-PO Diversidad taxonómica y filogenética de los peces dulceacuícolas de América Media

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Biological diversity can be broken down into different hierarchical levels and organizational scales. Among the most common estimators are α-diversity, which represents species richness at the local scale within a community or specific area, and β-diversity, which reflects differences in species composition between communities.

In this study, we analyzed the α- and β-diversity of freshwater fishes in Middle America from both taxonomic and phylogenetic perspectives, with the objective of evaluating species variability and the spatial patterns of distribution, turnover, and nestedness. To this end, data from 680 species distributed across level 4 and 5 hydrographic basins, delimited according to the Pfafstetter system, were compiled to generate presence–absence matrices.

Taxonomic α-diversity was estimated as species richness, while phylogenetic α-diversity was evaluated using three indices: Phylogenetic Diversity (PD), which quantifies the sum of branch lengths in a phylogenetic tree; Net Relatedness Index (NRI), which measures the average phylogenetic relatedness among species; and Nearest Taxon Index (NTI), which emphasizes more terminal phylogenetic relationships. β-diversity was calculated with the Sørensen index (βsor), which was further partitioned into turnover (βsim) and nestedness (βnes).

The results show that PD and NRI presented positive values in northeastern and central Mexico, indicating phylogenetic clustering possibly associated with environmental filtering. In contrast, southeastern Mexico and Central America exhibited negative values, reflecting phylogenetic overdispersion, i.e., communities formed by evolutionarily distant lineages. Likewise, NTI was mostly negative across the region, suggesting that community structure is influenced by the coexistence of terminally divergent species.

Regarding β-diversity, the taxonomic component showed medium turnover values and low nestedness, indicating moderate species replacement among basins without clearly nested communities. In contrast, phylogenetic β-diversity displayed low values in both components, reflecting high evolutionary similarity among communities.

454-II-PP Evaluación de pH, gas y residuo no fermentado como indicadores de fermentabilidad colónica *in vitro* de harina de plátano y agavinas con inoculo fecal de personas físicamente activas y sedentarias

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Gut microbiota can be modified by a variety of factors including physical activity. Although the impact of physical activity on the microbiota has been little explored, current evidence points to a bidirectional relationship between microbiota, sports performance and exercise intensity. Moderate exercise can diversify the microbiota, whereas strenuous exercise and ergogenic aids can cause dysbiosis. Banana flour (BP) and agavins (AGA) have demonstrated their prebiotic potential, as well as positive effects on cholesterol, triglycerides and serum glucose.
However, there is still little evidence of the use of dietary fibers to regulate dysbiosis associated with intense physical activity To evaluate in an in vitro system colonic fermentation parameter of soluble fibers with fecal inoculum from sedentary and physically active people. Fecal samples were collected as inoculum for in vitro colonic fermentation from physically active population (PFA) (n=7, regular recreational exercise: Monday to Friday) and sedentary individuals (SED) (n=6). Samples of HP and AGA were used as fermentable substrate (Martín-Carrón and Goñi,1999). pH, gas and unfermented residue (RNF) were measured as indirect indicators of microbial activity and diversity. After 12h of fermentation, pH decreased in both populations; however, at the end of fermentation (48 h) it was observed that the decrease in pH was greater for AGA. The decrease in pH was positively related to gas production, in the AGA more gas production was observed with respect to the HP, in a shorter time. The RNF value was higher in the HP than in the AGA, in both populations, indicating a lower fermentability. These indicators may suggest that PFA are more fermentable than HP, due to their structural differences; and in the SED population there could be a higher microbial load, associated with an increase in gas production in less time. Although the exact type of bacteria present was not identified, it is possible to suggest that there are differences between the microbiota of both populations (PFA and SED).

455-II-PP Análisis comparativo de expresión de transcritos asociados al complejo m6A en líquido seminal de individuos con distinto IMC

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La subfertilidad masculina representa un problema creciente de salud y la obesidad se reconoce como un factor clave que altera el eje hipotálamo-hipófisis-gónada y la función espermática.
La metilación epitranscriptómica N6-Metiladenosina (m6A), modula la expresión de mRNAs y media su estabilidad y traducción. El complejo m6A, agrupa genes y proteínas como metiltransferasas METTL3; METTL14, desmetilasas como FTO; ALKBH5 y proteínas lectoras de grupos metilo YTDHC1; ZC3H13. Estas proteínas, mantienen la homeostasis metabólica en la espermatogénesis.
El Índice de Masa Corporal (IMC) es una variable ampliamente estudiada y define apoyado de otros datos antropométricos, los grados de peso corporal y de obesidad. Se ha demostrado que un aumento de IMC altera los parámetros espermáticos asociados a subfertilidad y los perfiles de expresión a nivel de mRNAs.
En este estudio, nos propusimos cuantificar la expresión relativa de mRNAs de genes codificantes de metiltransferasas (METTL3, METTL14,) desmetilasas (FTO; ALKBH5) y proteínas lectoras de grupos metilo (YTDHC1; ZC3H13) dentro del complejo m6A en líquido seminal de hombres con distinto IMC.
Para ello, se incluyeron 60 hombres de 25–45 años, distribuidos en grupos de 20 a los que se le registraron las medidas antropométricas (IMC-ICC). Se evaluaron los parámetros convencionales de calidad espermática. Posteriormente, se extrajo RNA total, se sintetizó el cDNA y se realizó RT-qPCR para analizar la expresión relativa de genes del complejo m6A y su relación con características seminales.
Se realizaron los cálculos de expresión relativa de los mRNAs asociados al complejo m6A y los datos estadísticos se analizaron en el programa SPSS mediante prueba de rangos con signo de Wilcoxon donde $p<0.005$ se considera estadísticamente significativa.
Los resultados obtenidos, demuestran la relación del IMC y cómo su aumento afecta la expresión de transcritos asociados al complejo N6-Metiladenosina en líquido seminal de hombres con distintos grados de peso corporal.

458-II-PO Nivel de conocimientos sobre los síndromes hipertensivos del embarazo en el personal de enfermería

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The lack of compliance with international indicators regarding maternal health such as the diagnosis of certian pathologuies that are part of hypertensive disorders of pregnancy and the presence of risk factors whitin the mexican population, wich has inherent characteristics that increase likelihood of complications during pregnancy, have led current laws to focus on mandatory training at both public and private levels. This training aims to ensure proper care for pregnant women through the continuous education of nursing professionals responsable for attending to this highly vulnerable population. To determine the degree of knowledge of nursing personnel about hypertensive syndromes of pregnancy in a second level hospital in the areas of gynecology, obstetrics and toco-surgery. Quantitative, non-experimental, descriptive, cross-sectional research in 58 nursing professionals in the aforementioned areas to obtain a confidence level of 95%, a error of 5%. It was found that the nursing staff has insufficient and moderate knowledge about SHE, with predominant deficiencies in the recommendations to pregnant women with risk factors, alarm signs and symptoms, in the actions in suspected SHE and in the evaluation of patients with magnesium sulfate. Although SHE is a frequent entity in the Mexican population, risk factors, alarm data and nursing interventions are not identified. Implications: Ongoing evaluation of SHE identifies areas of opportunity in pregnancy care.

468-II-PV Genetic and in silico modeling insights into BabA from disease-associated Helicobacter pylori strains

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Helicobacter pylori infects nearly half of the global population, adhering to the gastric mucosa primarily through the interaction between its BabA adhesin and the host's Lewis b antigen. We analyzed 730 babA genes extracted from 1,012 high-fidelity H. pylori genomes associated with non-atrophic gastritis (NAG), intestinal metaplasia (IM), and gastric cancer (GC). Clustering analyses of babA gene sequences were performed, and linear discriminant analysis suggested the existence of disease-specific babA variants. The complete three-dimensional structure of BabA was modeled from reference strains 26695 and J99, as well as from NAG-, IM-, and GC-associated strains, revealing a previously uncharacterized β-sheet transmembrane barrel. Changes were observed in amino acid residues involved in Lewis b binding, which may underlie strain-specific pathogenicity. Furthermore, a computational protocol was designed to ensure the equilibrium of BabA conformation during molecular dynamics simulations.

471-II-PP Evaluación de geles a base de celulosa bacteriana y fructanos de agave para su uso como andamio

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Actualmente, la celulosa bacteriana ha surgido como un material con gran variedad de aplicaciones biomédicas, principalmente en desarrollo de andamios, debido a su alta biocompatibilidad y estabilidad. Sin embargo, la celulosa bacteriana conforma un material que tiende a colapsar, esto debido a que es material suave, inestable y frágil, por lo que ha sido mezclada con otros componentes como proteínas o polisacáridos para mejorar su estabilidad en aplicaciones biomédicas. Una alternativa para emplear en esta técnica, son los fructanos de agave (Agave angustifolia Haw) para mejorar aún más su potencial en aplicaciones biomédicas, como sus propiedades mecánicas, químicas y físicas, así como su capacidad para interactuar con células y tejidos. En el presente estudio se evaluó el uso de celulosa bacteriana (CB) funcionalizada con agavinas AG (Agave angustifolia Haw) y ácido hialurónico (AH) para su uso como andamios (geles) biomédicos. Inicialmente, la celulosa bacteriana (CB) fue sometida a 2 procesos de purificación con hidróxido de sodio e hipoclorito de sodio que redujeron significativamente residuos bacterianos, generando un material base homogéneo y estable, lo cual se pudo confirmar mediante microscopía óptica y electrónica mostrando una superficie libre de residuos que pudieran interferir en la generación e interacción en el gel, posteriormente se analizó la estabilidad térmica de la muestra mediante termogravimetría (TGA) y calorimetría diferencial (DSC), se reveló un aumento en la temperatura de descomposición inicial (>150 °C). El análisis reológico de los geles mediante barridos oscilatorios a 37 °C demostró que en todas las formulaciones el módulo de almacenamiento (G´) fue superior al módulo de pérdida (G´´), con valores de tan δ menor a 1 (gel estable), en específico formulaciones con concentraciones (1 % CB, 1 % AH, 3 % AG), lo que indica un comportamiento predominantemente viscoelástico y apto para aplicación como un gel estable adecuado para andamios.

474-II-PP Evaluación *in vivo* del potencial antidepresivo del extracto de Rubus fruticosus L

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Depression is a neuropsychiatric disorder that significantly affects quality of life and is associated with increased brain oxidative stress. In the search for natural treatments, the Rubus genus, particularly Rubus fruticosus L. (blackberry), has attracted attention due to its richness in bioactive compounds such as polyphenols and flavonoids, recognized for their antioxidant and neuroprotective properties. In this study, the antidepressant effect of the methanolic extract of R. fruticosus was evaluated using an in vivo model. To this end, the extract was prepared, and its qualitative and quantitative phytochemical characterization was performed, in addition to determining its antioxidant capacity by UV-VIS spectrophotometry. Rodents of the CD-1 strain were divided into three groups: one treated with the extract, another control with vehicle, and a positive control with reference drugs, administered orally for 12 consecutive days. The antidepressant effect was assessed using the chronic forced swim test, which quantifies immobility time and locomotor activity, indicators of depressive behavior. Phytochemical analyses confirmed the abundance of potentially pharmacological bioactive compounds, while behavioral results showed a significant reduction in immobility time in animals treated with the extract, with no alteration in locomotion observed, thus suggesting an antidepressant effect comparable to that of standard drugs. In conclusion, Rubus fruticosus L. extract exhibits a potential antidepressant effect in vivo, probably mediated by its antioxidant activity. This opens the possibility of using it as a natural alternative for the management of depressive disorders and encourages the development of safe and effective phytopharmaceuticals.

480-II-PP Kale (Brassica oleracea var. sabellica): Un vegetal con doble mecanismo prebiótico mediado por fibra dietética y polifenoles

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Functional foods that have prebiotic activity are essential to promote the prevalence of beneficial bacteria such as Lactobacillus spp. (Gibson and Roberfroid 1995). An exceptional candidate that has emerged importantly is kale (Brassica oleracea var. sabellica), which combines bioactive compounds such as polyphenols and insoluble dietary fiber. These compounds have a synergistic effect to promote bacterial growth (Kaulmann et al. 2019). This study aims to demonstrate the prebiotic effect of kale via two pathways (Gibson and Roberfroid 1995). The fiber as a matrix serves as a fermentable substrate while the polyphenols, which are soluble, favor the viability of bacteria, strengthening its position as a functional food. Methodology: The prebiotic effect was evaluated by the growth kinetics of the Lactobacillus spp. Consortium in: 1. kale powder (1% in MRS) same which preserves dietary fiber (Park et al. 2022). 2. kale aqueous extract (870 mg polyphenols/100g, which Folin-Ciocalteu quantified) (0.2, 0.4, and 0.6%). MRS with bacteria and MRS were taken as controls. OD620 was measured every 2 h for 48 h (Gómez et al. 2021). The kale powder (1%) maintained bacterial growth for 48 h, achieving an optical density 25% higher than the control ($p<0.01$), which is attributed to the presence of insoluble dietary fiber (Holscher 2017). The aqueous extract (0.4%) decreased the lag phase by 40% compared to the control ($p<0.05$), correlating with the high polyphenol content. Both treatments validated the prebiotic activity of kale, although in different routes: prolonged viability enhanced by dietary fiber and growth acceleration caused by polyphenols (Terpou et al. 2023). Kale is a functional food with a dual prebiotic mechanism: its insoluble dietary fiber optimizes bacterial fermentation, while its soluble polyphenols favor microbial viability. These findings support the use of kale in products that are designed for the modulation of the intestinal microbiota, making it a vegetable that stands out among others.

490-II-PO Expresión de marcadores de entrenamiento inmune en linfocitos T gamma delta (gd)y células asesinas naturales (NK) de pacientes con espondiloartritis

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Spondyloarthritis (SpA), are a group of chronic autoinflammatory rheumatic diseases that share genetic and clinical characteristics with prevalence of 0.6% in Mexico. They have been related to bacterial infections. It has been reported that 60% of patients with SpA present intestinal inflammation, which could be a key pathophysiological factor of the disease. The interactions between the intestinal microbiota and the immune system of the patients leads to alteration of the intestinal barrier, activation and abnormal migration of innate immune cells such as lymphocytes T gd and intestinal resident NK cells, which could be deposited in the joints of these patients. Considering the relationship with previous infections, together with enhancing factors such as mechanical stress, these may be recognized as key events in the development and maintenance of the disease. Possibly these cells express a trained memory phenotype that explains their inflammatory response. Therefore, the expression of markers related to immune training, in addition to IL-17 and IL-22 production in lymphocytes Tab, T gd , NK and NKT cells from peripheral blood and synovial fluid of patients with SpA was evaluated by spectral cytometry. We enrolled 6 patients, with HLA-B27 (100%), time of evolution (9±7.1 years), ASDAS-CRP (3.4±1.7) CRP (19.7±9.8), ESR (36.8±35.5), as well as 6 healthy controls. Significant differences were found in the percentages of total T gd lymphocytes producing IL-17 (P=0.0453), frequency of total T gd lymphocytes CD161+ (P=<0.0001), frequency of total T gd lymphocytes a4b7+ IL-17(P=0.0411), frequency of total T gd lymphocytes a4b7+ CD161+ (P=<0. 0001), frequency of total T gd lymphocytes a4b7+ CD27- (P=<0.0260), frequency of total T gd lymphocytes a4b7+ CD45RO- (P=<0.0431), total Tab CD161+ (P=<0.0416), frequency of total NK cells CD161+ (P=0.0167), frequency of total NK cells a4b7+ CD161+ (P=<0.056). In addition, with the combined use of analysis tools for flow cytometry such as t-SNE (Stochastic neighbor embedding with t-distribution) and FlowSOM (self-organizing maps of flow cytometry data) allowed the discovery of rare populations not evident by manual selection of conventional regions.

496-II-PO Incremento de la estabilidad térmica y afinidad de leptina recombinante: un enfoque para la aplicación farmacéutica

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The function of proteins depends on their specific three-dimensional structure, called the native structure. This structure can be altered by changes in ionic strength, pH, or temperature. Leptin is a protein hormone that generates anorexigenic effects by increasing energy expenditure and appetite satiety. The structure of leptin consists of four antiparallel a- helices that form a simple knotted loop topology. The effects of leptin are conditioned by its interaction with its cell receptor. In this work, leptin variants were designed to improve both thermostability and affinity for its receptor. Amino acid substitutions in the leptin sequence were predicted to improve the stability of the leptin-receptor complex with BeAtMuSiC. We then confirmed the binding affinity of the complex with the different substitutions in FoldX. We selected four leptin variants that increased the binding affinity for its receptor by 4 (D79I), 10 (D79F), 22 (D9F) and 65 (D79W) times compared to wild-type leptin. The selected variants were produced by recombinant engineering in a heterologous system (E. coli strain C41) using 2Xyt medium and purified to homogeneity by binding and ion exchange chromatography. We confirmed that point amino acid substitutions do not modify the secondary structure, as judged by the circular dichroism signal. Thermal unfolding transitions (from 25 to 85 °C) evaluated by circular dichroism at 222 nm indicate that three of the purified variants showed average unfolding temperatures of 68.5 (D79W), 65.8 (D79F) and 66.8°C (D9F), making them more thermostable than wild-type leptin (W100E, 62 °C). The point substitution of a negatively charged amino acid for a hydrophobic one within the binding interface of the leptin-ObR complex improves the stability and affinity of the complex without inducing significant structural changes in the leptin structure, while the D79W variant showed greater thermostability. These findings are relevant in pharmaceutical applications because they give rise to a new method for generating more stable drugs with a longer shelf life and greater product stability to thermal changes, and with greater affinity because they improve interaction with their receptor.

503-II-PP Actividad anti-inflamatoria de extractos de Azadirachta indica in vitro

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Chronic diseases present various inflammatory disorders, which are considered a global health issue. Conventional treatments such as non-steroidal anti-inflammatory drugs (NSAIDs) and corticosteroids are effective; however, prolonged use can cause adverse side effects. Due to this, the search for natural therapeutic alternatives is on the rise, such as the use of medicinal plants. Azadirachta indica, belonging to the Meliaceae family, has demonstrated therapeutic properties in various pathogenic models; previous studies have reported that wild plants of this species exhibit anti-inflammatory activity. Therefore, this work aims to verify whether in vitro cultivated seedlings exhibit this activity. Seeds of A. indica were collected, disinfected, and germinated in MS media (4.4 g/L), supplemented with sucrose (3% p/v) and phytagel (0.25% p/v), under a photoperiod of 16h light/8h dark at 25°C. Three-month-old seedlings were collected, lyophilized, and subjected to extraction with solvents of increasing polarity, which were then concentrated. The extracts were applied in a murine model (n=6) of TPA-induced ear edema (2.5 µg), compared with dexamethasone as a positive control. The inhibition of edema was evaluated and the effective dose 50 (ED50) of the most active extract was determined. The results showed that all extracts, except for the methanol one, exhibited anti-inflammatory effects in the following order: EH>EAc>DX>EAE. The hexane extract (EH) was the most effective, with an inhibition of 81.94%, surpassing the positive control (49.44%), and an ED50 of 65.5 mg/kg. The aqueous extract (EAc) also showed an effect comparable to that of dexamethasone (DX) with 52.77%, while the ethyl acetate extract (EAE) reached an inhibition of 27.77%. In conclusion, the extracts of A. indica seedlings cultivated in vitro exhibit significant anti-inflammatory activity, highlighting that the hexane extract may be a promising alternative and in vitro cultivation as a sustainable source of metabolites with therapeutic potential against inflammation.

504-II-PP Validación del cuestionario del comedor emocional en población mexicana con sobrepeso y obesidad

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Negative emotions and persistent stress can lead to abnormal compensatory behaviors, known as emotional eating (EE). However, there is a gap in research aimed at validating EE questionnaires in specific populations.
To validate the Emotional Eating Questionnaire (EEQ) in Mexican adults with overweight and obesity. This is a clinimetric study. Sedentary patients aged 18 to 60 years with overweight or obesity were included. The study consisted of three phases: a Delphi panel to validate content, administration of the EEQ to a sample of at least 300 patients, and repetition of the EEQ in 15% of the sample to assess test–retest reliability. Criterion validity was evaluated using confirmatory factor analysis (CFA). The CFA model fit was assessed, internal consistency was measured using Cronbach's alpha and Dillon–Goldstein's rho, and test–retest reliability was determined using the intraclass correlation coefficient (ICC).
A total of 508 patients were recruited (123 (24.2%) men and 385 (75.8%) women; mean age 44.5 years, standard deviation 10.6). The mean BMI was 32.5 (range 27.0–59.3). The Delphi panel validated the content in two rounds. The CFA showed excellent model fit. Internal consistency was adequate (Cronbach's alpha 0.822, Dillon–Goldstein's rho 0.863). Test–retest reliability was acceptable (ICC 0.60) in 78 reassessed patients (18 (23.1%) men and 60 (76.1%) women; mean BMI 33.3, standard deviation 5.8).
The EEQ proved to be reliable and valid for assessing EE in Mexican adults with overweight and obesity, standing out for its simplicity and ease of use in patients.

506-II-PO Síntesis de carbazoles naturales C_{13} y C_{18}

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Natural C_{13} and C_{18} carbazoles are a class of alkaloids with noteworthy biological properties, including antituberculosis, neuroprotective, and enzyme-inhibitory activity related to neurodegenerative diseases and cancer. Compounds such as 3-formyl-6-methoxycarbazole, methyl 6-methoxycarbazole-3-carboxylate, and clausena Z have demonstrated such effects in various studies. However, their therapeutic potential has been limited due to their extremely low concentrations in plant sources. For instance, claulansine M has been isolated in only 1.6 mg from 200 kg of *Clausena lansium* stems (yield of 8×10^{-7}%), while 1.3 mg of 3-formyl-6-methoxycarbazole was obtained from 12 kg of leaves of the same species (1×10^{-5} %). Similarly, clausena Z was extracted from Clausena excavata with a yield of 0.0024 %, methyl 6-methoxycarbazole-3-carboxylate from *C. lansium* with 9×10^{-5}%, and 1-hydroxy-3-methylcarbazole from *Murraya koenigii* with 0.0015%.

To address this limitation, the present work proposes an efficient and reproducible synthetic route for the preparation of these carbazoles in the laboratory. The strategy is based on a methodology developed by Tamariz and collaborators in 1997 and involves four key steps: a regioselective Diels–Alder cycloaddition between exo-heterocyclic dienes derived from N-aryl-4,5-dimethylene-1,3-oxazolidin-2-one and suitable dienophiles; aromatization of the resulting adducts to generate benzoxazolones; basic hydrolysis to form functionalized diarylamines; and a final oxidative cyclization catalyzed by Pd(II) through double C–H activation. This methodology stands out for its structural versatility, enabling the modification of substituents on both dienes and dienophiles, thus facilitating access to a broad range of natural and non-natural carbazoles.

Using this approach, five natural C13 carbazoles were successfully synthesized: clausena Z (6 steps, 20% yield), 3-formyl-6-methoxycarbazole (6 steps, 28%), methyl 6-methoxycarbazole-3-carboxylate (6 steps, 13%), and 1-hydroxy-3-methylcarbazole (7 steps, 17%). Additionally, the C_{18} carbazole claulansine M was obtained via two alternative routes: one comprising 8 steps (19%) and a more efficient 7-step route (26%). These results validate the methodology as a scalable and versatile platform for the development of bioactive carbazoles with potential pharmacological applications.

513-II-PP Validación de la fórmula de Martin para el cálculo del colesterol de lipoproteínas de baja densidad en la población pediátrica

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Obesity in children and adolescents has been associated with increased levels of total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C), showing a positive correlation with body mass index. Given that high LDL-C levels in early life can predispose individuals to cardiovascular complications in adulthood, monitoring these levels in children and adolescents is essential, especially in the Mexican context, where the prevalence of obesity continues to rise. In this context, Martin's formula has emerged as a more accurate alternative for estimating LDL levels, with successful validations in various populations. However, its applicability in Mexican schoolchildren and adolescents still needs to be validated. Pediatric participants aged 4 to 17 years were included and had their lipid profile quantified, which included LDL-C, TC, high-density lipoprotein cholesterol, and triglycerides, with all parameters expressed in mg/dL. Patients who did not meet the fasting requirement were excluded, as were those who had taken vitamin C or paracetamol. Blood samples were obtained after an 8- to 10-hour fast. Cholesterol, triglycerides, HDL-C, and LDL-C were measured in serum using the enzymatic colorimetric method. LDL-C was estimated using Martin's formula. Statistical analysis was performed using the intraclass correlation coefficient between LDL-C values obtained with Martin's equation and LDL values obtained by the reference method. We applied the equation to 224 pediatric participants, 114 (50.2%) of whom were female, with a mean age of 12 years. A concordance of 0.943 (0.926, 0.956) was found between the Martin equation and the LDL-C value obtained by the reference method in the pediatric population. The concordance between LDL-C estimated using the Martin equation and that obtained in the laboratory in Mexican schoolchildren and adolescents is excellent, supporting its use in clinical practice.

514-II-PP Efecto de la (-)-Epicatequina sobre los niveles de PDGFRα y la fibrosis en el diafragma del modelo murino *Sgcd* $^{-/-}$

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Muscular dystrophies (MD) are genetic diseases that progressively affect skeletal muscle, including the diaphragm. This disease is characterized by muscle atrophy, endomysial adipose tissue infiltration, and fibrosis. Fibroadipogenic receptors (FAPs) are a type of mesenchymal stem cells, characterized by expressing PDGFR-α on their surface, which actively participate in the processes of fibroadipogenesis in MD. Furthermore, treatment with (-)-Epicatechin (Epi) decreases fibrosis and improves muscle function in male *Sgcd* $^{-/-}$ mice. The objective of this project was to determine whether Epi reduces fibrosis by reducing the amount of FAPs in the *Sgcd* $^{-/-}$ mouse model. Thirty-six male mice, aged 12 weeks, were distributed into four groups: Wild + 0.01% DMSO vehicle, Wild + 1 mg/kg of Epi, *Sgcd* $^{-/-}$ + DMSO, and *Sgcd* $^{-/-}$ + Epi. After treatment, the diaphragm was removed for histological (n=12) and protein expression (n=24) analysis. Histological sections (10 µm thick) were stained with Hematoxylin-Eosin and Modified Gomori's Trichrome, and total proteins were extracted for Western blot to evaluate PDGFRα and Collagen-3. Proteins were detected by chemiluminescence. Histological analysis showed that *Sgcd* $^{-/-}$ mice treated with Epi had a lower percentage of fibrosis compared to untreated mice. Furthermore, PDGFR-α and collagen-3 protein levels decreased in *Sgcd* $^{-/-}$ mice treated with Epi compared to untreated mice. Treatment with Epi reduces fibrosis levels (collagen-3), which is associated with a decrease in FAPs (PDGFR-α) in the diaphragm of *Sgcd* $^{-/-}$ mice.

522-II-PP Efecto del flavanol (-)-Epicatequina sobre los niveles de proteínas miogénicas y en la vía de recambio de fibra en el músculo esquelético en un modelo murino de distrofia muscular *Sgcd* $^{-/-}$

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Muscular dystrophies are hereditary diseases that affect proteins with different functions in skeletal muscle, causing chronic damage. Because they have no cure, molecules such as (-)-Epicatechin have been studied. This improves functionality and decreases fibrosis in dystrophic muscle deficient in the delta-sarcoglycan protein (*Sgcd* $^{-/-}$). However, the mechanisms underlying the effect of (-)-Epicatechin and the influence of sex are still unknown, so (-)-Epicatechin was evaluated on the regeneration-repair pathway and fiber type replacement in the female *Sgcd* $^{-/-}$ murine model. 12-week-old female mice were used. They were divided into 4 groups of healthy and mutant female mice, untreated and treated with (-)-Epicatechin (1 mg/kg, n=3 for all groups). The myogenic proteins β-catenin, MyoD, and Myomaker, as well as the myosin heavy chain type I and IIb (MyHC) isoforms of the gastrocnemius muscle, were analyzed by Western blot. Treatment with (-)-Epicatechin reversed the levels of β-catenin, MyoD, and Myomaker in mutant females to values similar to those found in healthy, untreated mice. Regarding the fiber type replacement pathway, treatment with (-)-Epicatechin increased MyHC I and IIb to a greater extent in mutant females compared to their control counterparts, which had a higher prevalence of the IIb isoform. These results suggest that (-)-Epicatechin can maintain muscle regeneration levels in mutant female mice similar to those in healthy mice without treatment. Furthermore, it can induce the formation of type 1 and 2 fibers in the gastrocnemius muscle of the female *Sgcd* $^{-/-}$ mouse model. The contribution of this work lies in the fact that it was carried out in females; our research group is also working with males, in order to subsequently discuss the effect of (-)-Epicatechin in both sexes.

527-II-PO U-BAC acelera la regeneración tisular en un modelo de úlcera gástrica

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Gastric ulcer represents an important public health problem, since between 10 and 15% of the population worldwide suffers from it. Complications of this disease can include bleeding, perforation, and risk of development an oncogenic process, all these complications represent a high expense for patients and also for the health care system. The use of medicinal plants offers a promising therapeutic alternative. The World Health Organization estimates that more than 80% of the world´s population uses traditional medicine to treat primary health problems. In this work, we evaluated the healing effect on gastric ulcer of a micro and nano encapsulated flavonoid enriched extract (U – BAC) obtained by spray drying method carried out in a Nano Spray Dryer B-90 equipment. The encapsulated (U – BAC) was administrated through an orogastric tube to Wistar rats with surgically induce gastric ulcers by injecting 20% acetic acid. Comparison was made between different experimental groups; omeprazole, extract, encapsulated extract and saline solution treatments, showed that micro and nano capsules within 2 mg/kg of extract, completely reduced the ulcerated area and promoted the 95% of ulcers healing. Histopathological studies confirmed almost the complete regeneration of the gastric epithelium. These findings support the use of encapsulated Bacopa procumbens extract as an effective and innovative strategy for the treatment of gastric ulcers. Experiments currently in progress will allow us to determine the molecular mechanism exert by UBAC.

537-II-PO Efectos de la competencia sobre atributos de crecimiento y reproducción en las historias de vida en *Poecilia mexicana* y *Poeciliopsis gracilis* en condiciones de laboratorio

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Introduced species can negatively impact native communities; in freshwater ecosystems, they have become one of the main causes of extinction. Competition for resources is a relevant interaction, with negative effects that can modify life-history traits of the species involved. In the Pánuco River basin, *Poecilia mexicana* is a native species whose abundance and distribution have declined since the introduction of *Poeciliopsis gracilis* in the 1970s, which, in contrast, increased in both variables. Both species share habitat and diet, suggesting that competition could be contributing to the decline of *P. mexicana*. If the spatial interaction between both species is due to competition, their growth and reproductive traits could be affected. To evaluate this effect, the growth of both species was analyzed under independent and mixed rearing conditions in the laboratory. In January 2025, organisms were collected, bred in captivity, and their offspring used in controlled experiments. Isolated treatments with 30 individuals per species and a mixed treatment with 15 individuals of each were established. For 10 weeks, standard length (SL) and weight (W) of each individual were recorded weekly, determining growth type through the relationship W = aSL^b. The value of b defines allometric growth type (isometric = 3; negative < 3; positive > 3). Differences between treatments were evaluated through ANCOVA. *P. mexicana* showed negative allometric growth in both treatments (Isolated: b = 2.653; Mixed: b = 2.517), indicating a greater increase in length than in weight. Although differences were not significant (t = 1.17, p = 0.245), there was a slight trend toward higher weight per unit length when reared in isolation. In contrast, *P. gracilis* showed nearly isometric growth (Isolated: b = 3.000; Mixed: b = 3.027) in both treatments, with no significant differences (t = –0.21, p = 0.831). Results suggest a possible negative effect of interaction on *P. mexicana*. However, as this was not significant, it is proposed to extend the duration of the experiments and apply complementary analyses of growth rates.

538-II-PO Variación morfológica de *Herichthys pantostictus* (Taylor y Miller 1983) asociados a dos ambientes lóticos y lenticos

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The main objective of ecomorphology is to analyze how the morphology of an organism relates to its ecology and, how this is linked to biological function. Therefore, it is clear to understand that ecomorphological studies help clarify how morphological variation interacts with the ecological environment. For this reason, this proposal examines the relationship between morphology and different habitat types of *Herichthys pantostictus* in the Pánuco basin, where it is the native cichlid with a broad distribution that also occupies contrasting habitats (lotic and lentic).
Specimens from the state of Hidalgo were analyzed: Laguna de Atezca (n=56), the San Pedro de Tlatemalco stream (n=5), Puente Jihuico (n=16), and the Venados River (n=9). Numerical differences among localities reflect the representativeness of the IPN collection holdings. The lotic systems of origin were classified according to their cross-section (rivers > 15 m and streams <15 m) and altitude (0 to 100 m.a.s.l; 100 to 500 m.a.s.l; >500 m.a.s.l). To asses morphological variation, 14 morphometric dimensions and six morphometric indices were determined, both associated with the body, fins, and head. Differences were evaluated using a multivariate analysis of variance (MANOVA), a Principal Component Analysis (PCA), a clustering analysis by the unweighted pair group method with arithmetic mean (UPGMA), and Euclidean distances. Additionally, body shape was assessed using geometric morphometry with 21 anatomical landmarks to assess differences in body shape through two analyses, a Principal Component Analysis (PCA) and a Canonical Variates Analysis (CVA). The evidence obtained reflects that the populations of *H. pantostictus* exhibit morphological differences due to the habitat they occupy. The populations found in streams and rivers are associated with elongated bodies and dorsal and anal fins that are longer than they are high, developed for fast currents. While those from the lake exhibited robust shapes and taller fins for greater maneuverability in waters with little or no current speed. Consequently, the populations of *H. pantostictus* in the Pánuco basin exhibit a plastic response to the efficient use of contrasting habitats.

539-II-PP Papel de las células Treg en el efecto inmunomodulador de la proteína de choque térmico de 60kDa de *Klebsiella pneumoniae* (HSP60Kp) en un modelo murino de psoriasis

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Psoriasis (PsO) is an inflammatory skin disease characterized by erythematous plaques with whitish scales. Multiple murine models have been designed for its study, and the imiquimod-induced psoriasis (IMQ) model is currently the most widely used. In a rat arthritis-induced model, an immunomodulatory effect of an enterobacterial 60 kDa heat shock protein derived from *Klebsiella pneumoniae* (HSP60Kp) was reported. Several studies suggest that microbial HSPs can induce regulatory T cells (Tregs), which can regulate adaptive immune responses. Therefore, in this study, we studied the potential immunomodulatory effect of HSP60Kp in PsO.

To evaluate the presence of Treg cells in the immunomodulatory effect of HSP60Kp in an imiquimod-induced murine model of psoriasis.

Balb/C mice were immunized with HSP60Kp at a concentration of 50 µg/100 µL in saline solution prior to psoriasis induction, which consisted of topical application of 5% IMQ to the back and right ear at doses of 50 mg and 25 mg, respectively, for 14 days. Lesions were evaluated macroscopically and microscopically. The hematoxylin-eosin technique was used for skin staining, and immunofluorescence was used to detect CD4+FoxP3+ lymphocytes.

Greater skin thickening and redness were observed in the ovalbumin control group, as well as a higher Psoriasis Area Severity Index (PASI). Microscopically, the control group showed more features of the disease, such as epidermal hyperplasia, elongation of epidermal ridges, polymorphonuclear cell infiltration, vascular dilation, and the formation of Munro microabscesses. Finally, a greater presence of Tregs was observed in male mice treated with HSP60Kp.

549-II-PP Factores sociodemográficos y los medios audiovisuales asociados al uso de anticonceptivos en mujeres mexicanas sexualmente activas

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The contraceptive methods use is a fundamental practice in reproductive health. Factors associated with contraceptive methods use can vary widely depending on the socioeconomic, cultural, and demographic context.
To determine the factors associated with the use of contraceptive methods in sexually active women in the Mexican population.
We used the 2018 National Survey of Demographic Dynamics (ENADID), which is a nationally representative probability survey of Mexican women aged 15 to 54. Odds ratios (ORs) were used to estimate the effect size of the factors.
Of the 63,556 women studied in the 2018 ENADID, 47.6% reported using contraceptive methods. In the bivariate analysis, factors such as age, education, socioeconomic status, marital status, age at first sexual intercourse, desire for more children, and information about contraceptive methods received through radio, television, and magazines were associated with contraceptives use. In the multivariate analysis, women aged 15 to 19 were found to be 0.184 times more likely to use contraceptives compared to those aged 25 to 29 (95% CI: 0.166–0.204, P<0.001). Likewise, women who “do not want to have more children” were 1.185 times more likely to use contraceptives compared to those who “do not know if they want more children” (95% CI: 1.029–1.363, P=0.018). Regarding the media, those who did not receive information through newspapers and magazines were 0.849 (95% CI 0.790-0.912, P < 0.001) more likely than those who received information through these means.
47.6% of the women studied reported using contraceptives. Age, education, socioeconomic status, marital status, access to information through newspapers, magazines, posters and brochures were identified as factors associated with their use.

551-II-PV Evaluation of nutritional status and cardiometabolical risk of primary school students in Juchitepec, State of Mexico

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Childhood is a crucial period in which nutrition plays a fundamental role in children's overall growth and development. Adequate nutrition promotes the acquisition of knowledge, general well-being, and the prevention of long-term diseases. In rural areas, several factors can hinder access to a balanced diet, thus increasing the risk of problems such as malnutrition, obesity, and chronic diseases.
Despite institutional initiatives, the problem of childhood obesity continues. Educational and team methodologies have proven effective when they integrate the school environment with the family. Protecting children's health requires the implementation of comprehensive strategies that focus on prevention and promote community involvement. Background: Initiatives such as the Hermosillo program and the "Live Healthy, Live Happy" campaign have attempted to promote healthier eating habits in schools. These initiatives have detected high levels of overweight and obesity, highlighting the importance of creating well-regulated school spaces and promoting active family participation.
Nutritional status is a reflection of the balance between the amount of nutrients consumed and how they are utilized, and is an important indicator of a population's well-being. An assessment is carried out through

- Anthropometry (weight, height, and waist circumference measurements)
- Biochemistry (glucose, lipid, and hemoglobin analysis)
- Clinical assessment (observation of physical signs)
- Diet (using recalls and surveys)

The double burden of nutrition manifests itself in the simultaneous presence of malnutrition (14% of anemia in children under 5 years of age) and obesity (37.4% in children aged 5 to 11 years). Multiple factors influence this situation: biological, socioeconomic, cultural, environmental, and educational. Childhood Cardiometabolic Risk Among the most common risk factors are abdominal obesity, hypertension, lipid disorders, insulin resistance, physical inactivity, poor diet, and family history. These factors increase the risk of developing type 2 diabetes and cardiovascular disease in adulthood.
Objectives

- General: To assess nutritional status and cardiometabolic risk in students from rural areas.
- Specific: To diagnose body mass index (BMI), estimate cardiometabolic risk, and establish relationships between the two. Methodology
- Design: Descriptive, cross-sectional, and analytical study.
- Population: Children aged 6 to 12 years from two elementary schools in Juchitepec.

Instruments: ISAK, CDC tables, and standardized anthropometric measurements.

- Analysis: Descriptive statistics and Student's t-test.
- Ethics: Informed consent and assent were obtained, in accordance with the principles of the Declaration of Helsinki.

The analysis sample consisted of 267 students from Juchitepec, with age bias due to students whose birthdays were reached during the assessment and the non-participation of some students in subsequent measures (such as cardiometabolic risk).

- Nutritional status: 41% of children are classified as healthy, 10% underweight, 20% overweight, and 29% obese.
- Cardiometabolic risk (CMR): 68.8% of children had CMR based on waist-to-height ratio; only 31.2% had healthy results.

The data indicate that only 41% of students have adequate nutritional status, while 20% are overweight and 29% are obese. Furthermore, 68.8% have cardiometabolic risk based on waist-to-height ratio. These findings reveal an alarming prevalence of overnutrition in a vulnerable child population, which aligns with national statistics such as those from ENSANUT 2021.
The presence of these factors from childhood increases the risk of chronic diseases in adulthood, highlighting the immediate need to implement measures. The community of Juchitepec, like many other rural areas, faces structural inequality. This phenomenon illustrates how poverty, food insecurity, and lack of access to a healthy diet not only cause nutritional deficiencies but also encourage excessive consumption of ultra-processed foods high in sugar, fat, and sodium.

560-II-PO Iridoides de *Crescentia alata* con actividad antiinflamatoria y perfil de gastroseguridad

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Crescentia alata belongs to the *bignonaceae* family and is a plant commonly known as "morro" or "jicaro" It is used in traditional Mexican medicine to treat conditions such as internal trauma and gastrointestinal discomfort. Despite its ethnobotanical use, scientific evidence validating its pharmacological properties is scarce. Iridoids are a group of monoterpenoid chemical compounds that have been identified in *Bignonaceae* and are known to have anti-inflammatory activity. The objective of this study was to fractionate the fruit extract of *Crescentia alata* and qualitatively identify the iridoid-rich fraction to evaluate its anti-inflammatory efficacy and gastric safety profile in an animal model.

The extract of the ripe pulp of *Crescentia alata* was obtained using pressurized liquid. Fractionation was then performed on a chromatographic column. Qualitative identification of iridoids was performed using thin-layer chromatography and infrared spectroscopy. Anti-inflammatory activity was evaluated using the carrageenan-induced plantar edema model in Wistar rats. The *Crescentia alata* fraction was administered at a dose of 300 mg/kg for 10 days. Inhibition of plantar edema was measured, comparing it with a control group and with naproxen (30 mg/kg), the reference nonsteroidal anti-inflammatory drug (NSAID). In addition, a macroscopic analysis of the gastric mucosa of the treated animals was performed to evaluate the gastrosafety of the fraction.

Fraction 2 was identified as positive for iridoid-type compounds. In the acute inflammation assay, fraction 2 achieved an anti-inflammatory percentage of 41% and did not induce gastric lesions compared to naproxen.

These findings suggest that iridoids from this species exert their anti-inflammatory effect through mechanisms that do not compromise the integrity of the gastric mucosa, offering a therapeutic advantage over current anti-inflammatory drugs. The results of this study support the traditional use of *Crescentia alata* for inflammatory conditions and point to iridoids as promising bioactive compounds in the development of new phytotherapeutic strategies for the treatment of chronic inflammatory diseases, free from the gastric adverse effects commonly associated with NSAIDs.

563-II-PP Impacto del conocimiento del paciente ante las prácticas sobre el cuidado de lentes de contacto

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Contact lenses (LC) are medical devices that are effective for the correction of ametropia and other purposes of use, the patient is informed about LC care and maintenance.
Fitting of contact lenses, during the process, also includes informing and educating the patient about contact lens care and maintenance to avoid eye surface infections and alterations that could compromise eye health and integrity of visual health, therefore, It is imperative to study and investigate the knowledge that contact lens wearers may have about maintenance and care. Lack of information about contact lens hygiene and maintenance may contribute to the risk of complications such as: protein deposits in contact lenses, bacterial or fungal conjunctivitis, and microbial keratitis.
The objective of this study was to assess compliance with LC-related care and determine the most common factors associated with non-compliance.
The study was observational and cross-sectional, carried out between January and March 2025, LC users with at least one year of experience were included, to carry out the study, a structured online questionnaire was conducted, which is composed by 15 items on use, LC hygiene and maintenance, 186 LC users were included, and the average age of participants was 27.3 years.
In results 59% of LC users used soft LC, 8% made use of hard LC, while 23% did not know what type of lenses they were using; for cleaning the LC 78% made use of multi-purpose solutions and 19% did not know what kind of solution they were using; 86% purchased their LC in optics while 14% of users purchased their LC on the internet. 63% of patients reported using LCs for 5 to 12 hours a day.
97% of the users did not share their LCs, 91% of the patients reported washing their hands before using LCs, 94% avoided cleaning with water and saliva and 86% did not sleep with LCs. In conclusion, although most users showed good hygiene habits, some users persisted with significant deficiencies in key aspects of lens care, particularly clinical follow-up and case maintenance.

585-II-PO Desarrollo de un nanoconjugado basado en sílice mesoporosa como sistema de liberación controlada de un sesquiterpeno de la planta arantó para el tratamiento del cáncer de mama triple negativo

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Triple-negative breast cancer (TNBC) is a highly heterogeneous neoplasm characterized by the absence of hormone receptors, which has limited therapeutic options and leads to a less favorable prognosis for patients. Although current treatments are multidisciplinary, their effectiveness is often accompanied by significant side effects. Nanotechnology has emerged as a promising option through the design of controlled-release systems based on mesoporous silica nanoparticles ($MSNSiO_2$), which have contributed to improving drug bioavailability, specificity, and effectiveness. Furthermore, the surface of these nanoparticles can be modified to direct drug transport to tumor cells. Recently, the arantó plant has been shown to have a potential antitumor effect due to the presence of different metabolites, such as MS3, which through *in silico* analysis has shown the ability to recognize active sites of proteins involved in cell invasion. Therefore, in this study, the use of $MSNSiO_2$ as a targeted delivery system for the secondary metabolite MS3 was evaluated. The nanoparticles were synthesized using the Ströber method and subsequently loaded with the metabolite. Morphological characterization was performed using transmission electron microscopy (TEM) and scanning electron microscopy (SEM), while physicochemical analysis included Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and thermogravimetric analysis (TGA). The obtained $MSNSiO_2$ presented ordered mesoporous channels and an average size of 100 nm. FTIR confirmed the presence of characteristic signals for both silica and MS3. Thermal analysis revealed the mass loss corresponding to each component of the nanoconjugate system. Release assays were performed in media with different pHs and demonstrated that acidification of the medium favored the release of MS3, displaying selective cytotoxic activity on TNBC cells. These results support the potential of the designed nanoconjugate as an innovative, targeted therapeutic platform against TNBC, combining a naturalbioactive with nanotechnology to optimize the efficacy and specificity of MS3.

589-II-PO Un nuevo nanosistema para la entrega selectiva de un sesquiterpeno en cáncer de mama luminal

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Breast cancer remains a global health concern due to its high incidence and mortality rates. Among the current therapeutic strategies, chemotherapy is widely used; however, its administration is often associated with significant adverse effects. This highlights the need to explore alternative therapeutic options, including those derived from medicinal plants. Aranto plant has emerged as a promising source of bioactive secondary metabolites, one of which is the sesquiterpene MS3. When loaded into functionalized mesoporous silica nanoparticles, MS3 can be selectively delivered to cancer cells, enhancing its anticancer potential.

Initially, MS3 was characterized through computational analyses, which suggested that it may modulate the overexpression of 20 genes implicated in critical oncogenic processes such as cell proliferation, migration, invasion, metastasis, and apoptosis induction. Toxicological predictions further indicated that MS3 possesses a favorable biosafety profile, showing no signs of hepatotoxicity, neurotoxicity, or nephrotoxicity when compared to conventional antineoplastic drugs.

Subsequently, five different types of mesoporous silica nanoparticles were synthesized using the Stöber method to successfully encapsulate MS3, which was commercially obtained. The various nanoparticle types were characterized using a range of physicochemical techniques (SEM, TEM, BET, XRD) to confirm successful synthesis, and FTIR spectroscopy was employed to verify the presence of MS3. Among the systems developed, the nanosystem functionalized with folic acid exhibited the most promising results, enabling selective release of MS3. Finally, MTT assays demonstrated the cytotoxic effect of the MS3-loaded nanoparticles. These findings supported the development of a targeted nanosystem for the treatment of luminal breast cancer.

III.Social and Administrative Sciences

11-III-PO Parque Nacional Los Remedios: una experiencia desde lo local a lo internacional

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This paper focuses on the experience of Parque Nacional Los Remedios, a Natural Protected Area (NPA) located in Naucalpan de Juárez, State of Mexico, declared as such in 1938 by President Lázaro Cárdenas. The aim is to highlight citizen-led actions linked to the social valuation of ecosystem services that positioned this NPA to be the first to join a mandatory international legal instrument on environmental matters whose spirit is to strengthen access to information, participation in decision making and to seek environmental justice, the Escazú Agreement. The study, currently in progress, is grounded in four theoretical pillars: ecosystem services, their social valuation, social innovation as a process enabling territorial transformation, and the link between civil society and international instruments to mobilize environmental action. It follows a qualitative approach using the systematization of experiences, encompassing a documentary review, a preliminary actor mapping and semi-structured interviews (to be conducted in the next stage). The analysis will involve triangulating data from documentary, testimonial and direct observation sources. Given that the research is at an early stage, the elements presented here reflect exploratory insights drawn from participant observation and the review of public available documents. These shed light on community articulation, the use of national and international environmental protection mechanisms and the recent inclusion of PNLR in federal support programs. Preliminary recommendations are offered to strengthen citizen participation, environmental education and the implementation of the Escazú Agreement.

32-III-PP Factores que inciden en la rotación de personal en PyMES del sector automotriz

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Employee turnover represents a significant challenge for small and medium-sized enterprises (SMEs) in the Mexican automotive sector, negatively affecting productivity, organizational culture, and operational costs. This thesis aims to identify and analyze the factors that influence employees' intention to leave their jobs in this sector, with the objective of proposing strategies to mitigate this issue and promote talent retention. To achieve this, a systematic review of the existing literature was conducted and analyzed using the Python software through the variational Bayes algorithm known as Latent Dirichlet Allocation (LDA). The results obtained from LDA served as the foundation for designing the data collection instrument, which enabled the identification of various internal and external factors related to turnover, among which the most prominent are organizational climate, job stress, leadership, motivation, and reward systems. It is noteworthy that 74% of the analyzed studies were conducted in Asian countries, revealing a significant research gap in the Latin American context, particularly in Mexico. The methodology employed follows a quantitative approach, with a cross-sectional, non-experimental, and correlational design. The sampling strategy proposed for the study includes convenience sampling to select the SMEs and simple random sampling for surveying employees. Data collection is planned to be carried out through structured questionnaires, incorporating validation and statistical analysis to identify significant correlations between the studied factors and turnover intention. The expected results include the clear identification of organizational factors that influence turnover intention, presented in diagrammatic form to enhance comprehension. The conclusions are expected to provide practical recommendations for senior management and human resources departments, aimed at improving the work environment, reducing stress, and strengthening employee commitment. These actions are intended to reduce turnover and improve human talent retention in SMEs within the automotive sector. This study contributes to addressing a significant research gap regarding the Mexican automotive industry and provides valuable insights for human capital management in companies operating in this sector.

36-III-PO Propuesta de un producto a base de plantas para comedores industriales mediante la Teoría del Comportamiento Planificado

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The current environmental situation on the planet requires special attention and human beings to take action to make certain disruptive changes; one of them is the transition from current consumption habits to more sustainable ones, in this case, on food consumption habits, in which society and companies play a fundamental role. There are some foods that tend to have a lower environmental impact compared to others, such as plant-based foods, since they usually have a lower environmental impact in three key areas: GHG emissions, land and water use, as well as health benefits, and unprocessed foods tend to be more economically viable and consider animal welfare, all in comparison to foods of animal origin. The objective of this research is to propose a plant-based product for industrial canteens located in Mexico City using the Theory of Planned Behaviour. It explores the willingness and behaviour of actual and potential users of industrial canteens in Mexico City, as well as the willingness of industrial canteens located in Mexico City to opt for the offering of such a product. Under the hypothesis that there are certain factors/elements that have a major influence on such behaviour. It is a quantitative research of correlational type, the collection of data in both samples was carried out by means of an online survey, which included 97 respondents, real and potential users, and 37 industrial canteens. The results found indicate that there is a positive willingness to adopt the plant-based product in industrial canteens on the part of users and canteens; additionally, there are certain individual and collective factors with greater weight.

43-III-PO La huella de la migración transnacional en el patrimonio cultural edificado de la CDMX

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My research focuses on exploring how the arrival of upper-middle-class international migrants to Mexico City's historic center is significantly transforming this area. In the last decade, the search for new lifestyles and the rise of luxury tourism have driven the renovation of traditional buildings, which are now converted into vacation apartments, boutique hotels, art galleries, and restaurants focused on attracting tourists. These changes not only drive up housing prices and displace local residents but also alter the physical, social, and symbolic environment of the neighborhood. Long-time residents experience a disconnect with their surroundings, feeling that their neighborhood loses authenticity. In addition, urban renewal policies, driven by the government together with the private sector, prioritize profitable projects over the preservation of cultural and historical heritage.

Based on an analysis of more than 190 documents and studies by key authors such as Víctor Delgadillo, David Navarrete, Michael Janoschka, Ibán Díaz-Parra, Mathew Hayes, and Ernesto López Morales, I examine concepts such as transnational gentrification, heritage touristification, and the “rent gap”. However, I found that there is a lack of research on the architectural impacts, community resistance, and cultural effects of these processes. The project that I propose to develop during the next semesters of the PhD program focuses on addressing a gap in the academic literature. This approach will consist of analyzing various factors, such as the proportion of foreign residents, the influence of state incentives, fluctuations in rental prices, and transformations in the use of real estate. In addition, I will explore residents' perceptions of authenticity and sense of belonging in their communities. Through this analysis, I seek to offer a comprehensive perspective on how Mexico City can foster economic development without compromising the preservation of its cultural heritage and the quality of life of its inhabitants, especially in the post-pandemic context.

47-III-PO Innovación en la práctica psicológica: Modelo Psicopedagógico del Bienestar para la prevención y atención práctica de problemáticas de malestar psicológico

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There is growing interest in improving personal well-being. Especially among younger generations, and considering the devastation to mental health during and after the pandemic, it is essential to consider new techniques, strategies, or therapies that are more accessible and of greater interest to these generations, allowing them to approach psychology and its benefits for the integral development of the individual without taboos or barriers. For this reason, since the pandemic, the benefits of the Psychopedagogical Model of Well-being (MPB) have been developed, studied, and corroborated. This model aims to open the doors to universal prevention and education on six factors of human affectivity. When evaluated and addressed in a psychopedagogical process, these factors become an innovative and user-friendly alternative for anyone who wants to transform their discomfort into personal well-being. And, which can subsequently guide others in a practical and pedagogical way, to begin a responsible path in their self-care of psychological health. According to studies conducted on the theorization, clinical cases, and evaluation of the Psychopedagogical Model of Well-being, it has been demonstrated that it can offer effective responses to personal well-being through psychopedagogical therapy and is also a key element in education and primary prevention of mental health in the general population. This allows people to overcome prejudices about psychology while learning about psychological well-being, allowing for innovative and comprehensive responses to current problems of psychological distress through the innovation of psychological practice combined with pedagogy from a socio-formative perspective. Therefore, this work aims to present the model and its results and implications, based on the publication of research articles on it.

52-III-PO Evaluación de la gestión del transporte público en El Salvador

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This research work evaluates the public transport model in El Salvador, through the analysis of models and case studies, for their interpretation and compatibility in El Salvador. The methodological matrix was structured into ten analytical categories, adapted and modified from the LART environmental management model (Rivas, 2009), adding quantitative indicators. Grounded theory (Strauss & Corbin, 2022) was developed as an analytical technique for the constant comparative method. This originality will allow for visualizing, validating, and understanding the characteristics of a management model, responding to each category based on its functions, responsibilities, strategies, and management findings. It concludes with a proposal that establishes a baseline assessment tool and recommends an organizational structure.

93-III–PO Implementation of a program to promote cognitive skills in primary school students with BRI

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Children with BRI present cognitive skills difficulties, resulting in a delay in their learning expectations according to their grade level. This delay is often not evident for the scholar authorities because this group of children are not identified by specialists and are therefore labeled, which affect other areas of their development. An early intervention can reduce this delay, especially to provide learning tools for the students and the adults responsible for them. The main objective was to evaluate the effects of a play-based program to improve psychological processes linked to school learning. This was a mixed pre and post longitudinal test study. A non-probabilistic selection was made, with the participation of seven first year students from a public primary school in Mexico City with an average age of 6.8 years, selected after matching with BRI students' criteria. The program consisted of three blocks, to assess the progress, rubrics were used and then a post evaluation was done. The data was collected in SPSS (v25), the Wilcoxon test was applied. The results identified changes statistically significant in IQ ($p = 0.02$, $p < .05$) and in the IVP ($p = 0.01$, $p < .05$), additionally parents reported favorable changes in the adaptive behavior. In conclusion, an early detection and implementation of an intervention program to promote cognitive skills in early primary school has proven to be highly effective in shortening the existing gap compared to their classmates and helping them to continue their studies, without the stigma of being bad students.

107-III-PO Estudio comparativo de la gestión de los programas de prevención a la deserción escolar, “Yo no abandono” y “Passport to success”

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The objective is to differentiate the management processes of the institutional programs "Yo No Abandono and Passport to success" to prevent school dropout at the National College of Technical Professional Education (CONALEP) in the State of Mexico Eastern Zone, with the purpose of identifying the best results in both programs. School dropout is the academic situation that occurs when a student abandons his studies without having completed his education; at the upper secondary level it presents various causes ranging from low academic performance, failure, family, economic or attitudinal problems. In the case of CONALEP, it represents a serious problem, which requires the implementation of effective actions to counteract this problem. This is a final research whose objective is to differentiate the management processes of the institutional programs "Yo No Abandono and Passport to success" designed to prevent school dropout at the National College of Technical Professional Education (Conalep) in the State of Mexico Eastern Zone. The methodology used includes a quantitative, cross-sectional and comparative approach. Highlighting as a preliminary conclusion that it is essential to prevent school dropout and dropout, since this contributes to ensuring the future of young people. Therefore, it is necessary to foster an educational environment that motivates students, promotes the enjoyment of physical activity and encourages a healthy and active lifestyle.

130-III–PO El paisaje como eje estratégico para el desarrollo del turismo urbano en Cuernavaca, Morelos

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Cuernavaca is the capital of the state of Morelos, known as the "City of Eternal Spring," named after Alexander von Humboldt, a naturalist and explorer who found this place a true earthly paradise due to its climatic conditions, vegetation, and the abundant flora, all thanks to its surroundings (Gobierno de Morelos, n.d.). Cuernavaca is one of the most recognized national tourist spots for its location, history, and natural and cultural attractions, perfect for enjoying a weekend or vacation. Given the current conditions in the city, there is a risk to the quality and modification of its climate and urban and peri-urban ecosystems, which are deteriorating due to the pressure of urban and tourist growth. Consequently, their landscapes have been deteriorated, degraded, and polluted in recent years, so landscape recognition can be understood as a right, which should function as a tool and strategy for conservation, care, and protection of the territory, especially if it is focused on a tourism product. Furthermore, it is important to conduct a landscape assessment to understand the current situation and determine favorable or unfavorable conditions, considering the positive and negative impacts that tourism development may have on the municipality.

148-III-PO Alternativas financieras para los planes de pensión en la CDMX: Calidad de vida

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Accelerated population growth intensifies inequality that affects poverty, health system coverage and education (UN HABITAT, 2022). Added to this is the demographic challenge of aging (IMF, 2023), which puts pressure on pension systems (Steindel, 2020). Faced with this scenario, mechanisms such as savings and privatization can relieve public finances, given the deterioration of contribution density (Ramirez, 2019). According to Mercer CFA Institute, a retirement income system based on private pension plans allows for long-term sustainable returns. This study is relevant because of the impact of making financial decisions at a social level that allow comparing, evaluating and determining through existing financial alternatives through pension plans in the CDMX, for a better quality of life. Through the literature review and the application of the Portfolio Selection Model and MCDM multicriteria model (WSM), quantitative and qualitative dimensions linked to Quality of Life indicators are integrated in a hypothetical market in order to obtain an efficient portfolio of pension plans adjusted to the life cycle that optimizes resources for an improvement in the quality of life of retirees. The results present an evaluation based on three age groups (30, 40 and 50 years) and two income scenarios (3 and 5 SMGV), within the context of the CDMX. From the determination of the IMSS contribution regime, the calculation of expected returns and the construction of the efficient frontier, in addition to the weighting of the attributes of the Quality of Life Index. They allow the identification of preferences through financial strategies and the methods considered, despite uncontrollable biases, are observed to be highly effective in optimizing resources.

151-III-PO La importancia de la cartografía digital para la toma de decisiones de seguridad turística

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The issue of security has been handled for years having ups and downs in different economic sectors, in this case the issue of tourist security has been handled in different concepts starting from a concept of public security, situational security in the prevention of crime, which have given rise to the generation of different strategies taking into account digital cartography which allows to have a visualization of the information geospatial through the support of technologies such as Geographic Information Systems (GIS). Within this concept, digital cartography allows routes to be planned in a more precise and dynamic way; for the security part, it allows the identification of risk areas, as well as coordination with other institutions. By being able to work with Geographic Information Systems, tourist security allows specialized forces, such as the Tourist Police, to implement better mapping in those with the greatest influx of tourists, with the aim of safeguarding national and international tourists who visit those areas. On the other hand, digital cartography takes an important role since it allows a relationship between tourism promotion and citizen protection, with the real-time data that these tools provide allows an optimization of tourism such as urban security, achieving the development of safer tourist destinations within cities.

167-III-PO Análisis regional de la educación en México y su impacto en los salarios

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This research analyzes the relationship between education and wage income, aiming to measure the impact of different educational levels on salaries by estimating a Mincerian equation using Ordinary Least Squares (OLS), complemented with the Heckman correction to address potential selection bias. To this end, variables such as work experience, age (and its square), gender, productive activities, and regional location are considered. The results show that although higher education is generally associated with higher wages, significant regional variations persist. In particular, the educational impact on reducing the wage gap is more noticeable when comparing regions with different levels of development, with stark differences emerging between the most marginalized áreas such as the South Pacific and the Gulf of Mexico and the northern and central regions of the country.

176-III–PO Regionalización funcional del Oriente del Estado de México

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The research, divided into three parts, examines the social and territorial dynamics that have occurred since the year 2000 in the municipalities located in the eastern urban periphery of the Metropolitan Area of the Valley of Mexico, in localities with significant population and economically active population, such as: Texcoco, Chimalhuacán, La Paz, Chicoloapan, Ixtapaluca, Chalco, and Valle de Chalco. Some of these municipalities are part of the so-called bedroom municipalities and have a high dependency on entities outside their own state, generating daily trips in search of services that the municipalities do not offer, especially local jobs, with long commutes exceeding 30 minutes, on congested avenues and overcrowded public transport, affecting the quality of life of the residents. This approach offers a perspective on the transformations resulting from public policies that seek to provide housing and transportation while ignoring employment, education, and recreation. Through geospatial and statistical analysis of data provided by INEGI in the Population and Housing Censuses, as well as the origin-destination survey conducted in 2017, the aim is to complement the regionalization proposed by the development plans of the State of Mexico and to create a functional region that can develop and integrate the municipalities of the east and reduce dependence on entities of CDMX.

190-III–PO Impacto de un programa de intervención en la creatividad gráfica de estudiantes de primaria con Aptitudes Sobresalientes

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In recent years, in Mexico, the attention of students identified with Outstanding Abilities (OA) has become more important given the remarkable academic potential they have to consolidate their skills faster compared to other students from the same group of peers (SEP, 2024). For this reason, the presence of an educational environment that encourages creative thinking in infants starting their primary schooling with the aim of potentiating the ability to create novel and original ideas (Torrance (1977). The objective of the study was to identify the impact of an intervention program on the graphic creativity of primary school students with "OA". It was a mixed study, pre and post test, longitudinal and field. Participants were 10 students identified as students with "OA" from a public primary school in the eastern area of the CDMX, with an average age of 7.5 years (SD=. 52). After obtaining the consent of the students' parents, the Figural Creativity Test (Torrance, 1981) was applied as a pretest to assess the level of students' graphic creativity. Subsequently, an intervention program focused on the enrichment of written creativity was implemented, consisting of three blocks with six sessions each. Finally, a post-evaluation was carried out to identify changes in creative performance. Nonparametric descriptive and inferential statistics were applied to related Wilcoxon data. Results: According to the pre and postest comparison, statistically significant differences were identified at level . 05 in favour of the postest evaluation (Wilcoxon test) in components: fluidity (Z=-2.247, p=.025), title abstraction (Z=-2.254, p=.024), closing strength (Z=-2.807, p=.005), with respect to the overall score also statistically significant differences were obtained in favor of the implementation of the intervention program (Mpretest=60.00, SD= 18.45; Mpostest=89.10, SD=12.47) (Z=-2.807, p=.005). Conclusion: From the results, it is evident that the intervention program contributed significantly to improving the graphic creativity of students with "OA", which has a positive impact on their ability to express their own ideas in an original and innovative way.

192-III–PO Espacio costero turístico vulnerable ante fenómenos hidrometeorológicos en las zonas Diamantes: Punta, Acapulco y Playa

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The world is going through a climate crisis that has become more evident in recent decades, intensifying the magnitude of threat of some natural events that in contact with society and conditions of this build disastrous scenarios and tourism activity is not exempt from these impacts. Mexico is located in the middle of two oceans, the Atlantic and the Pacific, so it is exposed to hydrometeorological hazards during specific periods, due to this many of its coasts are threatened and sometimes are heavily impacted which leads to human, economic and infrastructure losses, it is important to note that in many of the coastal regions of the country tourism activity is carried out and that coexisting with the environment that surrounds it is constantly at risk. For that reason, the objective of the research is an analysis of the tourist space to explain the relationship of vulnerability with the tourist sector in the area of Punta, Acapulco and Playa Diamante, and to be able to describe certain characteristics that it shows. The type of research to be carried out is exploratory-descriptive due to the missing proposals for the analysis of vulnerability in the tourism activity and in turn the description of the territorial analysis, while the approach is mixed, in addition to the methods used are the research-action and the systematic method, applying the techniques of bibliography analysis, non-participatory observation and mapping. With the proposal of a model that explores vulnerability in the tourism sector, as well as a spatial analysis by means of dynamic maps where the main characteristics that make up vulnerability and the risks faced by the hotel plant in the corridor can be observed. The expected conclusions are the generation of a definition of tourism vulnerability and its dimensions, in addition to obtaining a series of recommendations for the reduction of vulnerability in hotels located in coastal areas exposed to the same type of hazards caused by hydrometeorological events.

193-III–PO Producto turístico en la alcaldía Milpa Alta

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This research proposal aims to integrate the dispersed elements of the tourism product to design a comprehensive strategy that addresses the sociocultural, economic, and environmental particularities of Milpa Alta, located in the southern part of Mexico City. Milpa Alta has great potential for developing community-based rural tourism, starting with its landscape resources, which include ecosystems such as forests, volcanoes, and agricultural zones like nopal fields and vegetable gardens, considered valuable natural areas for tourism activities. Its gastronomy, based on nopal and corn, offers a unique competitive advantage compared to Mexico City's consolidated tourism offerings. This characteristic serves as a guiding element in strategy development, as the borough, immersed in an urban setting, can take advantage of this trait to strengthen the use of its resources. This may represent an alternative economic source beyond traditional rural activities, while valuing ancestral knowledge and traditional farming practices and encouraging the involvement of the local community in tourism processes from planning to execution. The research began with a documentary analysis of community-based rural tourism, including historical background and its evolution from Europe to Latin America and Mexico. The tourism supply in Milpa Alta was also examined, focusing on rural tourism and revealing challenges such as lack of infrastructure and signage, minimal promotion, insufficient training in tourist services, and weak project management. Furthermore, current initiatives remain isolated, lacking a coherent plan that links tourism resources, local actors, and market demand. This research seeks to create new economic opportunities and empower residents as active agents in tourism, fostering a sense of belonging and environmental stewardship. It highlights the importance of collaboration between academia, public policy, and the local community to ensure feasible and lasting initiatives.

200-III-PO Forecasting public debt and pension liabilities in emerging markets: A machine learning approach

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This paper aims to forecast the trajectory of public debt and pension-related contingent liabilities in Latin American countries by applying machine learning models to anticipate fiscal risks associated with population aging. Using a comparative quantitative approach, the study employs algorithms such as Random Forest and multilayer perceptrons (MLP), alongside traditional methods like ARIMA time series models and deterministic actuarial baselines. Predictive performance is evaluated using standard error metrics, including RMSE and MAE. The analysis is based on an annual panel dataset covering eight countries from 1994 to 2024, incorporating key macroeconomic indicators (GDP per capita, inflation, social spending, public debt) and demographic variables (dependency ratio, life expectancy, fertility rate). The results show that machine learning models significantly outperform traditional methods in most cases, particularly in countries with nonlinear fiscal dynamics and demographic transitions. These tools allow for the early identification of structural vulnerabilities and the simulation of counterfactual scenarios under fiscal stress. While the study offers an innovative framework for forecasting long-term pension expenditure, it acknowledges limitations related to data availability, model interpretability, and country heterogeneity. Nevertheless, the findings underscore the value of combining predictive analytics with economic reasoning to strengthen public finance sustainability in aging societies.

214-III-PO Modelo de certificación para empresas que requieran ser reconocidas como Pet Friendly en la Ciudad de México

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During the Covid-19 pandemic, INEGI (2021) recorded a 73.4% increase in pet adoption in Mexico. Since having pets gives as benefits to reduce loneliness, reduce cortisol levels, increases feelings of support, improves mood, among others (National Institutes of Health,2018). During this period, many companies changed their work modality to home office, and employees who lived with a pet, had better health conditions, greater resilience and better coped with the stress of the workload (López Argueta, 2022). Due to the bond generated between people and pets, their dynamics transcends their home, since they are currently looking for Pet Friendly places, where they offer products and services focused on their needs, since offers have emerged to serve them, however, they are not usually safe or reliable, that is why the Maple Law emerged, since it deals with new regulations for some service providers, owners and municipalities, to avoid animal abuse and negligence (El Financiero, 2023). In addition, the Secretary of Tourism, Miguel Torruco, recognized that the Pet Friendly segment provides a competitive advantage and consequently a greater economic benefit for Mexico City (SECTUR, 2022). The purpose of the research is focused on the creation of a certification model for companies that need to be recognized as Pet Friendly in Mexico City, in order to provide a structure that covers different needs and concerns of the current market, and as a result of the adaptations obtain a better positioning against the competition.

215-III-PO Plan de negocios para una empresa certificadora de establecimientos Pet Friendly en la Ciudad de México

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Pets have been with humans since ancient times, at the beginning people sought to obtain benefits from them, but this relationship has become an increasingly close affective bond (Valadez Azúa, 2003; 2016). Due to the growing importance that pets have acquired in everyday life, many people seek to integrate them into their daily activities. In response, several companies began to offer products and services companies began to offer products and services for the Pet Friendly market, among these are hotels, restaurants, cafeterias, shopping, malls, etc. (Valencia, 2023). Even though establishments have taken the initiative so that people can share public spaces with their pets, there is still no organization that provides guidance by implementing standards to regulate the quality, safety and animal welfare in these spaces. Given this need, the purpose of this research is to design a business plan for the creation of a company that certifies Pet Friendly establishments in Mexico City. It is expected that this research will contribute to raising the quality and confidence in services for pets, as well as to promote more respectful and inclusive environments between people and pets, through a company that provides guidance during the process.

219-III–PO Estrategias de turismo comunitario de la cocina tradicional de Xochimilco

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Xochimilco is a historically lake-based region with an agricultural tradition, recognized for its chinampa system, which has transcended the history of the Cuenca de México for its natural resources and tangible and intangible cultural resources, modeling the identity of the population. The objective of the research is to create community-based tourism strategies focused on the traditional cuisine of Xochimilco and its stakeholders. Through qualitative research with an exploratory ethnographic approach, divided into documentary research and field research using direct observation and semi-structured interviews, the history of Xochimilco gastronomy is described, traditional dishes and their main ingredients that permeate the present day are identified, and the traditional cooks of the region are identified and grouped together.

228-III–PV Sostenibilidad de las MIPYMES

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Micro, small, and medium-sized enterprises (MSMEs) play a crucial role in the economic growth and development of countries. In Mexico, they account for 99.8% of all businesses and generate 80% of jobs. These enterprises not only foster inclusive growth, but they also promote gender equality and drive technological innovation. Notably, over 70% of microenterprises are led by women, providing stable employment opportunities and adapting to current market trends, such as online sales. However, the survival rate of these enterprises is concerning, with 50% failing within the first two years. This highlights the importance of identifying the key factors that contribute to the sustainability of MSMEs. The research presented is significant because it addresses this pressing issue and aims to expand knowledge in the field. Based on existing literature, three essential pillars for the sustainability of MSMEs have been identified: the economic pillar, the environmental pillar, and the social pillar. Together, these pillars not only enhance a company's competitiveness but also ensure a lasting positive impact on the economy while benefiting society and the environment.

232-III-PO Efecto de las enfermedades no transmisibles en la productividad laboral global. Un análisis generacional

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Noncommunicable diseases (NCDs), as defined by the Pan American Health Organization (PAHO/WHO), are diseases that are not caused by an acute infection but are long-term, and are therefore considered chronic and degenerative, requiring long-term treatment for complications. These diseases include cancer, cardiovascular disease, diabetes, and lung disease.
The main risk factors for the development of these diseases are harmful alcohol use, tobacco use, overweight or obesity, unhealthy food consumption, and physical inactivity.
NCDs represent a significant burden on public health, negatively and differentially affecting economic productivity. This impact on productivity due to the increase in these diseases can significantly reduce a country's economic growth, affecting people's quality of life and generating expenses that reduce people's income.

According to the World Health Organization (WHO), these diseases are most prevalent in low- and middle-income countries, with high mortality rates caused by these diseases and affecting men and women equally. An interesting fact is that the population lives longer, but due to these conditions and their complications, they do not live with a good quality of life.

The connection between health and productivity is based on a variety of theoretical frameworks; this study combines complementary approaches: This study combines two complementary approaches: human capital theory, human development theory, and Grossman's health demand model.

234-III–PO Programa de fortalecimiento basado en la construcción de una red de cuidado colectivo para el bienestar en la comunidad estudiantil

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This research was conducted using an implicative qualitative methodology, with the primary objective of promoting a network of collective care from the perspective of community feminism in a public upper secondary school, aiming to create safe spaces for student community well-being. This goal is grounded in the theoretical premise that the creation of a collective care network, based on the principles of community feminism, seeks to question and transform historically entrenched power structures such as patriarchy, capitalism, and colonization (Paredes, 2010), and can foster systemic change.

The conceptual proposal is structured around five interrelated dimensions: body, memory, time, space, and movement. These dimensions understand care as an integral, community-based, and political practice (Montero & Paredes, 2015), aiming to strengthen the social and emotional fabric within the school environment. They also align with the United Nations (2019) guidelines on adolescent well-being. Furthermore, from a holistic perspective, Prilleltensky (2006) emphasizes that well-being results from the synergy between the personal, relational, and social spheres.

In the initial phase of the study, a participatory diagnosis was carried out through collective mapping. This process identified the main concerns of adolescents as well as the available community resources, such as peer solidarity and the support of educational figures. Additionally, proposals were gathered to strengthen relational ties and collective care.

Data analysis included the coding of 181 records focused on the constructs of well-being and collective care. From this process, key categories emerged, such as proposals for well-being, study conditions, risks of addiction, school coexistence, institutional climate, gender-based violence, and overall well-being. Structural problems identified included lack of maintenance, scarcity of resources, and limited institutional support, alongside incidents of physical and verbal violence, insecurity, and discrimination against LGBTQ+ students.

The findings reveal that school well-being depends not only on material conditions but also on the quality of interpersonal relationships and the perception of safety. Students positioned themselves as active agents of collective care during the participatory diagnosis, demonstrating that school well-being is built upon affective networks, collective practices, and acts of resistance, despite the tensions arising from adverse structural conditions. This diagnosis provides the foundation for designing a participatory strengthening program aimed at creating safe and equitable spaces for adolescents, which will be implemented in the next phase of the study.

239-III–PV Modelo de inteligencia tecnológica para la creación de un ecosistema circular en el sector de servicios administrativos en México

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Technological globalization is a process of economic, social, and cultural interconnection accompanied by technical advances in various countries, industries, and companies that face sustainability challenges. In Mexico, the Administrative Services Sector lacks a framework that integrates digital technologies for the efficient and sustainable functioning of the ecosystem of actors and enterprises. The objective of this research is to propose a Technological Intelligence (TI) Model for the creation of a Sustainable Ecosystem (SE) in the Administrative Services Sector in Mexico, under the hypothesis that with the proper implementation of the TI Model, actors in the Administrative Services Sector will be able to create an SE to transition from linearity to organizational circularity. The research begins with a documentary review contextualizing the characteristics, functions, and performance of the Administrative Services Sector economy, its actors, and components, at the national and international levels. A literature review is conducted to analyze the elements and dimensions of TI for the structuring of the Model, and the factors and indicators related to the SE are determined. The research method used is qualitative because it will characterize the phenomenon under study, non-experimental because it will use deductive reasoning, cross-sectional because the information will be collected only once during the course of the research, and descriptive because it will describe the characteristics of the observed phenomenon. Documentary research techniques will be used to collect information and analyze the behavior of the two qualitative variables. The expected findings consist of relating the key components of technological intelligence that determine the creation of a sustainable ecosystem through the analysis of the variables and their dimensions, allowing the Model to be proposed and the actions to be taken for its proper implementation in companies in the Administrative Services Sector to be identified, optimizing resources and maximizing organizational efficiency.

254-III-PO Modelo de Negocio Sostenible para la Comercialización de Productos Agrícolas de la Zona Oriente Volcánica del Estado de México

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Agriculture is one of the most important primary activities for generating food for human consumption. It practically emerged with the establishment of the first civilizations more than 12,000 years ago in response to the needs of our ancestors. These changes were inherent to the sedentary lifestyle of the first formally consolidated societies until it became established as a necessary activity to feed everyone. This was the nutritional basis of human evolution in terms of the expansion and development of the cradle of civilization. Little by little, evolutionary conditions permeated the way agricultural activities were carried out. Over time, societies transformed into empires, nations, federations, etc.; they began to have access to their productions, so the idea of economic gain through the exchange of goods and services, such as agricultural products, was taken into account to generate profits with the help of exchange, thus evolving into what we know today as commercialization. Mexico is the third largest agricultural producer in Latin America and the twelfth in the world. With the potential to generate more than 800 agri-food and fishery products, approximately 78% of food exports are destined for a secure market. Approximately 32 million inhabitants in Mexico live in rural areas and their income depends on agriculture, but these incomes are low compared to the average monthly income, and agriculture only contributes 5% of the national GDP. Therefore, it is necessary to understand and identify the working conditions of agricultural producers in the Eastern Volcanic Zone of the State of Mexico. Understanding the concepts and elements of sustainability that allow for reducing the carbon footprint, by reviewing and explaining the sustainability models that impact the reduction of carbon emissions. Identify the concepts applicable to marketing and explain the different marketing models and/or plans. Based on what has been reviewed, it is important to implement a sustainable business model capable of increasing the marketing of agricultural products from the eastern volcanic zone of the State of Mexico.

266-III–PO Adolescencia migrante en la frontera sur de México. Una mirada desde la *agencia*

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The migration of unaccompanied Central American children and adolescents in transit to the United States through Mexico became notable in 2010. However, 2014 marked a turning point, as the high number of children and adolescents arriving at the US border revealed a novel dynamic of human mobility (Acuña, 2016) in the Central America-Mexico-US migration system. Since then, cases of migrant children and adolescents in transit through Mexico have continued to be reported, reaching a total of 500,113 between 2010 and 2023 (Migration Policy Unit - SEGOB, n.d.).

The persistence of unaccompanied children and adolescents in regional migration flows, despite the risks inherent to irregular and transit migration, has attracted the interest of qualitative research. This research has focused on understanding aspects such as the motivations and strategies of migration transit, and the development of resilience and agency in children and adolescents seeking a better life and reuniting with their families who had previously emigrated. In this context, this work is based on a graduate thesis in Social Work in progress, which delves into the agency of unaccompanied Central American adolescents in transit through Mexico, from the perspective of the Sociology of Childhood, which recognizes children and adolescents as active social agents.

The research employs a qualitative methodology, using semi-structured interviews with adolescents aged 12 to 18, of Guatemalan, Honduran, and Venezuelan nationality, who have entered Mexican territory "irregularly" through the Mexico-Guatemala border and are temporarily in Tapachula, Chiapas.

The objective is to understand how adolescents express their agency when constructing their migration project, considering their motivations, desires, decision-making, and the resources they mobilize. This analysis seeks to offer a different perspective on migrant adolescents, recognizing them not only as collateral and passive presences, but as active participants in migration processes.

274-III–PO Propuesta de estrategia de promoción turística digital para el barrio San Agustín de las Cuevas de la Ciudad de México

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Information and Communication Technologies (ICT) play a crucial role in promoting tourist destinations and have made it possible to transcend the barrier of physical distance. Today's tourists mostly demand them, from searching for information to planning their trip. In a competitive tourism market, cities use digital tools to reach different audiences in an economical and personalized way.
Mexico City is no exception, offering a wide range of tourist attractions in neighborhoods full of mysticism and charm. In the south of the city, the San Agustín de las Cuevas neighborhood, part of the Tlalpan Historic Center, was once classified as a magical neighborhood due to its heritage, natural, ecological, historical, and cultural characteristics. The Mayor's Office's government program recognizes tourism as a strategic axis, but it does not include the use of ICTs as required by current trends.
Therefore, a digital tourism promotion strategy is proposed at the local level for the San Agustín de las Cuevas neighborhood, focused on promoting the preservation and visibility of its cultural attractions. Digital promotion actions will be designed by integrating the main actors in the neighborhood: the mayor's office, local businesses, and the community. Creating quality content that highlights a differentiated experience and unique attractions in this neighborhood can encourage interest in visiting it.

The theoretical framework is analyzed through local tourism promotion and its link to endogenous development and culture. In addition, concepts such as promotion, digital marketing, content marketing, and neighborhoods as urban nodes are clarified. A qualitative methodology is adopted, with an ethnographic research method and a descriptive scope. The scope of the research is descriptive with a cross-sectional time frame and convenience sampling.

Based on the interviews conducted, the neighborhood has social media accounts for general dissemination, but they do not differentiate tourism content. The Mayor's Office is planning the “Tlalpan Vibra” campaign, which will leverage the region's potential for disconnection and discovery of the undiscovered. In addition, they advocate for promoting and including religious, archaeological, and indigenous tourism in tourist routes.

279-III–PV Diseño de estrategias didácticas para fortalecer competencias digitales en estudiantes de programa semiescolarizado de enseñanza de idiomas

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The aim of this study is to strengthen the digital competencies of students enrolled in the blended undergraduate program in Language Teaching at the Benito Juárez Autonomous University of Oaxaca (UABJO), through the effective and context-sensitive integration of accessible digital tools into their educational process.

The research is structured using a mixed-methods approach. On the one hand, surveys are conducted with students in the program to quantitatively assess their technological practices, the challenges they face, and their current level of digital appropriation. On the other hand, semi-structured interviews are carried out to provide a more detailed qualitative understanding of students' experiences, perceptions, and access conditions.

The diagnostic stage reveals significant gaps and specific demands that hinder the effective development of these competencies. The most recurring issues include poor internet connectivity, limited availability of technological devices, and inadequate use of such tools.

Preliminary findings indicate that students urgently require further training in the effective use of digital tools. Consequently, a set of didactic activities is proposed to enhance the training of future language teachers, including the use of various technological platforms and solutions.

The chosen context for this intervention deliberately moves away from highly connected urban areas. Instead, it focuses on a region characterized by limited connectivity and scarce resources for implementing educational initiatives. In this way, the study proposes strategies that can be adapted and applied in other educational settings with similar conditions.

280-III-PO Fortalecimiento del Perfil Empresarial Femenino a través del Desarrollo de Habilidades Blandas con uso del PDA (Análisis del Desarrollo Personal) en Pymes de Tizayuca, Hidalgo

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The project titled “Strengthening the Female Entrepreneurial Profile through the Development of Soft Skills Using the PDA in SMEs of Tizayuca, Hidalgo” aims to empower women entrepreneurs by developing key soft skills such as —leadership, communication, emotional intelligence, and teamwork— through the use of the PDA (Personal Development Analysis). This initiative addresses multiple challenges faced by women entrepreneurs in the region, including difficulties in decision-making, low adaptability to change, lack of support networks, and limited integration of technological tools for professional development.

The research follows a qualitative methodology that includes semi-structured interviews, focus groups, and the application of the PDA instrument, with the goal of identifying the behavioral and leadership profiles of the participants. Based on this analysis, the project seeks to characterize the behavioral profile of the entrepreneurs and understand the particularities of their context. This information will enable the design of a personalized training program aimed at strengthening the skills necessary to improve their professional performance. The program will include workshops, coaching sessions, and practical activities, with an emphasis on developing the soft skills previously identified as priorities.

The project also includes a dissemination phase, with the publication of results in scientific journals, presentations at conferences, and the development of recommendations for key stakeholders such as local authorities, business organizations, and the entrepreneurs themselves. This proposal aligns with the National Development Plan 2025–2030, particularly in the areas of gender equality, inclusive economic development, and regional sustainability. It also contributes to various sectoral programs and the Sustainable Development Goals (SDGs), highlighting SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth), SDG 10 (Reduced Inequalities), and SDG 17 (Partnerships). In summary, the project seeks to create fairer, more sustainable, and collaborative conditions for women leaders of SMEs in Tizayuca, recognizing their specific challenges and providing practical solutions to boost their leadership and the competitiveness of their businesses.

313-III-PP Prueba piloto del proceso de cultivo del hongo seta en Organizaciones sociales dentro del municipio de Xochiapulco de la Sierra Norte de Puebla

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The cultivation of edible mushrooms does not require large areas of land because it is concentrated in small spaces, being a vertical crop. It also requires a lower investment compared to traditional crops. Therefore, greenhouse mushroom cultivation represents a sustainable productive alternative, with an impact on the local economy, and creates an option for the consumption of quality food products.

This study was conducted from January to April 2025, conducting a pilot test with two social organizations in the municipality of Xochiapulco interested in the production process for self-consumption and marketing of edible mushroom production. The purpose of the pilot test was to identify the opportunities and challenges offered by the edible mushroom production process within the municipality of Xochiapulco. The pilot test was divided into four stages: 1) recognition and productive interest, 2) preliminary production, 3) establishment of production areas and replication of the production process, and 4) challenges and opportunities for post-harvest production. The objective was to implement an edible mushroom cultivation model, generating a new alternative for producing healthy food and strengthening the local economy.

A qualitative methodology was used through participant observation with two social organizations belonging to the Sembrando Vida program, through workshops and focus groups. The workshops documented collective interests, opportunities, and challenges encountered during the implementation of mushroom production, as well as an understanding of the technique used for mushroom cultivation and the productive conditions necessary for optimal growth.

The findings show that the cultivation of edible mushrooms in social organizations can be an alternative for social entrepreneurship. As an initial phase of the project, it can be used for self-consumption, as a sustainable model due to the use of agricultural waste, the absence of agrochemicals, and the ease of replicating the production process in limited spaces. Additionally, social strategies were identified that allow for local economic strengthening, benefiting small producers in the municipality.

Several key stakeholders participated in this process, such as PRORED (Projects for Strengthening Research in Networks), Sembrando Vida, and the municipal government.

The production process for edible mushrooms in social organizations in the Sierra Norte of Puebla has proven to be a potential way to promote food self-sufficiency and income generation. However, public policies, support programs to promote the development of productive projects, and financial resources are needed to initiate local and sustained production of edible mushrooms.

330-III-PO Accesibilidad en los destinos de sol y playa: algo más que rampas

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Talking about accessibility in tourism means talking about rights, inclusion, and quality; however, today it remains a pending issue on beaches. Mexico has 17 coastal states, of which only six have accessible beaches. This reflects the limited attention given to this segment in tourism. Furthermore, unfortunately, in sun and beach destinations, accessibility has been limited to basic solutions that do not address the real needs of people with disabilities, whether physical, sensory, cognitive, or mental (CNDH, 2012). It is a misconception to think that accessibility is solved by building ramps. Therefore, the objective of this research is to analyze accessibility in sun and beach destinations from a general perspective that goes
beyond physical infrastructure, promoting inclusive tourism.

To achieve this, a qualitative approach was used, based on documentary research of national and international best practices, as well as national regulations (Código Ético Mundial para el Turismo, 1999), (ONU Turismo, 2001), (Blue Flag, 2025), (OMT, 2015), (NMX-AA-120-SCFI-2016, 2016) and field research in Playa Quieta, Ixtapa-Zihuatanejo, Guerrero, Mexico, over a cross-sectional period. This methodology made it possible to identify existing areas of opportunity and conclude that physical, attitudinal, communication, social, and architectural barriers are still frequently present in tourism.

Analyzing accessibility in sun and beach destinations allows us to identify the needs of people with disabilities, with the aim of remaining competitive with other destinations and promoting inclusion, so that not only people with disabilities, but all tourists will have a better experience. In addition, it directs tourism towards compliance with the reduction of inequalities, goal 10 of the 2030 Agenda (ONU, 2015), which seeks to reduce discrimination against all people. Looking beyond ramps in terms of accessibility reduces barriers and limitations when discovering new places. It helps to minimize negative impacts, as everyone's needs would be met (B. Joseph Pine II, 1998). Because accessible tourism not only transforms destinations, it transforms lives.

331-III-PO Turismo como un derecho humano para los mexicanos

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In order to understand the value of social tourism as a bridge to access tourism as a universal right, the objective was established to build theoretical-conceptual supports that underpin social tourism in the case of Mexico. Therefore, this research used a qualitative approach, analytical method, exploratory scope, and cross-sectional temporality to achieve a desk study in which documents supporting the enjoyment of tourism as a human right were collected and analyzed: legal documents, academic studies, and social tourism projects.

The results of this research revealed long-standing and innovative social tourism projects, the fruit of the efforts of the tourism actors involved, which have challenged the traditional tourism model by bringing together vulnerable groups who, due to economic or physical limitations, are unable to enjoy tourism on their own, such as older adults, people with disabilities, families, young people, and migrants. In the case of Mexico, social tourism has also made progress at the federal, state, and local levels, but these achievements present a complex problem due to the abrupt changes that the state adopts to promote social tourism as a result of the succession of power every six years. To understand this issue, a timeline was developed showing the changes implemented from the government of President Luis Echeverría Álvarez (1970-1976) to the administration of President Claudia Sheinbaum Pardo (2024-2030).

In conclusion, it is necessary to question social tourism programs and their shortcomings in addressing the problems of marginalized communities in Mexico, since the ineffectiveness of these initiatives does not arise solely from administrative changes, but begins with the planning and monitoring of projects such as the National Council for Social Tourism or the Public Policy on Tourism for All, where poor management has impacted the implementation of social tourism. Therefore, although social tourism has positive impacts for assisted tourists, the State, and tourism service providers, these benefits will only be possible with collaborative planning, management, and evaluation by the tourism actors participating in social tourism.

354-III-PP Mujeres rurales conectadas: inclusión económica mediante tecnología en la Mixteca oaxaqueña

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This research analyzes the impact of social media dissemination campaigns as a strategy to increase foot traffic and sales in a community market composed of rural women in three highly marginalized municipalities in Oaxaca: Tepelmeme Villa de Morelos, San Miguel Tequixtepec, and Concepción Buenavista. Using a quantitative approach supported by structured surveys and digital metrics from Facebook Insights, the digital performance of the market was evaluated. The results show a strong correlation ($R^2 = 0.748$) between link clicks and digital interactions and the increase in weekly sales. However, the low level of active engagement on social media highlights gaps in digital literacy. The study concludes that social platforms are an effective and accessible tool to strengthen the local economy, provided they are accompanied by training and ongoing support. This model is replicable in rural communities with similar conditions as part of strategies to reduce poverty and promote sustainable development.

359-III–PO Ciudades concebidas para ser ciudades. El caso de ciudades mexicanas de la segunda mitad del Siglo XX e inicios del XXI

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Human beings, by producing, transforming, building, and reconstructing the territory, have conceived overtime spaces to be with others, to inhabit, to develop their day-to-day lives, or to obtain the necessary resources to meet their needs. Thus, cities have been configured as preferred spaces for human coexistence; some, like Mexico City, have a deep-rooted history that dates back centuries and beyond. However, in that effort to transform space, to conceive it, societies over time, and specifically in the Mexican context from the second half of the 20th century to the present, have left various experiences of spaces designed to be cities. In this way, the objective of this work is to recount and analyze urban projects located in central Mexico, to account for how these projects have had repercussions on the level of space, social life and urban infrastructure. The projects analyzed are Ciudad Sahagún and Ciudad Cooperativa Cruz Azul in the State of Hidalgo, Ciudad Satelite, Cuautitlan Izcalli, and the Ciudad del Bicentenario de Zumpango in the State of Mexico.

Although the vocations of these cities were conceived differently in their time, they all share the idea of forming urban spaces. The work conducts two types of analyses based on comparative method; the first is historical documentary, based on online research consultations and official and dissemination data sources (that is, official websites, press, and institutional sources). In this part, elements such as their vocation and general aspects (geographical location, population, and relevant historical aspects) are reviewed. The second analysis considered uses Geographic Information Systems (GIS), in this case utilizing the Google Earth Engine satellite imagery platform and Google Colab, a processing tool through code Notebooks based on text generation, machine learning, and deep learning; with the use of both tools, a modular workflow was developed that managed to analyze 4 out of the 5 cities using five-year data from 1985 to 2025. There, images were obtained that represent a median of the five-year data. At the same time, the Normalized Difference Vegetation Index (NDVI) was calculated, to which values were assigned, and an unsupervised classification (K-Means) was performed to classify pixels. Subsequently, a quantification of coverage areas by class was carried out, along with an analysis of coverage change according to the classification. These were contrasted with part of the data from the first analysis.

With these tools, time series of images were formed and obtained along with their analysis; from this work, it is possible to establish relationships between the findings of the first research method and the one recently described, such as demographic growth and the level of urban expansion, and how cities present a sustained population as in the case of Cuautitlan Izcalli, while in the case of Zumpango, there is exponential demographic growth associated with urban growth, or areas where it can be inferred that there is a slight decrease, as in Ciudad Satelite. This helps to understand that these projects have not only transformed the territory over time, but also how this has repercussions at the demographic level and in the growth of urban areas.

376-III-PV Costo financiero y social del tratamiento para pacientes con enfermedad de diabetes mellitus tipo 2 en la Clínica Hospital “B” ISSSTE Ciudad Valles en 2025

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Financial and social cost of treatment for patients with type 2 diabetes mellitus disease at the Hospital "B" ISSSTE Ciudad Valles Clinic in 2025.

Worldwide, the number of people living with diabetes has increased from 108 million to 420 million in the last thirty years. In the Region of the Americas, diabetes is the sixth leading cause of death and the seventh leading cause of life lost prematurely (PAHO, 2022).
Dying early or living ill as a result of a chronic condition has significant economic consequences that represent a social cost. This social cost includes not only the private cost that people face immediately, but also that of the externalities caused by the fact that the population does not adopt measures to prevent or better control the disease, that is, the cost for people in the long term (Lloréns, 2015). Consequently, the objective of the work is to identify the financial and social cost of the average treatment of patients with type 2 diabetes mellitus disease aged 45 to 64 years at the Hospital "B" ISSSTE Cd. Valles Clinic by 2025. Thus, a descriptive, cross sectional, non-experimental study was carried out, with a quantitative approach, where interviews were first conducted with personnel from the departments of doctors, statistics, financial resources, material resources, hospital pharmacy service on information on diabetes treatment to know the public cost (direct cost) and then a survey was carried out in a sample population of 363 people to know the cost indirect of patients (externalities). The sum of both costs makes up the social cost.
The result of the analysis of direct public cost per annual patient represents a total of $5,823.60 Mexican pesos, as for the indirect cost, an expense of $1,626.00 Mexican pesos is observed.
The results obtained in terms of the costs of this condition represent a significant expense for the institution, considering that it is a preventable non-communicable disease. Therefore, it would be necessary to emphasize preventive spending and analyze curative spending.
Keywords: Diabetes mellitus, treatment costs, social cost and financial cost.

377-III–PO Satisfacción marital y calidad de vida en padres de hijos con Trastorno del Espectro Autista: una revisión sistemática

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The diagnosis of autism spectrum disorder (ASD) carries significant implications for parents, who often face behavioral and emotional variations as part of their daily experience. Consequently, family dynamics require adjustments in everyday activities to adapt to this new reality. The objective was to critically analyze the existing literature on the relationship between marital satisfaction and quality of life in parents of children with ASD, and to provide elements that guide future psychosocial interventions aimed at strengthening family well-being. This review followed the PRISMA statement. The study search was conducted in the SpringerLink, ProQuest Psychology, and Dimensions AI databases, covering the period from 2019 to 2024. Inclusion criteria were research involving parents of children with ASD, using a quantitative, non-experimental approach, with cross-sectional, correlational, or longitudinal designs. Methodological quality was assessed using the AXIS tool. A total of 11 articles were included, revealing that the level of dissatisfaction in marital relationships was higher among mothers than fathers, attributed to the fact that mothers tend to take on a greater share of caregiving responsibilities. Furthermore, it was concluded that the symptoms of childhood ASD have significant indirect effects on marital conflict. Low relationship satisfaction, parenting-related stress, and disagreements in coparenting were more frequently reported by mothers. Finally, it was identified that the ASD diagnosis negatively impacts both marital satisfaction and quality of life, although social support may play a key role in improving both variables.

395-III-PO Panorama de la Producción Científica Mexicana en Ciencias Médicas (2017–2023): Un Análisis Bibliométrico Multibase

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Medical sciences focus on the human body and generate a significant amount of knowledge, mainly transmitted through scientific journals. To characterize this production, a bibliometric analysis was performed on articles published by Mexican authors, indexed in the Web of Science, Scopus, and PubMed databases between 2017 and 2023. The biliometrix library for R and Pajek were used for this purpose. A total of 84,390 publications were identified, with an average citation count of 1.72. Five journals of Mexican origin were found to have the highest number of publications. The five institutions with the highest output were the Universidad Nacional Autónoma de México, Instituto Mexicano del Seguro Social, Instituto Nacional de Ciencias Médicas y Nutrición “Salvador Zubirán,” Universidad de Guadalajara, and Instituto Politécnico Nacional, all with a growth in publications directly proportional to the number of years. Only 43.83% were articles with Mexican correspondence, but none of the 10 most cited articles had a lead or corresponding author. The most frequent topics of study were COVID-19, diabetes, hypertension, diabetes, and cancer, with no emerging topics of study found. Although it was not possible to compare productivity results with other countries, the results suggest that despite the large number of articles produced, the research topics lack breadth and are far from achieving translational medicine.

417-III–PP Domestic work in Mexico: An expression of structural tensions in informal labor markets

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This research analyzes how Mexico's informal labor market reproduces structural inequalities, using paid domestic work as a case study. In the third quarter of 2024, this sector employed 1.94 million people, 96.5% of whom worked under informal conditions—well above the national average of 54.6%. Furthermore, 97.1% of workers in this occupation were women, highlighting the highly feminized and vulnerable nature of this labor sector (DataMéxico, 2024).

The analysis draws on three complementary theoretical frameworks. Structuralist labor theory, developed by authors such as Raúl Prebisch, Michael Piore, and Alejandro Portes, interprets labor market segmentation as an expression of dependency, underdevelopment, and the hierarchical organization of peripheral economies. Reproductive labor theory, represented by Silvia Federici, Shahra Razavi, and María Ángeles Durán, underscores the centrality of care work in sustaining life and its historical exclusion from formal economic systems. Finally, feminist economics, with scholars such as Nancy Fraser and Corina Rodríguez Enríquez, offers a critical lens on the sexual division of labor and the power asymmetries that restrict women's access to labor rights.

The study employs a mixed-methods approach. A Logit model based on microdata from the National Employment Survey (ENOE, 2018–2024) reveals that contract type, working hours, and income significantly influence the probability of being affiliated with social security. This is complemented by participant observation in organizational spaces, particularly at the National Center for the Professional Training and Leadership of Household Workers (CACEH), which uncovers symbolic and institutional barriers not captured by quantitative analysis.

The findings lead to the conclusion that informality is not an individual choice but the outcome of a segmented labor structure and insufficient public policies to ensure effective labor rights. By centering on the experiences of domestic workers, this study contributes to ongoing debates on informality, social protection, and the care economy. It advocates for rethinking institutional design and recognizing domestic work as a central pillar of economic and social reproduction in Mexico.

423-III–PO Innovación en modelo de negocio descolonizador para artesanas Bawe Paria en la Bahía de Ohuira

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This study develops and tests a decolonizing business model innovation for Bawe Paria, an artisanal enterprise led by women of Yoreme heritage on the coast of Ohuira Bay in Sinaloa, Mexico. Faced with unequal task distribution, limited digital connectivity, and threats to local ecosystems, the project applied an artisan-centered Design Thinking methodology to co-create internal governance protocols, a culturally grounded brand identity, and a digital marketing strategy. Key outcomes include a clear division of roles and benefit-sharing mechanisms; a redesigned logo and visual identity that integrate Yoreme cosmology; and a social media prototype. Findings suggest that integrating ancestral knowledge into business design improves both market competitiveness and social cohesion. This case offers a replicable innovation for gender-responsive Indigenous enterprises seeking sustainable development paths that resist extractive paradigms. Future research should assess long-term socioeconomic impacts, refine digital marketing tactics, and explore policy mechanisms to protect coastal ecosystems integral to artisanal livelihoods.

465-III–PO Extensión del modelo de oligopolios de Cournot: un modelo dinámico para anticipar la concentración de mercado

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The research study comes under the ambit of Industrial Organization with particular relevance to economic competition and business economics. The study is concerned with the interaction of a market among a small number of firms such that each of these firms changes its production based on the actions of its competitors. Unlike the perfect competition model in which producers lack market power, oligopolies are characterized by strategic firm actions.

From the traditional static Cournot duopoly model, we convert it into a discrete time dynamic model. We add a best response rule that reacts on quantity non-negativity. This piecewise linear model, which resulted from the above, is one where dynamics are affine when all firms are in the market but system dimension decreases if one firm is out of the market. Such a process only reflects strict exit processes, potential fluctuations, and selection by competition, all of which the static model does not consider.

The method is divided into two: mathematical study of the dynamic system with the aim of determining conditions for convergence to concentrated market structures (duopoly or monopoly) and numerical simulations showing firm paths and checking the stability of the theoretical results.

The results are that for four or fewer firms, a single condition will suffice to keep all but the most efficient firm forever excluded. For five firms, a second condition is required in order to ensure convergence. For more general markets, we construct a spectral-type inequality which is used to restore stability. Furthermore, a comparable analysis explains the formation of stable duopolies.

Finally, the paper provides good quantitative estimates for forecasting market concentration and an analytically tractable model for explaining the speed and direction of concentration. The technical character of the approach is suggested in the title but emerges only when the paper is presented, with the final section emphasizing economic insight as well as regulatory applicability.

478-III-PP Agroturismo y desarrollo local: Enfoque asociativo desde la economía social y solidaria en productores de mezcal de Santiago Matatlán, Oaxaca

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En los territorios rurales, donde la agricultura representa su principal medio de sustento, la diversificación de actividades productivas surge como una nueva alternativa para generar ingresos. A través de la revalorización de los productos endógenos que marcan la identidad local, estas comunidades encontraron en el turismo una forma de ampliar y complementar sus tareas tradicionales.

Sin embargo, las conexiones entre el sistema agrícola y el turismo han sido poco estudiadas, por esta razón, la presente investigación analiza cómo el agroturismo, visto como una estrategia para el desarrollo local, basada en un enfoque asociativo característico de la Economía Social y Solidaria se desarrolla en Santiago Matatlán, Oaxaca, comunidad reconocida por su producción de mezcal.

Para la presente investigación se realizó una evaluación exhaustiva de artículo en inglés y español encontrados en bases como Scopus, Web of Science y Google Schoolar que se relacionaran con los términos 'agroturismo', 'desarrollo local', 'economía solidaria', 'asociativismo rural', 'mezcal', 'Santiago Matatlán' en el periodo de 2008 al 2024, encontrando autores clave para las dimensiones de este estudio como Savedra García et al (2012) que define el asociativismo; Collin (2008) en la economía social y solidaria; Galán-Cuevas et al (2017) en el agroturismo y desarrollo local, entre otros.

Se implementó un diseño mixto secuencial (Pérez, 2011): los datos cualitativos obtenidos en el análisis bibliográfico realizado permitieron una mejor comprensión de los resultados generados porla aplicación de un cuestionario creado a partir de Google Forms, que cuenta con tres dimensiones de estudio: asociativismo, implementación del agroturismo y el desarrollo local. Los resultados arrojaron que solo el 25% de los productores (as) participan en organizaciones formales, sin embargo, eso no limita su participación dentro de la organización de la feria del mezcal en donde el 63% participa en la toma de decisiones. Positivamente se puede mencionar que 3 de cada 4 productores realizan actividades de turismo en sus palenques o áreas de producción, ofertando recorridos a parcelas de agave y degustaciones de diferentes tipos de mezcal. Aunque los productores le dan un gran significado e importancia a su cultura y tradiciones (45%), existe una desigualdad de ingresos muy marcada, pues solo el 13% afirma tener una mejor calidad de vida por asistir a estos eventos. los resultados cuantitativos fundamentan el predominio y auge del enfoque en prácticas turísticas; así como el análisis cualitativo permite la comprensión de las motivaciones y limitaciones de los productores de mezcal. Se deduce que el agroturismo dirigido hacia el asociativismo posibilita la diversificación económica y aumenta el bienestar colectivo.

505-III–PO Cooperación y conflicto en el sector forestal mexicano: un análisis de la tragedia de los comunes desde la teoría de juegos

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From the perspective of forest economics, natural resource management in Mexico faces a structural trade-off between cooperation and conflict, primarily determined by the prevailing form of collective ownership in the country. This dynamic is manifested by the choice between resource conservation and maximizing economic efficiency. Particularly in agrarian communities (ejidos and communities), the management of forest assets faces challenges derived from rivalry over use and the difficulty of excluding potential users, which defines their nature as common assets. This paper proposes an analytical approach based on game theory, with the objective of formally modeling the strategic decisions faced by actors involved in forest management under collective ownership schemes. Based on this theory, and supported by new institutional economics (NIE), a conceptual framework for ownership is developed. Furthermore, it is shown that resolving cooperation dilemmas requires understanding the formal and informal rules that structure individual and collective incentives. In contexts characterized by weak institutional governance, external market pressures (timber and non-timber), and internal social fragmentation, these dilemmas are intensified. Non-cooperative game models, such as the prisoner's dilemma, allow for the representation of situations in which actors maximize their individual benefits without internalizing the negative effects on the common resource, leading to inefficient and potentially unsustainable equilibria. This characteristic can be applied to common property; however, cooperative equilibria can be achieved through endogenous institutional arrangements. Therefore, forest economics can benefit from the analytical tools of game theory to understand the patterns of strategic interaction between actors and to propose governance schemes that promote cooperative outcomes. This will allow for the formalization of conflicts over resource use and, at the same time, identify the conditions necessary for the long-term sustainability of forest systems under common ownership.

516-III-PO El uso de tecnologías disruptivas en el Sistema de Transporte Inteligente. El Caso de la Ciudad de México

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Smart cities are an innovative concept for creating cities that use technologies to improve citizens' quality of life. A fundamental element of this concept is public transportation services, which can be optimized through Intelligent Transportation Systems (ITS) that utilize disruptive technologies, with the goal of promoting efficient and improved service for users.
This research aims to explore the use of disruptive technologies in the ITS system, in the case of Mexico City, with the goal of making recommendations for developing an ITS system in this city. To theoretically support the research, a literature review was conducted following the methodologies of Levy & Ellis (2006), Saunders, Lewis, & Thornhill (2019), and Booth, Sutton, & Papaioannou (2015). According to Levy & Ellis (2006), a literature review is an effective way to establish a solid foundation for knowledge. Its characteristics include the analysis, identification, and synthesis of quality literature, as well as guidance in the construction of coherent conceptual frameworks. Furthermore, case study research was used as a strategy to understand the implementation of intelligent transportation systems in a real-life context. This methodology, according to Yin (1984), consists of analyzing phenomena in a real-life context with the goal of answering how and why questions. This methodology requires case study selection, data collection, comparative analysis, and triangulation with previous literature.

The cases of the European Union, Japan, the United States, and Singapore were studied, all of which have innovative and standardized Intelligent Transportation Systems (ITS) that comply with international standards. In addition, the case of Mexico City and its challenges in advancing toward ITS were studied. The results of the study suggest that these countries are implementing practices and projects related to Intelligent Transportation Systems (ITS) and can serve as an example for improving public transportation in Mexico City. Based on the analysis, recommendations were made for their development in Mexico City.

518-III-PP Feria interactiva de las matemáticas en la educación medio superior para el desarrollo de habilidades lógico-matemáticas

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Mathematics is an essential subject for the development of logical–mathematical skills in upper secondary education students; however, most face difficulties in understanding this discipline. This situation results in low academic performance and a negative attitude toward the subject. Among the main causes are the use of non
interactive methodologies and the lack of application of its contents to real-world contexts. The objective of this project was to analyze the implementation of an interactive mathematics fair based on games as a strategy to promote the development of logical–mathematical skills. For this purpose, the Game Based Learning methodology was employed, defined by Plass, Homer, and Kinzer (2015) as the creation of playful experiences with clearly defined educational objectives, integrating motivational, cognitive, and sociocultural components to facilitate meaningful learning. Furthermore, Gee (2008) notes that this approach fosters problem-solving, structured task progression, and immediate feedback.

In this study, various mathematics games were designed and implemented, such as Patomatemático, 100 Mathematicians Said, Mathematics Marbles, Mathematics Treasure Hunt, Figure Probability, Mathematics in Motion, as well as origami and 3D figure construction workshops, among others. These activities were presented at different stands during the Interactive Mathematics Fair, where participants engaged in challenges, solved problems, and collected tickets exchangeable for prizes. This dynamic encouraged participation, increased interest, and contributed to strengthening logical–mathematical skills in a motivating and collaborative environment.

The results suggest that this proposal represents an innovative and engaging way to learn mathematics, fostering greater student interest and facilitating the understanding of abstract concepts. In conclusion, the Interactive Mathematics Fair is presented as a viable alternative to promote the development of logical– mathematical skills in upper secondary education.

520-III–PO Productividad y tecnología y sus efectos en las PYMES en México

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This research aims to demonstrate the effects of productivity and technology on the life expectancy of SMEs in Mexico, and is supported by three theories, one for each variable: the theory of the business life cycle and Ansoff's contribution related to the corporate strategy that favors the life expectancy of companies; the explanatory variables are supported by the theory of capital productivity primarily in the practical way that Marshall uses it on the theory of the company, and with the theory of the diffusion of innovation and the model of technological innovation at the organizational level as proposed by Tornatzky. In order to achieve the objective, it uses a data panel with a base built from data corresponding to the 2009, 2014 and 2019 economic censuses. After the panel, a clustering technique is carried out to obtain groups with homogeneous characteristics, first with a universe of companies of all sizes, and then with a universe that includes only SMEs. In both the data panel and the clusters, regressions with fixed effects and regressions with robust PCSE models are carried out. The tests applied to the data are: VIF, classification matrices, Hausman test, Jochmans test and Wald test. The results obtained show that the subvariables with the greatest positive relationship with the age of the companies are: total gross production, the stock of machinery and computer equipment, employed personnel, internet service and the percentage of personnel who make use of it; productivity is only positively related to a cluster of SMEs. In general terms, it is concluded that the variables included in the developed model explain the variability of the age of the companies, but there are variables not included in the model that can also explain it, so it is recommended that for future projects the explanatory variables be expanded.

525-III–PO Multiplier effect of expenditure on research and development among economic subsectors in Mexico

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This study analyzes the multiplier effect of research and development (R&D) spending on the gross value added (GVA) of 86 economic subsectors in Mexico during the period 2016-2018. The data was sourced from the 2019 Economic Census published by the National Institute of Statistics and Geography (INEGI). In economic literature, the concept of a multiplier refers to the rate at which an initial change in an economic variable, such as expenditure, causes an amplified change in income or product. This study adapts this concept to the context of economic growth and innovation, using a balanced panel database with interactive dummies to identify which subsectors had a statistically significant impact on GVA. This approach moves beyond an aggregated analysis to reveal that the returns on innovation investment are not uniform across the economy but are concentrated in specific industries.

The findings indicate that thirteen subsectors show positive and statistically significant effects from expenditures on R&D, software, and patents on their GVA. These subsectors, which include e-commerce (couriers and messengers), personal services, healthcare products, fashion, wholesale trade intermediation, and petroleum product manufacturing, are highlighted for their ability to leverage technological innovation to improve processes, products, and competitiveness.

The study's key contribution is its granular analysis, which reveals where innovation investments generate measurable value. Notably, the subsectors of couriers and messengers, and credit and non-securities financial Intermediation demonstrate a significant positive relationship with GVA across all three types of innovation spending (R&D, software, and patents). This suggests that these industries are highly innovation-driven, utilizing a multifaceted approach to technological advancement and intellectual property protection to maximize their economic output. These results can serve as a guide for policymakers to better understand the sectors with the greatest potential for technological absorption and to design targeted policy interventions that account for the unique innovation profiles of specific economic activities.

526-III-PO Participación de la comunidad y de estudiantes de medicina en la prevención de enfermedades metabólicas en México

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Justification. This study is part of my thesis for my PhD in Economic Sciences. Introduction. The metabolic diseases type 2 diabetes mellitus, obesity, and systolic hypertension (DOH) are a triad with increasing prevalence worldwide and in Mexico, which also impacts the economies of families and governments. The dominant prevention model promotes individual measures and holds individuals accountable for the results. A more effective alternative is community-based prevention, anticipating the disease and contributing to social health organization. Objective. Community-based prevention for DOH, with the participation of students from the Higher School of Medicine del IPN in the detection of risk factors and the formation and care of Neighborhood Prevention Groups (NPGs), proves that students are an effective human resource for prevention, and also improves their professional and social preparation. Materials and methods. School practices were organized in local markets in the municipality of Miguel Hidalgo. 70 students participated. 271 DOH risk factor screenings were conducted in people over 20 years of age, and 10-neighborhood health care teams NPGs were formed to monitor these outcomes through meetings and phone calls during the school year. Support was provided by local and health authorities, as well as participation from community social organizations. Risk factor screening and quality of life monitoring forms were used. Statistical processing and report preparation were carried out by the students. Results. In an aggregate analysis of the three diseases, 43.9% of individuals were at risk for one of the three diseases, 33.7% were at risk for two diseases, and 22.4% were at risk for all three diseases. The results provided the students with an understanding of the scope of these problems. Conclusions. This type of community health intervention demonstrates that students are an important human resource. They raise awareness, knowledge, and develop skills for community organization and participation, meet educational objectives, and provide support to local health authorities and services.

532-III–PO Pensión del bienestar y ahorro voluntario en México. Modelo de diferencias en diferencias

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Since the pension system reform, voluntary savings among Mexican workers have been characterized by their low levels. Behavioral economics, as well as conventional economic theories, offer various explanations for this phenomenon. On the one hand, there are biases in current consumption or consumption by the next neighbor; on the other, low incomes or capital market imperfections. In addition, the constitutional designation of the Welfare Pension may turn it into an additional incentive to inhibit voluntary savings. This paper seeks to analyze whether the Welfare Pension has discouraged voluntary savings in individualized accounts. To do so, we use a Difference-in-Differences Model with data from the National Survey of Financial Inclusion, considering households with at least one person aged 65 or older as the treatment group; and households with people under 65 as the control group. The results indicate that the Welfare Pension reduces the likelihood of voluntary contributions in households with at least one person aged 65 or older compared to households that do not live with people in that age group. In quantitative terms, a reduction in this probability of 2.4 percentage points is estimated. These findings raise the possibility of strengthening not only financial education but also advancing the development of more attractive and accessible financial products, or designing incentives that encourage long-term savings, even in the context of a universal pension program.

535-III–PO El Sistema Nacional de Infraestructura de la Calidad y el Desarrollo Sostenible

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In Mexico, the National Quality Infrastructure System (SNIC) is based on the Quality Infrastructure Law (LIC, 2020) and consists of the following elements: metrology, standardization, accreditation, and conformity assessment services. The LIC aims to "promote economic development and the quality of goods and services, to expand productive capacity and foster international trade," with a priority on the protection and promotion of health, the protection of the environment, and the physical integrity, health, and safety of workers. The SNIC contributes to sustainable development thru the development of standards and the evaluation of their complianceThis mixed-method, inductive, exploratory research is conducted through document review and case study, applying questionnaires and interviews to users and experts of the SNIC, with the aim of analyzing the SNIC's contribution to sustainable development and identifying areas for improvement.It was determined that 54.2% of conformity assessment bodies consider the Official Mexican Standards (NOM) and the Mexican Standards (NMX) to be up-to-date and relevant; 76.2% consider the main benefit of accreditation to be the reliability of its results. Companies constitute 81.7% of the users of conformity assessment services, and public institutions 24.7%; the main services used are: equipment calibration, 68.4%, laboratory testing, 57.9%, and management system certification, 47.4%.For companies, the benefits of these services are to provide confidence to clients and consumers and to ensure compliance with regulatory requirements.The main area for improvement is the publication of the Law's regulations, which is considered a limitation for the SNIC.

536-III-PO Propuesta de un modelo de evaluación de políticas públicas urbanas a través del análisis espacial

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Accelerated urban growth poses significant challenges to sustainability and social equity in contemporary cities. Within this context, urban public policies (UPPs) represent a key mechanism for shaping and managing territorial development. However, the lack of systematic evaluation mechanisms often undermines their effectiveness. This study proposes a theoretical and methodological model for evaluating UPPs from a quantitative and spatial perspective, applied to the case of the "Granadas" Cooperation Action System (SAC) in Mexico City. The approach integrates statistical data and Geographic Information Systems (GIS) tools to transform qualitative objectives into verifiable quantitative indicators. Results reveal a 578.72% increase in the resident population within the intervention area, meeting the stated goal but raising concerns about the model's sustainability and its alignment with private sector interests. The proposed model is presented as a replicable tool to enhance transparency and the effectiveness of UPPs, provided that their design and implementation are guided by principles of social equity and collective benefit.

541-III–PO Enseñanza de la química mediante el compostaje: Estrategias didáctico-pedagógicas para la comprensión de la primera Ley de la Termodinámica en la EPOEM-308 (2021-2025)

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This research analyzes the teaching and learning of chemistry at the high school level to link the microscopic dimension with the macroscopic world based on the concepts of composting, promoting in students the understanding and importance of a new management of the organic fraction of municipal solid waste, based on the theory of project-based learning, which maintains that experimental practice allows students to understand the scientific knowledge of chemistry in a meaningful and contextualized way. It has been proven that the tool of integrating high school students into composting processes effectively links the most important aspects of the first law of thermodynamics, especially the principles of energy conservation and transformation of matter.

From a social science perspective, teaching chemistry through composting constitutes a powerful pedagogical tool that articulates scientific knowledge with social and environmental practices. This method not only facilitates the understanding of chemical processes such as aerobic decomposition, the transformation of organic matter, and the carbon cycle, but also promotes critical reflection on the role of science in building sustainable societies, developing the following aspects in students: Meaningful learning; Comprehensive education; Connection with the environment; Composting introduces values such as respect for nature, resource reuse, and the circular economy; Transformation of cultural practices; Youth empowerment..

We can say that teaching chemistry through composting not only strengthens scientific learning but also contributes to the development of critical citizenship, committed to environmental care and social transformation from the classroom.

The mixed methodology implemented included the application of surveys to 51 students from two first-year groups of the Official Preparatory School of the State of Mexico number 308 of the municipality of Nicolás Romero (group 1ro1 with academic deficiencies and group 1ro2 with favorable performance), structured interviews with teachers and specialists from the science workshop, and direct and participant research through the collaborative construction of composting systems in an area specifically established for that purpose.

The most important findings revealed the following: In the same way that energy is neither created nor destroyed, it is only transformed according to the first law of thermodynamics, natural resources are neither created nor destroyed but are transformed through biogeochemical processes that can generate pollution when not managed properly, which aroused a genuine interest among students in active participation to build compost and directly observe the transformations of organic matter, which facilitated the integration of interdisciplinary knowledge of chemistry, biology, physics and environmental education, demonstrating the effectiveness of project-based learning for the understanding of complex scientific concepts and the promotion of sustainable practices in municipal solid waste management.

548-III–PO Entre la fragmentación y la consolidación: análisis de instrumentos estratégicos de gestión del suelo en zonas limítrofes entre la CDMX y el Estado de México

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Between fragmentation and consolidation: an analysis of strategic land management Instruments in border areas between Mexico City and the State of Mexico.

The process of urbanization in the Mexico City Metropolitan Area (ZMVM) has shaped an extensive, complex, and inequable territory, where border zones between Mexico City and the State of Mexico have become pivotal areas for understanding urban fragmentation phenomena and the challenges associated with the potential consolidation of the urban fabric.

This research aims to evaluate the current scope and limitations of strategic land management tools and territorial information systems applied within this territory. Its objective is to propose criteria that promote the consolidation and legal and functional harmonization of the urban structure in the ZMVM. The study will be exemplified through the border area between the Miguel Hidalgo borough and the municipality of Naucalpan, characterized by marked contrasts in infrastructure, urban equipment, regulatory frameworks, and the quality of public spaces.

The analysis will focus on two major groups of instruments: 1. Urban management and action tools— replotting, land regularization, public-private urban agreements, and regeneration efforts; and 2. Information and diagnostic tools—including geographic information systems (GIS), land inventories, urban observatories, and cadastral records.

The methodology employs a mixed approach, combining documentary and regulatory analysis with spatial analysis using Geographic Information Systems (GIS). The work will be structured into four phases: Collection and systematization of instruments; Multi-layered, multi-level territorial analysis, evaluating possible patterns of consolidation or fragmentation based on application of the instruments; Operational and comparative evaluation of their implementation and coverage; and Development of criteria and recommendations for their improvement or redesign.

Data sources include official cartography (INEGI, SEDUVI, IMEVIS), normative documents, and georeferenced databases.

The purpose of this research is to foster a critical reflection on the urgent need for public policies in both entities to coordinate efforts, leading to the establishment of technical and operational criteria that can inform future policymaking. It also seeks to reassess the role of urban planning in addressing imminent challenges such as interjurisdictional governance and urban consolidation.

550-III–PO Mercados de carbono como parte de las estrategias de sustentabilidad en empresas del sector alimentario en México

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Climate change is primarily attributed to the intensive use of fossil fuels and environmentally harmful production systems, generating significant increases in the intensity and frequency of extreme weather events. Mexico is particularly vulnerable to climate change, facing risks of impact on its environmental, social, and economic systems.

Regarding greenhouse gases (GHG), it is estimated that the food production system contributes more than a third of total emissions generated worldwide, and in Mexico it represents approximately 30% of national emissions.

Given this scenario, carbon markets are emerging as economic instruments that seek to limit the generation of GHG emissions through a pricing mechanism for GHG emissions.

This research aimed to analyze the incorporation of carbon markets into the sustainability strategies of companies in the food sector in Mexico. The methodology consisted of a review of the sustainability reports of the ten most competitive companies in the sector in 2023. Their sustainability strategies as well as their reported emissions were analyzed.

The results show that companies in the food sector in Mexico do not integrate carbon markets into their sustainability strategies, focusing their efforts on achieving reductions at the source of generation. They are also aligned with climate initiatives that do not recognize the use of external compensation mechanisms in meeting their emissions reduction goals. All of the above is also linked to the fact that Mexico's Emissions Trading System has not entered into operation.

552-III-PO Hilado del tejido colectivo de la Red Latinoamericana de Defensoras digitales. Tejiendo cuidados: Rumbo al fortalecimiento de su bienestar

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Las organizaciones de mujeres activistas implacables en la lucha de los derechos de las mujeres y muchas veces con más resultados que algunas instituciones gubernamentales e incluso organizaciones internacionales, tal es el caso de la Red Latinoamericana de defensoras digitales que se ha dedicado al acompañamiento de sobrevivientes de violencia digital, reformas legislativas y actuación política. Sin embargo, su activismo tiene altos costos para ellas, pues su bienestar se ve disminuído y con ello sus relaciones interpersonales. Cuidar de las mujeres activistas y de sus espacios colectivos es un acto político y una semilla clave para los derechos de las mujeres y la dignificación de sus cuerpas-territorio. Por ello, el objetivo de esta investigación es hilar el tejido colectivo de la Red Latinoamericana de Defensoras Digitales para favorecer acciones de cuidados que fortalezcan su bienestar, a través de la investigación acción participante que es una metodología de corte dialéctico-implicativo que permite la evaluación y la transformación comunitaria desde la interacción social, poniendo al centro sus voces y saberes para la reconstrucción de sus propias espacias. Hasta ahora los hallazgos han derivado en reconocer la importancia de su organización interna y el hilado de su propia comunidad para que el cuidado sea sostenido por todas las integrantes sin la violencia simbólica que coloca a la mujer en la sobre responsabilización del cuidado de otras/otros y la despoja de su cuidado propio.

565-III–PO Fortalecimiento del proceso de producción de café en la Sierra Norte de Oaxaca

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Coffee production stands for a livelihood for more than 500,000 producers in Mexico. Therefore, the aim is to find alternatives that improve the quality of life of coffee growers in the community of San Isidro Reforma, in the Sierra Norte of Oaxaca. This study applied a qualitative method based on semi-structured interviews and participant observation with coffee producers in the study community. As a result, it was seen that coffee producers in this community are promoting organic farming through agroecological production systems, the production of biofertilizers, and the control of coffee fermentation and processing processes. Thanks to these practices, they have achieved excellent quality coffees, which have increased their commercial value and, so, improved the producers' quality of life. The problems found are that profits are concentrated in the final sales, while producers receive a reduced income despite their hard work in the fields. Undervalued materials are discarded in the production line, generating economic losses for producers. Among the main recommendations to strengthen the coffee production process are promoting fair trade by regulating coffee prices in the market; fostering more efficient productivity through practices based on the circular economy; and through the sustainable use of coffee by-products to generate added income. This ensures cleaner production that preserves product safety and offers nutritious and healthy alternatives. Furthermore, strengthening producer organizations and marketing and distribution channels through cooperative dynamics and associations is essential. In conclusion, it is important to promote agroecological systems, as they allow for biodiversity conservation, nutrient recycling, and efficient energy use, unlike traditional farming systems. Furthermore, it is important to value coffee by-products to boost the economic growth of coffee-growing communities, product derived from participation in the SIP 20250303 project.

566-III–PP Aplicación de Inteligencia Artificial en Educación Superior: Optimización del aprendizaje y desarrollo de competencias tecnológicas

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The integration of artificial intelligence (AI) in higher education presents a strategic opportunity to address the existing gap between technological competencies developed in academic settings and current labor market demands. This research focuses on **evaluating the impact** of specific AI tools (intelligent tutorial systems, adaptive platforms, and educational chatbots) on the development of technological competencies among university students in emerging technology programs in Mexico City.

The study employs a sequential explanatory mixed-methods design (quantitative → qualitative) with a sample of 200 students and 30 faculty members from higher education institutions. The quantitative phase assesses statistical impact through pre and post-intervention tests, while the qualitative phase explores underlying mechanisms through semi-structured interviews and focus groups.

Expected results focus on:

- Determining the effectiveness of AI tools in improving specific technological competencies, measured through a 30% increase in emerging technology mastery
- Identifying learning personalization mechanisms that significantly contribute to the development of technical and transversal skills
- Validating the hypothesis that systematic AI integration improves student preparation for technological labor market challenges.

These findings will contribute to scientific knowledge about educational AI effectiveness in Latin American contexts and provide empirical evidence to support technological integration policies in higher education.

567-III–PO Alfabetización digital en arquitectura: el rol de la IA en la democratización del conocimiento técnico en PyMES

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Today, the digital transformation in the Architecture, Engineering, and Construction (AEC) sector poses significant challenges and opportunities for small and medium-sized enterprises (SMEs). This is due to their inherent difficulties in accessing specialized technical knowledge. This research explains how artificial intelligence (AI) can become a useful tool for digital literacy in the AEC sector, promoting the sharing of technical knowledge in resource-limited environments.

The role of AI as an auxiliary tool in decision-making and process automation is explored, highlighting its potential to ease the challenges faced by professionals and SMEs in the AEC sector. This is achieved through an analysis of three case studies selected based on criteria of technological accessibility, applicability in contexts with limited infrastructure, and public availability of information. The sources consulted include academic databases, open-access platforms, and experiences documented by organizations in the sector. This review includes accessible tools that are considered useful for facilitating learning and stimulating the development of digital skills among SME professionals in the sector under study.

The ethical, social, and professional considerations to be taken into account when using AI are also addressed, proposing guidelines for responsible and critical adoption. Among the findings derived from the analysis, it was identified that the use of AI-based virtual assistants significantly improves efficiency in small project management, while generative design platforms allow SMEs to explore architectural solutions without requiring specialized software. These examples demonstrate the transformative potential of AI in resource-limited contexts.

Finally, the role of digital literacy as a strategic pillar to enhance innovation and transformation in SMEs in the AIC sector is analyzed. This research seeks to highlight the importance of equity in access to technical knowledge, offering an interdisciplinary approach.

568-III–PO Análisis bibliométrico de la investigación acción participativa aplicado a estudios sobre medios de vida

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Background. A livelihood (LV) is made up of the capabilities, assets, and activities necessary to achieve our subsistence goals and becomes sustainable when it can recover from stresses, shocks, or disturbances. The livelihood approach is participatory, holistic, and aimed at empowering people because it seeks to generate changes that improve the quality of life in communities, as well as address issues that threaten their livelihoods; the best way to approach this is through participatory action research (PAR), and solutions should be generated from the communities themselves. Objective: To conduct a bibliometric analysis on the application of PAR in livelihood research. Methodology. The documents consulted were obtained using the Scopus® metasearch engine employing boolean operators (AND/OR) and filtered with the terms: “Livelihood” and “Livelihood” AND “Participatory Action Research” appearing in the title, abstract, keywords, or text of the document, utilizing the PRISMA methodology for resource exclusion. The search covered the period from 1980 to May 2024. The softwares used were Rstudio v. 4.3.2® with its Bibliometrix and Biblioshiny add-ons, as well as mapchart® for the map creation. Results. The United States is the country with the highest number of publications on LV (8,374), and Mexico ranks 29th with 677. The search for “Livelihood” yielded 58,384 academic resources, of which only 0.48% have applied participatory methodologies. The search for the terms “Livelihood” AND “Participatory Action Research” yielded 279 resources, with the most used keywords in academic resources being “participatory approach,” “action research,” and “climate change”; the LV approach experienced significant growth following the contingencies caused by COVID-19 for the vulnerability analysis of developing countries. Conclusion. It is important to prioritize citizen participation in LV work through collaborative approaches like PAR and transdisciplinarity; it is also essential to focus research on natural capital as a primary axis of analysis since it provides ecosystem contributions that strengthen livelihoods.

581-III–PO El impacto de la globalización a través de los flujos financieros en México

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Globalization is a process that some authors attribute to political origins stemming from neoliberal ideology, which has brought about inequalities that several scholars have studied. From the perspective of urban studies, this inequality manifests in uneven spatial development, which can be understood as transformations of urban regions.
This study quantitatively analyzes the transformations of urban regions caused by capital flows through Foreign Direct Investment (FDI) by means of a longitudinal correlational analysis covering the period from 2005 to 2025, with an explanatory scope.
Regarding the research design, a non-experimental quantitative approach is proposed, for which existing data from official databases provided by institutions such as the National Population Council (CONAPO), the National Institute of Statistics and Geography (INEGI), the Secretariat of Agrarian, Territorial and Urban Development (SEDATU), the Secretariat of Economy, and the Government of Mexico will be collected. Additionally, it is important to highlight the use of Geographic Information Systems (GIS) as a data management tool, which will allow us to conduct this study at a national scale.

582-III-PO Turismo cultural y usos económicos del patrimonio edificado: vínculos y efectos en la conservación de la arquitectura patrimonial de los Pueblos Mágicos de México (Caso de estudio: Malinalco, Taxco, Tepoztlán y Sombrerete)

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The study presented here aims to analyze and recognize the impact of activities linked to cultural tourism and the threats to which the built heritage of Mexican towns is exposed by this activity. It considers Malinalco, Taxco, Tepoztlán, and Sombrerete as case studies. This study aims to identify alternatives for reducing the negative disturbances generated by tourism in its constructive, historical, social, and artistic aspects (façades, Disneyfication, and staging), where built assets are transformed and adapted to meet tourism demand, resulting in the long-term loss of built heritage. The methodology used is mixed, integrating risk theory, which allows for recognizing under what conditions tourism becomes a means of disturbing built heritage, from the physical, social, economic, and regulatory dimensions, as well as the effects found in the so-called Magical Towns of Mexico (as a federal tourism policy incorporated and consolidated over 24 years). Statistical data are analyzed to retrospectively study the changes in the selected magical towns. and tours are integrated that allow for contrasting statistical information and verifying the changes, transformations, and effects on the aforementioned populations, culminating in prospective studies. Among the limitations of the research are the large number of existing populations that currently have the designation of "magical towns" (177), which makes it difficult to find a representative sample that allows for the analysis of cases with exceptional monumental quality, given that they are promoted through a program that homogenizes their particularities with this name. The contribution of the research consists of incorporating the perspective of heritage conservation as third-generation cultural rights into tourism policies; raised from the values and aspects of exceptionality of built heritage; where the economic perspective that categorized and appropriated the landscape as an element subject to consumption and exploitation has predominated; therefore, from the perspectives of conservation and architecture.
The results of the research address mechanisms of integral resilience between tourism and built heritage, highlighting the role of the adaptive cycles of heritage throughout different eras and its relationship with tourism systems, promoting resilient tourism schemes that contribute to conservation and enhancing the role of tourism as a tool for the conservation and maintenance of said heritage.

583-III-PO De la renovación a la regeneración urbana - Una Metodología Taxonómica en Intervenciones Urbanas. En tres casos latinoamericanos en las ciudades de Panamá (Panamá) y Recife (Brasil)

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The search for intervention strategies in deteriorating urban areas has been one of the most difficult challenges faced by public managers and contemporary cities since the end of the Second World War. Since that period, the range of authors addressing the decay of cities has grown (Colean, 1953; Jacobs, 1961; Grebler, 1965; Richardson, 1978; Von Hoffman, 2008; Klemek, 2011). A review of the topic reveals a wide range of debates and diverse proposals on how to recover the urban heritage affected by these processes.

Indeed, in Europe, North America, Latin America, and other contexts, addressing the degradation of what Portas (1986) defines as the existing city has relied on a set of strategies and definitions with various meanings, such as urban renewal, rehabilitation, revitalization, requalification, and urban regeneration. However, the use of these concepts has frequently been marked by polysemy and disputes over content (Hernández, 2010; Busto-Peñafiel, 2020; Delgadillo, 2020). This disrupts the analysis and development of priority actions in declining urban contexts of varying scales, high volumes of public or private investment, and significant impacts on urban and community life.

This study proposes applying a methodology for classifying urban interventions in Latin American cases in the cities of Recife, Brazil, and Panama, Republic of Panama, associated with concepts of urban renewal, rehabilitation, revitalization, requalification, and regeneration through the development of taxonomic parameter analyses.

The literature review supports a conceptual matrix of urban interventions, identifying: objectives; strategies; spatial scale; changes in physical space; and outcomes of each type of intervention. Based on this table, three structuring foundations of the analysis guide the classification: a) conceptual chronological analysis according to Colantonio and Dixon (2011); b) priority analysis emanating from Przywojska's (2021) approach; c) the implementation mode, by projects or by processes according to Barros Silva and Melo (2000). As a result of this analytical triangulation, five dimensions and their related variables for interventions emerged: Physical, Environmental and Heritage; Social and Community Impacts; Economic and Financial; Management and Governance; and Implementation Dynamics, which together structure the taxonomy.

587-III–PP De la tradición a la innovación: Mezcal, turismo rural y sostenibilidad

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Sustainable tourism fully considers the current and future economic, social, and environmental impacts in order to meet the needs of visitors, the industry, the environment, and host communities (UNWTO, 2024). Among the tourism products that must meet sustainability criteria are traditional Mexican beverages derived from maguey, with mezcal being one of them. Its name comes from the Nahuatl word meaning "maguey" or "cooked agave hearts." It has a protected designation of origin recognized in 11 states of the Mexican Republic. In 2024, production was recorded at 11,362,436 liters (COMERCAM, 2025). Mezcal is made by cooking agave piñas (hearts), crushing them, fermenting, and distilling to obtain a crystal-clear or slightly yellow liquid (DOF, 2024). According to CEPADE (2016), 7 kilograms of dry firewood and 20 liters of water are used for every liter of mezcal produced. The UN, (2024), renewable energies come from natural sources that replenish faster than they are consumed. This research provides a synthesis of mezcal production as a sustainable tourism product, with special emphasis on its alignment with the Sustainable Development Goals (SDGs). To achieve this, the Systemic Method is used along with its development via the Soft Systems Methodology (Tejeida, Cruz, & Bariones, 2016). The history and evolution of mezcal production are examined, highlighting traditional methods, recent innovations, and the impact of NOM-070-SCFI-2016, which defines the requirements for the Mezcal Designation of Origin (DOM). The Hacienda Vergel de Guadalupe, located in the state of Guanajuato, is used as a case study. The findings underline the relevance of rural tourism in the commercialization of mezcal to benefit local communities, as well as socio-technical innovations in production to generate a sustainable tourism product.

IV. INTERDISCIPLINARY

19-IV-PP Thermal Diffusivity of Nanocomposites Composed of Multiwalled Carbon Nanotubes Immersed in Polymeric Matrices: A Self-Normalized Photoacoustic Technique Study

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Currently, there are many scientific areas where multiwalled carbon nanotubes (MWCNT) are finding applications, such as material science, physics, biology and chemistry, some of them re-quire these materials to be functionalized. The functionalization of MWCNT allows enhances their properties, with which they acquire advantage for developing innovator nanodevices. In the present work, a self-normalized photoacoustic technique was applied for measurement of thermal diffusivity of nanocomposites of MWCNT immersed in two different polymeric matri-ces, PVDF and PVP. Pristine carbon nanotubes (p-MWCNT) were functionalized with two dif-ferent solutions, the first one with nitric acid (HNO3) and the second one with a mix of nitric acid and sulfuric acid (H2SO4). Nanocomposites were analyzed under different carbon nano-tubes functionalization conditions. It was shown that photoacoustic technique is able to detect differences in thermal diffusivity between these different nanocomposites.

20-IV-PO Diseño de proceso de manufactura para el electro-recubrimiento de electrodos con níquel

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The efficient production of hydrogen by alkaline electrolysis depends to a large extent on the performance and stability of the electrodes used, since they represent approximately 50% of the total cost of the equipment. In this work, the behavior of nickel coatings applied on different metallic materials is studied. These electrodes will be used in an alkaline electrolyzer designed to optimize its performance in concentrated alkaline solutions, specifically with 30% potassium hydroxide. The nickel coating improves corrosion resistance, increases electrical stability and extends electrode life. A comparative analysis was made between different materials for possible coating: copper, aluminum, iron, carbon steel and stainless steel. For each one, the properties before and after the nickel plating process were evaluated, observing significant improvements in conductivity, wear resistance and electrochemical behavior. The specific challenges of nickel plating were also identified according to the type of material, such as the need for pre-treatment in the case of aluminum and stainless steel (Wood bath).

The results allow establishing technical criteria for the selection of materials and operating parameters of the nickel plating process, which has a direct impact on the efficiency of alkaline electrolysis systems for hydrogen production. It was observed that the coatings made on copper substrates showed superior adhesion and greater uniformity compared to those obtained on carbon steel and stainless steel. Additionally, tests were carried out at different current densities, identifying that from 0.3 A/cm^2 defects began to appear in the nickel deposit. Among these defects were found poor adhesion of the coating, formation of dendritic structures or “ramifications” on the edges of copper and carbon steel parts, as well as a lack of effective deposition on the stainless steel surface.

35-IV-PP Extracción y microencapsulación de compuestos bioactivos de la cáscara de mango (*Mangifera indica* L.) var. "Kent" y determinación de su bioaccesibilidad *in vitro*

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Mango (*Mangifera indica* L.) is a tropical fruit widely used for its sensory characteristics; during its production, by-products are generated, among which the peel stands out. Recent studies have identified the presence of bioactive compounds in mango peel that are beneficial to health, however, these compounds react to different factors (light, oxygen, temperature, pH) affecting their stability, bioavailability and their positive effect on health. Considering this, the aim of this work was to extract the bioactive compounds present in "Kent" mango peel and protect them through microencapsulation and evaluate their bioaccessibility.

The extraction of bioactive compounds from the peel was optimized by considering factors such as temperature, time, solvent concentration and number of extractions. Subsequently, the extract was microencapsulated using gum arabic (10%) as wall material and two methods: spray drying and spout-fluid bed drying.

The microcapsules were characterized, observing that the fluidized bed method has a higher concentration of compounds and antioxidant activity. In addition, differences were identified in the shape of the microcapsules; while spray drying produced a spherical and small shape, the fluidized bed method produced a laminar shape and larger size.

Finally, in the evaluation of the bioaccessibility of compounds and antioxidant activity after in vitro digestion, it is observed that in the microcapsules obtained by fluidized bed drying have better bioaccessibility in phenolic compounds (86.63%), flavonoids (68.85%) and antioxidant capacity by ABTS (72.60%) and DPPH (75.74%), on the other hand, carotenoids had better bioaccessibility in spray drying (17.46%). These results demonstrate the use of microencapsulation as a strategy to protect bioactive compounds and to incorporate them in the elaboration of functional foods, to provide the positive effects that these compounds bring to health.

41-IV-PO Optimización de Catalizadores NiW/SBA-15 para la Hidrodesoxigenación de Fenol: Efecto de la Composición Metálica en la Actividad Catalítica

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Biofuels represent a promising alternative to fossil fuels, offering benefits in terms of sustainability and greenhouse gas emissions reduction. Biofuels, derived from renewable resources such as plant-based oils, agricultural waste, and phenolic compounds derived from lignocellulosic biomass, provide a sustainable means of generating energy. Their acquisition may require several catalytic processes, most notably hydrodeoxygenation, which removes the oxygen content from phenolic compounds present in pyrolysis oils and other biochemical liquids. This process facilitates the conversion of these compounds into aromatic hydrocarbons suitable for use as renewable fuels. In order to optimize this process, NiW catalysts supported on mesoporous materials type SBA-15 have been developed for the hydrodeoxygenation of phenol as a model molecule, which have been synthesized from the active surfactant pluronic 123 dissolved in hydrochloric acid and as a source of silicon tetraethyl orthosilicate and reserved at 38 ° C for 24 hours under constant stirring, then the solution was transferred to an autoclave and heated to 110 ° C for 24 hours. After cooling, it was washed with deionized water, filtered and dried at room temperature for 72 hours, the obtained product was calcined at 550 ° C for 6 hours with a heating ramp of 2 ° C / min. The impregnation of Ni and W was carried out by the incipient wetting technique at 10%, 12% and 15% of the active metal and 3% of the promoter. The catalytic evaluation was carried out in a Parr 4842 batch reactor at 320 ° C, 380 rpm, 800 psi of hydrogen and 6 hours of reaction, and the hydrotreated product was analyzed by gas chromatography. The catalysts were characterized by X-ray diffraction obtaining 3 characteristic peaks of SBA-15, verifying that they are maintained in the structure of the catalysts; in terms of catalytic activity, the highest conversion of phenol occurs in the NiW (12%) / SBA-15 catalyst, due to greater formation of active phases, and synergy between Ni and W, predominating the direct deoxygenation route.

49-IV-PO Evaluación de superficies de fractura mediante un perfilómetro óptico 3D

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A process was established to obtain the geometric model of fracture or deformed surfaces of an object, using a 3D optical profilometer that was developed at CIITEC. This versatile tool allows determining the X, Y and Z coordinates of said surfaces quickly, accurately and with a high degree of repeatability. The processing of the surface model by mathematical software can reveal linear profiles, the origin and growth direction of the faults, as well as roughness and flatness, characteristics that are not only useful but essential for various disciplines such as metallurgy, mechanical engineering, or civil engineering. In the present project, this process was used specifically for the analysis of the surface of Charpy impact test specimens.

55-IV-PO Tipos de evaluación sobre el bienestar psicosocial en población adulta mayor. Una revisión sistemática cualitativa

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To conduct a content analysis of the most common approaches to assessing psychosocial well being, in order to identify the factors that most influence it and determine the most relevant ones. The PRISMA 2020 guidelines were followed. Inclusion criteria comprised studies published within the ast 10 years, written in Spanish or English, employing quantitative, qualitative, or mixed methods, and assessing quality of life (QoL) or any form of well-being in older adult populations. Studies were required to meet at least 80% of the PRISMA checklist. Systematic reviews and study protocols were excluded. Searches were conducted across five databases: Scopus, Web of Science, ProQuest Psychology, LILACS, and SciELO. A total of 38 articles were included in the analysis, which was conducted using Atlas.ti version 9. The factors that most significantly influence psychosocial well-being are health, life satisfaction, QoL and social support. The type of well-being most commonly associated with these factors is subjective well being, which is the most frequently assessed form—more so than psychological, social, or emotional well being—typically measured using Likert scales. This is reflected in the research methodologies employed: 83% quantitative, 10% qualitative, and 7% mixed methods. Social support stands out as a key contributor to enhanced QoL, playing a crucial role in improving psychosocial well-being and increasing the perception of subjective well-being. Longitudinal studies, as well as qualitative and mixed-methods research, are recommended to develop interventions aimed at strengthening social support networks. These efforts should focus on enhancing QoL through increased social participation. Additionally, it is essential to raise awareness among healthcare professionals about the specific needs of this population.

56-IV-PO Desarrollo de software para el procesamiento y análisis de sondeos verticales de parámetros fisicoquímicos con sondas multi sensores

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Aquatic ecosystems and ecosystem services are fundamental to biodiversity and human activities. It is therefore important to continuously and systematically monitor and assess the health of ecosystems. Among the wide variety of techniques and parameters required to monitor aquatic ecosystems are vertical surveys using multi-sensor probes (depth, temperature, conductivity, dissolved oxygen, chlorophyll-a fluorescence, hydrogen potential, ammoniacal nitrogen, nitrates, and chlorides). The main advantage is that measurements can be viewed in situ. However, the measured data must undergo quality analysis to ensure that they are free of errors made in the field. This is achieved by developing computer programs in high-level languages that process and analyze the quality of the measured data. The objective of this work is to develop a graphical user interface (GUI) in MATLAB® 2025a to process and analyze measurements obtained with multi-sensor probes. The main feature of the GUI will be that users without programming knowledge can easily process and analyze data. Currently, the GUI consists of multiple selection buttons, fixed and drop-down buttons, a menu bar, as well as tables and areas for viewing original and corrected vertical profiles. The IGU is capable of reading files downloaded from the probe control units, eliminating all unnecessary alphanumeric characters. Additionally, the IGU locates, displays, and corrects technical errors typical of field sampling: duplicate depths, depth inversions, measurements captured outside the water surface, as well as combinations of these. The IGU also displays the desired parameters and erroneous values in tables using a range of colors and exports error-free files for post-processing analysis. The IGU is intended to optimize the processing and analysis of physicochemical parameters, contributing to public policy decision-making.

57-IV-PP Design and characterization of a 3D scaffold made of PCL, collagen, and akermanite for bone regeneration

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In recent years, various strategies have been developed to accelerate the repair and regeneration of bone defects caused by different pathologies. Bone tissue engineering, based on the manufacture of three-dimensional (3D) constructs from synthetic or natural scaffolds combined with bioactive molecules and cells, has emerged as a promising alternative for the reconstruction and treatment of these injuries. Poly-ε-caprolactone (PCL) is a synthetic polymer widely used in the manufacture of customized scaffolds using 3D printing technology. Collagen (Col) has been used as an additive to modify the surface of PCL and improve its bioactivity, while bioceramics such as akermanite (Akr; ($Ca_2Mg[Si_2O_7]$)) have been incorporated into scaffolds to provide osteoinductive properties. In this study, a 3D-printed scaffold composed of PCL coated with Akr nanoparticles and surface-modified with Col was designed, manufactured, and characterized in a ratio of 79:20:1 (weight percentage: PCL:Akr:Col). As experimental controls, three types of scaffolds were prepared: PCL (100%), PCL-Akr (80:20%), and PCL-Col (99:1%). The morphology of the scaffolds was analyzed by optical microscopy, their chemical composition by Fourier transform infrared spectroscopy (FTIR), and their hydrophilicity by contact angle measurement. In addition, the effect of the scaffolds on the proliferation of dental pulp stem cells (DPSCs) was evaluated using the MTT assay on days 0, 3, 7, and 10 of culture. Cell adhesion was examined by scanning electron microscopy on days 5 and 35, and osteogenic properties were evaluated by alizarin red staining and analysis of the gene expression of osteogenic markers (Runx2 and OPN) by RT-qPCR. Results and conclusion: The PCL-Akr-Col scaffold demonstrated superior physical, chemical, and biological properties, significantly promoting the proliferation, adhesion, and osteodifferentiation of mesenchymal trochanteric cells compared to the control scaffolds. These findings suggest that the PCL-Akr-Col scaffold is an ideal alternative for bone tissue engineering applications and represents a promising option for bone defect regeneration.

58-IV-PO Design and manufacture of materials for dental tissue regeneration

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Dental pulpitis, which is often caused by untreated cavities, can progress to dental pulp necrosis and affect adjacent tissues. The conventional treatment for this condition is endodontics, which involves removing the affected tissue and replacing it with inert materials, such as gutta-percha. However, this approach has limitations, including loss of vitality and tooth fragility, which may necessitate additional treatment. Regenerative endodontic therapy (RET) is an alternative approach that seeks to regenerate dentin-pulp tissues using biodegradable, biocompatible biomaterials, such as poly ε-caprolactone (PCL), polyglycolic acid (PGA), collagen (Col), and mesenchymal stem cells (MSCs). This study developed three types of scaffolds with different PCL:PGA ratios (20:80, 50:50, and 80:20), functionalized with collagen using electrospinning. The scaffolds were characterized using scanning electron microscopy (SEM), confocal microscopy, and micro-FTIR. For the biological assays, 5×10^3 dental pulp MSCs were seeded on each scaffold. Cell adhesion was evaluated after 24 hours using SEM. Cell proliferation was evaluated using the MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium) assay on days 0, 3, 7, 14, and 28. Scaffold degradation was evaluated after 28 days. Odontogenic differentiation was analyzed by RT-qPCR. The results showed that the PCL:PGA ratio did not significantly affect the scaffold morphology, though the addition of collagen reduced pore and filament size. All scaffolds demonstrated good biocompatibility. The 20:80 collagen-functionalized scaffold degraded faster, which could favor regenerated tissue integration. Additionally, higher expression of odontogenic genes was observed in collagen-containing scaffolds, suggesting inductive potential for cell differentiation. Therefore, PCL/PGA/Col composites, especially those with a higher PCL:PGA ratio, are promising materials for tissue engineering.

61-IV-PP Primer registro de interacción de Ara militaris con carroñeros y su relación con mortalidad en nidos

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The military macaw (Ara militaris) is one of two macaw species that inhabit Mexico. It is considered Endangered in Mexico and Vulnerable at the international level. It nests in cavities found in cliff walls and trees. The breeding season in Mexico is variable. Vultures, a general name for birds belonging to the family Cathartidae, are the only obligate scavengers among vertebrates. By feeding exclusively on carrion, they contribute to waste removal, which is their primary ecological function. There are very few studies on the natural predators or nest mortality of the military macaw, and no existing work has reported interactions between vultures and psittaciforms. The aim of the present study is to provide information on mortality events and interactions with scavengers recorded at military macaw nests in the population inhabiting the Tehuacán-Cuicatlán Biosphere Reserve (TCBR) in Mexico. Between 2004 and 2023, reproductive monitoring of Ara militaris was conducted at a site within the TCBR. Photographs were taken of the cliff walls where the species nests. Nests were monitored by observing the entries and exits of the macaws, as well as their behavior around the nest sites. Interactions with other bird species were also recorded. Observation sessions lasted between 8 and 13 hours per day and were carried out using binoculars and a telescope. During the study period, 12.5% of nesting attempts showed evidence of scavenger inspection or the presence of carcasses. The causes of death were not determined. These observations constitute the first record of interaction between Ara militaris and scavengers and highlight the important ecosystem services of regulation and maintenance provided by scavengers, who, by removing carcasses from macaw nests, help prevent the proliferation of parasites and diseases.

64-IV-PO Efecto de la deformación compresiva localizada sobre la rapidez de propagación de grietas por fatiga en acero ASTM-A572-50

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The localized compressive deformation effect generated by an indentation process at the crack tip on the fatigue crack growth of the steel ASTM-A572-50 is reported. Eccentrically loaded single-edge crack tension specimens (ESE(T)) in accordance with standard ASTM E647 were pre-cracked at a crack length of about 4 mm from the machined notch by applying a constant amplitude fatigue loading. Subsequently, the localized compressive deformation (LCD) process was performed by using a semi-spherical indenter to compress the crack tip zone at different forces (5.0, 7.5, 10 kN), applied on both sides of the crack tip. The compressive load and the number of delayed cycles is discussed in terms of crack length and crack tip opening displacement (CTOD). The localized compression deformation effect was evident from the first compressive force of 5 kN, although when the force increased, the crack arrest also increased. The crack arrest was more evident with the compressive force of 10 kN, reaching 1000000 cycles without crack growth. The change in the stress state due to the application of localized compressive deformation at the crack tip was quantified using strain gage rosettes, model C4A-06-G1350A-120-39P. A second approach was carried out through finite element simulation in Ansys APDL, using a bilinear kinematic model. Based on the results obtained, it was observed that the application of LCD induces a residual compressive stress field that contributes to the delay of crack propagation due to fatigue.

66-IV-PO Coinvestigación comparada con un modelo tradicional para mejorar la nutrición de los adolescentes de secundaria en los Valles Centrales de Oaxaca

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Adolescence, as a crucial stage of individual development, represents an opportunity to promote positive habits, appropriate lifestyles, and attitudes of personal and environmental care. To achieve this, adolescents must be accompanied by professionals with whom they can engage in a horizontal dialogue in an environment of respect and trust. The objective was to compare the application of co-research and a traditional intervention methodology with adolescents in two populations, aimed at promoting responsible food consumption (RFC) by reducing the intake of edible products and packaged foods. It is to provide a theoretical and methodological basis that will contribute to rethinking current intervention methods for this age group. It was a cross-sectional, mixed-method, experimental study that included anthropometric measurements, questionnaires, focus groups, and interviews. Activities were carried out in both communities in the following order: a) diagnosis: evaluation of nutritional status, determination of the Responsible Food Consumption Index (RFCI), and frequency of consumption of packaged foods (FFCAE). The results of the diagnosis were shared in both communities; b) execution: In one school, a collective was formed to implement co-research for the CRA.Meanwhile, in the other, informative talks were held on pre-established topics; and c) evaluation: after three school years of applying both methodologies. As a result of applying co-research, malnutrition decreased by 20%, the ICRAA level increased (0.64), and the FCAE decreased (5.3/week). In the qualitative part, the following were identified: interest in topics related to food, impact on empowerment, greater confidence, a profound sense of belonging, and positioning of the members of the collective as agents of change, no longer just passive recipients of information. The traditional model showed: an increase in malnutrition (3%), a decrease in the ICRAA (0.50), and an increase in the FCAE (4/week), while in the qualitative aspect, no interest in the topic of food or differences in the attitudes of the students with whom the talks were given were identified. It is concluded that co-research had better results than the traditional model for these work contexts.

69-IV-PO *Fusarium* sp. and *Curvularia* sp. causing wilt and rot on tomato in Oaxaca, México

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Mexico ranks ninth on tomato production worldwide and is the leading exporter to the United States. Moreover, it constitutes a source of economic income for the indigenous communities of Oaxaca. However, this crop has recently reported problems with postharvest diseases. The aim of the study was to identify, at the genus level, the causal agent of wilt and rot on Saladette tomato crop in Oaxaca based on its morphological characteristics. In March 2025, disease symptoms were observed on tomato plants in a commercial orchard in the Istmo de Tehuantepec. Symptoms on the fruit consisted of necrotic lesions with high visible salmon-colored sporulation, the leaves showed wilting, yellowish, and eventually browning spots. In advanced stages, the lesions on the fruit became sunken, darked, and covered white cottony mycelium. The single spore isolation method was applied to obtain monoconidial isolates from the symptomatic tissue, then transferred onto fresh potato dextrose agar (PDA) plates, and incubated at 25°C ± 2 °C in the dark for 7 days. Two isolates with different morphological characteristics were obtained (*T1C25*, *T4C25*). On PDA, *T1C25* showed abundant salmon-colored conidial mass exudate. Microconidia (n= 50) were abundant, ellipsoidal to falcate shaped and slightly sharp apexes, with 1 to 3 septa, measuring 8.3 x 14.7 µm. *T4C25* showed velvety black colonies with olive pigmentation at the edges. Conidia (n=25) were light-brown, light color at both ends, curved, fusiform with 2 to 3 septa, bent spindle, measuring 8.4 x 24.3 µm (sometimes conidia attached to conidiophores). Conidiophores were multiseptated, branches, brown. Pathogenicity test was carried out using six-days old PDA cultures at 25°C under controlled conditions and repeated twice. After two days, the infected fruit developed the same symptoms to those observed in the orchard. Based on morphology characteristics, the *T1C25* isolate was identified as *Fusarium* sp. and *T4C25* as *Curvularia* sp. causing wilt and rot on tomato Saladette in Oaxaca, México.

72-IV-PO Microbial biopesticides for the biological control of *Scyphophorus acupunctatus*

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In Oaxaca, Mexico, agave is fundamental for mezcal production and plays an important role in food preparation, housing construction, textile manufacturing, and other cultural practices. However, the production of both wild and cultivated agave is declining due to infestations by *Scyphophorus acupunctatus* (agave weevil). This insect is considered the most significant pest of agave, as it bores into the plant stem, facilitating the entry of pathogens that lead to the death of plants at various growth stages. *Scyphophorus acupunctatus* has traditionally been managed with synthetic chemical insecticides, which pose serious risks to the environment, non-target organisms, and human health. In light of these concerns, there is an urgent need to explore sustainable and environmentally friendly biological alternatives. The aim of this study was to evaluate *in vitro* the biological efficacy of biopesticides formulated with entomopathogenic fungi (EPF) isolated from undisturbed soils in Oaxaca for the management of *S. acupunctatus*. Three liquid bioformulations were developed and tested: one based on *Metarhizium brunneum* (Mb), one on *Beauveria bassiana* (Bb), and a combination of both fungi (MB). These formulations were applied spraying onto adult weevils at a concentration of 1×10^8 conidia/mL. The MB formulation was the most effective, causing a mortality rate of 78.94% at 14 days post-application (dpa). This result was higher than obtained with the Bb (63%), Mb (42.10%) formulations, and the commercial control META-A (48%). The results suggest a synergistic interaction when both fungal strains are combined, highlighting the MB bioformulation as a promising ecological alternative for the sustainable management of agave weevils.

80-IV-PO Estudio experimental de pirólisis de biomasa vegetal residual en México: caracterización, optimización de variables de operación a microescala y obtención de parámetros cinéticos

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In the current context of population growth, rising energy demand, and increasing waste generation per capita, it is imperative to develop and promote technologies that diversify the energy mix and, at the same time, reduce the amount of waste in urban environments. Pyrolysis is a technology that enables the conversion of biomass, it could be residual biomass, into energy-rich products such as charcoal, pyrolytic gas (containing hydrogen, methane, and carbon monoxide), and bio-oil, which is a complex mixture of approximately 200 organic compounds. This bio-oil can be used as a feedstock to produce other valuable chemicals such as solvents, flavorings, and adhesives.
Using data from the World Bank, the ten most abundant food-derived vegetal waste materials in Mexico were identified: tortilla, white bread, orange, tomato, potato, mango, jalapeño pepper, beans, avocado, and banana. These residual vegetal materials were characterized by determining their elemental and proximate composition, infrared (IR) spectra, and calorific value. In the first stage, these residual feedstocks were pyrolyzed on a micro-scale (< 40 mg) to produce three value phases: solid (charcoal), liquid (bio-oil), and gas (pyrolytic gas). A central composite design was used, consisting of 20 experimental runs, 5 levels, and 3 variables. The first variable was the final pyrolysis temperature, ranging from 500 °C to 800 °C; the second was the heating rate, from 10 °C/min to 100 °C/min; and the third was particle size, from 180 µm to 1180 µm. The optimal conditions to maximize the volatilization of matter (permanent and condensable gases) during pyrolysis were found to be: a temperature of 800 °C, a particle size of 250 µm, and a heating rate of 100 °C/min. The highest percentage of volatilized matter obtained was 76.56%, while the lowest was 68.50%. Additionally, standardized effect results showed that the most influential variable in volatilization was the final temperature, followed by particle size. Subsequently, using a non-isothermal iso-conversional method under the above-mentioned optimal conditions, the activation energy of the pyrolysis reaction for the mixture was determined to be 194.53 kJ/mol.

81-IV-PP Síntesis y evaluación de tintas bimetálicas de Cu-Ni para su potencial aplicación en biosensores de glucosa

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Actually, due to the increasing number of patients with diabetes, there is growing interest in the development of novel materials for in-body glucose biodetection. Moreover, bimetallic materials are relevant for their improved physical and chemical properties arising from the combination of two metallic elements. Accordingly, in this study a Cu-Ni bimetallic system was synthesized via a hydrothermal method, with pH (5-10) as the variable parameter while maintaining a constant reaction temperature (140°C), a reaction time (6 h) and precursors molar ratio (1:1). The resulting material was characterized by X-ray diffraction, identifying a set of diffraction peaks at 2θ angles of 44.33°, 51.62° and 76.31°, which are characteristic of nickel, as well as other peaks set at 43.34°, 50.47° and 74.23°, which are associated with copper. The observed values correspond to the (111), (200), and (220) crystallographic planes, respectively, indicative of a face-centered cubic structure for both metals. Subsequently, the bimetallic powder was processed in solution using water as the primary dispersant and incorporating different surfactants: ethylene glycol, Triton X-100 or sodium dodecyl sulfate. The hydrophilic behavior of the resulting suspensions was evaluated by the sessile-drop method on indium-doped tin oxide-coated glass substrates. The results obtained allowed us to establish the optimal wetting conditions for deposit of the bimetal on the conductive substrate (ITO), with the objective of evaluating its performance as an active layer in capacitive biosensors fabricate at low temperature. It is expected that the capacitor will be able to respond to variations in glucose concentration, showing potential application as a component in glucose biosensors.

84-IV-PP Funcionalización de hidrogeles de pectina con nanopartículas de magnetita a través de una metodología in situ para aplicaciones biomédicas

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Magnetite nanoparticles (Fe3O4) have attracted significant attention from researchers due to their ability to respond to external magnetic fields and their inherent biocompatibility, making them promising materials for various biological and biomedical applications, such as environmental remediation, catalysis, magnetic resonance imaging contrast agents, and cancer hyperthermia treatment. However, achieving stability in biological environments remains a challenge. In this project, we propose the functionalization of pectin hydrogels with magnetite nanoparticles to harness the advantageous properties of the nanoparticles while taking advantage of the biocompatibility, low toxicity, and high encapsulation capacity offered by pectin in hydrogel form. The hydrogel was synthesized in situ by mixing a pectin solution with iron salt precursors and stabilizing agents ($FeSO_4$, urea, and glycine). The pH was adjusted to 9-11 to favor magnetite formation over the other oxide phases, using NaOH and $NaHCO_3$. This pH adjustment was essential to obtaining the magnetite phase rather than other iron oxide forms. Subsequently, the hydrogel was crosslinked with $CaCl_2$, and once the polymeric three-dimensional network was stabilized, it was molded for further analysis using various characterization techniques. Among these techniques, Fourier Transform Infrared Spectroscopy was employed to assess chemical structural changes resulting from the synthesis process. The analysis confirmed the crosslinking of pectin chains by $CaCl_2$ addition and the interaction of magnetite nanoparticles with the polymer matrix. Additionally, X-ray Diffraction analysis confirmed the formation of pure magnetite, distinguishing it from the other iron oxide phases. The preliminary results suggest that pectin-magnetite hydrogels may offer a promising platform for magnetic field response in biomedical applications.

86-IV-PP Caracterización hidrogeoquímica del área natural protegida Balandra, Baja California Sur, México

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Áreas Naturales Protegidas (ANP) are those zones under the protection of the Comisión Nacional de Áreas Naturales Protegidas (CONANP), which have not been denaturalized by anthropogenic activity; or ecosystems with specific functions that require preservation. Balandra is a complex ecosystem that includes coastal dunes, reefs, mangroves, estuaries, and wetlands, and therefore, in 2012, it was granted the title of Área de Protección de Flora y Fauna Balandra (APFF Balandra). The area of interest is located in the Baja California peninsula, in the state of Baja California Sur, within the municipality of La Paz, with a territorial extension of 2,512.73 hectares, and a predominantly hot and dry climate. The objective of this research is to evaluate the water quality between the years 2022 and 2023 in the APFF Balandra, Baja California Sur, through the following physicochemical parameters: Temperature, Dissolved Oxygen, Turbidity, Salinity, Conductivity, pH, Total Dissolved Solids, Total Suspended Solids, and, in order to assess the abiotic conditions of the water, the analysis of hydrocarbons in water is proposed, as well as recording the concentrations of dissolved metals and metalloids in the water column. In general, the results of the spectrometric analysis indicate that the concentrations of metals are significantly influenced by geogenic sources (Fe, Mn, Ni, Cr, Cu, Co), circulation of deep waters (Cd), atmospheric deposition (Pb), hydrothermal processes (As), and hydrocarbons. It is determined that the hydrogeochemical and physicochemical parameters of the water in the Área Natural Protegida Balandra present a significant variability in the concentrations of metals and metalloids over time, driven by natural and anthropogenic factors affecting water quality, evaluated according to the Norma Mexicana NMX-AA-120-SCFI-2016.

87-IV–PO Estrategias bioclimáticas para confort térmico en viviendas rurales

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Bioclimatic strategies are capable to reduce greenhouse gases, which generates global warming. These gases are produced during energy generation that supplies other things, such as mechanical systems these lasts provide the proper temperature and humidity conditions for user´s comfort. These strategies are the resulf of different configurations (size, location, quantity, etc.) of passive systems (windows, doors, materials, etc.). These systems don't use external energy to operate. Thermal comfort is a neutral thermal state where neither cold nor heat is perceived. Bioclimatic strategies can be developed from empirical knowledge of the population and also from technical scientific knowledge in educational institutions. The combination of both types of knowledge in bioclimatic strategies are able to lead to a greater community adoption of these approaches. The first step presented in this work, is to explore population's understanding about bioclimatic strategies. For this analysis it was selected the town of Altamirano, Chiapas. In this place over 97% of its population is classified live in extreme poverty. A desk research which consist in: urban layout, average temperature, bioclimatic strategies in the population, urban-architectural configuration, and population statistics. The results revealed a reticular urban layout and a warm, dry bioclimate. The annual average temperature is 24°C,shown the month of April as the warmest month (29°C on average, with a maximum of 36°C), followed by December for being the coldest month (27°C on average, with a minimum of 22°C). The strategies found include the use of central courtyards, vegetation as sunscreens, openings with a 40% area ratio relative to the wall, the use of pitched roofs, and natural material colors (grey tones from unfinished construction). Housing configurations feature elongated facades, rectangular plots of 10 m x 20 m, the use of industrial materials with an exposed finish on walls (thermally massive construction systems), and zinc sheeting for walls or roofs.

89-IV-PO Producción de melanina por un hongo septado oscuro en ambientes contaminados con nanopartículas metálicas

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The development of metallic nanoparticles (MNPs) has generated an increase in toxic waste, causing an ecological imbalance due to their inadequate disposal. Once released into the environment, MNPs can alter the transport and sorption of soil nutrients and modify various functions of microorganisms. Nowadays, a group of fungi known as dark septate endophytes (DSE) is known, which is characterized by the dark pigmentation of its mycelium due to the synthesis of melanin; a biopolymer associated with the detoxification of environments contaminated by MNPs. The aim of this study was to evaluate melanin production by *Cladosporium* sp. (a DSE) in the presence of CuO-NPs as a function of the concentration in the carbon source.*Cladosporium* sp. UAM12 was cultured in Sabouraud medium with and without CuO-NPs. After 14 days, biomass production (gravimetry) and melanin synthesis (spectrophotometry) were quantified. A central composite design (CCD) was carried out varying the concentrations of CuO-NPs (100 to 200 mg/L) and dextrose (20 to 60 mg/L) to evaluate their effect on melanin production. Finally, a canonical analysis was performed to establish the conditions that allow increased melanin production by Cladosporium sp. Melanin production increased in the presence of CuO-NPs in contrast with the culture without CuO-NPs. However, the CCD showed that CuO-NP concentration does not have a significant effect on melanin production, but increasing dextrose concentration promotes melanin synthesis. Through canonical analysis, it was determined that in Sabouraud medium with 60 g/L of dextrose and 150 mg/L of CuO-NPs, melanin production increases 4-fold compared to the culture without CuO-NPs. Through the application of a CCD, it was possible to identify the effect of the concentration of the carbon source and CuO-NPs on melanin production by *Cladosporium* sp. UAM12, indicating that dextrose concentration plays an important role in pigment synthesis, suggesting that increasing the concentration of the carbon source improves melanin production by *Cladosporium* sp. in the presence of CuO-NPs.

94-IV-PV Implicaciones de la afluencia masiva de Sargazo pelágico en sedimentos carbonatados de Puerto Morelos

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Beach sediments in the Mexican Caribbean are characterized by a predominantly pellet-based biogenic composition, although they are also composed of foraminifera, mollusks, and calcarean algae. Since 2014, the beaches of the Mexican Caribbean have been affected by the massive influx of pelagic Sargassum, which is a determining factor in the biogenic reconfiguration from the calcareous epibionts it brings with it, particularly bryozoans, which can cover more than 70% of the surface of this macroalgae. Since there are no precedents on this subject, this study examines and determines the composition of biocomponents in beach sediments in the northern Mexican Caribbean, comparing the conditions before and after the arrival of Sargassum. Thirty-two sediment samples were collected between 2006, 2016, and 2022 in Puerto Morelos, Quintana Roo. To determine the biocomponents of the sediment, a petrographic analysis of thin sections was performed using a polarized light microscope. The biogenic composition originally dominated by pellets, it experienced a significant shift to include pellets, bryozoans, and foraminifera, with reduced proportions of mollusks, corals, calcareous algae, and ooids. The most prominent changes were reflected in the decrease in pellets from 82 ± 5 % in 2006 to 35 ± 9 % in 2016 and 34 ± 8 % in 2022, while bryozoans increased from 6 ± 3 % in 2006 to 25 ± 3 % in 2016 and 29 ± 5 % in 2022. Massive Sargassum inflows rapidly altered the proportions of biogenic components in the sediments. They affected the mineralogical maturity of the beach environment along the northern coast of the Mexican Caribbean. This highlights the significant and rapid impact of pelagic Sargassum inflows on the biogenic characteristics of coastal sediments.

95-IV-PV Evaluación de extractos de *Verticillium* sp.: Actividad ovicida y larvicida de fracciones polares y no polares contra *Aedes aegypti*

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This research evaluated the deadly effect of polar and non-polar extracts obtained from *Verticillium* sp. on eggs and second instar larvae early *Aedes aegypti* (*Ae. aegypti*). The bioassays were made under a completely random design with three repetitions. Each experimental unit consisted of 20 larvae, 99 mL of distilled water and 1 mL of the corresponding treatment. Concentrations of 25, 100, 200, 400, 500, 600 and 800 ppm were tested, and control without application was included. The data obtained were analyzed using variance analysis and Tukey mean comparison test ($p < 0.05$) with Minitab 18.1 software. The results showed that at 24 hours post-application, ovicidal activity with polar extract reached values above 60% at concentrations of 800 and 600 ppm. In parallel, the non-polar extract recorded 62.01% mortality at 800 ppm. In larvae, after 24 hours of exposure, the non-polar extract induced values greater than 80% of larval mortality with the application of concentrations of 800 and 600 ppm, a result with significant differences compared to control. The non-polar extract showed significantly lower efficacy against larvae in all evaluated treatments. The results show that extracts of *Verticillium* sp. they have a toxic effect on the immature stages of the mosquito *Ae. aegypti*. The polar fraction showed greater ovicide effectiveness than larvicide in the tested conditions. In general, the data demonstrate the potential of secondary metabolites contained in *Verticillium* sp. extracts, particularly non-polar ones, as control agents of mosquito populations in immature phases. These compounds could be integrated into future integrated pest management strategies, offering a promising alternative to conventional chemical insecticides.

96-IV-PV Link between holocene climate, marine resources and human settlement patterns of La Paz Bay

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Historically, changes in resource availability have led to the rise and collapse of entire civilizations. The Holocene, despite being known as an interval of relative global climatic stability, has presented a series of significant climatic events, whose effects have impacted ecosystems and human communities of the Baja California peninsula. Through the analysis of coastal archaeological sites and the use of stable oxygen isotopes in bivalve shells, palaeoceanographic and paleoclimatic changes, as well as their effect on human communities can be studied. Through this method, we have reconstructed climatic scenarios of the last 12,000 years that have determined the availability of marine resources of la Paz Bay, Gulf of California, as well as their effects on human populations. Here, periods of human coastal settlement coincide with relatively cool sea surface temperatures, arid conditions and high marine primary productivity. In contrast, periods of coastal abandonment coincide with elevated sea surface temperatures and a consequent collapse of productivity, falling below the minimum viability threshold for coastal human settlement. As a result, these contrasting and periodic scenarios throughout the Holocene can be implemented as a tool for understanding current and future climate change, as well as its effect on human populations.

101-IV-PO Reducción de cromo hexavalente con *Shewanella oneidensis* en presencia de mediadores redox

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One of the problems that poses an environmental and global risk is water pollution, which can impact not only marine life but also human health. The presence of heavy metals further worsens the situation, as some of them are carcinogenic. According to a 2017 ONU report, it mentions that approximately 80% of wastewater worldwide is discharged without adequate treatment, which has driven the search for new alternatives, one of them being bioremediation through bacteria under anaerobic conditions. *Shewanella oneidensis* MR-1 is a bacterium capable of reducing heavy metals. The objective of this research was to evaluate the reduction of hexavalent chromium in the presence of redox mediators, specifically riboflavin and anthraquinone-2-sulfonate (AQS). For this, 1 mL of *S. oneidensis* in exponential phase was added to tubes containing 9 mL of minimal medium. Three concentrations of chromium were used: 14.7 ppm, 29.4 ppm, and 58.8 ppm, following stoichiometric ratios. The samples were incubated for 9 days at room temperature.Subsequently, the reduction of hexavalent chromium to trivalent chromium was analyzed using a HANNA® kit that employs diphenylcarbazide reagent. The reaction was allowed to proceed for 6 minutes before measuring the absorbance with a HANNA instruments® multiparameter photometer at a wavelength of 525 nm. The results obtained for chromium reduction without redox mediators were: 68% for 14.7 ppm, 66% for 29.4 ppm, and 57% for 58.8 ppm. In the presence of riboflavin, the reduction achieved was 99.16% for 14.7 ppm, 99% for 29.4 ppm, and 98.7% for 58.8 ppm. In the presence of AQS, the percentages were 99.77%, 99.8%, and 99.15%, respectively. In conclusion, the addition of redox mediators such as riboflavin and anthraquinone-2-sulfonate (AQS) significantly enhances the reduction of hexavalent chromium by *Shewanella oneidensis*, achieving efficiencies above 98% even at high concentrations.

102-IV–PO EL hidrógeno blanco, una alternativa prometedora como energía limpia y renovable que emerge de la tierra

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Hydrogen is a fuel that can be used in many ways. It is a primary energy source commonly generated through physicochemical and biological processes. It is grouped according to its origin in colors, for example: "gray," "green," "blue," and "white." The last one, also known as "natural or geological" hydrogen, can be generated in association with serpentinized ultramafic rocks called ophiolites, presenting a lithological set of igneous origin, undergoing metamorphic processes and ultimately changing their original mineralogical structure. Ophiolites are found in various parts of the world, both on the surface and underground. These rocks, being buried and subjected to temperatures greater than 350°C, could be the key to the natural generation of hydrogen. In addition, hydrogen can also be found captured in the pores of certain geological formations in oil fields or can seep to the surface through fractures present in the subsurface in certain places on the planet. The main advantage of white hydrogen is that it does not generate gas emissions that affect the environment, nor does it produce hazardous waste. Although it is still in the early stages of exploration for commercial use, it promises to be an important source to support the global energy transition process. This doctoral research project aims to identify areas with potential evidence of white hydrogen emissions for possible incorporation into the Mexican energy sector. Broadly speaking, the proposed methodology consists of using images from the Sentinel 2 satellite to identify natural hydrogen emissions on the Earth's surface, as well as analyzing oil wells drilled in the study area. Preliminary results have already identified potential subsurface hydrogen emissions in southeastern Mexico. These results will be verified once the exploratory work is completed and samples are collected for subsequent chromatograph analysis. White hydrogen represents a significant opportunity to generate clean and economically viable energy that could transform the decarbonization of energy systems, industries, and transportation, overcoming the limitations of current approaches. In Mexico, there are still no academically documented methodologies for exploring this energy source.

104-IV-PO Desoxigenación en el Pacífico mexicano a partir del registro sedimentario de foraminíferos bentónicos de los últimos 5 mil años

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Oxygen minimum zones (OMZ) are characterized by dissolved oxygen (DO) concentrations <0.5 ml L-1. In situ DO concentration measurements suggest that the upper boundary of the OMZ is shallower than it was 60 years ago due to global warming. However, predictions of OMZ change require an understanding of their spatial and temporal variability. Benthic Foraminiferal Assemblages (BFA), biological productivity tracers, and trace elements (TE) have been used as quantitative and qualitative indicators of water column oxygenation. Based on the BFA, a classification of oxygenation levels has been established throughout the Northeast Pacific. Two sediment cores, MC-02 (0–1150 years) and GC-04 (920–5000 years), collected at 680 m depth, were examined for paleoecological analysis, DO concentration estimation, and comparison with organic carbon (Corg) and TE contents at the southwestern margin of Baja California Sur. Principal component analysis defined two BFA: peregrina (suboxic conditions: 0.3–1.5 ml L-1) and seminuda (dysoxic conditions: ~0.1–0.3 ml L-1), which mark OMZ fluctuations. Furthermore, cluster analysis defined a dysoxic group: B. subadvena, B. seminuda, E. exilis, C. carinata and a suboxic group: B. argentea, U. peregrina, E. pseudobeyrichi, T. delicata, T. angulosa). DO concentrations inferred from BFA ranged from 0.28 to 0.07 ml L-1. Overall, the trend among Corg, TE and DO suggesting that the North Pacific Intermediate Water (5000-2200 years BP) and Equatorial Subsurface Water - Equatorial Intermediate Water (2200-present) were responsible for maintaining the dysoxic conditions in the OMZ during the last 5000 years.

135-IV-PP Distribución de esfuerzos residuales en componentes mecánicos reparados por manufactura aditiva

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Wire Arc Additive Manufacturing (WAAM) is emerging as an efficient method for repairing large-scale components; however, the intense thermal gradients involved generate residual stresses that can compromise service life. This study investigates the influence of layer height on the magnitude and distribution of such stresses in A36 steel plates deposited with six passes. The blind hole drilling method with strain gauges (ASTM E837-13) was applied to both constrained and unconstrained structures. Initial tests revealed a steep gradient in the constrained samples: the principal stress reached approximately 1.7×10^2 MPa just 4 mm from the weld bead and dropped below 2×10^1 MPa at 80 mm, representing a decrease of over 85%. In contrast, the unconstrained plates showed a more moderate peak (~1×10^2 MPa) and a stress sign inversion (from tensile to compressive) at 80 mm, indicating partial stress relief after removing the restraints. Additionally, a 50% increase in layer height resulted in an approximate 35% rise in maximum surface stress. These findings highlight the need to optimize deposition parameters—particularly layer height and confinement conditions—to minimize internal stresses and ensure the structural integrity of remanufactured components. The study continues with thermo mechanical simulations and fatigue testing to correlate residual stresses with in-service performance.

138-IV-PP Estudio de las propiedades ópticas y estructurales de nanopartículas de oro sintetizadas por irradiación de microondas mediante técnica fotopiroelectrica: influencia del tiempo de reacción y del agente reductor empleado

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Gold nanoparticles were synthesized based on the Turkevich method using hydrogen tetrachloroaurate trihydrate ($HAuCl_4 \cdot 3H_2O$) as a precursor. Heating was performed via microwave irradiation, and the reaction time was varied to 5, 7, 10, and 15 minutes. For this study, experiments were designed using three different reducing agents: one inorganic; sodium borohydride ($NaBH_4$), and two organics; trisodium citrate dihydrate (Na_3Ct) and potassium sodium tartrate (KNaTrt), commonly known as Rochelle salt. Microwave heating, compared to conventional heating, offers several advantages such as faster processing, more uniform heating, lower environmental impact, and more efficient resource utilization due to reduced synthesis times. This makes it a more energy-efficient and reproducible process. A comparative study was conducted to evaluate the effect of microwave irradiation time and the type of reducing agent used in the synthesis of gold nanoparticles. Parameters such as particle size distribution in dispersion, zeta potential (ζ) to determine colloidal stability, and surface plasmon resonance (SPR) absorbance were analyzed. Additionally, scanning electron microscopy (SEM) was used to characterize the morphology and structure of a subset of the synthesized nanoparticles. The optical properties were then evaluated using the one-dimensional (1D) photopyroelectric technique, which allows measurement of the optical absorption coefficient (β), indicating a substance's ability to absorb radiation at a specific wavelength. The results showed a correlation between the optical properties and the size of the synthesized nanoparticles, depending on the reducing agent used and the microwave irradiation time. These findings are particularly relevant to photodynamic therapies and hold important implications for the pharmaceutical industry.

139-IV-PV Comportamiento histórico de la precipitación en relación con fenómenos de variabilidad climática en el sur de Tamaulipas

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The local perception in southern Tamaulipas is that precipitation has decreased since 2016. In 2024, precipitation and water levels decreased drastically, causing the drying up of the lagoon system located on both sides of the Tamesí River. The minimum average water level value (-0.5m) occurred in may 2024. The objective of the research was to analyze the monthly accumulated precipitation and the average water level in southern Tamaulipas during the 2016-2024 period, as well as to relate the precipitation deficit to climate variability phenomena. Precipitation and water level measurements were obtained from the Comisión Nacional del Agua climatological and hydrometric stations known as Sistema Lagunario del Río Tamesí and Bombas Altamira. The precipitation deficit was calculated from the standardized precipitation index. The most relevant results were the duration and intensity of the drought periods from october 2020 to august 2022 (23 months, very dry) and from march 2023 to june 2024 (15 months, extremely dry). The Southern Oscillation El Niño was associated with these two drought periods. The first dry spell was associated with La Niña, while the second dry spell was associated with El Niño. In addition, these drought periods coincided with the warm phase of the Atlantic Multidecadal Oscillation and the cold phase of the Pacific Decadal Oscillation.

140-IV-PO Influencia del emprendimiento colectivo en la vida y entorno de mujeres rurales del Estado de México

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Rural women in Mexico represent 34% of the country's productive workforce (PNUD, 2023) and are considered primary contributors to food security (INMUJERES, 2016). However, between 49.7% and 70.1% live in conditions of inequality, marginalization, and poverty, despite working 6.2 hours more per week than men (INMUJERES, 2021; Government of Mexico, 2025). Research examines strategies to improve their quality of life, highlighting entrepreneurship through collective organizations as a vehicle for their economic empowerment (Government of Mexico, 2025). Studies on collective entrepreneurship offer an encouraging outlook for reducing inequalities and improving the lives of rural women. Nevertheless, certain conditions limit the development of individual and collective capacities, potentially hindering the consolidation of their enterprises and generating adverse consequences. This contrast invites a deep understanding, from their own voices, of how they experience collective entrepreneurship. he objective of this presentation is to contribute to the academic debate on rural women's entrepreneurship in specific sectors, such as forestry. It presents progress from qualitative research, using a participatory case study design with the group "Productive Chain of Otomí Women Workers, Rural Limited Liability Production Company" (Cadena Productiva de Mujeres Trabajadoras Otomíes S.P.R de R.L), in the State of Mexico. The purpose is to understand, through participatory workshops, participant observation, and semi-structured interviews, how this group experiences collective entrepreneurship. Preliminary results suggest that the women face organizational, administrative, and entrepreneurial deficiencies. This represents a barrier to their potential and breeds anger, frustration, and sadness. On the other hand, attributes like perseverance and strength enable the enterprise's survival. Their achievements generate pride, satisfaction, and a sense of empowerment. Collective entrepreneurship impacts multiple spheres of its members' lives, from the economic to the psychosocial. The diversity of emotions, challenges, and achievements influences its meaning for each woman. Understanding these impacts will enable proposals for improving their quality of life.

143-IV-PV Propuesta de áreas de conservación de la biodiversidad en la cuenca del Río San Pedro-Mezquital, México

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The San Pedro-Mezquital River Basin (SPMRB) is in western Mexico, cuts across the Sierra Madre Occidental from northeast to southwest, and connects the Mexican Plateau with the Pacific Coastal Plain of Nayarit. Its geographic position and complex topography generate high environmental heterogeneity, fostering remarkable biological diversity and making it a key site for conservation planning. Currently, the SPMRB has four Protected Natural Areas (PNAs) focused on biodiversity conservation, which together cover only 3.2% of its total area and whose biodiversity representativeness remains unknown. This study identified complementary conservation areas using Systematic Conservation Planning tools. A total of 142 endemic or threatened species of vascular plants, amphibians, reptiles, birds, and mammals were used as biodiversity surrogates. For those with at least ten records, ecological niche models were generated in MaxEnt using four topographic variables at 90 m resolution. Overlapping these models with the records of non-modeled species allowed us to assess their representation within existing PNAs. Subsequently, the rarity-complementarity algorithm implemented in ConsNet was used to identify complementary areas, incorporating the generated models and designating sites with records of non-modeled species as irreplaceable for conservation. From the identified areas, six priority polygons were selected through a multi criteria analysis considering species richness, endemism, and vegetation types. These polygons are distributed along the basin's altitudinal gradient: Málaga (28.87 km^2), La Joya de Atotonilco (20.92 km^2), Aserradero La Flor (260.57 km^2), El Cerro Gordo (18.61 km^2), San Blasito (68 km^2), and San Pedro Ixcatán (74.70 km^2). Together with the current system, the proposed areas would represent 1,287 species (41.2% of the total), including 219 not previously protected and two vegetation types absent from the existing network. These areas constitute a starting point for a more representative conservation network, whose implementation should consider ecological connectivity and socioeconomic feasibility.

144-IV-PP Aprovechamiento de residuos agroindustriales para la producción de invertasas por Aspergillus tamarii NRRL 26252

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Filamentous fungi of the Aspergillus genus are recognized for their ability to produce extracellular enzymes such as invertases, which hydrolyze sucrose into glucose and fructose by cleaving the α-1,2 glycosidic bond. The production of invertase through microbial cultures using media containing agro-industrial residues represents a sustainable alternative framed within the principles of the circular economy. In this study, the production of invertases by Aspergillus tamarii NRRL 26252 was evaluated in submerged cultures using media containing agro-industrial residues. First, various agro-industrial residues were tested at 1% concentration as substrates for fungal cultivation. Then, invertase activity was determined in the culture broth using the DNS method to quantify reducing sugars. Enzymatic kinetics were performed with 1.42% sucrose in 0.1 M acetate buffer at pH 5, at 30 °C for 15 minutes under controlled agitation. In this stage, 1% lemon peel in the culture medium yielded 615.73 ± 13.18 U/L of invertase activity. In a second stage, the physicochemical conditions for invertase activity determination were optimized using a central composite design in Design-Expert 13. Parameters such as pH, temperature, and substrate concentration were evaluated. A maximum activity of 558.65 ± 19.69 U/L was obtained using 2.43% sucrose at 58 °C and pH 5.4. Subsequently, four culture media were tested, and the one with the highest activity (798.697 ± 27.001 U/L) was selected. Based on this, a new experimental design was developed to optimize culture conditions, achieving 2442.20 ± 6.010 U/L of invertase activity using 5% lemon peel at pH 6 in flask-scale cultures. Finally, a 264-hour microbial culture was carried out in a pH-controlled bioreactor using a medium with 1% lemon peel. The highest invertase activity was reached at 168 hours, with 1839.308 ± 23.327 U/L. In conclusion, lemon peel proved to be a suitable substrate for invertase production by Aspergillus tamarii. The optimization of culture conditions through experimental design allowed for a maximum activity of 2442.20 U/L.

145-IV-PP Optimización de la producción de celulasas por *Aspergillus tamarii* NRRL 26252 a partir de residuos agroindustriales

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Aspergillus tamarii is a filamentous fungus recognized for its ability to produce hydrolytic enzymes such as cellulases, which degrade the β-1,4-glycosidic bonds of cellulose, releasing glucose. These enzymes have applications in the food, pharmaceutical, and biotechnological industries. Additionally, agro-industrial residues, rich in cellulose and hemicellulose, represent a viable and sustainable alternative as substrates for cellulase production. In this study, the production of cellulases by *Aspergillus tamarii* NRRL-26252 was evaluated in submerged cultures using various agro-industrial residues. In the first stage, a mapping of cellulase production was carried out using 1% of different residues. Cellulase activity was determined using 1.42% CMC in 50 mM citrate buffer (pH 4), at 50 °C for 30 min by the DNS method. The highest activity was obtained with lemon peel, reaching 754.83 ± 63.94 U/L. In the second stage, the response surface methodology (RSM) was applied using a central composite design in Design-Expert® 13 to optimize the quantification of cellulase activity. Substrate concentration, pH, and temperature were evaluated at five coded levels (−α, −1, 0, +1, +α). Optimal conditions were 1.5% CMC, pH 6.5, and 65 °C, yielding 1573.3 ± 60.17 U/L of cellulase activity. In the third stage, five culture media were evaluated, selecting the most efficient one to carry out a kinetic study. The maximum activity recorded was 1404.63 ± 117.82 U/L at 216 h. Subsequently, the cultivation conditions were optimized using another central composite design, evaluating lemon peel concentration (%) and pH at five coded levels (−α, −1, 0, +1, +α). An activity of 2134.86 ± 42.30 U/L was obtained with 4.65% substrate and pH 6.68. Finally, these conditions were validated in a bioreactor, achieving 1748.28 ± 16.45 U/L at 216 h. In conclusion, the application of experimental design strategies effectively optimized cellulase production by *Aspergillus tamarii*, achieving 2134.86 ± 42.30 U/L in flask cultures and 1748.28 ± 16.45 U/L in bioreactor under optimal conditions.

146-IV-PV Fosfobacterias asociadas a la rizósfera de maíz (Zea mays L.): Avances

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Maize (Zea mays L.) is one of the most widely cultivated cereal crops worldwide, used for both human consumption and livestock feed. However, its cultivation is increasingly threatened by the excessive use of synthetic fertilizers and pesticides, which compromise its sustainability, the conservation of native varieties, microbial biodiversity, and food security. Understanding the microbiota associated with agroecosystems is essential for effective soil management and for the development of alternative biotechnological tools in agriculture. This study aimed to evaluate the potential of phosphate-solubilizing rhizobacteria associated with maize plants as plant growth-promoting bacteria. To this end, a composite sample of rhizospheric soil was collected from a maize plot located in Villa Talea de Castro, Oaxaca (Mexico). Phosphate-solubilizing bacteria (PSB) were isolated using serial dilutions and plating on NBRIP medium. A total of 58 PSB isolates were obtained, with a population density of 5.35×10^6 CFU g^{-1} of soil. Microscopic characterization using Gram staining enabled the identification of both the cell morphology and Gram classification of the isolates, revealing 7 Gram-positive and 51 Gram-negative strains. This work contributes to advancing our understanding of the diversity of PSB associated with maize plants.

147-IV-PP Bioconversión de la cáscara de limón para la producción de pectinasas por cepas de *Aspergillus*

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Pectinases are hydrolytic enzymes that degrade pectic substances present in the plant cell wall. Fungi, particularly those of the *Aspergillus* genus, are recognized as efficient producers due to their high enzymatic secretion capacity. Lemon peel, an agro-industrial byproduct rich in pectin, represents a suitable substrate for pectinase production. Industrially, these enzymes have applications in the food, textile, paper, and biofuel sectors, supporting their increasing market demand. This study aimed to evaluate pectinase production from lemon peel by *Aspergillus niger* and *Aspergillus tamarii* under submerged fermentation. Initially, 1% lemon peel was used in two culture media to compare enzyme production between both strains. Subsequently, cultivation conditions were optimized using response surface methodology (RSM) with a central composite design in Design-Expert® 13, evaluating lemon peel concentration and pH at five coded levels ($-\alpha$, −1, 0, +1, $+\alpha$). Finally, pectinase production was monitored in a pH-controlled bioreactor. Pectinase activity was determined using 1.42% citrus pectin in sodium citrate buffer (pH 5), through 30-minute enzymatic reactions at 30°C under controlled agitation. The DNS method was employed, and one unit of pectinase was defined as the amount of enzyme releasing 1 µmol of galacturonic acid per minute. Greater pectinase production was observed in *Aspergillus tamarii NRRL-26252* than in *Aspergillus niger NRRL-322*, *Aspergillus tamarii NRRL-26252* reached a pectinase production of 725.10 ± 93.20 U/L at 120 h of culture with 1% lemon peel while *Aspergillus niger* NRRL-322 reached 575.43±85.04 U/L, hence it was disqualified. Under the optimal conditions determined by the experimental design (5% lemon peel, pH 7), enzymatic activity reached 926.61 ± 94.56 U/L. Finally, bioreactor culture yielded a pectinase activity of 1010.33 ± 62.93 U/L at 192 h. These results indicate that *Aspergillus tamarii NRRL-26252* can produce pectinases under controlled conditions, highlighting the importance of experimental optimization particularly neutral pH and high substrate loading for maximizing enzymatic activity.

149-IV-PP Optimización de las condiciones fisicoquímicas para la cuantificación de las actividades celulasas y xilanasas producidas por Trichoderma reesei mediante un diseño experimental 2^3 con metodología de superficie de respuesta

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Enzymes are biocatalysts with applications in the food, pharmaceutical, and other industries. Cellulase and xylanase enzymes play a crucial role in the degradation of lignocellulosic residues through the hydrolysis of complex polymeric structures such as cellulose and hemicellulose. Trichoderma reesei is a filamentous fungus widely recognized for its high capacity to produce lignocellulolytic enzymes. In this study, physicochemical conditions were optimized to quantify the cellulase and xylanase activities produced by Trichoderma reesei. Corn stover was used as the substrate, and a spectrophotometric method was applied. An experimental design was developed using two statistical approaches: a central composite design for carboxymethylcellulases and a Box-Behnken design for avicelases and xylanases activities. Submerged cultures were carried out using 1% corn stover and inoculated with a suspension of 1×10^6 spores/mL. Cultures were incubated at 30°C for 168 hours. The culture supernatant was recovered by filtration and used to estimate carboxymethylcellulase, avicelase, and xylanase activities. As part of the experimental design, the effects of three variables were evaluated: pH (4.0–6.0), temperature (40–70°C), and substrate concentration (0.5–3%). The combinations of these variables were defined using the Design Expert software. Enzymatic kinetics were performed at different time points to estimate carboxymethylcellulases (20 minutes), avicelases (60 minutes), and xylanases (10 minutes) activities. The 3,5-dinitrosalicylic acid (DNS) colorimetric method was used to quantify of reducing sugars. A quadratic model was obtained for each of the experimental designs. For carboxymethylcellulase activity, the optimal conditions were pH 4.45, 62.1°C, and 2.95% substrate concentration, yielding an activity of 1260.33±52.77 U/L, which was consistent with the predicted value from the software (1295.58±104.29 U/L). Additionally, an avicelase activity of 88.92±0.52 U/L was obtained at pH 5.14, 56.29°C, and 1.17% substrate concentration, also closet to the predicted value (60.34±5.23 U/L). Finally, a xylanase activity of 27393±339.01 U/L was obtained at pH 5.94, 68°C, and 2.33% substrate concentration, which was likewise consistent with the prediction (27120.4±1791.14 U/L). In conclusion, the experimental design enabled the definition of the optimal physicochemical conditions for determining carboxymethylcellulase, avicelase, and xylanase activities. The resulting models were statistically significant and showed a strong correlation between the experimental and predicted values.

152-IV-PO Análisis de la presencia de metales pesados en suelo de cultivo y granos de maíz en México

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Maize is a fundamental food in Mexican culture, however, its production has been affected by monoculture practices and the use of agrochemicals that have degraded the soil where it is sown to meet market demand; this has directly resulted in the contamination of these sites by different elements, including heavy metals. Using the Inductively Coupled Plasma Mass Spectrometry technique, the concentration of six heavy metals (Cd, Cr, Cu, Pb, Th and U) was obtained in eleven soil samples and maize grains grown in Poza Rica, Veracruz, Mexico. By applying different geochemical indices, it is known that the contribution of heavy metals in the soil has both natural and anthropogenic origin, demonstrating a moderate level of contamination. By comparing the values in soil and grain, the Bioaccumulation Factor of these elements was obtained, with a behavior tending towards tolerance. The average concentrations in grain have the following pattern Cu (20.6 mg/Kg) > Pb (2.84 mg/Kg) > Cr (0.84 mg/Kg) > Cd (0.009 mg/Kg) > Th (0.002 mg/Kg) > U (0. 001 mg/Kg); likewise, estimates were obtained of the risk to human health associated with the consumption of maize with the possibility of developing oncological and non-oncological diseases (Cd, Cr, Pb for the first case; and Cd, Cr, Cu, Pb, U for the second case) based on the methodology of the U.S. Environmental Protection Agency, resulting in a considerable risk in the case of the development of non-cancerous diseases and an urgent risk in the case of cancerous diseases, reflecting that it is likely that 1 in 100 people could acquire such a disease.

154-IV-PP Desarrollo de una barra alimenticia funcional conteniendo células inmovilizadas de *Lactobacillus casei*

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Functional foods are products enriched with bioactive compounds that serve a specific function in the body. Among these are foods containing probiotics, with *Lactobacillus casei* begin a probiotic strain that offers benefits to human health. For this to happen, the microorganism must adhere to the human and remain viable to exert their probiotic effect. However, cell viability is often affected by aggressive physicochemical gastrointestinal conditions present in the human gastrointestinal system. For this reason, cell immobilization by entrapment in polymerics matrices provides physical protection to *Lactobacillus casei* cells, ensuring their viability is preserved. In this project, we developed cereal bars containing immobilized *Lactobacillus casei* cells. We prepared three formulations (F1, F2, and F3) using two matrices: M1 (5% sodium alginate, 2.5% inulin) and M2 (1.5% alginate, 6.8% inulin, 1.5% gum Arabic, 0.5% Xanthan gum). Cell immobilization was performed by entrapment in $CaCl_2$ (0.3M) microspheres. An initial concentration of 2×10^9 CFU/g was established for each bar. The bars were at 24°C and 4°C to analyze cell viability. All formulations experienced a total loss of viability at 24°C. In contrast, at 4°C, formulations with matrix M1 showed a viability of $1.12X10^6$ CFU/g for formulation F2 and $9.46X10^5$ CFU/g for formulation F3. Subsequently, formulation F2 with immobilized *Lactobacillus casei* cells in both M1 and M2 matrices, was evaluated for shelf life at 4°C over 14 days. The viable cell concentration was higher in formulation F2 with matrix M2, resulting in a final viability of $4.3X10^7$ CFU/g, whereas matrix M1 yielded a viability of $1.1X10^6$ CFU/g. Compared with Bampi et al., 2016, who incorporated Lactobacillus acidophilus (initial 3.16×10^{10} CFU/g) into an inulin-polydextrose matrix in savory cereal bars, obtaining 6.3×10^9 CFU/g of viable cells over 15 days at 4°C, differences due to matrix composition are evident. However, both studies emphasize product refrigeration to preserve viability. In conclusion, cereal bars successfully maintained the viability of immobilized *Lactobacillus casei* when refrigerated.

155-IV-PV Efecto de los plaguicidas organoclorados sobre los niveles de la gonadotropina FSH en sangre de mapache (Procyon lotor) en Navachiste, Sinaloa

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Organochlorine pesticides (OCs) have the ability to act as endocrine-disrupting chemicals (EDCs). Due to their liposolubility, bioconcentration, and bioaccumulation properties, they persist in the environment for extended periods. OCs enter and remain throughout the trophic web and have been associated with reproductive issues in wildlife species. The hypothalamic-pituitary-gonadal (HPG) axis is responsible for regulating the reproductive phase in mammals. The gonadotropins follicle-stimulating hormone (FSH) and luteinizing hormone (LH) stimulate the production of steroid hormones, which provide feedback signaling for gonadal maturation. Disruption of the HPG axis can lead to changes in reproductive capacity. The aim of this study is to determine the effect of OCs on blood levels of FSH in raccoons (P. lotor) from Navachiste. A total of 23 blood samples from raccoons (P. lotor) were collected in Navachiste. OC concentrations were determined using the USEPA 8081b method, and FSH levels were measured with an ELISA kit. Kruskal-Wallis variance tests with post-hoc analysis ($p<0.05$) and Spearman correlation tests ($p<0.05$) were conducted. A total of 18 OCs were detected. Strong negative correlations (-0.9) were observed between FSH and methoxychlor and heptachlor epoxide, and a strong positive correlation (0.9) was found between FSH and β-HCH. OCs remain present in the environment and may be causing reproductive problems in wildlife.

163-IV-PO Síntesis de una posible vacuna de ARN y su evaluación en un modelo in vitro

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Dengue is an RNA virus transmitted by Aedes aegypti, with four serotypes causing symptoms ranging from fever to hemorrhagic dengue, and currently represents a public health problem with no specific treatment. Therefore, we propose to synthesize in DNA the coding sequences of the envelope (E) protein anchoring peptides from all four dengue virus serotypes (DENV 1 to DENV 4), amplify them by PCR, and transcribe them in vitro into mRNA using the Biolabs T7 ARCA kit. This mRNA will then be encapsulated in liposomes and transfected into J774A macrophage cells. Expression of the target peptide will be evaluated using techniques such as ELISA, HPLC, or flow cytometry, aiming to demonstrate that the cells present the E protein on their surface and potentially activate an immune response. This strategy is supported by robust evidence showing that lipid nanoparticle–encapsulated mRNA vaccines encoding prM/E proteins generate protective immunogenicity in preclinical dengue models — including the production of neutralizing antibodies, T-cell responses without antibody-dependent enhancement, and protection against lethal challenge in mice. This study was supported by funds from the Secretaria de Investigación y Posgrado del Instituto Politécnico Nacional (Proyectos Insignia IPN-2015, SIP 20231313 and SIP-IPN:20240060), and Brian Axel Candia Rosado received a master's scholarship from CONAHCYT (CVU: 2099374)."

164-IV-PO Factor de inhibición intra-experimental como propuesta de análisis para comparar la actividad sobre la α-glucosidasa

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In enzyme inhibition experiments it is common to determine the mean inhibitory concentration (IC50), the concentration at which a drug, compound or extract inhibits 50% of the enzyme. The IC50 is determined by varying the inhibitor concentration with respect to the enzyme concentration and keeping the substrate and all other variables constant. It is used to compare inter-laboratory inhibitory activity; however, even for the same compound, the IC50 can show great variability. For example, some of the IC50s reported for the drug acarbose, used as a control in the determination of inhibition on α-glucosidase, are 0.0839, 2401 and 30,870 µg/mL, showing that the absolute IC50 values are not directly comparable in inter-experimental comparisons. Moreover, when working with extracts not all compounds act by the same enzymatic inhibition mechanism. Therefore, in this work we propose to determine and use the intra-experimental inhibition potential Ip (Ip=IC50 control / IC50 compound), which indicates the potential of a compound to inhibit 50% of the enzyme with respect to a control tested under the same experimental conditions. This ratio allows inter-experimental inhibition comparisons, being relevant for compounds with a certain structure-activity relationship, for which the same inhibition mechanism would be assumed. Its use, like the IC50, requires the evaluation of the percentage inhibition of the compound or extract and the control (acarbose) at different concentrations, which is useful for detecting the effectiveness of the extract and not due to other experimental factors such as solvent or deactivated enzyme. In addition, the Ip allows for easy inter-experimental comparisons with data reported in the literature. The proposal was applied to Salmea scandens extract, evidencing that it has an inhibitory potential up to 2.17 times that of acarbose.

184-IV-PO Desarrollo de una matriz polimérica de PCL y gelatina funcionalizada con péptidos antimicrobianos como un potencial bioterapéutico de acción tópica contra la infección ocasionada por *Pseudomonas aeruginosa*

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Antimicrobial resistance (AMR) is currently recognized as a silent pandemic, largely driven by the excessive and inappropriate use of antibiotics. In this context, Healthcare-Associated Infections (HAIs) are primarily caused by multidrug-resistant pathogens, complicating treatment and, in some cases, rendering it unfeasible. This situation generates a significant economic burden, with estimated annual losses ranging from 13.4 to 28.4 billion pesos for the Mexican healthcare system. One of the main etiological agents of HAIs is *Pseudomonas aeruginosa* (*Pa*), an opportunistic Gram-negative bacillus that poses a serious threat to hospitalized patients with open wounds, in whom the epidermal barrier is compromised. Given this scenario, the development of novel therapeutic strategies to combat multidrug-resistant strains of *Pa* is urgently needed. Antimicrobial peptides (AMPs) offer a promising alternative to conventional antibiotics. They act as a first line of immune defense and are noted for their anti-biofilm and immunomodulatory properties. Moreover, they exhibit high specificity and a low propensity to induce resistance. The use of antimicrobial peptides as biotherapeutic agents constitutes an effective alternative for treating infections caused by *Pa*. A nanofiber matrix was designed using optimized electrospinning techniques, employing a blend of polycaprolactone (PCL) and gelatin as the base polymers. The resulting nanofibers were morphologically characterized using scanning electron microscopy (SEM) to confirm their structural conformation. Subsequently, the matrices will be functionalized with AMPs via chemical crosslinking techniques, using activating agents to enable a controlled and sustained release of the biotherapeutic. Electrospinning conditions were standardized by adjusting key parameters such as voltage, flow rate, and collector distance, resulting in homogeneous nanofibers with dimensions suitable for peptide functionalization. Two AMPs with high specificity against Pa were identified: RW (sequence: RWRWRWRW-NH_2) and KRF (sequence: KRFRIRVR NH_2). These peptides will be used during the coupling stage and are characterized by their antimicrobial potency, target specificity, and low resistance induction potential. PCL/gelatin-based polymeric nanofibers provide a suitable and safe platform for the localized delivery of antimicrobial peptides. This strategy represents a promising therapeutic approach for the treatment of infections caused by *Pseudomonas aeruginosa*.

185-IV-PP Efecto de la pasteurización térmica y de alta presión sobre leche descremada adicionada con microplásticos mediante espectroscopia infrarroja

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The present research project aims to evaluate the effects of different thermal and high-pressure pasteurization treatments on polyethylene terephthalate (PET) microplastics (10–40 µm) added to skimmed cow's milk. In recent years, the presence of microplastics in food has raised increasing concern due to their potential health risks, such as the release of toxic chemicals and their interaction with biological systems. This study focused on analyzing the effects of microplastic aging and degradation, which may alter their chemical and physical properties. Fourier-transform infrared (FTIR) spectroscopy in reflection mode was applied to identify spectral changes in the composition of the microplastics after subjecting milk samples to different combinations of temperature, time, and pressure. The spectral regions associated with sugars and proteins showed the most relevant variations. In addition, morphological characterization was carried out using optical and electron microscopy, allowing the observation of structural and surface alterations in the microplastics. The obtained data were analyzed using both unsupervised and supervised machine learning methods (PCA, PCA-LDA, and PCA-SVM). The unsupervised analyses revealed adequate clustering according to pasteurization parameters. However, the supervised models showed better performance, which allowed correlating the experimental results with the applied treatments. In particular, high-pressure pasteurization demonstrated better performance in preserving the milk matrix, whereas thermal pasteurization showed a greater impact on the degradation of the microplastics.

186-IV-PP Establecimiento de una prueba de concepto de una plataforma de entrega de antígenos basada en puntos cuánticos de carbono

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Currently, antimicrobial resistance (AMR) is one of the most serious threats to global public health. The World Health Organization (WHO) has classified it as one of the main challenges of the 21st century because more and more infections no longer respond to traditional treatments. AMR happens when microorganisms develop mechanisms that help them survive the effect of antibiotics. This makes treatment more difficult, increases the length of illness, and raises the risk of spreading harmful microbes. In this context, vaccines are seen as a smart way to reduce the use of antibiotics and to prevent resistant infections. In particular, creating new types of vaccines that use efficient delivery systems can help produce stronger and more specific immune responses. In this research project, we propose using carbon quantum dots (CQDs) as a system to deliver antigens. These nanomaterials are promising for biomedical use because of their special physical and chemical properties, their compatibility with the human body, and their tunable light emission. We used a hydrothermal synthesis method to create CQDs with controlled size and structure. These will be compared with CQDs made by another method, called solvothermal synthesis, to find out which one is better and easier to reproduce. After choosing the best method, the CQDs will be purified and functionalized with specific proteins of interest, in order to test their potential as a vaccine platform.

So far, the best results have come from the hydrothermal synthesis method using electromagnetic radiation. This involves placing the materials (carbon and nitrogen sources) into a reactor with water, then applying constant conditions like temperature, pressure, and solvent control. The reaction is carried out at about 180°C for 20 minutes. In this time, we successfully created CQDs in solution. These nanomaterials emit blue and green light under UV light (around 365 nm), which confirms their formation. The color of the light also gives an idea of the size of the CQDs. Blue light means very small particles (1 to 5 nm), while green light usually means slightly larger sizes (around 15 nm or more). This helps us move forward to the purification and structural analysis stages. These final steps are very important, because they will show whether the CQDs can continue to be used or not. We performed absorbance, emission intensity, and morphology tests using scanning electron microscopy, which showed that the CQDs have similar shapes and sizes (about 20.73 ± 0.6 nm). They also showed characteristic absorbance and emission signals, with good intensity and color, thanks to the correct synthesis and selection of CQDs. Now, we are ready to move on to the functionalization stage. This will involve covalently linking the antigens to the CQDs using chemical crosslinking with the reagents EDC (1-ethyl-3-(3-dimethylaminopropyl) carbodiimide) and NHS (N-hydroxysuccinimide), in order to make a stable and efficient connection. In conclusion, synthesizing and functionalizing carbon quantum dots—thanks to their useful properties—offers a new opportunity to create antigen delivery systems as an alternative to antibiotics, helping to fight AMR.

187-IV-PP Estandarización de una nueva metodología para la extracción de microplásticos conforme a la ISO 24187 e ISO 17025

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Flotation is one of the most widely used techniques for the preliminary detection of microplastics in aquatic matrices, due to its simplicity, low cost, and ability to separate plastic particles based on their density. However, there is currently no universally validated and standardized methodology that ensures the reproducibility and reliability of results obtained through this technique. This methodological gap significantly limits the comparability between studies and hampers the accurate assessment of the magnitude and environmental impact of microplastic pollution. This study aims to develop and validate a systematic flotation protocol to optimize microplastic recovery from water samples, using saline solutions of varying densities under controlled laboratory conditions. Additionally, this stage will be complemented with a morphological and dimensional analysis of the recovered particles using optical microscopy and, where applicable, spectroscopic techniques to confirm their polymeric composition. The proposed methodology will be evaluated in terms of its sensitivity, precision, and reproducibility, with the goal of generating a robust technical framework that can be adopted and adapted by other researchers in similar contexts. This effort will contribute to the establishment of a solid comparative basis for the monitoring and management of microplastics in aquatic environments.

191-IV-PP Diseño y expresión recombinante de una vacuna nonavalente basada en Partículas Similares a Virus (VLPs) contra el Virus del Papiloma Humano (VPH)

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Human Papillomavirus (HPV) is one of the most common sexually transmitted infections worldwide. Persistent infection with high-risk HPV types can lead to cancer. Currently, cervical cancers account for more than 90% of HPV-related cancers in women and were also the second leading cause of death among women in 2022. The existing prophylactic vaccines against HPV approved by the FDA, such as Gardasil®, Cervarix®, and Cecolin®, are based on Virus-Like Particles (VLPs) expressed in different expression systems, including insect cells, yeast, and bacteria. It has been shown that antigenic epitopes can be inserted into HPV L1 proteins to generate chimeric VLPs capable of inducing immune responses against multiple pathogens, as seen in constructs targeting both HIV and HPV, or various HPV types. These strategies have demonstrated correct structural assembly and the production of neutralizing antibodies, highlighting their potential as multivalent platforms. Therefore, the aim of this project is to develop a recombinant nonavalent vaccine based on chimeric VLPs capable of inducing an effective immune response against the main oncogenic HPV types. An in silico analysis was conducted to predict 15-amino-acid epitopes with high affinity for MHC class II, aimed at inducing a humoral response against HPV types 31, 33, 45, 58, and 59. The selected peptides exhibited high antigenicity, low allergenicity, no toxicity, and good solubility. These were inserted into the L1 protein of HPV types 6, 11, 16, and 18, generating four chimeric constructs. These constructs were modeled, refined, and structurally validated. The optimized sequences were cloned in silico using SnapGene and sent for synthesis through GeneUniversal. Currently, recombinant expression in Pichia pastoris, Western blot analysis, purification, and characterization are in progress. The in silico analysis allowed for the rational design of four chimeric L1 proteins incorporating the selected epitopes, maintaining structural viability to form immunogenic VLPs. This project is funded by Project SIP-CC-002-2024.

197-IV-PP Imbibición de un fluido incompresible en un medio poroso (papel filtro) con diferentes configuraciones geométricas a distintos grados de inclinación por métodos de goteo y capilaridad

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This project focuses on the analysis of patterns formed during the process of imbibition in porous medium. In particular, the results of the imbibition fronts were recorded and analyzed, which were defined as the dynamic interface or boundary that separates the dry and wet regions as the fluid advances through the porous medium. For this, the porous medium that was used is filter paper with porosity of 20 µm, also of use of various varied geometric configurations of the filter paper, for example: Circular, Square and Triangle, about which it was done a visual follow-up of the progress of the fluid, this is named as: Imbibition front. The methodology used included the capture of video sequences with time limit (8 min), after that an analysis and digitalization of various photographic images for different ranges will be carried out (1, 5 y 10 seconds). With this, it can quantify precisely the temporal evolution of imbibition front in different Software (Excel and SmartView). This approach allowed the obtaining of special data such as graphics and results of widths of the imbibition fronts, where they were analyzed: time vs distance, that were compared with different theoretical models existing in all the directions (y+, y-, x+, x-). The experimental results showed that there was good concordance with the predictions from Washburn's Law for (y+, x+), that describe the motion and behavior of the fluid such as t, but for (y-) this case will be "linear" this for a geometric form triangular at 90°, but for other geometric configurations, focused in the forms Square and Circular at 0° inclination, this doesn't happens for (y-), therefore, it can be described through the model previously mentioned.

198-IV-PV La parasporina A34-2 producida por bacillus thuringiensis induce la muerte celular en línea celular de cáncer de mama MCF-7

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Cancer remains one of the leading causes of mortality worldwide, and despite major advances in conventional therapies such as surgery, chemotherapy, radiotherapy, and immunotherapy, the most significant challenge remains: the lack of selectivity. This leads to undesirable side effects, such as systemic toxicity and treatment resistance, ultimately affecting the patient's quality of life. This need has driven the search for new treatments with selective antitumor properties, such as parasporins, proteins produced by different strains of Bacillus thuringiensis that have been shown to possess this valuable selective cytotoxicity by inducing the death of cancer cells without significantly affecting healthy cells, making them a potential therapeutic candidate against cancer. In the Papaloapan region, the A34-2 protein has been identified with selective cytotoxic activity in breast cancer cells, MCF-7. Despite the significant contributions made by various studies around the world, parasporins are still in the initial stages of research. Therefore, the objective of this study is to provide information intended to serve as a basis for future research examining their therapeutic potential in the fight against this type of cancer.

201-IV-PO Personality traits of Mexican artisans: a comparative analysis between Michoacán, Oaxaca and Puebla

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The research examines the differences in personality traits among artisans from Michoacán, Oaxaca, and Puebla. Personality traits are measured from the Big Five approach: extroversion, agreeableness, consciousness, neuroticism, and openness. The aim was to identify if there are significant differences between artisans' personality traits related to their state. Considering that the sociocultural environment can influence their experiences and personal development (Dana & Salamzadeh, 2023, Salmony & Kanbach, 2022). The research was quantitative and cross-sectional, with a total sample of 276 artisans interviewed across 92 surveys applied in each state. A one-factor analysis of variance (ANOVA) was performed in SPSS software to look for significant differences at a 95% confidence level. The results showed statistically significant differences in agreeableness, consciousness, and neuroticism. No significant differences were found in extroversion and openness. These findings contribute to the literature on the artisanal sector by revealing differences in personality traits based on regional context. The results have practical implications by providing information for the development of differentiated public policies that address the needs of each state.

203-IV-PV Productividad acuícola de camarón blanco del Pacífico en unidades de producción de alimentación manual-tradicional y en las que se ha implementado la alimentación automática

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White shrimp (Penaeus vannamei), produced by aquaculture, is important to Sinaloa for its profitability and economic impact, although feed accounts for more than 50% of the total cost. In the Guasave region, automatic feeders have been implemented to improve feeding efficiency and productivity. This study evaluated whether timed automatic feeding (8 rations/day) in semi-intensive farming improves productivity compared to traditional manual feeding (2 rations/day). The research was conducted at a company in La Brecha, Sinaloa, using four ponds per treatment (n = 2 x 4) during an 18-week growth cycle. Water quality parameters such as temperature (°C), dissolved oxygen (mg/L), pH, and salinity (g/L) were recorded for each pond. Productivity was evaluated through biweekly biometrics to determine individual weight (scale) and estimated survival (individuals/area). The data were analyzed using Excel for tabulation and Minitab for statistical analysis, considering yield, final weight, survival, feed conversion ratio (FCR), biomass, and feed supplied. The treatments were standard manual feeding protocol (SMFP) and automatic feeding protocol (AFP), with initial densities of 12 and 10 shrimp/m2, respectively. The results showed significant differences in yield (1,817 and 1,343 kg/ha), biomass per pond (7.14 and 3.35 t/pond cycle), and feed supplied (10,668 and 4,976), with an FCR of 1.50 and 1.40, respectively. Other results have investigated variants of the change from manual to automatic feeding; other authors have found higher productivity and yield when implementing automatic technology. However, in this preliminary study, the first cycle showed higher yield with manual feeding, with a significant difference in this parameter. The modernization of feed management in semi-intensive systems through automatic feeders has the potential to increase the profitability of production units, according to the literature reviewed. However, no significant differences were observed between treatments in variables such as FCA, survival, and individual weight. Therefore, it is essential that producers also consider water quality and environmental conditions so that the use of feeding technology generates tangible commercial and environmental benefits.

205-IV-PP La frecuencia de la luz artificial, modifica la atención sostenida de estudiantes desde la Ciudad de México

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The work analyzes artificial lighting conditions (frequencies and intensity) in the sustained attention of university students in the afternoon, arising from the problem of appropriate conditions to improve their cognitive performance. The central question is: What intensities and wave lengths of artificial lighting influence the modification of sustained attention levels in higher education students in the afternoon at México City? The hypothesis is that the intensity and wave length of artificial light affect sustained attention in this context. The ongoing investigation, with data analysis, focuses on higher education students residing in the metropolitan area of the City of Mexico, between 18 and 30 years old, who attend in the afternoon, particularly at the Instituto Politécnico Nacional, Escuela Superior de Ingeniería y Arquitectura, Tecamachalco unit. The methodology evaluates independent variables (intensity and wavelength of light) and its influence on sustained attention, dependent variable. The process was divided into pre-experimental, experimental and post-experimental phases, controlling variables to ensure validity and reliability in measurements. In the pre-experimental phase, the protocol was validated and participants were prepared through pilot tests with four people, identifying and correcting errors. A "Pre-Test" was carried out explaining the objective and protocol of the study, in addition to obtaining informed consent, guaranteeing their physical and psychological integrity. The MEQ-SA-ESP questionnaire was also applied to determine your chronotype, which influences your circadian rhythms. To reduce confusion variables, participants were instructed about the use of dark clothing, abstinence from caffeine, alcohol or energizers, and adequate prior rest. Participants were familiarized with the space and light conditions.

206-IV-PO Validación de una estación de calidad del aire de bajo costo en la zona conurbada Altamira-Tampico-Madero

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The Tampico-Ciudad Madero-Altamira metropolitan area has significant economic activity, including a refinery, two industrial corridors, two cargo ports, shipyards, platform assembly plants, a fishing fleet, oil extraction, thermoelectric plants, open dumps, and public, cargo, and private transportation. Although the MoCaALTAMA Air Quality Monitoring Network has been in place since October 2023, with four monitoring stations that analyze CO, SO2, NO2, O3, suspended particles of 1.0 µm, 2.5 µm, and 10 µm, atmospheric pressure, temperature, and relative humidity, the number of stations is not sufficient to achieve complete spatial coverage, nor to predict trends or track pollution episodes within the urban core. In response, a station was developed with low-cost sensors that measure carbon dioxide, particulate matter of 1.0 µm, 2.5 µm, and 10 µm, temperature, and relative humidity. To validate this station, the values obtained for particulate matter, temperature, and relative humidity from the developed station were compared with a station that is part of the MoCaALTAMA network over a period of two months. The analysis included the application of a correction factor for overestimation of particulate matter concentrations due to humidity based on Köhler's theory, which allows for a more accurate comparison. Statistical metrics such as the correlation coefficient (R2), root mean square error (RMSE), and mean absolute error (MAE) were used to evaluate performance. The results show an acceptable correlation, especially after hygroscopic correction, demonstrating the performance of the air quality monitoring station developed to complement monitoring networks and improve spatial resolution in areas with high industrial activity.

210-IV-PP Obtención de celulosa bacteriana a partir de un consorcio microbiano y Acetobacter xylinum

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Bacterial cellulose is a linear homopolysaccharide, composed of β-D-glucopyranose units held together by β-1,4-glycosidic bonds. Microorganisms synthesize a random nano-fibrillar network of cellulose chains of 10 to 50 nm in diameter and 100 to 1000 nm in length, which generates a porous matrix. The characteristics of the fibers give the material properties such as mechanical strength, crystallinity and water retention capacity, making it a biotechnological alternative for multiple applications. In this research, the yield of bacterial cellulose from the static fermentation of two culture media with a microbial consortium and a strain of Acetobacter xylinum was evaluated for 14 days at 28°C±2 . With the microbial consortium 2.79 g/L and 1.5 g/L were obtained in Hestrin-Schramm (H-S) medium without carbon source and in black tea with sucrose, respectively. With Acetobacter xylinum, 3.84 and 3.24 g/L were obtained in H-S medium with sucrose and H-S without carbon source. A decrease in pH was recorded in the fermentations with carbon source in the medium, indicating the formation of organic acids. The cellulose obtained with the microbial consortium is a uniform membrane that maintains its shape upon washing, NaOH treatment and drying. With Acetobacter xylinum the cellulose film is fragmented into segments

213-IV-PP Hidrogel funcionalizado con MIL-88A(Fe) para la eliminación eficiente de contaminantes emergentes

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The present work deals with the study of the degradation of a model mixture (MM) composed of dibutyl phthalate, bisphenol A and nonylphenol, using ozone as oxidant. Among the less studied catalysts are metal-organic compounds (MOFs) formed by metal nodes and organic linkers; due to their large specific surface area, adjustable porous structure and controllable chemical components, and according to previous studies, the Lewis acid sites in the catalyst play an important role in the adsorption and decomposition of ozone; among them is MIL-88A. This material was synthesised by the hydrothermal method using dimethylformamide (MIL 88A) as solvent and precursors such as iron chloride hexahydrate and fumaric acid and then used in the degradation of MM by ozone treatment. The results showed that catalytic ozonation achieved a model mixture removal rate of 82% compared to the conventional treatment of 20% in 120 min. The catalytic activity of MIL 88-A was evident in the mineralisation results as it reached 91.60% compared to 9.06% in the conventional process due to the formation of oxidising species such as hydroxyl radicals (-OH). However, at the end of the treatment, iron ions are present (4.31 mgL-1), which shows the instability of the material in sudden changes of pH and aqueous medium, so it was decided to support it in a porous material (hydrogel) to improve its activity and avoid metal leaching. Such that, after an evaluation, a 76% removal of the MM was achieved and leaching of the metal was avoided; in addition, one third of the initial catalyst concentration was used.

216-IV-PP Determinación de la viabilidad de *Lactobacillus casei* en presencia de café soluble en un sistema de simulación gastrointestinal in vitro

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Lactobacillus casei is a microorganism with proven beneficial health effects. To do that, the probiotic microorganism must adhere to the colon. However, before this can happen, probiotics must overcome the adverse conditions of the human gastrointestinal tract. In addition to the conditions of the human gastrointestinal tract, diet is a factor that interferes with cell viability. In this context, instant coffee is a widely consumed beverage among the Mexican population. Coffee components, such as caffeine and phenolic compounds, can negatively affect the viability of probiotic cells. Therefore, it becomes essential to evaluate the effect of certain foods on the cell viability of *Lactobacillus casei* to ensure that the probiotic cells can reach the human colon viable and with sufficient capacity to establish colonization. This project involved *in vitro* simulations of gastrointestinal tracts with free-living and immobilized *Lactobacillus casei* cells in the presence of three commercial brands of instant coffee to determine the impact of instant coffee on Lactobacillus casei cell viability. The immobilization matrix consisted of alginate (2%), inulin (10.6%), arabic gum (1.2%), and Xanthan gum (0.5%). Free-living and immobilized *Lactobacillus casei* cells were subjected to in vitro gastrointestinal simulation for 240 minutes using simulated gastric juices and an instant coffee solution (0.8%). Bacterial viability was determined every 30 minutes by counting CFU/mL (Colony Forming Units) on MRS agar (de Man, Rogosa y Sharpe). *In vitro* gastrointestinal simulation with free-living *Lactobacillus casei* cells ($1.88x10^{10}$ CFU/mL) and immobilized cells ($1.64x10^{10}$ CFU/mL) showed a considerable decrease in cell viability in the presence of instant coffee, reaching 3% cell viability ($4.74x10^{8}$) at the end of the simulated digestion process in the case of immobilized cells. In contrast, the freeliving cells exhibited only 0.2% viability ($4.3x10^{7}$) during the same simulation period. In conclusion, the immobilization matrix provided stability and physical protection, allowing the cell viability of *Lactobacillus casei* to be maintained, compared to free cells, even in the presence of instant coffee.

217-IV-PP Efecto de la proporción Quitosano:TPP en la formación de nanoencapsulados de DNA

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The application of exogenous nucleic acids (DNA and RNA) in agriculture represents an innovative technology for gene regulation and crop protection. One of the main challenges is to prevent the degradation of these molecules under environmental conditions. In this context, the development of nanomaterials is an essential step for the protection, storage, and delivery of genetic material.
In this project, DNA nanoencapsulates were developed using chitosan as the main biopolymer and sodium triphosphate (TPP) as the cross-linking agent, with the aim of generating stable structures capable of protecting and transporting genetic material for potential application in agriculture. Nanoparticles were prepared in three different chitosan:TPP ratios (1:1, 2:1, and 4:1) to evaluate the effect of the ratio on the encapsulation efficiency, stability, and physicochemical characteristics of the particles formed. The nanoparticles were characterized using various techniques. Fourier transform infrared spectroscopy (FTIR) analysis identified the transmittance of the amino groups, evidencing the interaction between chitosan and TPP with shifts at 1654 and 1542 cm-1. However, an increase in absorbance was observed in the 4:1 ratio at these wavelengths, while for the 1:1 and 2:1 ratios it was similar. Agarose gel electrophoresis, which was used to evaluate DNA retention, determined that all ratios were able to encapsulate the DNA completely. Morphological observation under a microscope allowed the shape and approximate size of the nanoencapsulates obtained to be visualized, determining that the 1:1 and 2:1 ratios have similar morphological characteristics, obtaining mostly spherical agglomerated structures, while for the 4:1 ratio, distributed spheres without agglomerations were observed, which would allow for a more uniform delivery at the time of application. Preliminary results show that the chitosan:TPP ratio significantly influences the properties and efficiency of the encapsulates, with the 4:1 ratio being the most efficient. This type of nanoencapsulation system represents a promising strategy for the protection and targeted release of genetic material in agricultural applications, such as the delivery of RNAi or genes of interest, with potential advantages in terms of biodegradability, specificity, and low environmental impact.

221-IV-PO Optimization of Ultrasonic Welding Parameters in 304 Stainless Steel

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Ultrasonic metal welding is a process that uses mechanical vibrations at frequencies above 15 kHz to produce joints between wires and thin sheets. This technique does not use external heat sources as required by electric arc processes (GMAW, GTAW, SMAW), so there are no heat-affected zones or material splashes, resulting in a fast, clean, and efficient process. The operation and efficiency of the process depend on the tools used to generate and transmit mechanical waves, so their design is very important for the quality of the weld performed. These tools, known as ultrasonic transducer and acoustic horn, must operate in resonance at a specific frequency and under controlled parameters of time, force, and energy, not only to perform the joining work but also to prevent failures in the components that make up an ultrasonic welding system. This work focuses on obtaining the pressure and energy parameters for ultrasonic welding of 0.75 mm thick 304 stainless steel sheets, maintaining a constant time of 1 s and a frequency of 20 kHz. Ultrasonic cleaning was performed on the samples of the material to be joined to remove grease and surface contaminants, while maintaining a constant surface finish. Joint tests were performed using resonant tools at 20,290 kHz with a contact surface of 35 mm², a pressure of 30 to 90 Psi, and an energy level of 30% of the total capacity of the ultrasonic generator. The data collected from these tests was used to construct a table of acceptable process parameters for the material in question. The joints obtained with these parameters were subjected to tensile testing using a calibrated 500 N load frame, withstanding various loads (kg) before separation. The tests performed offer an opportunity to improve the quality of the joints achieved with the ultrasonic welding system. Joining tests were performed using resonant tools at 20,290 kHz with a contact area of 35 mm², a pressure of 30 to 90 Psi, and an energy level of 30% of the ultrasonic generator's full capacity. A welding window for the aforementioned material was constructed using the test data. The joints obtained with these parameters were subjected to tensile testing using a calibrated 500 N load frame, withstanding various loads (kg) before separation. The tests identified additional variables that affect system performance, offering the possibility of improving the quality of the joints achieved with the ultrasonic welding equipment.

224-IV-PV Diseño de una nanopartícula basada en lumazina sintasa como plataforma de entrega de antígenos candidatos a vacuna contra bacterias prioritarias multirresistentes a antibióticos

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The use of organic nanoparticles in the development of vaccine platforms enables the induction of a robust immune response. A representative example are platforms based on the lumazine synthase protein (LuS), which, due to its physicochemical properties of stability and self-assembly, offers a safe and biocompatible alternative for antigen delivery. Based on this premise, we designed a chimeric subunit of LuS fused to the SpyCatcher fragment, derived from the CnaB2 domain of *Streptococcus pyogenes*, with the aim of creating a modular platform for antigen presentation through the SpyTag/SpyCatcher technology. This system allows antigens to be stably coupled to the nanoparticle surface through a high-affinity covalent isopeptide bond. Three chimeric variants of the lumazine synthase–SpyCatcher system were designed and synthesized, using lumazine synthase from *Aquifex aeolicus*, a hyperthermophilic microorganism whose enzyme is highly stable and forms icosahedral structures of 60 subunits. The design included the incorporation of flexible linkers of the type $(GGGGS)\backslash_4$, the removal of potential glycosylation sites, and the addition of the CD5 signal peptide to facilitate expression in eukaryotic systems. The variants differ in the position of the SpyCatcher domain relative to the protein: in the first, it was fused to the N-terminal end; in the second, to the C-terminal end; and in the third, it was inserted into an internal loop of lumazine synthase, dividing the protein into two segments (residues 1–70 and 71–154) that remain connected through the flexible linkers. In all cases, lumazine synthase was coupled to the SpyTag/SpyCatcher system, allowing a modular presentation of antigens through high-affinity covalent bonds. So far, all three constructs have been successfully synthesized and one of them has been stably cloned in *E. coli* Top10, validating the feasibility of the design. The next step will be their expression in *E. coli* BL21 to confirm nanoparticle self-assembly**.**

229-IV-PV Rizobacterias solubilizadoras de fosfato asociadas a plantas de café (*Coffea arabica* L.): avances

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The intensive use of phosphorus fertilizers in high-value crops, such as coffee, has demonstrated limited efficiency in plant utilization, in addition to generating adverse environmental impacts associated with the loss of phosphorus in the soil. To mitigate these impacts, biological alternatives, such as plant growth-promoting rhizobacteria capable of solubilizing complex forms of inorganic phosphorus, represent a key tool for improving the bioavailability of this nutrient and promoting sustainable agricultural production. Therefore, the objective of this study is to isolate, characterize, and identify phosphate-solubilizing rhizobacteria to formulate bioinoculants capable of promoting the growth of coffee plants (*Coffea arabica* L.). To this end, rhizospheric soil samples were taken from ten randomly selected coffee trees, approximately 20 years old, at a distance of 20 m and a depth of 0 to 10 cm. Phosphobacteria were isolated by serial dilutions and plated on NBRIP medium supplemented with aluminum phosphate. The isolates obtained were purified and characterized macroscopically and microscopically. A bacterial population density of 5.8×10^4 CFU g^{-1} of soil was recorded. A total of 22 bacterial isolates capable of biosolubilizing insoluble inorganic phosphates were obtained, all gram-negative. The concentration of solubilized phosphorus was evaluated as the dependent variable using the Olsen colorimetric method, and the three phosphate sources [$Ca_3(PO_4)_2$, $AlPO_4$ and $FePO_4$] used in NBRIP liquid medium were evaluated as independent variables, in order to quantitatively evaluate the phosphate solubilization capacity of the bacterial isolates. Preliminary results indicate that the isolates analyzed so far have demonstrated the ability to solubilize three forms of inorganic phosphate. The soluble phosphorus concentrations obtained were 11.73 to 25.16 µg mL^{-1} in media with $Ca_3(PO_4)_2$, 10.96 to 25.27 µg mL^{-1} in media with $AlPO_4$, and 16.22 to 20.55 µg mL^{-1} in media with $FePO_4$. These preliminary results suggest that phosphobacteria associated with the coffee rhizosphere have the ability to solubilize various forms of insoluble phosphate, which demonstrates their functional versatility.

233-IV-PP Evaluación de enzimas provenientes de microorganismos termófilos y su aplicación alimentaria en la degradación de gluten

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Gluten is a glycoprotein composed of gliadin and glutenin. In recent years, gluten-related disorders (GRDs) have increased significantly, with a strict gluten-free diet being the only effective treatment. The use of enzymes offers an alternative approach for the development of gluten-free (GF) products; however, the lack of thermostable enzymes presents a major challenge. The aim of this study was to isolate and identify thermophilic microorganisms capable of producing thermostable glutenases. Samples were collected from water and sediment at El Geiser, Río Grande, Hidalgo, with temperatures ranging between 70°C and 85°C. A total of 36 thermophilic microorganisms were isolated using MCG-1 + gluten selective medium. Enzymatic activity was assessed by the formation of degradation halos, selecting isolates with halos larger than 10 mm. Glutenase production was evaluated at 60°C by quantifying free amino acids via absorbance at 575 nm using a ninhydrin-cadmium solution. Isolates with enzymatic activity exceeding 200 µg/L were further analyzed. 16S rRNA sequencing identified *Geobacillus kaustophilus* as a glutenase-producing strain. Thermostability assays conducted at 60°C yielded 216 µg/L of free amino acids as a result of gluten hydrolysis. These findings suggest the potential of *G. kaustophilus* as a source of thermostable glutenases for industrial gluten degradation applications.

235-IV-PP Análisis bioinformático de péptidos antimicrobianos aislados de ranas

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Frogs are a group of vertebrates that due to their characteristics are vulnerable to environmental changes, facing a decline in their global populations due to various factors, such as emerging diseases. Evolutionarily, they have developed physiological strategies to counteract such changes. Since ancient times, frogs have been used in different cultures as a remedy for various diseases due to the properties of their skin, which are attributed to molecules produced by granular glands in their skin, called peptides. Some peptides have antimicrobial properties, which help to counteract infections by external pathogens. The objective of this work was to review the antimicrobial peptides that have been isolated to date from frogs of the genera Agalychnis, Lithobates and Leptodactylus, which are present in our country and many of them are endemic. As results, six different types of peptides have been isolated from the genus Agalychnis, seven from the genus Lithobates and one from the genus Leptodactylus were obtained, all with their respective subtypes. In addition, it was possible to establish against what type of pathogens they present antagonism, the most outstanding some hospital and food bacteria, as well as against yeasts and the fungus Batrachochytrium dendrobatidis, the cause of the decline of amphibians in the world. Antimicrobial peptides as strategies of the frog immune system represent a promising source of biotechnological innovations.

236-IV-PP Integración Fenotípica y Molecular de BPCV para la Rehabilitación Sostenible de Suelos Agrícolas

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Modern agriculture faces a severe crisis in productivity and soil health due to intensive practices and indiscriminate use of fertilizers and pesticides, which have eroded fertility, degraded organic matter, and impoverished microbial biodiversity. In response, plant growth-promoting bacteria (PGPB) have emerged as key allies for restoring damaged soils. These bacteria synthesize auxins (IAA) that enhance root elongation, secrete chitinases and organic acids that improve soil structure and water-holding capacity, and release essential nutrients such as phosphorus and iron in plant-available forms. Likewise, halotolerant PGPB strains help mitigate saline stress in soils impacted by intensive irrigation or organic-matter breakdown, while plant growth regulators (PGRs) support plant adaptation to adverse conditions and boost development. To identify and select the most effective strains for biofertilization programs, both biochemical and molecular assays are combined. IAA production is quantified via the colorimetric Salkowski reaction on culture supernatants; chitinase activity is measured by the diameter of degradation halos on chitosan-supplemented agar; siderophore secretion is assessed using the Chrome Azurol S (CAS) assay; and phosphate solubilization is evaluated by observing clear zones around colonies on Pikovskaya medium. Complementarily, genomic DNA is extracted and purified through enzymatic lysis, silica-column binding, and buffer washes. The 16S rRNA region is then amplified with universal primers and sequenced on high-throughput platforms (e.g., Genetic Analyzer). To deepen taxonomic resolution and infer functional potential, phylogenetic trees are reconstructed using software such as M12 with Ward's method and Euclidean distance. In summary, this integrated approach underscores the pivotal role of plant growth-promoting bacteria in soil restoration. By combining rigorous phenotypic assays with molecular analyses, researchers can select strains that enhance soil structure, promote root development, and strengthen crop resilience. Ultimately, these strategies drive the transition toward more sustainable, resilient, and environmentally respectful agricultural systems.

237-IV-PO Deslignificación de fibra de bagazo de caña para su aplicación en concretos de baja huella ambiental

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Sugarcane bagasse fiber (CBF) represents a promising alternative as a natural reinforcement in sustainable concrete, especially in mixtures formulated with low-carbon cements such as LC3. However, the presence of lignin on its surface limits its adhesion to the cementitious matrix, affecting its reinforcing performance. Therefore, this study proposes a controlled delignification treatment as a preliminary step to improve its compatibility with cementitious materials. The procedure was carried out by exposing the CBF to an oxidizing solution (5% H2O2) under direct current conditions, maintaining control over variables such as voltage and exposure time. The treated samples were characterized by Fourier transform infrared spectroscopy (FTIR) to evaluate changes in functional groups primarily associated with lignin removal. In addition, optical microscopy was used to examine changes in appearance, texture, and roughness. Spectroscopic and morphological characterization of the fibers will allow for the assessment of the effectiveness of the applied treatment, considering the partial removal of lignin as a favorable indicator for its subsequent integration into cementitious mixtures. This stage represents a key advance in the valorization of agroindustrial waste for its use as functional reinforcement in sustainable concrete. In future phases, the effect of this modification on the workability, durability, and mechanical performance of concrete formulated with LC3 cements, which are susceptible to early pathologies such as shrinkage and cracking, will be evaluated.

240-IV-PV Establecimiento de un banco de candidatos vacunales contra Pseudomonas aeruginosa

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Introduction. Healthcare-Associated Infections (HAIs) represent a critical challenge in the healthcare sector due to their increasing incidence, costs, and mortality rates. Among the main pathogens responsible for HAIs, Pseudomonas aeruginosa (PA) stands out due to its antimicrobial resistance, particularly affecting immunocompromised hospitalized patients with medical devices. This pathogen causes severe infections such as pneumonia and bacteremia, leading to prolonged hospital stays and significantly increased mortality. In this context, vaccine development against PA emerges as an alternative strategy to reduce antibiotic dependence and combat PA-associated antimicrobial resistance. Objective. To establish a highly specific antigen bank aimed at preventing infections caused by PA. Materials and Methods. By integrating bioimmunoinformatics, molecular, and immunological tools, eight vaccine candidate antigens against PA were initially identified through reverse vaccinology. These candidates were subsequently cloned for the expression and purification of their products. Once the proteins are characterized in terms of identity and purity, they will be subjected to in vitro immunogenicity assays using convalescent sera from patients previously infected with PA. In addition, selected candidates will be genetically fused to a Spy-Tag peptide for potential coupling to nanoplatforms, enhancing delivery efficiency and vaccine candidate stability. Results. Eight vaccine candidate antigens against PA were identified through reverse vaccinology. Specific oligonucleotides were designed to amplify the genes from PAO1 strain DNA. Cloning and expression strategies were simulated in silico. Experimentally, five genes have already been inserted into specific cloning vectors, and work is ongoing to clone the remaining ones. Subsequent subcloning into expression vectors will allow protein production and purification, followed by immunological evaluation in vitro using convalescent patient sera. Conclusions. To date, we have initiated the characterization of five vaccine candidates for the establishment of an antigen bank against PA, with the aim of providing a viable and cost-effective solution for vaccine development and the prevention of HAIs associated with this pathogen, as well as an alternative to the uncontrolled use of antibiotics.

241-IV-PP Construcción sostenible a partir del aprovechamiento de residuos agrícolas: Fibra de bagazo de caña

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The search for more sustainable concrete has driven the development of materials that utilize agricultural waste as reinforcement, with the aim of reducing the use of natural resources and advancing towards construction aligned with the principles of the circular economy. In this context, sugarcane bagasse fiber (SCBF), obtained as a by-product of the sugar industry, is valued as a renewable resource capable of reintegrating into a production cycle, helping to reduce the accumulation of agricultural by-products and decreasing the consumption of virgin aggregates in the construction industry. In the present project, SCBF undergoes a delignification process assisted by electrohydrolysis, using hydrogen peroxide (H_2O_2 at 5%) under a voltage of 2 V for 30 min, with the purpose of reducing lignin and hemicellulose content and improving its adhesion to the cementitious matrix. The treated fiber is characterized by Fourier Transform Infrared Spectroscopy (FTIR) and optical microscopy to observe changes in its composition and texture. Subsequently, the treated fibers will be incorporated into concrete mixtures with LC3 cement in proportions of 1%, 2.5%, and 5% by weight relative to the fine aggregate. These mixtures will be evaluated for workability, durability, and mechanical properties, particularly compressive and tensile strength, with the aim of analyzing how the incorporation of the fiber influences the behavior of the concrete and determining whether it can contribute to improved mechanical performance. This proposal seeks to generate a positive impact on sustainability by reducing sand extraction through the incorporation of plant fibers and by employing LC3 cement, whose low-carbon-footprint formulation significantly reduces CO_2 emissions associated with cement production.

251-IV-PP Análisis de la transformación de fibra de algodón a fibra de carbón activado, mediante uso de espectroscopia ATR-FTIR y optimización geométrica molecular

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This study analyzes the transformation of cotton fibers into activated carbon fibers (ACF), the chemical process that comprises mercerization with sodium hydroxide (NaOH), thermal stabilization and activation with sulfuric acid (H_2SO_4). The objective is to demonstrate the structural modifications that cellulose (representative monomer of cotton) undergoes in the process to generate a porous carbonaceous material with high adsorbent potential and sustainable value. The methodology consisted of extracting samples at each stage of chemical treatment, drying them and characterizing them by attenuated total reflectance infrared spectroscopy (ATR-FTIR). This analysis revealed a progressive elimination of hydroxyl (–OH) groups, indicating a reduction in surface polarity and the formation of a more ordered carbonaceous matrix. In parallel, molecular simulations were carried out with DMol³, simulating the transformation of the cellulose monomer. The calculations showed electronic reconfigurations and an increase in molecular stability after activation, evidencing a decrease in electron density. The glucopyranosic ring retained its structural integrity, consistent with typical configurations of activated carbonaceous materials, while the removal of hydroxyl groups confirmed that cotton is a suitable and sustainable precursor for FCA production. This approach integrates experimentation and molecular simulation, providing insight into the changes that turn a natural fiber into an adsorbent.

253-IV-PP Actividad antifúngica de extractos de Psittacanthus calyculatus contra Colletotrichum sp., patógeno de Vanilla planifolia

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In Oaxaca, Mexico, vanilla cultivation, associated with coffee, banana, and soursop, among others, complements producers' income. However, production is declining due to the presence of diseases induced mainly by fungi of the Colletotrichum genus. This fungus represents a significant threat to the crop. The present study aimed to evaluate the in vitro biological efficiency of ethanolic extracts of Psittacanthus calyculatus leaves against Colletotrichum sp., the causal agent of pod anthracnose. In 2024, leaves of P. calyculatus, a parasitic plant of guaje trees (Leucaena leucocephala), were collected in the Villa de Zaachila, Oaxaca. The leaves were shade-dried (22±2 °C) for 20 d; they were ground and macerated in ethanol (96%) [1:2 (w/v) ratio] for 48 h. The solvent was removed with a rotary evaporator. The biological effectiveness of the extracts against Colletotrichum was evaluated using the agar diffusion technique, and the percentage of inhibition of radial mycelial growth was calculated. The fungus was challenged with three concentrations of the extract (320, 640, and 1280 ppm); a control was included, where the fungus was grown on PDA without extract. The extract was mixed with sterile PDA culture medium, poured into Petri dishes, and allowed to solidify. Subsequently, a disc of active mycelium was placed in the center of the dishes and incubated at 25 °C. Radial mycelial growth was measured every 24 h. Doses of 1280, 640, and 320 ppm inhibited mycelial growth by 45%, 27%, and 14% relative to the control after 7 d. This study suggests that parasitic plants are a source of secondary metabolites with antifungal properties; In future studies, the crude extract of P. calyculatus will be fractionated and the biological effectiveness of the fractions on the pathogenic fungus will be evaluated.

256-IV-PP Potencial sintético de la reacción tipo Michael 1,4- entre ciclohexanona y nitroestireno

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This project involved the development of a one-pot process with high potential and synthetic versatility based on a Michael 1,4- reaction between simple and accessible raw materials, such as cyclohexanone and nitrostyrene. The process used anhydrous tetrahydrofuran (THF) as a solvent and lithium diisopropylamide (LDA) as a reaction-promoting base. This one-pot process yielded complex and richly functionalized structures such as decalin derivatives, perhydrophenanthrene, and a dodecacycle. It should be noted that this procedure was developed in the context of green chemistry, since all these products were obtained through multiple chemical transformations in a single stage, minimizing the handling of intermediates, the consumption of solvents, and the generation of residues. All reaction products were analyzed using nuclear magnetic resonance spectroscopy (NMR), applying both one-dimensional (^{1}H and ^{13}C NMR) and two-dimensional (zTOCSY, COSY, HSQC, and HMBC) techniques applied to characterize the products. It is important to note that derivatives of decalin, perhydrophenanthrene, and the macrocycle obtained have not yet been reported in scientific literature. The one-pot process described in this work is notable for its versatility in generating structurally complex compounds from simple raw materials, making this protocol attractive. However, the course of the reaction is highly dependent on small variations in the reaction conditions, including the molar ratio of the reactants, the reaction time, the temperature, and the type of base used. Careful control of these variables will allow the one-pot process to be directed towards the selective formation of one of the aforementioned products, consequently increasing its chemical yield. The novel chemical structures obtained have high potential for future applications in organic synthesis, opening up new opportunities in the development of functional materials and bioactive compounds of interest to the pharmaceutical and chemical industries.

293-IV-PO Desarrollo de un candidato vacunal basado en la porina CarO contra la infección por Acinetobacter baumannii

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Acinetobacter baumannii is a multidrug-resistant Gram-negative opportunistic pathogen, classified as critical priority by the WHO. It causes Healthcare-Associated Infections (HAIs), mainly in Intensive Care Units (ICUs) and in immunocompromised patients due to its multiple virulence factors and Antibiotic Resistance mechanisms (AMR), one of the most notable being the CarO porin associated with carbapenem resistance. In Mexico, ~160,000 HAIs are estimated to occur annually, of which A. baumannii is responsible for 90% in ICUs, with mortality rates of 52%, leading to an estimated annual treatment cost of $28.4 billion pesos. In this context, the development of vaccines is the best cost-benefit strategy to prevent HAIs associated with the growing multidrug resistance of this pathogen. Our main objective is to develop a proof-of-concept approach using the CarO protein from Acinetobacter baumannii as a potential vaccine candidate. The CarO protein was identified through reverse vaccinology, expressed, purified, and characterized in silico and in vitro. In general, the carO gene was amplified by PCR and subsequently cloned into the pJET and pET28a(+) vectors. Escherichia coli TOP10 and BL21 cells, respectively, were transformed and grown in Luria Bertani medium supplemented with ampicillin and kanamycin accordingly. The CarO protein was subsequently expressed by induction with 0.1 mM IPTG for 2 hours, followed by histidine affinity purification on a cobalt resin column. Protein resolution was achieved by SDS-PAGE and Western blot. Immunoinformatics analyses of the CarO protein were performed. The results of the immunoinformatics evaluation of CarO are promising, suggesting it as a potential vaccine antigen.

296-IV-PO Isolation, characterization and evaluation of potential probiotic of wild strains isolated from fermented sap of *Acrocomia Mexicana*

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Probiotics are microorganisms that, when administered in adequate amounts, provide health benefits. Probiotic strains must survive the gastrointestinal environment and reach the colon viable. The objective of this study was to isolate, biochemically and molecularly identify, and evaluate the probiotic effect under simulated gastrointestinal conditions of bacteria from *Acrocomia mexicana* pulque. Pulque samples were collected in Benito Juárez, Oaxaca, Mexico. Lactic acid bacteria (LAB) were isolated based on their culture in selective medium, colony morphology, and Gram staining. These isolates were selected to determine their survival under gastric (pH 2 and pepsin) and simulated intestinal (pH 7, pancreatin, cholic acid, and sodium taurocholate) conditions. The Analytical Profile Index (API 50CH) was used for biochemical identification, and 16S ribosomal RNA sequencing was used for molecular identification. *Apilactobacillus micheneri, Lactobacillus kitasatonis, Lactobacillus portuensis*, *Lactobacillus pentosus*, and *Fructilactobacillus sanfranciscensis* were identified using the ABIS online program with similarity percentages of 93.6%, 92.2%, 91.9%, 90.1%, and 88.9%, respectively. Seven of the ten isolated LAB survived pH 2 and pepsin (3 mg/mL) with percentages of 68–98%. The seven strains that survived the simulated gastric environment when exposed to pH 7, pancreatin (1.9 mg/mL), cholic acid (1.5 mg/mL), and sodium taurocholate (1.5 mg/mL) showed survival percentages of 94–99%. Two strains with greater probiotic potential were molecularly identified as *Bacillus velezensis* and *Bacillus nakamurai*, both bacteria will be reported for the first time in this work. *Mexican Acrocomia* pulque is a traditional fermented beverage containing probiotic bacteria such as *Bacillus velezensis* and *Lactobacillus*.

298-IV-PP Obtención y caracterización de nanopartículas de celulosa mediante molienda de alta energía para su uso como biomaterial

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Cellulose is one of the most abundant biopolymers in the world that can be acquired from plant organisms and due to its availability, it is important due to its chemical, mechanical and thermal properties, which is why it represents a sustainable alternative in the field of materials engineering by serving as a basis for obtaining nanoparticles with applications in the development of biomaterials. In addition, its extraction from corn cobs allows the use of agri-food waste, which provides an alternative to reduce waste pollution, allowing them to be added value and contributing to the circular economy. This work shows the extraction and characterization of cellulose obtained from corn cobs and the nanoparticles generated from this biopolymer using high-energy mechanical grinding, as well as the selection of the best conditions for their use in the manufacture of biomaterials.

301-IV-PP Hypoxic exosomes derived from normal lung fibroblasts act as inducers of their profibrotic activity through their metabolic reprogramming (glycolysis)

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Exosomes transfer molecules that can modify the biological activity of recipient cells; however, a hypoxic environment alters their secretion and content. In idiopathic pulmonary fibrosis (IPF), a lethal disease characterized by progressive scarring of lung tissue, the presence of a hypoxic microenvironment is favored. To date, it is unknown whether exosomes secreted by normal human lung fibroblasts (NHLFs) in a hypoxic microenvironment could induce their metabolic reprogramming (glycolysis), thus contributing to their activation and promotion to a pro-fibrotic state. In this study, we isolated hypoxic exosomes (HExo) and normoxic exosomes (NExo) from NHLFs cultured under hypoxic (1% O_2) and normoxic (21% O_2) conditions, respectively. Additionally, the expression of the tetraspanins CD9, CD63, and CD81 in exosomes was examined. Likewise, the expression of the profibrotic genes α-SMA and collagen was evaluated in NHLFs cocultured with HExo or NExo, incubated under hypoxic or normoxic conditions. We also assessed the role of glycolytic activity in the expression of these genes using 3-PO, an inhibitor of PFKFB3, one of the main regulatory enzymes of glycolysis involved in the transition of basal fibroblasts to a profibrotic state. The results showed a differential expression of tetraspanins between the two groups of exosomes under study. In coculture assays with HExo, an increased expression of α-SMA and collagen was observed. The expression of these profibrotic genes was downregulated in the presence of the inhibitor 3-PO. Our findings reveal significant differences in tetraspanins expression between NExo and HExo, which may be linked to their biogenesis, cargo selection, and regulation of cellular metabolism. Furthermore, the role of HExo is highlighted as an inducer of profibrotic activity, related to the activation of the glycolytic pathway in NHLFs, a phenomenon associated with the progression of IPF.

303-IV-PV Aislamiento y Conservación de Neolentinus sp. nativo de San Esteban Atatlahuca, Tlaxiaco, Oaxaca

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In various regions of Oaxaca there are wild mushrooms during the rainy season, in the Mixteca, a diversity of fungi has been reported, some of which are used as food, with Neolentinus sp. marking the beginning of the reproductive season. The objective of this work was to collect Neolentinus sp. native from San Esteban Atatlahuca, Tlaxiaco, Oaxaca to isolate and conserve wild germplasm. Therefore, an ethnomycological analysis was carried out to learn about the consumption of Neolentinus, guided tours were conducted in the forests to collect data on the type of substrate, vegetation and morphological characteristics of the species collected. Vegetative isolation was carried out in PDA medium and incubated at 27-29°C in complete darkness. The results showed that, in the community, Neolentinus sp. is known as “hongo de cuaresma”, it grows in April, May and June, and is prepared in “amarillo” and “tamales”, in that sense it is also a mushroom with short reproduction periods and of low abundance in the forests. In May, a sample of Neolentinus sp. was collected from a decomposing pine trunk, between dry and wet needles in a forest dominated by pines with fallen trunks and branches, with a temperature of 24°C and an ambient humidity of 63%. The mushroom was firm, the pileus was 6 cm long, convex, smooth brown surface with dark brown scales. Lamellae decurrent, serrated, white with yellowish tones, prolonged towards the stipitate. Stipitate 5-6 cm, central, solid, brown with scales near the laminate. The mycelium of Neolentinus sp. isolated grew completely on the fifth day of incubation, white on the front and back of the plate. Reseeding was performed on PDA with a mycelial growth of 28.3 ± 0.88 mm per day. With this work, an isolated strain of Neolentinus sp. native to Oaxaca was obtained, which will allow the identification of the species and the conservation of its wild germplasm.

309-IV-PP Efecto de la combinación de estradiol y cúrcuma sobre el estrés oxidativo implicado en la función metabólica y vascular en un modelo murino con falla ovárica prematura

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Premature ovarian failure (POF) is characterized by a hypoestrogenic state favoring oxidation-reduction imbalance, endothelial dysfunction and metabolic alterations, promoting the development of cardiovascular diseases. The treatment is hormone replacement therapy, which at the moment is considered insufficient to prevent metabolic and vascular deterioration. In this study we propose turmeric as a coadjuvant in the treatment of cardiovascular disease. Objective: Determine the effects of combined estradiol and turmeric therapy on metabolism, vascular function and oxidative stress in a murine model with POF. Methodology: 30 Wistar rats, 7-9 weeks old, were divided into SHAM (n=3), POF (n=7), POF+E2 with 28 µg/ Kg/day of 17 β-estradiol (n=7), POF+ Turmeric 250 mg/Kg + 20 mg/Kg piperine (n=7) and POF + E2-Turmeric with the mentioned doses (n=6). Metabolic evaluation was determined with Lee's index, body mass index (BMI), total cholesterol (TC), triacylglycerides (TAG) and plasma glucose. Vascular function was studied by determining systolic blood pressure (SBP), diastolic blood pressure (DBP), Angiotensin (Ang II) and acetylcholine (ACh) concentration response curves. Oxidative stress was evaluated by MDA, quinones, total SH groups and GSH-Px activity. Results: After 13 weeks of evolution, both POF and treatments did not present alterations in Lee's index, BMI, TC and glucose, interestingly, TAG decreased in the POF+E2-Turmeric group. POF increased SBP and DBP. Concentration-response curves showed greater vascular reactivity to Ang II in the POF group and the combined treatment. This response was attenuated with the individual treatments. POF did not develop oxidative stress. The combination maintains similar damage markers between treatments, decreases SH groups and tends to restore GSH-Px activity. Conclusion: In this model, POF after 13 weeks of evolution, did not present metabolic changes and in the oxide-reduction state, although vascular function was affected. Individual therapy with E2 and turmeric prevented these alterations. Finally, combined therapy with estradiol and turmeric generated a better antioxidant effect.

315-IV-PO Caracterización de las arcillas naturales como catalizadores mediante pruebas de límites de Atterberg, Meb, Tga, Edx, Xrd Bet para la degradación de residuos orgánicos urbanos

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This project addresses the environmental problems arising from the accumulation and improper management of organic household waste in urban environments.. By adding clay to composting mixtures, the thermophilic phase can be prolonged and the degradation of organic matter can be improved. In addition, clay can reduce the release of methane (CH_4) and nitrous oxide (N_2O) during composting, which reduces greenhouse gas emissions and improves the quality of the final compost.
Furthermore, unlike traditional bioreactors, the proposed technological solution uses a system of smart wireless sensors that can be used to remotely monitor parameters such as temperature, pH, and humidity to visualize the organic matter degradation process in real time. This will allow the process to be controlled with a minimum margin of error and to determine the optimal time frames for managing organmetaic solid waste.

323-IV-PO Variabilidad espacial del sistema de carbonatos en la región costera de Acapulco, Pacífico tropical mexicano

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CO_2 emitted by human activities is one of the most important greenhouse gases. For decades, there has been an increase in its atmospheric concentration, and it is estimated that approximately 30% of the CO_2 emitted since the Industrial Revolution has been absorbed by the oceans. This has given rise to an emerging problem known as ocean acidification. In the national context, the carbonate system has been studied throughout the Mexican Pacific; however, the tropical region is one of the least documented. For this reason, in March 2020, an oceanographic campaign was carried out aboard the IMIPAS research vessel B/I "Dr. Jorge Carranza Fraser," in which the first author participated directly as part of the research crew. During the campaign, oceanographic stations were monitored using a rosette equipped with a CTD and Niskin bottles. Variables such as temperature, salinity, fluorescence, and pH were recorded throughout the water column. In addition, aliquots were collected at discrete depths for onboard analysis of dissolved oxygen and laboratory analysis of carbonate system variables. In order to understand the physical dynamics of the study region, satellite images of absolute dynamic topography and geostrophic flow were used, processed with MATLAB software. The results allowed us to identify alternating CO_2 uptake and emissions in the area off Acapulco, with FCO_2 values ranging from -6.31 to 4.24 mmol C m^{-2} d^{-1}. This variability was mainly driven by the presence of a cyclonic eddy during the study period, which had an impact on the vertical distribution of the other variables studied.

325-IV-PP Análisis de la obesidad y el envejecimiento celular en el programa de manejo integral de la obesidad

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Background: Obesity is characterised by the accumulation of excessive fat and has been linked to telomeric shortening and oxidative stress — two mechanisms of cellular ageing. Obesity rates in Mexico have increased, including within the Mexican Army, which is why the Integrated Obesity Management Programme (PMIO) was created. Objective: To investigate the relationship between cellular ageing mechanisms and obesity in individuals enrolled in the PMIO. Methods: The study population comprises obese military personnel participating in the PMIO in CDMX in 2024. Anthropometric measurements were taken to determine body mass index (BMI) and abdominal circumference (AC), as well as electrical bioimpedance to determine percentage body fat (PBF) before and after the programme. Blood samples were also collected at the beginning and end of the programme, and DNA was extracted using the QIAGEN DNeasy Blood & Tissue kit. Telomere length (TL) was quantified by qPCR using the ScienCell Absolute Human Telomere Quantification assay kit, and the expression of the antioxidant genes catalase (CAT) and superoxide dismutase (SOD) quantified by RT qPCR. Preliminary results: Approximately half of the population (26 participants), aged 30-49 years, mostly men, has been analysed so far. A significant decrease in obesity indicators was observed in both sexes. BMI decreased by 17.03% in men and 12.27% in women. AC decreased by 15.76% in men and 13.74% in women. PGC decreased by 23.95% in men and by 16.76% in women. TL increased by 87.15% in men and 27.74% in women. Preliminary conclusions: The data obtained so far indicate that PMIO is effective. Significant correlations between obesity, telomere shortening and antioxidant biomarkers are expected to be identified, which would allow TL and antioxidant biomarkers to be proposed as prognostic tools in the comprehensive approach to obesity.

328-IV-PV Desarrollo y caracterización de nanocuerpos dirigidos contra la proteína c-Met para tratamiento de diferentes tipos de cáncer

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The development of new therapies or the improvement of existing ones for the treatment of different types of cancer poses a challenge: ensuring their effectiveness and minimal adverse effects. The use of nanobodies for the development of different types of cancer therapies appears to be very promising, especially for treatments against localized solid tumors and metastases. The advantage of using nanobodies as biotherapeutics lies in the fact that they do not require specific glycosylation patterns compared to conventional antibodies, which commonly use production platforms with animal cells, which are expensive. Furthermore, conventional antibodies are more susceptible to generating adverse reactions caused by the presence of the crystallizable fragment (Fc). Therefore, the objective of this project was to develop nanobodies directed against the c-Met protein, which is present in different types of cancer and is associated with the development of metastases. To optimize their production, the solubility peptides MBP and Fh8 were used, with the goal of reducing the formation of inclusion bodies. However, due to the protein nature of each version of the nanobodies, which ended up affecting expression in *E. coli BL21*, it was decided to evaluate an experimental design to find the optimal culture conditions where protein expression would be maximized without being degraded. The results obtained indicate that despite using simpler production platforms such as *Escherichia coli*, there are multiple factors that have a great impact on protein expression. For this reason, these must be considered from the design of biomolecules, as well as constantly evaluate and provide feedback to the system, to maximize correct protein expression. In the case of nanobodies, the *E. coli* culture was subjected to cellular stress by adding ethanol and IPTG concentrations at 0.4 M were used during induction. For purification by affinity chromatography, elution was performed with imidazole at 500 mM. However, it is necessary to evaluate whether the nanobodies produced are functional enough to be used as biotherapeutics for the treatment of different types of cancer.

332-IV-PO Estrategia bioinformática para el mapeo de interacciones entre miRNA–Target y la anotación funcional en plantas

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MicroRNAs (miRNAs) are key post-transcriptional regulators in plants, acting primarily through mRNA cleavage or translational inhibition. This study presents a bioinformatic methodology to construct miRNA–target interaction networks in *Arabidopsis thaliana*, integrating visual attributes that reflect the type of regulation and interaction specificity. As a proof of concept, three representative miRNAs were analyzed: miR319, miR172, and miR160, each with 15 predicted target genes selected using the psRNATarget platform. Predictions were based on sequence complementarity and penalty parameters, applying an expectation threshold to filter the most probable interactions. To quantify the specificity of each interaction, a score was calculated using the formula: Score = 1 – (Expect/10), where values closer to 1 indicate higher specificity. This score was represented as node size in the network, allowing intuitive visualization of the most precise interactions. Networks were constructed in Cytoscape as directed graphs, with regulation types color-coded: red for cleavage, blue for inhibition, purple for both mechanisms, and green for miRNAs. This coding enabled the identification of regulatory patterns, such as targets with multiple regulation types or miRNAs predominantly associated with cleavage. Finally, a Gene Ontology (GO) enrichment analysis was performed on the target genes, grouping terms into relevant biological categories. The resulting GO network revealed activities related to transcriptional regulation, hormonal signaling, floral development, and abiotic stress response, with representation percentages that help infer the functional impact of each miRNA. This integrative approach not only facilitates the visual interpretation of regulatory networks but is also scalable to any miRNA in *Arabidopsis thaliana*, offering a versatile tool for exploring the functional architecture of gene regulation in plants.

336-IV-PO Astroturismo comunitario como ruta para rescatar y conservar el paisaje nocturno

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The celestial vault, as part of the nocturne landscape, has been a source of cultural, spiritual, religious, and scientific wealth throughout history, permeating diverse worldviews among peoples. In Mexico, the groups that inhabited it left testimony to this relationship: astronomical observatories, codices, and stories. Equinoxes and solstices, events that mark temporalities, have been used to create agricultural and religious calendars, which remain relevant since those who work the land continue to inherit these traditions, sometimes accompanied by elements that identify a community, such as their dress, language, customs, and practices. This connection between humankind and the sky has been transformed as the nocturne landscape has been changed by anthropogenic action and the failure to enforce regulations on light pollution (LP). In this context, we propose, from a holistic landscape perspective, community-based astrotourism as a path toward safeguarding dark skies, motivating alternative economic activity in communities and promoting the participatory, comprehensive conservation of this underexplored landscape. In collaboration with the Institute for Training for Employment in Morelos, a pilot astrotourism experience led by women from the VINA community group in Tlacotepec will be implemented around October 2025. They will participatively design, with our academic support, their own astrotourism experience enriched by their own astronomical knowledge. Through this initiative, we seek to promote the recovery and revaluation of the territory and traditional knowledge as part of the heritage and landscape, particularly the nocturnal landscape. The work is currently in the exploratory and training design phase.

339-IV-PO Estudio de percepción y apropiación de sanitario sustentable alternativo para espacios públicos

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Public spaces often lack sanitation services, and if they exist, they use liquid-based systems, either conventional water systems (which push excreta through a drainage) or portable chemical systems (for reception, transport, and remote processing). In both cases, the liquid determines the sanitation and maintenance of the system. As an alternative, a portable composting toilet (PCT) is proposed. This system stands out for its lack of water or chemicals, responsible waste management, and installation where necessary, promoting community inclusion and well-being. The study used the same type of furniture and composting toilet system within three collapsible booth designs. To identify the adoption of the PCT as an alternative sanitation system in public spaces, user perceptions were analyzed in various activities and public spaces in Oaxaca, specifically over a ten-month period among a group of women who engaged in weekly informal trade in a park. Using qualitative methodology through observation instruments, questionnaires, interviews, and field diaries, we identified how people of different ages perceive the toilet's functionality, aesthetics, and comfort. The results show that, although the alternative toilet offers economic and environmental advantages, it has not yet generated widespread adoption because the number of people using it is lower than expected. Perceptions of hygiene, aesthetics, and functionality were rated as positive to improvable. Therefore, we conclude that the successful adoption of ecological technologies in public spaces, such as the ecological toilet proposed in this study, is limited primarily by cultural and sensory factors. Integration requires not only technical improvements in design, but also social strategies that generate trust and acceptance among users and coordinators of activities in public spaces.

342-IV-PP Evaluación de la actividad antiinflamatoria *in vitro* de *Rosmarinus officinalis* (romero)

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The use of medicinal plants has become popular due to their antioxidant, flavonoid, tannin, steroid, and phenol content, which give them excellent bioactive properties. Rosmarinus officinalis (rosemary) is an extract of great therapeutic interest not only because of its antioxidant and antibacterial properties, but also because of its anti-inflammatory capacity. All these properties have made it a promising alternative for the development of anti-inflammatory products. Many studies have shown that its secondary metabolites are capable of modulating certain inflammatory processes in the skin by inhibiting the release of pro-inflammatory mediators and stabilizing proteins associated with the inflammatory process. In this research, the physicochemical characterization (phytochemical profile through qualitative tests (colorimetric reactions), quantification of secondary metabolites through analysis by spectrophotometry (UV-VIS), and anti-inflammatory activity through the bovine serum albumin (BSA) protein denaturation assay) of rosemary leaf extract through maceration (solid-liquid) with different solvents (ethanol, methanol, and water). The results showed the presence of secondary metabolites such as steroids, phenols, flavonoids, and tannins. Upon quantification, it was found that the methanolic extract had the highest content of secondary metabolites, with a concentration of tannins of (91,374±11,510 mg eq. tannic acid/g of plant), flavonoids (33.200±1.289 mg eq. quercetin/g of plant), phenols (8.527±0.742 mg eq. gallic acid/g of plant), and steroids (2.039±0.729 mg eq. cholesterol/g of plant). The BSA assay allows us to evaluate the anti-inflammatory potential in vitro against inflammatory processes, since the denaturation of this protein is associated with the inflammatory process, as certain proteins, when denatured, act as pro-inflammatory agents by activating immune responses. As a result, the ethanolic and aqueous extracts showed greater anti-inflammatory activity, indicative of their ability to prevent protein denaturation. It was demonstrated that the ethanolic and aqueous extracts of rosemary, rich in secondary metabolites that confer anti inflammatory activity, have the ability to stabilize proteins by preventing their denaturation, making them excellent candidates for use in the development of plant-based dermatological products.

348-IV-PP Estudio de $BiVO_4$ obtenido por electrodeposición para la degradación de ácido clofíbrico por ozonización fotocatalítica

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Advanced oxidation processes have gained significant relevance today due to their effectiveness in removing contaminants from water and air, representing more sustainable and efficient alternatives compared to conventional methods. This need arises from the increasing detection of so-called emerging contaminants — compounds found in various bodies of water that have not yet been fully studied or regulated by current environmental legislation and therefore pose a potential risk to human health and ecosystems. One of these compounds is clofibric acid (CA), which has been monitored in various water sources throughout the Mexico Valley metropolitan area. Its presence is a cause for concern because of its toxic effects on aquatic organisms, including alterations in growth and reproduction, as well as an increase in embryonic abnormalities. In humans, exposure has been associated with endocrine disruptions, liver damage, and the formation of gallstones. With the aim of contributing to its removal, this study synthesized thin films of $BiVO_4$ for application in the degradation of CA via photocatalytic ozonation. The films were grown by a pulsed electrochemical deposition technique, using fluorine-doped tin oxide–coated glass (FTO) as the working electrode. The results showed complete degradation of CA within 30 minutes in all systems. However, significant differences were observed when analyzing the degradation byproducts: the photocatalytic ozonation system in the presence of $BiVO_4$ thin films demonstrated the ability to degrade oxalic acid, one of the main byproducts. This behavior is attributed to an increase in reactive oxygen species (ROS) generated by the semiconductor. In conclusion, photocatalytic ozonation with $BiVO_4$ thin films not only enabled the complete degradation of AC, but also promoted the degradation of the generated by-products, thus achieving a higher degree of mineralization compared to the other evaluated systems. This study therefore provides an efficient alternative for wastewater treatment, offering a catalyst with high efficacy that can be easily recovered from the reaction medium.

349-IV-PO Fatigue behavior of ASTM A572 steel in welds

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Steel structures and componentssuch as buildings, bridges, etc., are frequently subjected to fluctuating loads throughout their service life, leading to progressive damage accumulation. This phenomenon, known as fatigue, compromises the structural integrity and long-term durability of these elements. Therefore, its study is crucial, as fatigue accounts for most failures in metallic structures.

To join structural components and transfer loads, electric arc welding is commonly used due to its versatility. However, this process can introduce stress concentrators and sometimes debilitate the weld zone or the Heat Affected Zone (HAZ). When operating under fluctuating loads, the performance of welded joints can be even lower than that of the base material.

This work investigates the mechanical behavior of structural steel ASTM A572 Grade 50, specifically its response when welded using the Gas Metal Arc Welding (GMAW) process, which poses no limitation filler material. Test coupons were extracted from an I-beam and evaluated for microstructural changes due to thermal distribution. Microhardness profiles showed that beyond 20 mm from the weld line, thermal input did not cause significant microstructural alteration.

Macroscopic analysis revealed a maximum bead width of 13.10 mm and a HAZ extending approximately 4.70 mm on each side. Three tensile tests were performed in different directions across the web and flange, and the closeness of results suggests the steel exhibits nearly isotropic behavior.

While the base steel withstood a stress of 462 MPa, the welded sample reached 558 MPa, although a drop in elongation from 33% to 23% was noted. Lastly, a specimen tested under a stress level of 271.2 MPa endured 2,300,000 cycles before failure, demonstrating considerable fatigue resistance.

353-IV-PO Método químico para la generación de bioplásticos nanométricos de PLA

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Nanoplastics (NP) are one of the most relevant emerging pollutants today, however, there are still doubts regarding the classification of these pollutants with respect to their size, in this work, it is established that NP must be below 100 nm to be considered as nanoparticles. The size is one of the principal characteristics that affect relationships and interactions with ecosystems and living organisms. Also, PLA nanoplastics (NPPLA) are relevant due to their presence in single use products and the rate of the degradation. In this research, NPPLA by means of a dissolution and precipitation reaction are obtained, dynamic light scattering (DLS) and transmission electron microscopy (TEM) were used to evaluated the size and morphology confirming the presence of homoaggregates around 60 nm, the chemical structure analysis was analyzed by Fourier Transform Infrared Spectroscopy (FTIR), X-ray diffraction (XRD) and Nuclear Magnetic Resonance (NMR) confirming that the structure is maintained after the chemical reaction. This was the first time a method is reported to obtain PLA particles below 100 nm, in the future these nanoparticles could be used to determine the toxicological effects, the fate in the ecosystems and to optimize the analytical methods for detection of NP.

357-IV-PO Evaluación del comportamiento TRIP modificando la rapidez de deformación de un acero 400Y690T

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The manufacture of structural components and reinforcement elements in the automotive industry has increasingly focused on transformation-induced plasticity (TRIP) steels due to the ideal mechanical properties they offer for the industry. The excellent formability that characterizes this steel allows for the creation of parts with complex geometries and also reduces the weight of the car. The multiphase microstructure of TRIP steel, composed of ferrite, martensite, bainite, and retained austenite (RA), is a feature that significantly characterizes its mechanical performance. The martensitic transformation of retained austenite is made possible by the TRIP effect. This phase transformation is the hardening mechanism of this steel, and the mechanical properties obtained simultaneously are high strength and ductility. The traditional characterization of the mechanical behavior of TRIP steel is carried out by means of tensile tests under low strain rate conditions (10-4s-1). In the present study, axial tensile tests were performed at different strain rates (3.1×10-4 s-1, 7.2×10-2 s-1, 1.4×10-1 s-1, 200 s-1, 400 s-1, 600 s-1) using a servo-hydraulic materials testing machine and another machine called an inertial wheel (manufactured and instrumented at CIITEC). Microstructure of steels before and after tensile were observed by means of optical microscope (OM), scanning electron microscope (SEM) and X-ray diffraction (XRD). The results were compared with each other and with the maximum stress in traditional tensile tests, which is 750 MPa and a percentage of strain of 35%. At different strain rates, it was observed that there was a lower maximum stress of 709 MPa and a percentage of strain of 29%. It was found that the deformation obtained is 6% lower compared to the deformation of the traditional tensile test, and the maximum stress only decreases by about 5%. It was observed that in the microstructure there is greater grain elongation at high strain rates and ferrite grain refinement. Retained austenite grains were found, indicating that there was no phase transformation of all the grains.

358-IV-PP Computational study on sulfamethoxazole nitroso derivative binding to human serum albumin for elucidating the molecular mechanisms of drug-induced hapten formation in the development of hypersensitivity

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Drug-induced hypersensitivity reactions are a significant clinical challenge, frequently arising from the covalent binding of reactive drug metabolites to endogenous proteins, forming hapten-protein complexes. Sulfamethoxazole (SMX), a widely used sulfonamide antibiotic, is metabolized to its nitroso derivative, the sulfamethoxazole nitroso (SMXno), which can bind to human serum albumin (HSA), specifically targeting lysine residues in HSA that might trigger a deleterious immune response in susceptible patients. Although experimental techniques such as mass spectrometry have identified certain lysine residues as targets for SMXno adduct formation, a full mechanistic understanding of haptenization remains incomplete due to the transient nature of reaction intermediates and the complexity of protein-drug interactions. To address these challenges, this study employed an advanced computational workflow to elucidate the molecular basis of SMXno-HSA haptenization. The methodology involved several key steps. First, molecular docking was used to explore the binding modes of SMXno within HSA, identifying potential reactive lysine residues. Conceptual density functional theory (CDFT) calculations were then applied to assess the reactivity of these lysine side chains, providing electronic and energetic descriptors for nucleophilic attack. To map the reaction pathways, intrinsic reaction coordinate (IRC) calculations were performed, revealing the transition states and intermediates involved in covalent bond formation. To gain a dynamic and realistic perspective, hybrid quantum-mechanics/molecular-mechanics (QM/MM) molecular dynamics (MD) simulations were conducted. These simulations accounted for solvent effects and protein flexibility, enabling atomic-level investigation of the reaction environment. Our results consistently identified Lys199 and Lys195, assisted by Glu292 in HSA's binding site I, as the most favorable sites for haptenization, in agreement with previous mass spectrometry data. Thermodynamic and kinetic analyses indicated a strong preference for the trans configuration of the resulting arylazoalkane adduct. The comprehensive computational workflow developed here offers a framework for predicting hapten formation between drug metabolites and proteins. By integrating docking, CDFT, IRC, and QM/MM MD simulations, this methodology provides detailed mechanistic insights and identifies critical factors influencing reaction outcomes. These findings advance our understanding of drug-induced hypersensitivity and support the rational design of safer therapeutics through predictive modeling.

373-IV-PO Análisis de antromas para el diseño de un modelo de gestión adaptativo participativo en el área natural protegida El Chico, Hidalgo

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Territorial planning, understood as the set of actions and measures aimed at the equitable and technically supported organization and management of land use, seeks to define the present and future uses of land. This includes areas designated for nature conservation due to their unique ecosystemic attributes and aesthetic value, such as a Protected Natural Area (PNA). With 126 years of history, the "Monte Vedado Mineral del Chico National Forest" already had a long-standing record of use by local communities. This PNA, functioning as a small anthropogenic biome, reflects a historical relationship between society and nature that has shaped both the landscape and its uses. Given this biocultural relationship, an analysis of anthropogenic biomes—or anthromes—will be employed to quantitatively assess how the growth of both local and transient populations directly impacts the Protected Area Management Plan (PMP) of this national park, significantly affecting the sustainable development of this socio-environmental system. A study based on anthrome analysis will help explain the evolution of the biocultural relationship within the PNA, focusing on local population growth and its impact on the forest ecosystem, using changes in forest cover (measured in hectares) as a reference value. The methodology involves vector analysis using specialized software to assess land use and vegetation changes with data from CONABIO, overlaid with demographic data layers from INEGI, beginning in 1982—the year in which the current boundaries of the PNA were established. This information will be compared with the PMP approved in 2006, allowing us to understand how both local and transient populations have developed around the forest, how human presence and activities have altered the ecosystem, and in what ways the PMP should be updated. Through anthrome analysis, a participatory adaptive management model will be implemented—one that recognizes both the capacity of local communities to care for their environment and their active role in shaping the landscape. In doing so, the PMP will promote an approach that integrates environmental justice and ecological sustainability, contributing to the conservation of the PNA.

379-IV-PO Análisis y evaluación de hidroxi-xantonas y derivados como potenciales inhibidores de HMGcoA reductasa

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This study focuses on the synthesis and characterization of substituted alkoxyxanthones and their in vitro biological evaluation as potential inhibitors of the HMG-CoA reductase enzyme, a key target in the treatment of metabolic syndrome. Analytical techniques such as spectroscopy and chromatography will be used for structural characterization, while biochemical assays will determine their inhibitory potential. In addition, computational methods such as molecular docking and molecular dynamics will be applied to understand the possible interaction mechanisms with the enzyme. The ultimate goal is to identify lead compounds that can be further optimized for the development of more effective and selective pharmacological therapies against metabolic syndrome.

381-IV-PP Inhibición del crecimiento de Pseudomonas aeruginosa mediante nanocápsulas sintetizadas con el biopolímero quitosano con extracto de café (Coffea arabica L.)

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Pseudomonas aeruginosa is a pathogenic bacterium that has developed a wide resistance to antibiotics, mainly affects immunocompromised people and is highly persistent, currently there are known strains with pan-resistance to antibiotics. For this reason, the present work seeks to implement the nanocapsules in a synergistic effect with the potential of roasted coffee extract to inhibit the growth of P. aeruginosa. The nanocapsules were developed by ionic gelation, using two molecular weights of chitosan (medium: CHINPC-PM and low: CHINPC-PB) at a ratio of (v/v) with chitosan (0.5 mg/mL) and TPP (0.7 mg/mL) and an optimal concentration of 9 mg/mL of coffee extract. Five clinical strains (PAE 1, PAE 3, PAE 8, PAE 104 and PAE 1186) and one type strain (PAE ATCC) of P. aeruginosa, a bacterial and antibiotic resistance profile was obtained for each strain, then inhibition tests were performed and the Minimum Bactericidal Concentration (MBC) was determined by OD600 nm turbidimetry, growth inhibition of up to 99% was observed with low molecular weight nanocapsules and 95% using medium molecular weight nanocapsules. The MBC for both types of nanocapsules was 1.8 mg/mL (20%) for all P. aeruginosa strains except for the PAE ATCC strain, which had an MBC of 2.7 mg/mL (30%) with CHINPC-PM.

382-IV-PP Aplicación de técnicas de Machine Learning y biosensores ópticos para la determinación de IL-6 en modelo murino rata inducida a un evento isquémico agudo

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Cardiovascular diseases (CVD) have a significant impact on public health in Mexico, ranking as the seventh leading cause of death in 2021, with over 37,000 fatalities. Among these, ischemic heart disease and cerebrovascular accidents (strokes) are the primary causes of mortality. Risk factors such as hypertension, diabetes, smoking, and high cholesterol are prevalent in the Mexican population. Additionally, the lack of timely access to medical care and delays in diagnosis and treatment contribute to high mortality and disability rates. Ischemic cerebrovascular disease, which occurs when a clot blocks blood flow to the brain, can result in brain damage, disability, or death.
Interleukin 6 (IL-6) is a key pro-inflammatory cytokine responsible for the proliferation and differentiation of immune and hematopoietic cells. IL-6 production following traumatic injury has been associated with neuronal inflammation and brain damage. Plasma IL-6 levels within the first 12 hours after an ischemic cerebrovascular disease (CVD) event are considered a strong independent predictor of early mortality. The objective of this study is to determine the expression of interleukin 6 using optical biosensors based on crystalline silicon and machine learning analysis after an episode of acute global cerebral ischemia in rats. The project aims to develop an innovative method for detecting interleukin 6 (IL-6) using optical biosensors based on crystalline silicon in rats after an episode of cerebral ischemia. The proposal integrates biotechnology, optics, and data analysis to create a fast, accurate, and cost-effective tool for monitoring IL-6 levels, facilitating the diagnosis and follow-up of brain damage. Biosensors with specific antibodies for IL-6 will be designed, structural changes will be studied using FTIR microspectroscopy, and machine learning techniques will be applied to enhance system accuracy. This approach seeks to optimize time and costs in diagnosing brain damage caused by ischemic events. Preliminary results showed a significant difference in IL-6 concentrations in samples taken 0, 1, and 6 hours post-ischemia and SHAM. This is consistent with results reported in the literature, and these differences are expected to be found in the missing samples.

384-IV-PP Prototipo de exoesqueleto robótico para miembros inferiores de infantes en edad escolar

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This work presents the development of a prototype lower limb exoskeleton (LLE) with six degrees of freedom (DoF) designed specifically for school-aged infants. The LLE allows the mobilization of pediatric users by emulating the gait cycle. The mechanical design considers the target users' anthropometric dimensions, as well as the development of hip, knee, and ankle flexion/extension movements for both extremities. The manufacturing of the device comprises mainly structures fabricated by three-dimensional printing techniques using polylactic acid filament as a manufacturing material, in addition to aluminum slotted profiles, two linear guide systems that are located in the hip and foot support, bearings that allow the foot support and aluminum support to hold the weight of the exoskeleton. As part of the electronic instrumentation, the device has an AK80-64 brushless actuator for each DoF, a LaunchPad LAUNCHXL F28379D microcontroller, and a PSN24-960 power supply for each limb. To generate the LLE motions, a first-order sliding mode control was designed, in addition to implementing a Super Twisting algorithm as a robust derivative to estimate the derivative of the position error. To visualize and operate the controls, two codes were developed; the first one is embedded in the microcontroller, regulates the control algorithm, and allows the reading of parameters such as torque, speed, and position of the LLE on a personal computer. The performance tests were carried out by running the EMI control for at least five cycles and were validated by comparing the trajectory tracking standard and the control standard between the developed algorithms. The results showed that the EMI can track the trajectory with an RMSE of 0.0291 at the hip, 0.0863 rad at the knee, and 0.0370 rad at the ankle.

387-IV-PO Control no lineal mediante observador de estado en la dinámica glucosa-insulina para diabetes mellitus

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Diabetes mellitus is a chronic condition in which the pancreas is unable to produce the required amount of insulin to regulate glucose levels in the blood. But also when the immune system eliminates beta cells produced by the pancreas, insulin cannot be produced, causing improper glucose regulation. The growing number of cases related to Diabetes mellitus is increasing in an unprecedented manner globally, due to various factors. The International Diabetes Federation (IDF) presents data indicating that 589 million adults(20-79 years old) have diabetes at a global level, and estimates the rise of cases to 853 million in the same population sector for the year 2050. Focusing on Mexico, there are 13.6 million diabetes cases in adults(20-79 years old), which is the reason it ranks among the 10 highest countries in the world with the most diabetes cases.

In the present research, a fourth-order nonlinear differential equation model is analyzed. The analysis model was proposed by Al Ali *et al.* (2022). The mathematical model describes the glucose-insulin system dynamics with growth hormone added to this system in Diabetes mellitus. By applying nonlinear control theory, a positive invariant domain is established, using the localization of invariant compact sets method(LICS). The main contribution is the estimation of system parameters, which involves the use of state observers, specifically Thau observer is implemented, through the proposition of a localizing function a Bounded Positive Invariant Domain (BPID) is established for a control that allows the stabilization of the dynamics related to glucose; this could be used in modeling treatments for said pathology. Also, plots have been made using MATLAB to illustrate numerical simulations of the main results for this system. The study provides a robust mathematical tool for understanding and controlling glucose-insulin dynamics. Currently, this disease presents a great challenge to solve. The study and behavior of this disease through mathematical modeling analysis is very interesting and is growing, as well as the importance of the search for an optimal glucose control that allows finding a possible treatment.

394-IV-PP Determinación de plaguicidas organoclorados en gónadas de peces de diferentes niveles tróficos del golfo de california

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Marine ecosystems are threatened by persistent pollutants, including organochlorine (OC) pesticides, which have a harmful effect on the health of organisms because they biomagnify in the aquatic food web and promote endocrine disruption. The objective of this work is to evaluate the relationship between the concentration of OCs in fish gonads from different trophic levels in the Gulf of California. Two oceanographic campaigns (2023 and 2024) were carried out with the support of IMIPAS where fish gonads were sampled. Samples were processed following USEPA method 8081b. In 2023 samples were obtained from 13 species (Caranx caballus, Decapterus macrosoma, Etrumeus acuminatus, Fistularia corneta, Haemulidae sp., Microlepidotus inornatus, Oligoplites refulgens, Opisthonema sp., Peprilus medius, Peprilus snyderi, Psenes sio, Scomber japonicus and Trichiurus nitens) and in 2024 samples were obtained from 5 species (Auxis rochei, Lutjanus novemfasciatus, Lutjanus jordani, Micropogonias altipinnis and Trichiurus nitens). In 2023, the highest average concentration was recorded by αHCH, and the highest frequency (%F) was presented by DDD, Etrumeus acuminatus recorded the highest concentration of αHCH (3031.22 µg/g) and Caranx caballus, Microlepidotus inornatus, Peprilus medius, Psenes sio and Scomber japonicus recorded the highest %F of DDD (100 %F). In 2024, aldrín presented the highest average concentration and endrín the highest %F, Trichiurus nitens recorded the highest concentration of aldrín (20.92 µg/g) and the species Lutjanus jordani, Micropogonias altipinnis and Trichiurus nitens recorded the highest %F of endrín (100 %F). By trophic level, at level 2 the highest concentration was recorded by heptachlor epoxide (65.02 µg/g) in Decapterus macrosoma, at level 3 the highest concentration was recorded by αHCH (3031.22 µg/g) in Etrumeus acuminatus and at level 4 the highest concentration was recorded by dieldrín (77.69 µg/g) in Caranx caballus. The gonads are consumed by some cultures, generally from the Asian continent, so it is relevant to mention that the concentrations obtained exceed the maximum limits allowed by the codex alimentarius created by FAO and WHO.

397-IV-PP Evaluación de las propiedades sensoriales de masas panificadas fortificadas con concentrados proteicos de *Leucaena esculenta*

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Wheat flour-based bread doughs are ideal food matrices for incorporating animal or plant-based ingredients, with the aim of improving their viscoelastic, nutritional, and organoleptic properties (smell, taste, color), which are determining factors in the quality of the final product. This study evaluated the effect of adding a protein concentrate (CPL) obtained from Leucaena esculenta (guaje) seeds on the technological and sensory properties of white bread dough. The CPL was obtained following the methodology described by Ohara et al. (2020), with modifications, and was incorporated into wheat flour at concentrations of 0.1, 0.5, and 1% (w/w). Textural parameters (hardness, cohesiveness, chewiness, elasticity, masticability) and organoleptic attributes (crumb color) were determined, using bread made without CPL as a control.

The results indicated that additions ≥1% caused a significant increase in hardness and a reduction in elasticity, generating unfavorable effects on viscoelastic and sensory quality. In contrast, concentrations <1% preserved most of the textural and organoleptic properties, while increasing the protein content of the final product. These findings show that CPL has high potential as a functional ingredient in baking, provided that the addition is kept below 1%. This approach allows the nutritional profile of bread to be enriched without compromising its technological characteristics or sensory acceptability. In conclusion, the controlled incorporation of CPL represents a viable strategy for the development of more nutritious and functional baked goods, contributing to the diversification of innovative ingredients in the food industry.

403-IV-PO Diseño del Modelo de Sistema Viable de una Electrolinera en Ciudad de México

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The current trend and future programs regarding electric mobility in Mexico cities involve a motivation to encourage users, producers, investors, and entrepreneurs to adopt and manufacture electric vehicles, as well as to develop the technical infrastructure that supports their use and an efficient management system to carry out the design of charging stations for various types of electric traction vehicles. In this work, a model is designed to improve the management of energy resources in charging stations by studying real-world systems and conceptualizing the charging infrastructure system. The methodology for designing the model begins with the identification of the relevant issues in charging stations. Once the problem-context matrix is established, the attenuators and constraints to be implemented in the station's management system are defined, and the structure of the model is designed through the classification of six intervention channels to achieve the feasibility of the charging station design. These channels are as follows: Intervention and Regulation Channel, Resource Allocation Channel, Operational Interrelations Channel, Environmental Interrelations Channel, System 2 Coordination Channel, and Monitoring Channel.

405-IV-PP Traslocación y viabilidad de Bdellovibrio bacteriovorus en el floema de hojas de limón Persa

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Huanglongbing is the most devastating citrus disease worldwide, caused by Candidatus Liberibacter asiaticus (CLas). Currently, there is no effective treatment for its control. The use of microorganisms offers an alternative: Bdellovibrio bacteriovorus, a Gram-negative bacterium belonging to the class Oligoflexia, has the ability to prey on other bacteria. Unlike chemical compounds and antibiotics, it does not pollute the environment or induce resistance.The efficiency of these bacterial predators has been demonstrated in controlling phytopathogens such as Pseudomonas glycinea, Burkholderia glumae, and Proteobacterium carotovorum, which cause diseases in soybean, rice, and potato, respectively. Based on this background, the objective of this study was to evaluate whether Bdellovibrio bacteriovorus can translocate and remain viable within the phloem of Persian lime. Since it is not endophytic to this crop, its behavior under the internal conditions of the plant is unknown. Persian lime leaves were collected from a citrus orchard in Veracruz. The leaves were disinfected with 5% NaCl and placed in direct contact via their petioles with 500 µL of B. bacteriovorus suspension (OD_{600} = 0.086), and 500 µL of sterile water was used as a negative control. The samples were incubated for six days at room temperature. After this period, three cuts were made: (1) base of the leaf, (2) middle, and (3) apex. Circular samples from each cut were taken using a sterile punch and placed in co-cultures for ten days. Genomic DNA (gDNA) was extracted from the plant material, and PCR was performed using 16S rRNA gene-specific primers, identifying B. bacteriovorus by an approximately 800 bp fragment. The circular samples in the co-cultures induced visible formation of cellular debris, indicating predatory activity and, thus, viability. These findings represent the first evidence of the translocation and viability of Bdellovibrio bacteriovorus in plant phloem tissue, opening the possibility of its use as a biocontrol agent against bacterial pathogens in citrus crops such as CLas.

409-IV-PV Diseño conceptual de aula ergonómica para posgrado: “Impacto en el bienestar físico y el rendimiento académico de estudiantes

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This study addresses ergonomic deficiencies in graduate classrooms that affect posture, comfort, and academic performance. The research question is: *How can the design of a graduate classroom be optimized to improve physical well-being and academic performance?* The main contribution lies in integrating a participatory systemic approach with ergonomic regulatory criteria (ISO 9241-5, NOM-025-STPS-2008) to generate a conceptual model adapted to the Mexican context. The methodology followed the seven stages of SSM: diagnosis through observation, semi-structured interviews, and documentary analysis; construction of conceptual models considering anthropometric, lighting, acoustic, and accessibility variables; comparison between the proposed model and the current situation using regulatory criteria and user perceptions; and refinement of the design based on cultural and technical feasibility. Data included anthropometric measurements, illumination levels in lux, photographic records, and feedback from students and faculty. The result was a refined conceptual model with a “U”-shaped layout convertible into group stations, adjustable chairs and desks available in the national market, LED lighting providing 500 lux, acoustic panels, thermal control, and an active break area. The proposal increased ergonomic compliance from levels 1–2 (current classroom) to 4–5 (refined model) in all evaluated criteria. This work offers a replicable framework to optimize academic spaces by combining empirical evidence, standards, and user participation.

412-IV-PP Conducción segura basada en el Modelo Circumplejo de Russell: evaluación de emociones y estrés de automovilistas durante conducción en simulador

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In 2021, work-related stress affected 63% of the workforce in Mexico City. The COVID-19 pandemic intensified existing mental health challenges. Daily stressors, such as traffic congestion and public transportation conditions, negatively impact individuals' health and quality of life. These stressors influence driver behavior and emotions, leading to aggressive driving, which consequently affects other drivers, passengers, and pedestrians. This proposal outlines the design of a case study involving young adults, intended to induce five levels of stress, observe behavioral changes across different scenarios, and provide regulatory tools while recording their physiological signals. The methodology incorporates nine probabilistic event variables: three traffic control variables (traffic density, traffic behavior, and pedestrian density) and six emergency variables (dangerous lane changes, emergency braking, sudden vehicle pull-outs, unexpected pedestrian crossings, accidents, and traffic light failures). Four regulatory techniques will be evaluated: temperature increase, temperature decrease, breathing exercises, and biofeedback. The event variables are combined with the regulatory techniques in a Greco-Latin square design to form five experimental groups, ensuring coverage of all possible combinations between stressor levels and regulatory techniques. The experimental design requires a minimum of 25 participants (95% confidence level; margin of error E=0.20), calculated using the standard formula for proportions without a prior estimate. A total of 30 subjects will be recruited: one pilot test and five participants for each technique, including a control group without any technique. The experimental protocol was approved by the Research Ethics Committee of the Escuela Superior de Medicina (registration: ESM-CEI-01/06-09-24). This research aims to examine emotional changes in response to stressful situations to promote safer driving. "Safe driving" is defined according to the Driver Taxonomy, which is grounded in Russell's Circumplex Model, mapping emotions onto a two-dimensional plane of valence and arousal. These variables are estimated from the Electroencephalogram using an Artificial Neural Network (ANN). Preliminary results confirm the protocol's feasibility for estimating valence and arousal, and Electrodermal Activity data shows the expected increase in arousal levels in response to traffic stressors.

420-IV-PO Variación del contenido fenólico de semillas de especies silvestres de *Phaseolus* del Estado de Durango

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The objective of this study was to evaluate the phenolic composition of seeds from wild populations of *Phaseolus* from Durango, Mexico. Three wild species, *P. lunatus*, *P. acutifolius*, and *P. coccineus*, were studied, including two accessions for each species, but from different locations in the State of Durango. Seed extracts were prepared from one gram of ground samples (previously dried in a botanical dryer at 40°C for three days). The seed flour was macerated in 10 mL of 80% (v/v) methanol for 2 hours in the dark at room temperature in a sonicator. The total extract was formed, concentrated sequentially (by evaporation), and resuspended in 80% methanol. For HPLC-DAD analysis of leaf and seed samples, total extracts were concentrated sequentially (by evaporation) and dissolved in 3 mL of methanol. All extracts were brought to a concentration of 100 mg/mL for analysis. Analysis of variance was used to determine the ability of phenolic contents to discriminate between samples. Data were subjected to principal component analysis (PCA) and cluster analysis. The population with the highest content of total phenols was the wild species of *P. lunatus* for the two accessions *P. lunatus* K with 328.95 and *P. lunatus* 33 with 293.75 mg EAG/ g DB and the lowest concentration in the species of *P. acutifolius*, in the two accessions *P. acutifolius* 9 with 123.08 and *P. acutifolius* 22 with 164.72 mg EAG/ g DB, for flavonoids the highest concentrations were found in the species of *P. lunatus* k with 161.36 and *P. acutifolius* 9 with 94.85 mg EQ/ g DB, the lowest in the species of *P. coccineus*, in the two accessions *P. coccineus* 26 with 73.27 and *P. coccineus* 7 with 73.64 mg EQ/ g DB, for condensed tannins the highest concentration was found in the *P. lunatus* species in the two accessions *P. lunatus* k with 102.33 and *P. lunatus* 33 with 148.52 mg EEC/ g DB and the lowest concentration was found in *P. acutifolius* in the two accessions *P. acutifolius* 9 with 36.25 and *P. acutifolius* 22 with 32.48 mg EEC/ g DB, and in anthocyanins the highest concentration was found in *P. coccineus* 26 with 666.56 µg C3OG/ 100 g DB and *P. lunatus* 33 with 495.95 µg C3OG/ 100 g DB and the lowest in *P. acutifolius* 22 with 330.63 µg C3OG/ 100 g DS and *P. lunatus* k with 345.66 µg C3OG/100 g DB. A total of 10 phenolic compounds were identified in wild bean seeds using HPLC-DAD. Wild bean species are important for conservation and genetic improvement. Therefore, the information generated is relevant to understanding the characterization and diversity of secondary metabolites present in wild *Phaseolus* species.

433-IV-PP Evaluación del potencial antioxidante y contenido total de fenoles y flavonoides en Zornia venosa: enfoque científico sobre propiedades medicinales

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The objective of this study was to evaluate the antioxidant potential and total phenol and flavonoid content of the ethanolic extract of Zornia venosa, a member of the Fabaceae family, which is recognized for its use in traditional medicine in the Sierra Tarahumara. Chemical and biological analyses were performed, where the total phenol content was determined using the Folin-Ciocalteu method, total flavonoids using aluminum chloride, and to determine the antioxidant activity, assays were performed to measure the DPPH• radical neutralization capacity (EC50) and the ABTS•+ radical blocking capacity (EC50). The methodology employed was evaluated following a quantitative approach, using previously reported and optimized protocols. The results exhibited significant values in the determination of total phenols, while the values revealed in flavonoids showed a low content. Regarding the antioxidant capacity, moderate values were obtained for the neutralization of the DPPH• radical and highly significant values for the ABTS•+ assay. The plant species Zornia venosa exhibits promising antioxidant activity and a significant total phenol content, supporting its traditional use by the Rarámuri communities. These findings also reinforce the importance of continuing to research medicinal plants to exploit their potential therapeutic applications and support established traditional practices.

434-IV-PV Synthesis and characterization of clay/graphene composite for application in water treatment

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Growing global overpopulation, scarcity of water resources, diminishing aquifers, and increasing pollution of inland waters are leading to a decrease in the amount of potable water available for human consumption. This has led to a search for materials that can purify water, or that can be combined with other materials. Clay/graphene composite materials are attractive for water treatment due to their 2:1 structure, which consists of tetrahedral and octahedral layers. However, synthesizing a clay/graphene composite into a solid slab in a single step is complicated, so there have been no previous attempts at generating it due to the complexity of optimizing the weight ratio of clay to carbon precursor, as well as understanding how to obtain graphene materials in situ.

In the following work, a clay/graphene composite was obtained in a sustainable manner from a carbonaceous precursor (sucrose) and clay, in which, by directly mixing both and calcining, graphene material was developed "in situ" in a 2:1 clay matrix, within the interlaminar zone of the same as a means to purify polluting agents in water. This process began with clay mixed with sucrose in different proportions (100:0, 75:25, 70:30, 65:35, 60:40, 65:45, and 50:50) of weight Table 1. To convert it into a (solid) plate with the direct mixture of both water in an adequate measure.

It was observed by subsequent Raman spectroscopy analysis that the most suitable combinations of the optimized composite generated from the graphene clay plate "in situ" are WP1-T2 (75:25:850°C) and WP2-T2 (70:30:850°C) since they obtained the lowest number in the ID/IG ratio which were 0.49 and 0.44 respectively and2ID/IG of 0.14 and 0.13 respectively, so these are the 2 combinations that will be used in later characterizations. Various characterization techniques were used, including XRF (X-ray Fluorescence), Raman Spectroscopy, XRD (X-ray diffraction), FTIR (Fourier Transform Infrared Spectroscopy), and UV-Vis Spectroscopy to evaluate the effectiveness of the composite generated. Initially, a quantitative chemical analysis method of elements by XRF was chosen, since when working with a natural clay it is necessary to determine its chemical composition and whether it does not contain elements harmful to human health, since this composite is intended to be used to purify water for human consumption. Subsequently, we carried out an “in vitro” test in a static manner in a beaker, where we placed 20 mL of a prepared solution of methylene blue Cas 61-73-4 in deionized water at 20 ppm concentration respectively, a plate of the WP1-T2 composite with a weight of 2586 mg +- 5 was placed and a period of 24 and 48 hours was allowed to pass in a controlled environment free from light and foreign. This project is still in the analysis phase, but it has been observed that it has the capacity to separate cationic inks such as methylene blue. It will subsequently be analyzed in a dynamic phase and a test phase with contaminated water, and the optimal amount of the composite to be used will be established. It will also be analyzed with various contaminants such as solutions with heavy metals and its antimicrobial capacity will be determined.

435-IV-PO Perfiles químicos de tres variedades de jitomate rojo mexicano determinados por RMN ^{1}H

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Although research on tomatoes (*Solanum lycopersicum L.*) has focused on improving physical characteristics such as size, color, and texture, consumers prioritize flavor, aroma, and nutraceutical properties. The flavor of tomatoes is attributed to the interaction between sugars, organic acids, and other low-molecular-weight metabolites. NMR is an effective analytical tool for determining metabolomic profiles in biological samples, making it useful for quality control and authentication protocols, key aspects of food globalization. This study developed an ^{1}H NMR-based methodology to determine the chemical profiles of three tomato varieties (Saladet, Cherry, and Bola), which were grown in Sinaloa and purchased at a commercial market in Mexico City. The mesocarp and locule juices of each variety were isolated and diluted at a ratio of 90:10 (juice:D_2O) with a D_2O solution containing TSP (0.7 mM), sodium azide (1%), EDTA (1 mM) and phosphate salts. The pH was then adjusted to 5. From the resulting mixture, 600 ml was taken and placed in an NMR tube, and ^{1}H NMR spectra were obtained. Analysis of these spectra using Chenomx®, a specialized database, and 2D NMR experiments allowed the identification of 46 metabolites.

The most abundant compounds were fructose, glucose and citric acid, followed by ascorbic acid and malonic acid. The least abundant compounds were fumaric, malic and lactic acids, which were mainly present in the locule juice. The most abundant amino acids were glutamine, glutamic acid, aspartic acid and asparagine. The variety with the highest metabolite concentration was 'Saladet', and the variety with the lowest concentration was 'Cherry'. Obtaining the chemical profiles of the juices analyzed will allow for the establishment of criteria for quality control, authenticity, designation of origin, and nutritional value of Mexican tomatoes.

439-IV-PP Evaluación de la calidad del aire en un aula de cómputo

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Indoor air quality (IAQ) in educational spaces is an essential component to guarantee the health and performance of students and teachers. In the present work, IAQ is analyzed in classroom OA-10 of the Universidad Tecnológica de Tecámac, characterized by high occupancy density and intensive use of electronic equipment with limited natural ventilation, considering 2 occupancy schedules during the day, 3 response variables were evaluated: temperature, carbon dioxide concentration (CO_2) and relative humidity. Measurements were performed during four consecutive days in the morning (07:00-09:00 h) and afternoon (14:00-16:00 h) shifts. Multiparameter sensors were used to record data every 30 minutes, under real conditions of occupancy and operation of electronic equipment. The evening shift recorded average temperatures of 29 °C and CO_2 concentrations that reached up to 1,150 ppm, exceeding the values recommended by the ASHRAE 62.1-2019 standard, while the relative humidity presented less variation between both shifts, with a range of 40-55%. These results provide relevant information for the design of healthy and sustainable educational environments, highlighting the need to implement more effective ventilation strategies, since intensive use and high occupancy density are conducive to the accumulation of heat and CO_2, compromising thermal comfort and perceived air quality.

444-IV-PP Evaluación de biocompuesto a base del amidón de maíz modificado por ultrasonido y reforzado con mucílago de nopal

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The increasing use of synthetic polymers in single-use plastics has generated a significant environmental impact due to their polluting origin and poor biodegradability. This has driven interest in developing natural polymer-based materials, with starch being one of the most promising due to its availability and easy biodegradation. In turn, the use of young cactus mucilage as reinforcement has been shown to produce stable polymer networks, improving the mechanical properties of biocomposites. In this regard, the objective was to evaluate the effect of ultrasound on the modification of corn starch for use in biocomposites at different concentrations of young cactus mucilage (0.5, 0.7, and 1 g) as reinforcement, as well as glycerin and water as plasticizers, using the plate-casting method. For this, the thermal and morphological properties of native and modified starch were evaluated by differential scanning calorimetry and X-ray diffraction, where an increase in crystallinity was obtained, attributed to a rearrangement in the starch chains. In turn, mechanical, solubility and permeability tests were carried out on the biocomposites, where lower amounts of mucilage and when applying the modified starch decreased their permeability and tensile strength, while solubility increased by about 50% by increasing the amount of mucilage and adding modified starch. Finally, biodegradation tests in compost were carried out, where there was a 14% increase in biodegradation in the modified starch biocomposites with a lower concentration of mucilage, thus giving a maximum biodegradation of 77% at 45 days. Therefore, there was an improvement in the properties of the starch when modified by ultrasound and it presented a favorable interaction with the mucilage.

446-IV-PO Viabilidad organizativa para la gestión del agua y el turismo en la Magdalena Atlitic

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In a world increasingly affected by human activity, it has become essential to readapt processes, indicators and practices that foster the co-creation of regenerative and sustainable environments. In this context, in 2021, UN Tourism proposed a shift away from traditional tourism towards a regenerative approach one that promotes ecosystem restoration, community inclusion, and resilience in the face of climate change. Rural communities in tourism-related environments play a crucial role in achieving this regenerative vision. La Magdalena Atlitic, a rural community located within Los Dinamos National Park in Mexico City, is currently facing multiple challenges due to the expansion of the urban footprint and the persistence of traditional tourism models. These pressures directly affect both the residents' way of life and the region's ecosystems, including the Magdalena River known as the last living river in the city. This research develops a diagnosis based on a systemic approach, applying the Viable System Model (VSM) methodology to assess the organisational viability of the community's social tourism enterprises and their connection to water management. Through fieldwork and the application of interviews, the actors involved in the current problem were identified across three system levels: 1. System-in-focus (community and social enterprises), 2. Microenvironment (local actors such as service providers, community committees, and tourists), and 3. Macroenvironment (government institutions, environmental authorities, and public policy). In addition, the tourism products and services offered by the enterprises were mapped, along with the main environmental conservation practices currently undertaken in the community. The findings reveal weak feedback between key system functions operation, regulation, and control and a lack of a shared vision around regenerative tourism and water stewardship among macro-level actors. The application of the VSM allowed for a graphical representation of the system's tensions and opportunities, which served as the basis for proposing a desired future state. This structure integrates the five subsystems of the model, with the aim of advancing towards a more just and sustainable form of management.

447-IV-PP Serological determination of Trypanosoma cruzi in northern region of the State of Mexico

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Chagas disease, caused by Trypanosoma cruzi, remains a significant public health problem in Mexico, particularly challenging to diagnose during its chronic phase, due to low parasitemia and the complex immune response. According to the Pan American Health Organization, no single test is sufficiently sensitive or specific to reliably detect chronic Chagas disease, requiring the use of multiple serological methods when results are inconclusive. This study aimed to assess the seroprevalence of Chagas disease in the largely uncharted municipalities of the North of State of Mexico. A total of 250 serum samples from 17 municipalities were analyzed using a comprehensive approach involving three serological tests: the BIO-CHAGAS commercial kit (MEXLAB®), an ELISA test with antigens derived from an endemic strain, and a confirmatory Western blot analysis. The results revealed that 240 samples were negative, 3 were inconclusive, and 7 were positive, yielding a seroprevalence rate of 2.8% (7/250). The endemicity demonstrated in the municipalities of Hueypoxtla and Tequixquiac, combined with the documented presence of the vector Triatoma barberi in these areas, suggests an ongoing risk of T. cruzi transmission. These findings underscore the urgent need for targeted public health interventions, including increased surveillance, community awareness, vector control programs, screening tests to identify cases, and prompt treatment, to curb the spread of Chagas disease in this region.

451-IV-PO Promoting responsible consumption and healthy habits among mothers and adolescents in Oaxaca through sustainable technologies

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Irresponsible food consumption has multiple effects, including chronic degenerative diseases, food waste, overexploitation of natural resources, and pollution. The irresponsible food consumption exacerbates climate change. The solution requires ongoing education, integrated policies, and meaningful community participation at all levels and with all age groups. The objective was to help reduce irresponsible food consumption and poor health habits in a group of mothers and their children from a secondary school in Oaxaca, Mexico, through nutritional education, participatory techniques, and the use of low-cost sustainable technologies such as a solar dehydrator, a family garden, and a worm composting bin. Methodology: A multidisciplinary intervention was carried out using Participatory Action Research, which included awareness-raising about the problem, co-design of activities from planning and execution to generate proposals that support sustainable food consumption, and evaluation of the actions. A pre/post-intervention questionnaire was administered with the following topics: a) sociodemographic characteristics, b) eating habits and physical activity, c) knowledge about food, pollution, and health, d) affective aspects of food consumption, and e) food consumption and purchasing behavior. The analysis was evaluated using SPSS v.26. The Responsible Food Consumption Index (RFCI) was created and used as an indicator. The RFCI was calculated on a Likert scale based on questionnaires applied to the study population. The sections about the RFCI assessed knowledge concerning nutrition, health, environmental, emotional, and practical responses. Another variable was the response to the purchase of local or supermarket vegetables or fruits. Results: Twelve sustainable and nutritional education activities were carried out. At the end of the intervention, the RFCI increased in the three thematic axes: knowledge, attitudes, and affective issues, as well as the total RFCI, which rose from 84 points (73.3%) to 90.25 points (79.8%). Additionally, healthy eating habits have improved. It is concluded that the intervention contributed to a decrease in irresponsible food consumption and poor health habits through participatory activities.

456-IV-PP Sinergismo de dos Fármacos como tratamiento en un modelo de obesidad en Rata Wistar

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Obesity is a chronic, multifactorial disease affecting approximately one-third of the adult population in Mexico. Its most severe complications are associated comorbidities such as cardiovascular diseases (CVD), type 2 diabetes, and metabolic dysfunctions. CVD is the primary health concern among obese individuals. Leptin, an adipocyte-derived hormone, regulates energy homeostasis, metabolism, and immune responses. In obesity, leptin resistance and hyperleptinemia are commonly observed and have been implicated in promoting cardiovascular dysfunction. Leptin's appetite-suppressing effect depends on the expression of its receptor, which requires activation of peroxisome proliferator-activated receptor gamma (PPARγ) pathways. Adipocyte hypertrophy in obesity can impair PPARγ signaling and receptor expression, resulting in increased appetite—an important target in anti-obesity therapy. This study aimed to evaluate the impact of simvastatin and fenofibrate, individually and in combination, on food intake and metabolic markers in a diet-induced obesity model. Forty male Wistar rats were assigned into five groups (n=8 each): Control (CN), Obese untreated (OB), Simvastatin (SVT), Fenofibrate (FNF), and Simvastatin/Fenofibrate (SVT/FNF). Obesity was induced through a hypercaloric diet over 8 weeks, followed by a 4-week treatment phase. Parameters assessed included body weight, abdominal circumference (AC), daily caloric intake, total cholesterol (TC), and triglycerides (TG). The SVT/FNF group showed a marked reduction in daily caloric intake (32.3 ± 5 g/day), compared to SVT (48 ± 4 g/day) and FNF (47 ± 5 g/day). AC also decreased significantly in the SVT/FNF group (20.5 ± 0.5 cm). TC levels were 82 ± 7 mg/dL in SVT/FNF, 80 ± 5 mg/dL in SVT, and 95 ± 7 mg/dL in FNF. TG levels were 110 ± 9 mg/dL (SVT/FNF), 120 ± 11 mg/dL (SVT), and 87 ± 6 mg/dL (FNF). In conclusion, combined simvastatin and fenofibrate therapy effectively reduced caloric intake and abdominal circumference without major adverse effects on lipid profiles, supporting its potential as a therapeutic strategy for appetite modulation and obesity management.

459-IV-PP Effect of the sequential application of photocatalysis and a ligninolytic fungi on sulfamethoxazole removal from wáter

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Emerging pollutants have garnered significant attention in recent years due to their chemical persistence, which limits their removal through conventional wastewater treatment processes. Among these contaminants, antibiotics are of particular concern, as their incomplete elimination facilitates the development of antibiotic resistance in pathogenic microorganisms. Sulfamethoxazole (SMX), a sulphonamide antibiotic commonly prescribed in both human and veterinary medicine, is frequently detected in wastewater effluents owing to its partial metabolic transformation in organisms. Advanced oxidation processes, such as photocatalysis, are often required to achieve effective degradation of SMX. In this study, photocatalytic treatment employing graphitic carbon nitride (g-C3N4) achieved approximately 50% removal of SMX at an initial concentration of 20 mg/L in aqueous solution after 180 minutes of irradiation. However, a known limitation of photocatalytic degradation is the generation of persistent intermediate compounds, such as low-molecular-weight organic acids, which can inhibit complete mineralization. To address this limitation, the integration of photocatalysis with biological treatments has been proposed as a synergistic strategy. Ligninolytic fungi, such as Phanerochaete chrysosporium, produce non-specific extracellular oxidative enzymes capable of generating reactive radicals that can cleave aromatic structures. In this context, the sequence in which the photocatalytic and fungal treatments are applied plays a critical role in the overall removal efficiency of SMX.

461-IV-PP Comportamiento de la actividad enzimática durante la fermentación tradicional de nuevos clones y nativos de cacao (*Theobroma cacao*)

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Cocoa fermentation is a complex process that involves a variety of enzymes of fruit that transform the pulp and bean, with the release of carbon dioxide, ethanol, lactic acid and acetic acid mainly. These enzymes act on proteins, starches and fats, resulting in a seed with the flavor, aroma and color required by the chocolate industry. In this work, the objective was to see how the enzyme profile changes during fermentation. Using specific synthetic substrates for different activities, α-amylase, α-galactosidase, α-glucosidase, β-glucosidase, esterase, aminopeptidase and carboxypeptidase-B were evaluated at the beginning and end of a fermentation process in boxes using four new clones developed by INIFAP Campo Experimental Huimanguillo, Tabasco and two native varieties. Micro-fermentation by batch insertion was used in the study. It was observed that the maximum activity of almost all activities except aminopeptidase was maintained, and carboxypeptidases-B increased its activity at the end of fermentation. The reduction in activity was most significant in the carbohydrolases α-galactosidase, α-amylase, a-glucosidase and b-glucosidase as well as mat activity. This is perhaps due to the increase in temperature and acidity, reduction in humidity, the production of alcohol and polyphenols generated in the fermentation of the grains, this according to some authors, this may not be the only thing that affects the presence of enzymes. In addition, lipids and soluble protein decreased in concentration at the end of fermentation, this is due to proteolytic activity, as proteins are also susceptible to being hydrolyzed. Aminopeptidase activity remained almost unchanged, while carboxypeptidase-B was the only enzyme that after fermentation increased its activity at the end of fermentation in all types of cocoa beans used.

462-IV-PO Análisis de variantes genéticas de la vía de las Semaforinas en pacientes pediátricos con transposición de grandes arterias

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SUMMARY Introduction: Transposition of the great arteries (TGA) is a congenital defect characterized by the discordant ventriculo-arterial connection that represents 5 to 7 % of congenital heart diseases. The etiology of TGA is currently considered multifactorial, but information on the underlying genetic causes is lacking. It has been reported gene variants of the semaphorin signaling pathway that are present when cardiac truncal-cone malformations in animal models; and unfortunately, there are no reports in the human-related literature on its association with TGA. Objective: Analyze the presence of gene variants of the semaphorin pathway that are possibly associated with the etiology of TGA. Material and Methods: Variants were identified by whole exome sequencing. To determine the pathogenicity of the variants, bioinformatics analysis was used using Polyphen2 and Mutation Assesor. The allele frequency in Latinos was determined by a prediction effects program, ExacBrowser, and the probability of appearance was performed by binomial distribution. In 20 patients, endpoint PCR and sequencing of the candidate genes were performed using a genetic trio approach, made up of a patient with TGA and her parents in a period of 2019-2021. Results: The SEMA3C p.(Val337Met) variants were found. SEMA6A p.(D567E), PLXNA2E p.(S122Y), PLXNA2E25 p.(V1536M), NRP1p.(S524L), HSPG2p.(G16345S) and GATA6 p.(G15R). The SEMA3C p.(Val337Met) variant was significantly represented in TGA patients (60%). In binomial analysis, it indicated that the probability of appearance was 9x10 -5, so the variant is considered to be of germline origin. Conclusions: The aggregation of deleterious variants of germline origin was observed in the genes of the Semaphorin pathway that could be associated with the pathogenesis of TGA. Keywords: variants, congenital heart disease, transposition of the great arteries, semaphorin 3c

463-IV-PP Petroquímica sustentable: uso de residuos agroindustriales en la síntesis de 1, 3-Butadieno

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The compound 1,3-butadiene (BD) plays a key role in the petrochemical industry, as it is a strategic input mainly used in the production of tires, insulators, shoe soles, and various types of elastomers. Currently, more than 98% of global BD production comes from naphtha cracking to obtain ethylene, making it a byproduct whose availability and price are closely linked to ethylene demand. In Mexico, although Petróleos Mexicanos (Pemex) is the only producer of ethylene through naphtha cracking, its technological and operational limitations prevent it from meeting the growing domestic demand. As a result, the country relies on BD imports. According to the Integral Foreign Trade System (SIICEX), in 2023, 13,500 tons of BD were imported, mainly from the United States, Saudi Arabia, South Korea, Japan, and Belgium. In this context, this study explores the use of agro-industrial residues (AR) or lignocellulosic biomass as a sustainable alternative with high potential for producing biofuels and bioalcohols. These intermediates can be converted into BD through alcohol dehydration reactions, followed by dimerization of the resulting alkene. AR have been used in various industries: in the manufacture of construction materials, paper, and cardboard; in agricultural applications such as fertilizers; and in the food industry to enrich products with fiber and nutrients—both for animal feed and for functional foods such as bread and cookies—due to their high cellulose and hemicellulose content. Methodologically, the study adopts a general approach based on converting bioalcohols derived from the fermentation of AR, using a catalytic dehydration reaction to obtain ethylene, followed by its dimerization to form 1,3-butadiene. The selection of catalysts and operating conditions will aim to assess their influence on process yield and selectivity. This review focuses on the sustainable use of AR with the objective of reducing the environmental impact caused by waste generation and minimizing costs associated with hydrocarbon extraction. The study aims to determine whether the process tends to produce a mixture of products or if it is possible to favor yield and conversion toward 1,3-butadiene, promoting industrial processes with lower carbon and greenhouse gas emissions. Ultimately, it seeks to encourage more efficient resource use, reduce dependence on fossil fuels, and support the development of a circular economy that strengthens a more resilient supply chain, less exposed to fluctuations in the oil market.

466-IV-PO Detección Automática de Anomalías de Rodilla Durante el Gesto Sit-to-Stand

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This project presents the design, development, and evaluation of an automatic classification system for knee abnormalities caused by genu varum, genu valgum, gonarthrosis, and patellar instability and deviation. The data used in this study were obtained from 30 patients at the CRI Apizaco, 10 of whom had no detectable issues, while the remaining participants had diagnosed pathologies. For data acquisition, IMU MPU6050 inertial sensors were strategically placed on the lower limbs to capture parameters during two Sit-to-Stand (STS) biomechanical gesture repetitions per patient. Data preprocessing involved noise reduction through filtering and segmentation. Features extracted from these events were categorized into four domains: temporal, spatial, frequency, and statistical. These features were used to train classification models, including Logistic Regression, Support Vector Machine (SVM), and Random Forest. Finally, the models' performance was evaluated using metrics such as precision, accuracy, F1-score, confusion matrix, and cross-validation. Results indicate that temporal features combined with the Random Forest algorithm yielded the highest performance in detecting knee pathologies. This demonstrates that monitoring the STS event with IMU sensors is effective for biomechanical knee assessment, offering a promising tool for preventive diagnosis, treatment monitoring, and assisted rehabilitation.

472-IV-PO Determinación de las propiedades inhibidoras de la cactácea *acanthocereus tetragonus* sobre acero AISI 4140 en un medio neutro (NaCl) mediante técnicas electroquímicas

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Corrosion is a highly relevant problem internationally. In 2013, each country allocated an average of 3.4% of its GDP to counteract the problems caused by this phenomenon. The most affected industries were the petrochemical and food industries In parallel, current environmental issues have sparked significant interest in the study of new organic compounds that may represent an ecological and biodegradable alternative as corrosion inhibitors. Therefore, this work proposes the use of the cactus Acanthocereus tetragonus as a corrosion inhibitor for AISI 4140 steel in the presence of a NaCl electrolyte. Static tests were carried out under continuous immersion, using concentrations of 50, 100, 300, and 500 ppm of the cactus extract. The electrolyte used was 3% NaCl by weight. The electrochemical characterization was carried out using conventional techniques such as: open circuit Potential (OCP), linear polarization resistance (LPR), electrochemical impedance spectroscopy (EIS), and Tafel extrapolation (ET), as well as chemical characterization using Fourier Transform Infrared Spectroscopy (FTIR). The preliminary results showed that the extract of the cactus Acanthocereus tetragonus promotes the protection of AISI 4140 carbon steel in the presence of a neutral electrolyte (NaCl), at a concentration of 300 ppm, with an inhibition efficiency of 80% under static conditions.

477-IV-PP Characterization of the structure of genetic variation in the components of microRNA biosynthesis

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MicroRNAs (miRNAs) are small non-coding RNAs that act as regulators of gene expression and are involved in physiological processes such as cell proliferation, differentiation, and apoptosis. Alterations in miRNA expression levels have been associated with various human diseases; these alterations may be due to the presence of single nucleotide variants (SNVs) in genes involved in miRNAs biogenesis. The aim of this work was to characterize the structure of genetic variation in the components of miRNA biogenesis in the Mexican population. This study included a total of 3,869 Mexican individuals—1,737 Amerindians and 2,211 mestizos—belonging to the MCDS, DMS, and MAIS cohorts. These individuals were previously genotyped, using the OMNI 2.5 microarray and whole-exome sequencing. Unphased genotypes were submitted to the TOPMed server for whole-genome imputation. Subsequently, all SNVs present in 14 miRNA biosynthesis genes were extracted using PLINK 1.9. Linkage disequilibrium maps were created using the R software package pheatmap.. The bioinformatics tools SIFT, PolyPhen, 3Dmissense, and microSNiper were used for functional prediction. In Amerindians a total of 7,348 SNVs were observed, of which 89% were rare variants (MAF< 0.01), 7% were common (MAF > 0.05), and 4% were low frequency (0.01 < MAF < 0.05). In mestizos a total of 9,747 SNVs were observed, of which 90% were rare variants, 7% were common and 3% were low frequency. GEMIN4 showed the highest number of SNVs in the exons; in contrast, RANBP1 showed the lowest. AGO1, AGO2, AGO3, AGO4, and GEMIN4 showed the same patterns of haplotypes in mestizos and Amerindians individuals. On the other hand, DICER1, XPO5, DDX20, RANBP1, and DGCR8 showed different types of haplotypes. According to, in silico prediction analyses SNVs rs72661618 and rs200451864 in AGO1 and AGO4, respectively were found to be damaging according to SIFT and PolyPhen, while SNVs rs764482617 and rs75667149 in AGO3 were found to be damaging by SIFT and structurally damaging by 3Dmissense. Some haplotypes identified differ in frequency and structure between mestizos and Amerindians, reflecting a genetic diversity that may influence microRNA biogenesis through different SNVs, which could be associated with various diseases.

479-IV-PO Educación sexual informada en adolescentes: resultados de una estrategia psicoeducativa en México

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According to recent statistical data, in the State of Mexico, one in five adolescents initiates sexual activity without using any contraceptive method despite receiving information on the topic within educational settings. This behavior contributes to a notable incidence of sexually transmitted infections (STIs) and early pregnancies. The present study aimed to enhance adolescents' knowledge regarding contraceptive methods through an evidence-based psychoeducational intervention. The sample comprised 133 adolescents aged 16 to 19 years (M = 16.47; SD = .598), enrolled in an Official High School located in the municipality of Chimalhuacán, State of Mexico. The evaluation tool applied was the Contraceptive Knowledge Test, which includes 31 items across three domains: (1) characteristics, (2) usage, and (3) efficacy, advantages, and disadvantages. Responses were multiple-choice, and the instrument demonstrated adequate reliability (KR = .739). Higher scores reflected greater knowledge levels. Following a request from school authorities and as part of the Health Education curriculum, a two-hour psychoeducational workshop was conducted on March 28 of the current year. The workshop was led by a certified Health Educator and a Psychologist, and focused on accurate, practical information about contraceptive methods. Data analysis was performed using JASP version 0.19.1. Participants obtained an average of 23 correct responses (SD = 4.69), indicating a positive impact of the workshop on participants' knowledge retention. In conclusion, strengthening adolescent sexual health education is imperative. Effective educational initiatives including campaigns, workshops, and intervention programs should integrate accurate and novel content, addressing gaps in adolescents' existing knowledge to facilitate meaningful and lasting learning experiences.

484-IV-PP Inhibición in vitro de Botrytis cinerea a partir de extractos de orujo de uva

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Gray rot caused by Botrytis cinerea is one of the most significant diseases in fruit and vegetable crops, affecting crop quality, shelf life, and yield. Currently, conventional control of this phytopathogen is carried out with synthetic fungicides, which has generated environmental, health, and fungal resistance concerns. In this context, extracts obtained from plants or plant residues contain a wide variety of bioactive compounds that can have antioxidant, antimicrobial, antifungal, and herbicidal properties, among others. Therefore, they represent a sustainable and environmentally friendly alternative. The aim of this project was to evaluate the antifungal activity against B. cinerea of extracts obtained from grape pomace, an abundant agro-industrial byproduct in the viticulture industry, taking advantage of the presence of bioactive compounds. A total of 16 extracts were prepared by maceration, where the influence of solvent variables, solvent concentration (% v/v in aqueous base), temperature, and extraction time on the biological activity of grape pomace extracts was studied. In vitro inhibition assays of Botrytis cinerea mycelial growth were performed at different concentrations of the dry extract base (1-5 mg/ml). The results showed dose-dependent inhibition, with a partial inhibitory effect observed at low concentrations and complete inhibition of fungal growth starting at 4 mg/ml. This concentration was identified as the Minimum Inhibitory Dose (MID) of the extract. The results of the study suggest that grape pomace extracts can be used as effective biofungicides against Botrytis cinerea. In addition to offering an environmentally friendly alternative free of toxic residues, this approach allows for the valorization of agro-industrial byproducts, aligning with circular economy strategies and benefiting grape producers.

486-IV-PO Modelado de susceptibilidad de inestabilidad de laderas basado en regresión logística binaria para el municipio de Jilotzingo, Estado de México, México

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On September 12, 2024, the municipality of Jilotzingo, located in the State of Mexico, experienced slope instability processes triggered by extraordinary rainfall generated by the interaction of hydrometeorological phenomena in the Pacific Ocean and the Gulf of Mexico. A series of flows, landslides and falls of geological materials caused a sudden disaster for the authorities and the population. The event resulted in human losses, infrastructure damage, disruption of daily life, loss of vegetation cover, soil alteration and changes in ecosystem services. Considering the above context and the objective of understanding how slope instability risk is constructed, it becomes necessary to identify the areas with the greatest susceptibility to these phenomena, considering the non-linear nature of slope instability, in which the properties of geological materials are involved in response to environmental changes. The methodological development consisted of predictive modeling of slope instability susceptibility through the analysis of the non-linear relationship between environmental factors and the set of observations of the phenomenon, which express its spatial distribution, using the binary logistic regression algorithm, applying a supervised learning technique within the field of machine learning. Regarding the results of the slope instability susceptibility modeling based on binary logistic regression, 36.89% of the municipal territory shows high and very high susceptibility to debris flows, 37.51% to soil landslides and 36.30% to falls. The performance of the models obtained, measured through accuracy, was 94.01%, 90.45% and 93.33% for flows, landslides and falls, respectively. The values of the area under the curve (AUC) from the ROC analysis were 0.940, 0.904 and 0.933 for flows, landslides and falls, respectively. By identifying the areas most predisposed to the phenomenon, the local government can design and implement public policies that define actions before, during and after the manifestation of the phenomenon, promoting community protection and effective comprehensive disaster risk management.

488-IV-PP Síntesis por Sputtering de películas de óxido de zinc dopado con europio (ZnO:Eu), caracterización por UV-Vis y fotoluminiscencia

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Due to the need for new lighting sources that are efficient, of better quality, low energy consumption and have a lower environmental impact, a wide variety of materials with luminescent properties have been investigated, including ZnO doped with rare earths such as Eu.
Zinc oxide films doped with europium at 3% atomic were obtained by sputtering, the deposition was carried out on glass and silicon substrates. Three samples with different parameters were obtained, the first sample was deposited on glass and silicon substrates with a power of 100W for 60 minutes (ZnO:Eu M1), the second sample was deposited on glass substrates with a power of 100W for 30 minutes and finally, the third sample was deposited on glass substrates with a power of 50W for 30 minutes (ZnO:Eu M3). Characterization was carried out by UV-Vis spectroscopy, which allowed obtaining the absorbance spectrum of the films and determining the different band gaps by the Tauc method. Likewise, photoluminescence tests were performed to know their optical properties, as well as their light intensity spectrum. The UV-Vis spectra showed an absorbance around 300 nm, and it was also noted that the ZnO:Eu M1 film has a higher absorbance. On the other hand, the band gap obtained is 3.27, 3.21, 3.17 eV for ZnO:Eu M1, ZnO:Eu M2 and ZnO:Eu M3 respectively. Likewise, the photoluminescence spectroscopy gave as a result that the films deposited on glass show an intense signal at 415 nm, while the silicon sample has a signal at 585 nm. The photoluminescence response of ZnO:Eu films indicates to us that they have potential for use in light emitting diodes.

495-IV-PP Propuesta de un sistema de monitoreo de activación muscular en rehabilitación de prótesis de rodilla

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This paper proposes an integrated muscle activation monitoring system for patients recovering from knee replacement surgery using surface electromyography (EMG) and computational processing. The system seeks to quantify activation patterns in the lower limbs during specific tasks such as walking and climbing and descending stairs in controlled environments, establishing comparisons with data from healthy patients to assess progress and detect abnormalities. The EMG sensors used will be surface-based and have a minimum frequency of 1000 Hz, in order to record the largest amount of data per event. The sensory system will consist of six sensors placed on the vastus medialis, vastus lateralis, biceps femoris, medial gastrocnemius, and tibialis anterior. Data preprocessing will include filtering, rectification, and normalization steps. There will be a segmentation step per sampling area for individual analysis. The characteristics to be worked on will be associated with common domains of statistical, temporal, and frequency analysis. These will serve as a basis for comparison between healthy patients and patients in different stages of rehabilitation. They will feed machine learning algorithms to measure recovery and identify future abnormalities in muscle activation. In the final stage of the project, a visual interface will be created to view details in comparative curves and automatically generate clinical records for personalized treatment monitoring.

517-IV-PP Una revisión de la alimentación tradicional y su valor en el desarrollo humano

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The transformation and evolution of dietary patterns has led to serious problems, such as an increase in chronic non-communicable diseases, the loss of food heritage, the disappearance of native species, and a growing dependence on food, with the replacement of natural and local foods with highly processed foods. The objective of this study was to analyze the role of traditional food from a multidisciplinary perspective through a bibliographic review to recognize its importance in human development. A search was conducted in various indexed reference databases, such as Scopus, Web of Science, Elsevier, PubMed, Scielo, Dialnet, and Redalyc, using traditional food as the keyword. A bibliographic analysis matrix was developed with the following sections: reference, objectives, methodology, results, and publication date. The analysis included 60 articles, websites of international organizations (UN, WHO, and FAO), and academic platforms. It is concluded that traditional food represents a viable alternative for improving people's health, strengthening their identity, promoting the use of local ingredients, reducing dependence on ultra-processed foods, and fostering local economic growth.

524-IV-PP Efecto anti hipertensivo de los estrógenos en la descendencia femenina de ratas con preeclampsia

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Preeclampsia is a risk factor for developing cardiovascular diseases in offspring, such as systemic arterial hypertension. Female offspring from pregnancy with preeclampsia are protected by estrogen against elevation of systemic blood pressure during reproductive age. The mechanism by which estrogens lower blood pressure is unknown. OBJECTIVE: To demonstrate the antihypertensive effect of estrogens in female offspring of a complicated pregnancy with preeclampsia in a murine model. METHODOLOGY: Ovariectomy was underwent on the seventh weeks of age of the Wistar rats. The groups CRÍAS S OVX control, CRÍAS OVX + Estradiol 40 µg/kg subcutaneous, CRÍAS S OVX without oestradiol y CRÍAS TMX 5mg/kg/day orally; and the groups CRÍAS P control, CRÍAS P OVX+Estradiol 40 µg/kg subcutaneous, CRÍAS P OVX without oestradiol y CRÍAS P TMX 5mg/kg/day orally; corroborating the estrogenic depletion with vaginal citology, weight evaluation; and evaluation of BP. RESULTS: the vaginal citology showed the OVX groups in estrus phase after the ovariectomy and proestrus phase was identificated after the hormonal treatmeant.BP was measured after estrogen depletion in the CRÍAS P OVX group (systolic 154.9 mmHg; diastolic 112.9 mmHg) and the CRÍAS S OVX group (systolic 157.3 mmHg; diastolic 118 mmHg). However, after treatment the groups CRIAS P OVX+E (systolic 145.2mmHg; diastolic 110.9mmHg) and CRIAS S OVX+E (systolic 143.4 mmHg; diastolic 104.8mmHg) decreased their blood pressure, while the CRÍAS P OVXE- and CRÍAS S OVXE- groups that did not receive treatment with estradiol, increased their BP. CONCLUSION: Treatment with estrogens reversed the increase in blood pressure after estrogen depletion, thus demonstrating the antihypertensive effect of estrogen.

528-IV PP Actividad eléctrica del globo pálido externo durante las crisis epilépticas tónico-clónica generalizada

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Generalized tonic-clonic seizures (GTCS) are associated with a lower quality of life, a higher likelihood of sudden death, and poor treatment outcomes. Understanding the circuits involved will offer better alternatives for controlling these seizures.
Generalized electrical discharges in epilepsy have an abrupt onset and offset. This favors the spread of epileptic activity to cortical circuits, which causes abnormal synchronization to subcortical circuits, such as the basal ganglia (BG). In this regard, patients with GTCS have been reported to show atrophy and hyperactivity in the BGs, which is why its anticonvulsant effect has been suggested.
The external globus pallidus (GPe) is a GABAergic hub within the BG circuit that synchronizes the overall activity of the BGs and the BG-thalamus-cortex circuit by controlling electrical activity toward its projection nuclei. Its alteration has been demonstrated in Parkinson's disease; however, its role in epilepsy has received little attention.
This context suggests that the electrical activity of Gpe neurons is modified during CGSTs. Therefore, this study aimed to analyze the electrical activity of Gpe neurons using single-unit extracellular recording with stereotaxic surgery, using a pharmacological model (50 mg/kg of intraperitoneal pentylenetetrazole) of CGSTs in rodents.
The presence of CGSTs was behaviorally assessed using the Racine scale.
Preliminary results showed an increase in Gpe firing frequency of 124.19% during CGSTs. Furthermore, the firing pattern (analyzed by the burst index [RI]) showed an increase (baseline RI 0.22 ±0.38 vs. 0.56 ±CGST RI). The Gpe firing frequency range was 20 Hz before the CTCG seizure; it increased to above 55 Hz during the seizure. These results suggest in conclusion: the Gpe's active participation during CTCGs and modification of its electrical activity during them has an effect on the other ganglia.

542-IV-PP Identificación de regiones de alta intensidad en imágenes de microscopía de fluorescencia por medio de análisis digital de imágenes

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In molecular biology and biomedical sciences, fluorescence microscopy is a fundamental tool for identifying molecules of interest using fluorophores—molecules that absorb energy at a specific wavelength and emit light at a longer wavelength, in accordance with the Stokes shift principle; among the most common fluorophores are antibodies conjugated with fluorescent molecules (e.g., Alexa Fluor), probes or small molecules capable of crossing cellular membranes, and metallic nanoparticles that exhibit the phenomenon of localized surface plasmon resonance. The resulting images not only reveal the presence and location of the fluorophores, also contain information about the size, shape, distribution, and fluorescence intensity within the specimen. This image data can be further enhanced through digital image processing, which allows for noise reduction, color-based or morphological segmentation, and quantification of relevant features in the object under study. In this interdisciplinary work, primary cultures of neonatal rat neurons, as well as SH-SY5Y human neuroblastoma cells, differentiated with retinoic acid, both were labeled with the transmembrane fluorescent probe NeuroFluor™ fluorescent probe, which specifically targets mature neurons. On the other hand, fluorescence microscopy images of basophils treated with spherical gold nanoparticles of 5, 20, and 40 nm in diameter were analyzed. The resulting images were digitally processed, initially by separating the digital image on its principal components red, green and blue (RGB) with the intent of segmenting the regions with higher fluorescent intensity corresponding to one of said channels, afterwards area in pixels was calculated, equivalent to the luminous intensity which was overlap with bright field digital images on the same region, making it possible to quantify and compare luminous intensity, upgrading the quality of the results and extracting more information concerning to the morphology, localization of luminous intensity and the number of components of the sample which exhibit the characteristic delimited by the fluorophores.

543-IV-PP Efecto de la norcantaridina en la transición epitelio mesénquima en la línea celular B16F1 de melanoma murino

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Melanoma is recognized as the most aggressive form of skin cancer. Due to their cellular plasticity, melanoma cells are capable of regulating multiple signaling pathways, enabling them to survive and develop resistance to current treatments. Epithelial-mesenchymal transition (EMT) is a critical process in metastatic progression; thus, identification of therapies that inhibit EMT could improve melanoma management. Norcantharidin (NCTD) has been shown in various studies to possess anticancer activity in multiple tumor types. To evaluate the effect of norcantharidin on epithelial-mesenchymal transition in the murine melanoma cell line B16F1. EMT was induced in B16F1 murine melanoma cells using TGF-β1 for 48 hours. Cell morphology (area), migration (wound healing assay), and vimentin expression (mesenchymal marker) were assessed. To investigate the effect of NCTD on EMT, 15 µg/ml of the compound was applied for 24 and 48 hours. Morphology, migration, and vimentin expression were analyzed by Western Blot and direct immunofluorescence. EMT induction with TGF-β1 in B16F1 murine melanoma cells resulted in morphological changes observable by optical microscopy; treated cells exhibited a mesenchymal phenotype, characterized by an increased cell area, accompanied by elevated vimentin expression. In EMT-induced cultures, cell migration analyses indicated wound closure within 24 hours. NCTD treatment during EMT showed relevant changes in morphology, with cells originally elongated and possessing dendrites adopting a round shape, resulting in a significant decrease in cellular area. In the migration assay, NCTD inhibited cellular movement, preventing full monolayer restoration. These outcomes were associated with a significant decrease in vimentin expression. NCTD exerts an inhibitory effect on EMT in the B16F1 murine melanoma cell line.

547-IV-PO Hidrogeles de nanocelulosa: una revolución natural para potenciar la innovación de productos sostenibles en múltiples industrias

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Cellulose is a natural biopolymer considered a renewable, sustainable raw material with good performance, high potential, and great interest for multiple industrial applications, thanks to its availability, biodegradability, and compatibility. Derived from agro-industrial waste from various plant species, it represents a strategic source for obtaining functional materials. In particular, cellulose has been widely investigated in the development of hydrogels due to its enhanced mechanical properties, biocompatibility, non-toxicity, and high water retention capacity. Hydrogels, defined as hydrophilic three-dimensional polymer networks, can absorb and retain large amounts of water or biological fluids. Their swelling capacity depends on both the nature of the base polymer and the type and degree of crosslinking. In this context, crosslinking agents play a key role by establishing covalent bonds between the functional groups of the polymer chains, facilitating the formation of structured networks with specific physicochemical properties. These characteristics make cellulose-based hydrogels highly versatile, with applications in areas such as tissue engineering, controlled drug delivery systems, wound dressings, membranes for wastewater treatment, biosensor development, catalysis, and soil conditioning. In this research study, nanocellulose was obtained from three agro-industrial waste sources: aloe vera bagasse (AVB), banana pseudostem (PPS), and sugarcane bagasse (SBC). Extraction was carried out by alkaline treatment with NaOH and subsequent acid hydrolysis with 65% H2SO4, with a reaction time of 15 minutes at 25°C. Subsequently, nanocellulose, chitosan, and citric acid hydrogels were synthesized in a 1:2 ratio (nanocellulose, chitosan). Characterization was performed using Fourier transform infrared microscopy (FTIR), identifying chemical interactions within the hydrogel matrix. Scanning electron microscopy (SEM) revealed a porous morphology with pore sizes ranging from 1.38 to 3.01 nm. Furthermore, the hydrogels exhibited a swelling percentage of up to 215% at pH 7 after 24 hours.

553-IV-PO Análisis computacional de un modelo dinámico de leucemia mieloide crónica, validación de condiciones mediante simulaciones numéricas

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This work constitutes a numerically rigorous foray into the five-dimensional structural model for chronic myeloid leukemia (CML) conceived by Clapp et al. which elegantly encapsulates the nonlinear interaction between leukemic cell populations and components of the autologous immune system. The research builds on the theoretical foundations previously established using localization of compact invariant sets (LCIC), by K. E. Starkov, which allows a precise partitioning of the parameter space and the inference of sufficient conditions to characterize the global dynamics of the system. The main purpose of this study is to validate such findings by subjecting to computational verification the analytical postulates that delineate the boundaries between persistence and eradication and to visually explore their dynamical consequences by connecting mathematical thresholds with biologically relevant compartments. By means of numerical simulations, different dynamical regimes will be investigated. The results will confirm that the dynamics of the system depends critically on the partitioning of the parameter space, identifying the trajectories that the systems follow, visualizing how they move to different regions of the phase space when crossing critical thresholds, thus validating the concept of parametrically variable localization. It will be shown that, under certain specific conditions, such as a sufficiently high immune cell source rate, the leukemia-free equilibrium point becomes a global attractor, eliminating cancerous populations. Thus, this study not only strongly validates the mathematical analysis developed by K. E. Starkov, but also shows the potential of the hybrid approach (mathematical and computational) to decipher the internal logic of complex biological systems.

569-IV-PO Impact of urbanization on the natural environment in central Mexico

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The pattern of land use changes due to different urban processes has followed a specific trend in recent decades. These changes in the territory extend beyond urban boundaries, crossing rural and agricultural areas and ultimately impacting natural environments. It is these ecological systems that bear the brunt of the negative effects of urbanization, repercussions that are evident in growing socio-spatial and socio-environmental inequality. Reflecting on the process of urbanization and its effects is essential, given the environmental crisis we find ourselves in. Currently, urban areas are responsible for consuming a large part of the planet's diverse natural resources and, at the same time, these spaces concentrate the largest percentage of the population on a global, national, and regional scale. This work is part of a thesis in progress and is presented within the framework of this event. The objective of this research is to analyze the transformations of the territory linked to urbanization. The case study focuses on the central region of Mexico, specifically in the area known as Bosque de Agua. The approach is quantitative, using GIS and remote sensing. The methodology focuses on analyzing the correlation between socio-environmental factors and changes in land use. Initial findings identify a clear replacement of areas with vegetation cover by anthropogenic surfaces. This scenario highlights the need to implement mechanisms aimed at environmental protection and land-use planning regulations that prioritize these ecosystems in order to ensure their long-term preservation and sustainability.

575-IV-PP Hidrogeles a base de PVA para el encapsulamiento de péptidos

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Currently, hydrogels based on biocompatible polymers, such as polyvinyl acetate (PVA) or polylactic-co-glycolic acid (PLGA), have proven highly useful for encapsulating water-soluble drugs or natural compounds. They enable the creation of gels that trap the compound in a biodegradable polymeric matrix, eliminating the need for toxic organic solvents. This significantly improves the compound's stability by preventing leakage through the carrier walls and preventing unwanted interactions and compound degradation after encapsulation for periods exceeding 8 weeks. In this work, PVA-based hydrogels were prepared using low-energy methods such as freeze-thaw using an ultrasonic tip for peptide incorporation into the hydrogel. Samples were prepared at different concentrations of PVA and peptides with a pH 7.4 buffer solution. For the encapsulation of peptides in dipalmitoylphosphatidylcholine (DPPC) liposomes, lipid bilayers were first prepared, then hydrated, and the hydrogel was added in the same step. They were then cooled to 4°C and filtered. To measure encapsulation efficiency, stability, and controlled release, Zeta potential and UV-vis spectroscopy were used to measure the stability of the gels before and after encapsulation, and infrared spectroscopy was used to verify the stability of the peptides after encapsulation. These tests were conducted over 8 weeks to verify their stability and controlled release, achieving favorable results. After analyzing the results, we concluded that the hydrogels allow the peptides to remain stable for periods of 8 weeks without significant degradation. In the case of hydrogel-loaded liposomes, we observed that they remained stable for 12 weeks without degradation or release of hydrogel, and they presented an encapsulation efficiency of 75%

580-IV-PO Efecto de la fluoxetina durante el embarazo: modificaciones en la reactividad vascular

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The use of antidepressants such as fluoxetine (FLX) has increased significantly in recent years, even during pregnancy. It is known that FLX acts by inhibiting the serotonin transporter (SERT). It has also been proposed that SERT plays a role in vascular contractility and that pregnancy produces modifications in the serotonergic system. This study aimed to evaluate the effects of FLX treatment during pregnancy on vascular reactivity. Additionally, maternal body weight, systolic blood pressure (SBP), glucose tolerance curve, and fetal development in Wistar rats were assessed. For this, rats were treated with FLX (5 mg/kg/day p.o.) for 14 days: non-pregnant (NP), pregnant at 14 days (P14), and pregnant at 20 days (P20). Concentration-response curves to serotonin (5-HT) or phenylephrine (PE) were performed on thoracic and abdominal aorta using the conventional isolated organ technique. FLX treatment increased the contractile response to 5-HT in both segments of the aorta in pregnant and NP rats. Meanwhile, FLX increased the response to PE only in the aortas of pregnant rats. FLX treatment did not alter SBP in any group, and body weight decreased in P14 rats ($p = 0.0280$). The glucose tolerance curve was reduced in P20 rats ($p = 0.0178$). No significant differences were found in weight, size, or number of offspring. These findings suggest that the involvement of the serotonergic system is modified by pregnancy, increasing the role of SERT in blood vessels.

586-IV-PO Fortalecimiento de la cultura del agua: Un caso de estudio en Oaxaca, México

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This study is based on the 4MAT model and the concept of water culture. The model identifies four learning styles: Imaginative (Level 1: Initial Understanding), Analytical (Level 2: Critical Analysis), Common Sense (Level 3: Practical Application), and Dynamic (Level 4: Dissemination and Expansion), structured into eight stages to promote comprehensive learning. Water culture refers to the set of practices and values that govern communities' relationship with water, which are essential for sustainable water management. The research aimed to implement an action plan to strengthen the water culture in Cieneguilla, San Andrés Ixtlahuaca, Oaxaca, between 2021 and 2023. A qualitative methodology was used, based on Participatory Action Research (PAR) and ethnographic methods. A total of 48 participants (children, families, teachers, and community authorities) took part in two phases: (1) Diagnosis of water culture, which identified sociocultural and environmental factors through field visits, interviews, workshops, and water resource mapping; (2) Design and implementation of an action plan based on the 4MAT model, evaluated through Likert-type questionnaires. Results showed that perceptions of water varied according to the community context and activities, revealing issues such as scarcity, pollution, and lack of awareness regarding water use. The action plan, supported by the 4MAT learning styles, helped strengthen the water culture. Notably, at Level 3, 55% of participants proposed and implemented actions for water conservation, and at Level 4, 45% shared the knowledge they had acquired. In conclusion, building a water culture requires participatory educational strategies grounded in the learning styles of the 4MAT model. To strengthen water culture, the community must reach Level 4 by engaging in the dissemination and expansion of acquired knowledge.

588-IV-PP Evolution of Patent-Driven Innovation (2009–2025) in Biocomposite-Based Food Packaging

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Food packaging plays a critical role in preserving quality, reducing microbial contamination, and extending the shelf life of food products. However, most of this packaging continues to be derived from petroleum, generating an environmental crisis with collateral and irreversible effects on human health and ecosystems. Against this backdrop, there is a sustained trend toward the development of biocomposite materials that can progressively replace conventional polymers, leveraging advances in material science to create more sustainable solutions. This article presents a study based on data mining of 1,138 patents filed between 2009 and 2025 on biocomposite matrices applied to food packaging, identifying 32 specific biocomposites whose evolution can be structured in three key development stages: the emergence of the first matrices, their progressive diversification, and a recent phase of technological specialization. With the information gathered, technological density metrics (mentions/patents × 100), growth acceleration indices $((V_2–V_1)/V_1 \times 100)$, emergence velocity analyses (ΔMentions/ΔTime), and technology readiness assessments were calculated to classify materials according to their stage of development. The legal status analysis revealed that 45.3% of the patents are active, 34.5% are under examination, with an overall protection success rate of 73.8%. The United States leads with 31.2% of the patents, although approximately 50% of the assignees are foreign companies, evidencing an innovation ecosystem with protection strategies in key markets. In addition, the results show sustained hegemony of polylactic acid (PLA) as the main platform, reaching density levels of 95.9% in the foundational phase, 107.3% in diversification, and 110.6% in specialization. This is accompanied by accelerated growth of hemp-based composites and mycelium materials, as well as the valorization of agricultural waste and the development of biotechnological processes. Nanocellulose, in particular, achieved the highest acceleration in its maturity level, evolving from basic cellulose applications to advanced nanotechnology implementations, reflecting a 1,150% increase in technological sophistication. PBAT and mycelium emerged as revolutionary biotechnological alternatives with 31 and 33 mentions respectively, representing new platforms for biodegradability and biotechnological manufacturing. The analysis also identified a trend toward integrating multilayer systems, nanocomposites, and hybrid architectures, along with antimicrobial properties, barrier technologies, and active functionalities targeting smart packaging solutions.

594-IV-PP Asociación de genes implicados en la vía vascular con la susceptibilidad al desarrollo de Demencia mediante análisis de GWAS en población mexicana

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This project proposes the association of genes from the vascular pathway related to the risk of developing dementia using the Genome-Wide Association Study (GWAS) technique, applied to the cohort of patients from the Study on Aging and Dementia in Mexico. Dementia is a chronic neurodegenerative disorder primarily associated with aging, in which cognitive functions gradually decline in older adults. Its incidence has been increasing, and it is projected that by the year 2050, approximately 152 million people will be affected by dementia (2). Cardiovascular risk factors and increased life expectancy contribute to the growing prevalence of the disease, among other factors.

The main types of late-onset dementia (LOAD) are Alzheimer's Disease (AD), followed by Vascular Dementia (VaD) and Mixed Dementia (MxD), with AD being the most common. Cerebral vascular pathology has been documented as a significant risk factor that accelerates cognitive decline in AD and lowers the diagnostic threshold for the disease (5). Several authors have proposed that dementia originates from coexisting vascular and neurodegenerative components. Genetic factors play a key role in the etiology of dementia. The ApoE ε4 gene was the first to be discovered and is still considered the most important genetic risk factor for the development of AD. Additionally, GWAS has identified various genetic variants that confer a risk for developing dementia through different pathways or mechanisms, including the immunological role of microglia (7), cholesterol metabolism (8, 9), and the β-amyloid process. Several vascular factors have been associated with cognitive decline and the development of dementia in older adults. Various authors have also suggested that vascular factors play a significant role in the progression of AD, are intrinsic to VaD, and are similarly reported for MxD (12–14). Furthermore, hypertension has been identified as one of the most important risk factors for the development of AD and is characteristic of VaD. Brain health largely depends on vascular integrity; the brain requires high perfusion to meet its specific metabolic demands (15). When abnormalities in vascularization occur, the risk of developing chronic neurodegenerative disorders increases (15). This vascular network forms the blood-brain barrier (BBB), which is responsible for mediating cerebral hemodynamics through a highly sensitive exchange between blood molecules and the brain. Recent reports have identified microglia as the main cell type expressing genetic factors associated with the development of Alzheimer's disease (AD), including TREM2, MS4A6A, CR1, and SPI1, among others (17). Most of the genetic variations identified through GWAS depend on the cellular context and spatial zonation, suggesting that dementia involves a heterogeneous response among different cell types in this context (18). Additionally, it has been found that genes identified via GWAS and expressed in hippocampal and cortical cells exhibit similar expression patterns, further suggesting a vascular involvement in the development of AD, vascular dementia (VaD), and mixed dementia (MxD).

595-IV-PO Fibras electrohiladas para el tratamiento de úlceras del pie diabético

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The natural repair of diabetic foot ulcers (DFU) is a complex, multiphase, and delayed healing process; its complexity can lead to partial amputations affecting patients' health and high costs for healthcare systems. A viable alternative for the generation of dressings for DFU is the fabrication of electrospun fiber scaffolds from natural polymers in combination with inorganic nanoparticles with antibacterial properties, low toxicity and that promote wound healing. In this work, fiber scaffolds were fabricated using the electrospinning technique from the mixture of chitosan (CTS), polyvinyl alcohol (PVA) and hyaluronic acid (HA), to which silver nanoparticles (Ag NPs) and zinc oxide (ZnO NPs) were added in different weight ratios for study as dressing materials. The development of these materials included a physicochemical, morphological and structural evaluation of the nanoparticles and fibers, as well as an evaluation of the in vitro biological properties of the scaffolds, which was performed by hemocompatibility and cell viability assays with human dermal fibroblasts (Detroit 548). The UV-vis spectrum of the CTS-Ag compound revealed the presence of the surface plasmon resonance band, indicating the microbicidal potential of Ag NPs. Determination of the bandgap energy revealed that ZnO NPs may be photoactive and capable of generating reactive oxygen specie (ROS) as an antibacterial mechanism. The PVA-CTS-HA-Ag-ZnO blended scaffolds were hemocompatible and non-hemolytic. Cell viability results demonstrated that the scaffolds were non-toxic to human dermal fibroblasts, showing a cell viability of 60 %. These results indicated that all materials produced are suitable for skin cell regeneration and have high potential for use as interactive dressing materials in the treatment of acute and chronic wounds, such as UPDs.

596-IV-PO Optimización de las relaciones sargazo (Sargassum fluitans o Sargassum natans) - lirio acuático (Eichhornia crassipes) para la obtención de biocombustible

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The massive accumulation of sargassum and water hyacinth in aquatic ecosystems poses a major environmental challenge in Mexico. These invasive biomasses, rich in structural polysaccharides, can serve as raw materials for bioethanol production, offering a renewable energy alternative. This project aims to optimize sargassum–water hyacinth ratios to maximize fermentable sugar release through alkaline pretreatment and enzymatic hydrolysis. Alkaline pretreatment with 1M NaOH was applied to remove hemicellulose and lignin, followed by enzymatic hydrolysis using commercial amylase under controlled conditions (35 °C, pH 4.8). Reducing sugars were quantified using the DNS method via UV-Vis spectrophotometry at 540 nm. Preliminary results showed average sugar concentrations of 0.37 mg/ml at 0 h; 1.12 mg/ml at 24 h, representing a significant increase; and approximately 1.08 mg/ml at 48 h, indicating stabilization in sugar release and suggesting that the optimal reaction time with amylase may be around 24 h. These preliminary findings help guide the selection of conditions for upcoming stages, where other enzymes (cellulase, subtilisin, driselase) will be evaluated individually and in combination, applying a factorial experimental design to optimize total sugar release. In future phases, the released sugars will be fermented with Saccharomyces cerevisiae to produce bioethanol, which will be purified and characterized following ASTM standards. This work aims to develop sustainable alternatives for managing invasive species and to contribute to bioenergy development in Mexico, framed within circular economy strategies and waste valorization.