Ulysseus
EUROPEAN UNIVERSITY

BIP HERO & AWARE

Poster Session

Blended Intensive Programme (BIP)

Villa Cambiaso - DIBRIS, University of Genoa, Italy

June 29 - 30, 2026
h. 14:00 – 15:00 CEST

Posters Abstracts:

HERO

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The 3 AM Companion: Ethical Ambient Intelligence and Affective Computing for Postpartum Mental Health Intervention

Postpartum Depression (PPD) affects up to 15% of new mothers globally, with symptoms frequently exacerbated during nocturnal infant care a period characterized by profound physical exhaustion and psychological isolation. Traditional digital health interventions (e.g., screen-based apps) suffer from low adherence due to the high cognitive load and blue-light exposure they demand from sleep-deprived mothers. This project proposes "The 3 AM Companion," a conceptual ambient intelligence (AmI) hardware interface designed to provide real-time, frictionless psychological support during night feeds. Utilizing privacy-preserving multimodal sensor fusion (mmWave radar, acoustic prosody analysis) and affective computing, the device detects nocturnal distress without active user engagement. An embedded, on-device Small Language Model (SLM) trained in Cognitive Behavioral Therapy (CBT) delivers voice-guided grounding techniques and empathetic companionship through a screen-free, low-luminance interface. Crucially, this research develops a novel ethical framework for deploying empathetic AI in vulnerable populations. We address the "automation of care" dilemma, algorithmic bias in vocal biomarker detection, and the edge-computing protocols necessary to detect acute crisis markers for seamless human-in-the-loop escalation. By merging ambient robotics, affective AI, and applied bioethics, this project offers a paradigm shift from reactive tracking to proactive ambient maternal care.

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High-Entropy Alloy (HEA) based-cermets and their potential applications in bioengineering and robotics

This poster summarizes the results from my BSc Thesis titled as “High-Entropy AlloyBased Cermets: a critical review”, a comprehensive state-of-the-art article supervised by Dr. Ernesto Chicardi Augusto, leader of the Powder Technology & Corrosion Research Group from ETSI-University of Sevilla. This work is intended to serve as the basis for my subsequent investigations, where we will develop new HEA-HEC and HEA-UHTC cermets for critical applications, attempting to cover the vast unknown terrain in the matter.

The basic ideas and characteristics of the paper are presented: from the background and definition of high-entropy phases and their core properties to the general results observed in investigations, in a brief manner. Afterwards, strategic proposals for bioengineering applications mainly and robotics in a broader sense are made, connecting the vision of the future for this material science field and the topics of the courses. Finally, technical discussions on the viability of these proposals are made, along with general conclusions and the future works that were mentioned before. Some interesting results were omitted for space and brevity reasons; the complete paper will be published soon.

The intention of this poster is to remember that material science, even though sometimes taken for granted, plays a crucial and non-omissible role in every technological advancement. Thus, it is important to have in mind the current directions of improvement in terms of new materials, because new technologies end up facing a material barrier sooner or later. The restrictive field for bioengineering, robotics and human well-being might be other, but at some point, the necessity to use improved materials will be evident.

Possibilities like HEA-based cermets and their designability can be a way of addressing those situations in the future.

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Automated Assessment of Autobiographical Memory: From Data Collection to NLP-Based Analysis

Autobiographical memory (AM) phenomenology has been associated with several psychological conditions, including depression, post-traumatic stress disorder (PTSD) and cognitive aging. However, large-scale assessment of autobiographical narratives remains time-consuming and dependent on expert human raters. Recent advances in Natural Language Processing (NLP) offer promising opportunities for automating this process.

This study presents a multilingual framework for the collection, annotation and automated analysis of autobiographical memories. A dataset of 3,768 autobiographical narratives was collected from 413 participants recruited through an online platform and Prolific. Participants completed the Autobiographical Memory Test (AMT) using positive and negative cue words and provided demographic and clinical information, including measures of depression (BDI-II), rumination (RRS) and PTSD symptoms (PCL-5). Human annotation was performed, showing substantial inter-rater agreement for AMT specificity and near-perfect agreement for emotional valence.

To enable automated AM specificity assessment, multiple machine translation systems were benchmarked and the Italian narratives were translated into English before processing with an NLP model previously validated on English for AM specificity scoring. Preliminary analyses showed that longer narratives and longer retrieval times were strongly associated with higher autobiographical memory specificity, whereas participants older than 40 years displayed lower specificity, although this effect appeared weak and unstable after correction for multiple comparisons. PTSD re-experiencing symptoms were associated with reduced specificity for negative autobiographical memories, but this effect was also modest. Overall, findings suggest that structural characteristics of autobiographical narratives in our database are more strongly related to automated specificity scores than global clinical symptom severity.

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AI-Powered Autonomous Drone Network for Sustainable Medical Logistics in Seville: A Human-Centred and Ethical Robotics Approach to Smart Healthcare Delivery

Rapid and reliable transportation of medical supplies is critical for healthcare systems, particularly during emergency situations where delays can directly affect patient outcomes. However, conventional road-based medical logistics are frequently constrained by traffic congestion, unpredictable travel times, high operational costs, and environmental impacts. This work presents an AI-powered autonomous drone network designed to support inter-hospital medical logistics in Seville, Spain, through a sustainable, efficient, and human-centred approach.

The proposed system connects major healthcare facilities using autonomous unmanned aerial vehicles (UAVs) capable of transporting blood products, laboratory samples, medicines, and emergency medical supplies. Artificial Intelligence is employed for route optimization, mission scheduling, fleet coordination, and real-time decision-making, while advanced communication technologies ensure secure and reliable operations. The framework is developed according to Human-Centred and Ethical Robotics principles, prioritizing safety, transparency, accessibility, and societal benefit.

A representative network linking Hospital Virgen del Rocío, Hospital Virgen Macarena, and Hospital de Valme was designed and evaluated. Performance analysis indicates that drone-based transportation can reduce delivery times by up to 71%, decrease CO_2 emissions by approximately 86%, and lower operational costs by 39% compared with conventional ambulance-based transport. Furthermore, the proposed system improves logistics reliability and enables continuous 24/7 operational availability for time-critical healthcare missions.

The results demonstrate the potential of integrating Artificial Intelligence, autonomous aerial mobility, and smart healthcare infrastructure to create faster, greener, and more resilient medical logistics systems. This research contributes to the development of sustainable smart cities while supporting future healthcare innovation and emergency response capabilities.

Keywords: Artificial Intelligence, Autonomous Drones, Medical Logistics, Smart Healthcare, Human-Centred Robotics, Ethical AI, Sustainable Transportation, Smart Cities

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The application of Smart Cameras and Artificial Intelligence in the Manufacturing Industry

Modern industrial camera systems have evolved from simple recording devices into sophisticated intelligent agents capable of interpreting the physical world. By combining high-resolution digital lenses with AI-driven "brains," these systems serve as essential tools for quality control, safety, and autonomous navigation.

A primary application of this technology is found in Automated Surface Inspection Systems, which utilize specialized lighting and high-speed processing to identify microscopic defects in manufacturing. By replacing manual inspection, these AI-powered systems reduce waste and prevent economic loss while ensuring that automotive and construction products meet rigorous safety standards. Beyond quality control, vision systems enable complex autonomous functionality. This was demonstrated in a competitive robotics tournament where our team successfully deployed an embedded AI model to navigate an obstacle course and perform precise liquid handling. By training the robot to recognize color contrasts and geometric patterns, we enabled it to autonomously extract and transfer fluid despite strict capacity and handling constraints.

Furthermore, AI-powered CCTV Safety Analytics is revolutionizing industrial site management by shifting from passive surveillance to proactive risk prevention. By layering AI detection onto existing camera infrastructure, facilities can identify "exposure events"—such as unauthorized pedestrian presence in forklift lanes—in real-time. This transition from reactive monitoring to the analysis of leading indicators allows Health, Safety and Environment teams to utilize structured behavioral data for evidence-based coaching and facility layout optimization. Collectively, these applications demonstrate that the integration of machine vision and artificial intelligence is fundamental to modern automation, transforming industrial environments into safer, more efficient, and highly precise operational spaces.

AWAKE

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Representation of older adults in pivotal clinical trials of sentinel lymph node biopsy and completion lympg node dissection for cutaneous melanoma: are current guidelines applicable to patients> 65 years old?

Background: Cutaneous melanoma predominantly affects older adults, yet the evidence supporting current surgical management has been generated from randomized clinical trials that may not adequately represent this population. Sentinel lymph node biopsy (SLNB) remains the standard procedure for regional staging, while routine completion lymph node dissection (CLND) has been abandoned following the MSLT-II and DeCOG-SLT trials. However, age-related biological changes, frailty, comorbidities, and competing mortality may significantly influence the risk-benefit balance of these interventions.
Objective: To evaluate the representation of patients aged ≥65 years in the pivotal clinical trials of SLNB and CLND and to assess the applicability of current guideline recommendations to older adults.
Methods: A narrative review of the landmark randomized trials (MSLT-I, MSLT-II, and DeCOG-SLT) and current international guidelines was performed, focusing on age eligibility criteria, cohort characteristics, methodological limitations, and the external validity of their conclusions for elderly patients. Particular attention was given to upper age limits, performance status requirements, and the absence of geriatric-specific analyses.
Results: The pivotal trials enrolled highly selected populations with median ages ranging from approximately 53 to 58 years. MSLT-I and MSLT-II excluded patients older than 75 years, while MSLT-II additionally required ECOG performance status 0–1. Frail individuals and patients with significant multimorbidity were therefore substantially underrepresented. Although these studies consistently demonstrated no melanoma-specific survival benefit from routine CLND, they did not evaluate frailty, quality of life, functional outcomes, or competing mortality, limiting the generalizability of their findings to the heterogeneous elderly population.
Conclusions: Current recommendations against routine CLND appear applicable to fit older adults but should be interpreted cautiously in patients with advanced age or frailty. Surgical decision-making should prioritize biological rather than chronological age and incorporate comprehensive geriatric assessment. Future clinical trials and artificial intelligence–based decision support models should explicitly include older adults and integrate frailty indices and quality-of-life outcomes to improve personalized melanoma care.

Becerra-Gallardo, Jose Antonio, Rosillo-Ramírez, M.A.; Muñoz-García, R.; Vázquez-Román, M.V.; Paredes-Sánchez, M.; León-González, A.J.; Pereira-Caro, M.G.; Colino-Moraga, A.; Muñoz-Castro, S.; Fernández-Bolaños, J.M.; Martín-Cordero, C.; Moreno-Rojas, J.M.; Barbarroja, N.; Sánchez-Hidalgo M.
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Protective Effects of Olive Leaf Extract and Oleuropein in a Proteoglycan-Induced Axial Spondyloarthritis Model in IL-4$^{-/-}$ Mice

Axial spondyloarthritis (axSpA) is a chronic immune-mediated inflammatory disease characterized by persistent inflammation, structural damage, and pathological new bone formation. Despite major advances in biological therapies, disease progression remains insufficiently controlled in a substantial proportion of patients, emphasizing the need for complementary therapeutic approaches.

This study evaluated the anti-inflammatory and tissue-protective effects of a phenolic□rich olive leaf extract (EXTO) and purified oleuropein (OLE) in a proteoglycan-induced model of axial spondyloarthritis using IL-4-deficient BALB/c mice. Olive leaf extracts from five cultivars were characterized by UHPLC-HRMS, and antioxidant activity was determined using the ABTS assay to identify the most suitable extract. Mice were allocated to Control, PG, PG + EXTO, and PG + OLE groups. Histopathological evaluation included hematoxylin-eosin, toluidine blue, and Masson's trichrome staining, while immunohistochemistry for F4/80 and type X collagen was performed to assess inflammatory infiltration and tissue remodeling. Serum inflammatory mediators were quantified using the Olink® Inflammation Panel.

The Lechín cultivar exhibited the highest phenolic content and antioxidant activity. Dietary supplementation with EXTO and OLE reduced vertebral involvement, attenuated inflammatory lesions, preserved cartilage architecture, and limited intervertebral disc degeneration compared with untreated PG mice. Moreover, treatment modulated the systemic inflammatory response, decreasing pro-inflammatory cytokines while increasing IL-10 levels.

These findings provide preclinical evidence that olive leaf-derived phenolic compounds exert protective effects in experimental axSpA and support their potential as complementary therapeutic strategies to reduce inflammation and preserve spinal tissue integrity.

Keywords: Axial spondyloarthritis; Olive leaf extract; Oleuropein

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Development of Electrochemical Biosensors: Aptamer-Based Biosensor for Interleukin-6

Interleukin-6 (IL-6) is glycoprotein which is important biomarker associated with inflammation and cancer development and is typically present in the extracellular environment in pg/mL concentrations. Traditional quantification methods used, like ELISA, are time consuming and expensive. The research conducted in the scope of my internship at Universitat Autònoma de Barcelona (UAB) had a subject of development of electrochemical aptasensor for a fast and cost-effective detection of IL-6. Electrodes of the sensor were made from Laser-Induced Graphene (LIG) material using UV laser engraving method on the polyimide material, which produces highly porous, carbon surface that is highly conductive and fast to manufacture. LIG electrode surface was functionalized using electrografting method with 4-aminobenzoic acid to bind carboxyl groups on the active surface of sensor. After EDC/NHS activation, immobilization of an IL-6 specific, 31-nucleotide, amino-terminated aptamer was performed.
Every modification and binding trial was characterized using Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS) in a $[Fe(CN)_6]^{3-/4-}$ redox probe solution. The results have shown that electroactive surface of active sensor surface is approximately 1.7 times higher in comparison to the geometric area due to high porosity of LIG material. EIS measurements have also confirmed successful aptamer binding by the consequential increase in charge transfer resistance. Upon incubation of the sensor with various IL-6 concentration solutions, aptasensor had shown significant increase in impedance at 100 ng/mL concentration, indicating selective recognition of IL-6. These results present potential for the aptasensor application in the clinical diagnostics field for early medical diagnostics but further research needs to be conducted for the possible development of applicable product based on this mechanism.

Keywords: Electrochemical Aptasensor, Interleukin-6, Laser-Induced Graphene

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Antioxidant and anti-inflammatory effects of Olea europaea l. leaf extract, tyrosol, hydroxytyrosol and its metabolites in LPS-stimulated THP-1 macrophages

Introduction: The beneficial properties of olive leaves are well documented and have been used in traditional medicine. Olive leaves are a rich source of high-added-valued molecules, such as tyrosol (T) and hydroxytyrosol (HyT), which have demonstrated significant efficacy against chronic inflammatory diseases, including rheumatoid arthritis. These bioactive compounds therefore represent promising candidates for the development of novel, natural therapeutic strategies.
Objective: To evaluate the anti-inflammatory and immunomodulatory effects of an olive leaf extract (OLE), T, HyT and HyT metabolites on the inflammatory response induced in the human monocytic cell line THP-1.
Materials and Methods: Phenolic content and antioxidant capacity of each olive leaf variety was quantified by the Folin-Ciocalteu and ABTS/DPPH assays, respectively. OLE was characterised by UHLPC-HRMS. The antioxidant capacity of OLE and the phenolic compounds was quantified using the ABTS assay. THP-1 monocytes were differentiated with PMA (8nM, 72h), pretreated with the compounds under study (1h) and stimulated with LPS (1µg/mL). Cell viability was assessed by the MTT assay. IL-6 and TNF α production was measured by ELISA, and the regulation of NFκB, Nrf2/HO-1 pathways and COX-2 expression was assessed by Western blotting.
Results: The Lechín variety shown the highest phenolic content and antioxidant capacity. None of the tested compounds exerted cytotoxic effect. OLE (0'1, 5, 25, 50µg/mL) and the tested compounds (5, 25, 50µM) reduced IL-6 production, except HyT-4-sulphate, which showed this activity only at the highest concentration. OLE (5, 25, 50µg/mL), HyT (5, 25, 50µM), HyT acetate (25, 50µM) and 3HyT-3-glucuronide (0'1, 5µM), reduced TNFα production. OLE (5, 25µg/mL) upregulated the Nrf2/HO-1 pathway, whilst OLE, T and HyT protect IκBα expression and reduced COX-2 overexpression.
Conclusion: OLE, its bioactive compounds (T and HyT) and its metabolites (HyT α-acetate, HyT-3-sulfate, HyT-4-sulfate, 3HyT-3-glucuronide and 3HyT-4-glucuronide) may represent a new therapeutic strategy for mitigating the immunoinflammatory conditions where the pro-inflammatory cytokine IL-6 and ROS play a key role.

Keywords: Inflammation, monocytes, olive leaf extract

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Olive leaf protein hydrolysate ameliorates Alzheimer-like cognitive decline via neuroinflammatory and microbiota modulation

The valorisation of olive-derived by-products represents a sustainable strategy to obtain bioactive compounds with potential biomedical applications. Olive leaves, an abundant byproduct of the olive oil industry, contain protein fractions that can release bioactive peptides after enzymatic hydrolysis. In parallel, Alzheimer's disease remains a major neurodegenerative disorder with limited therapeutic options, supporting the search for complementary nutritional approaches able to modulate neuroinflammation, glial reactivity and the gut–brain axis. This study evaluated the neuroprotective potential of an olive leaf protein hydrolysate obtained after 15 min of Alcalase digestion (OLPH15A) in a scopolamine-induced murine model of Alzheimer-like cognitive impairment.

Male C57BL/6J mice were randomly allocated into three experimental groups: Control, receiving oral vehicle by gavage for 12 weeks and intraperitoneal saline during the last 3 weeks; Sco, receiving oral vehicle by gavage for 12 weeks and intraperitoneal scopolamine during the last 3 weeks; and Sco + OLPH15A, receiving OLPH15A supplementation by oral gavage for 12 weeks and intraperitoneal scopolamine during the last 3 weeks. Cognitive performance was assessed using Barnes Maze, T-Maze and Novel Object Recognition tests.

Hippocampal astrocytic activation was evaluated by GFAP immunofluorescence in the dentate gyrus, CA3 and CA1 regions. Faecal microbiota composition and diversity were assessed through 16S rRNA metagenomic analysis.

OLPH15A supplementation improved cognitive performance in scopolamine-treated mice, particularly in tasks related to spatial learning and recognition memory. Histological analysis showed reduced hippocampal GFAP immunoreactivity in the Sco + OLPH15A group compared with scopolamine-treated animals, suggesting attenuation of astrocytic activation. In parallel, OLPH15A supplementation reshaped faecal microbiota composition and partially shifted the microbial profile towards the control condition. Overall, these findings support olive leaf protein hydrolysates as sustainable sources of bioactive peptides with neuroprotective potential, acting through the modulation of cognitive impairment, hippocampal glial reactivity and gut–brain axis alterations.

Keywords: Alzheimer's disease; olive leaf protein hydrolysate; neuroinflammation

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Rational Design of Hybrid Agarose–Copolymer Hydrogels: Structural Design and Functional Characterization

In this study, agarose-based semi-interpenetrated polymer networks (semi-IPN) were successfully developed by incorporating degradable copolymeric networks designed to enhance the mechanical and physicochemical properties of pristine agarose hydrogels. A series of copolymers were synthesized via reversible addition–fragmentation chain-transfer polymerization (RAFT) and atom transfer radical polymerization (ATRP) using 2-hydroxyethyl methacrylate (HEMA), oligo(ethylene glycol) methacrylate (OEGMA), and 2-(N,N-dimethylamino)ethyl methacrylate (DMAEMA) as primary monomers, and furfuryl methacrylate (FMA) or vinyl methacrylate (VMA) as crosslinking-promoting secondary monomers. The copolymers were purified and thoroughly characterized, with their chemical composition unambiguously established by proton nuclear magnetic resonance (NMR) spectroscopy. Their molecular weights and polydispersities were determined by size exclusion chromatography (SEC). Selected copolymers were cross-linked via Diels–Alder or thiol–ene reactions to form hydrogels. Further ionic cross-linking for gelation was also tested depending on the system composition. All gelation processes were successfully achieved, with co-p(HEMA70-VMA30) hydrogel (crosslinked by thiol-ene reaction) exhibiting the most favorable rheological properties. Additional work included the formation of copolymers-based networks within colloidal agarose solutions to create semi-IPN systems. These materials were rheologically characterized and compared to their copolymer hydrogel and pristine agarose counterparts. All semi-IPN systems showed significantly enhanced mechanical strength, with the DMAEMA-FMA-based network demonstrating the most pronounced improvement.
Scanning electron microscopy analysis revealed a well-defined, interconnected microporous architecture. Thermoresponsive behavior was demonstrated under specific conditions, although showing limited sensitivity to pH. This work highlights a robust strategy for engineering biocompatible, mechanically enhanced agarose-based materials with potential for biomedical applications such as drug delivery and tissue engineering.

Keywords: agarose; polymer-based semi-IPN systems; living polymerizations

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MOK signalling in microglia: A novel regulator of inflammatory responses and neuroinflammation

As life expectancy increases, the prevalence of neurodegenerative diseases continues to rise, representing a significant burden for affected individuals, their families, society, and healthcare systems. Although the mechanisms underlying neurodegeneration are complex and multifactorial, neuroinflammation has emerged as a common hallmark that contributes to the pathogenesis and progression of several neurodegenerative disorders.Neuroinflammation is a complex immune response within the central nervous system (CNS) that can exert both beneficial and detrimental effects. While acute and tightly regulated inflammatory responses are essential for maintaining tissue homeostasis and promoting repair, chronic or excessive neuroinflammation contributes to neurodegeneration. Microglia, the resident innate immune cells of the CNS, play a central role in regulating neuroinflammatory processes. These cells can adopt either neuroprotective or neurotoxic states depending on the intensity, duration and the specific context of the inflammatory response. Consequently, current therapeutic strategies aim to enhance protective microglial phenotypes while preventing the transition toward detrimental inflammatory states.

Our group previously identified a role for MAPK/MAK/MRK overlapping kinase (MOK), a poorly characterized signalling serine/threonine kinase, in the regulation of microglial responses through its interaction with the epigenetic reader BRD4. This study provided the first evidence implicating MOK in both immune regulation and CNS function. The aim of the present doctoral thesis was to further characterize the signalling pathways regulated by MOK in microglia under inflammatory conditions.

Our in vitro results suggest that MOK acts as a key regulatory node linking inflammatory responses, autophagy, and cellular metabolism. In vivo studies further confirmed a role for MOK in microglial activation and cytokine production. Notably, MOK deficiency was associated with sex-specific neuroprotective effects observed in female mice.

Overall, this work provides novel insights into MOK-mediated signalling pathways in microglia and identifies MOK as a potential therapeutic target for modulating neuroinflammation and attenuating detrimental inflammatory responses in the CNS.

Keywords: neuroinflammation, neurodegenerative diseases, microglia

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Microglia Therapeutic Potential of PLX3397-Mediated Microglial Depletion and Repopulation in Mouse Models of AD

Microglia are the main primary immune cells of the brain and play important homeostatic functions that seem to be lost in neurodegenerative diseases, including Alzheimer's Disease (AD). Persistent microglial activation has been widely described in different AD transgenic mice, creating a chronic neuroinflammatory environment in the brain that could contribute to the progression of the disease.
Moreover, we have described a microglial degenerative process in the hippocampus of AD patients, mainly mediated by pathological Tau species. All those reasons have raised interest in the development of microglial depletion approaches and their use in our understanding of the disease. PLX3397 is an oral tyrosine kinase inhibitor widely used for microglial depletion. It is in phase 1-3 clinical trials for treating different cancers and produces CSF1R inhibition, an essential receptor for the viability and proliferation of these cells. In accordance with other reports, we have observed that a rapid and complete repopulation follows microglial depletion. Since the phenotype of these emerging cells and its effect on the pathology is still unknown, we decided to perform a two-week PLX3397 treatment in both, hTau P301S and APP aged mice models of AD. Although we didn't see any differences in the amyloid or tau load in the depleted and repopulated mice, we did observe a reduction in the main inflammatory cytokines. Even though the emerging microglia exhibit a less activated phenotype, they appear to fulfill the functions of resident microglia. Both, hyperactivated and dysfunctional microglia seem to disrupt homeostasis in the brain with the progression of the pathology, as a result, microglial renewal may be a promising therapeutic strategy for AD.

Keywords: Alzheimer, microglia, neuroinflammation

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The Effect of High-Fat Diet on Aging Phenotypes of Hematopoietic Stem Cells

During aging, hematopoietic stem cells (HSC) accumulate in the bone marrow and lose their differentiation and self-renewal capability. Life-long challenges progressively drive the hematopoietic system impairment with age; however, this mechanism remains unclear. For instance, it is established that a high-fat diet (HFD) renders HSC less potent and leads to the loss of their stemness, but it is unclear whether it leads to a premature aging phenotype and whether this phenotype can be ameliorated by conditions of low inflammation. Furthermore, it is not known whether HFD-induced stress leads to a transcriptional memory in HSC. To address these questions, I employed HFD feeding for either a first or a second 4-week challenge, separated by a 4-week recovery period. HSC were then isolated to investigate multiple aspects of HSC biology in wild-type (WT) and in a low-inflammatory context generated by deletion of the MDA5 innate immune sensor (Mda5-/-). My results showed no significant difference in body weight, food consumption, and blood glucose levels between WT and Mda5-/- mice, indicating that our experimental design was successful to induce a stress rather than metabolic diseases. HFD remodeled the BM niche, reducing support for B-cell development while favoring T-cell representation across both challenges.
However, there were no differences between the groups in the HSPCs proportions of the bone marrow population. Also, in the first challenge, HFD was associated with a decreased frequency of G0 cells. Despite these changes, WT treated groups retained their repopulation capacity, indicating that HFD elicited an adaptive hematopoietic stress response without compromising functional potential. Next, we aim to test whether HFD induces stable epigenetic changes and transcriptional priming in HSC that are similar to what occurs in physiological aging.

Keywords: Hematopoietic stem and progenitor cells, High-fat Diet, RIG-I-like receptors

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Development of Experimental Devices for Light and Vibration Stimulation of Cells

This poster presents an overview of current knowledge on the effects of selected biophysical parameters, including light and mechanical vibrations, on cellular behavior. In vitro cell cultures are widely used to study biological processes; however, standard static culture conditions do not fully reproduce the dynamic physical environment present in living tissues. Increasing evidence suggests that external physical stimuli can significantly influence key cellular functions such as viability, proliferation, metabolism, and morphological adaptation.

Among the most studied biophysical stimuli, mechanical vibrations and light exposure have shown considerable potential in modulating cellular responses. Mechanical stimulation is associated with mechanotransduction processes, where physical forces are converted into biochemical signals that regulate cell activity. Similarly, light-based stimulation, particularly using light-emitting diodes (LEDs), has been reported to affect cellular metabolism and proliferation depending on wavelength, intensity, and exposure parameters. These findings highlight the importance of precisely controlled stimulation systems for reproducible experimental conditions.

This work also presents the development and preliminary verification of experimental devices designed for light and vibration stimulation of cells. The vibration platform was designed as a modular system enabling low-frequency mechanical stimulation with adjustable parameters, while the light stimulation system is based on LED technology with controllable wavelength and intensity. Both systems were developed as cost-effective and flexible laboratory tools intended for in vitro applications.

Preliminary testing confirmed the functionality and stability of the developed devices, including successful control of stimulation parameters and compatibility with standard cell culture formats. The results of the literature review and technical development indicate that biophysical stimulation represents a promising approach for influencing cellular behavior and provides a technical basis for future experimental studies, particularly in the field of regenerative medicine and stem cell research.

Keywords: Biophysical stimulation, Mechanical vibration, Photobiomodulation

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