OPEN ACCESS

BBR BIOMEDICAL AND BIOPHARMACEUTICAL RESEARCH

VOLUME 20, ISSUE 2 (2023)
pp. 1-13
doi: 10.19277/bbr.20.2.330

INVESTIGAÇÃO BIOMÉDICA E BIOFARMACÊUTICA IBB

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UNIVERSIDADE LUSÓFONA
RESEARCH CENTER FOR HEALTH SCIENCES & TECHNOLOGIES

Science Sessions 2023
Book of Abstracts

Catarina Rosado and L. Monteiro Rodrigues, eds.

Ângela Afonso

Constantinos Athanassopoulos

Marina Badenes

Margarida Florindo

Vera Isca

Ana Júlio

Catarina Leite

Bernardo Palma

Cíntia Pego

Miguel Remondes

Ana Ribeiro

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Science Sessions 2023

Development of human Cytochrome P450 competent genotoxicity tester bacterial systems for high throughput screening: Functional characterization of human Cytochrome P450 1A2 polymorphic variants

Bernardo Palma

CBIOS Lusófona's Research Center for Biosciences and Health Technologies, Universidade Lusófona, Lisbon, Portugal

Abstract

The formation of reactive metabolites through biotransformation is the suspected cause of many adverse drug reactions. Testing for the propensity of a drug to form reactive metabolites has increasingly become an integral part of lead-optimization strategy in drug discovery. DNA reactivity is one undesirable facet of a drug or its metabolites and can lead to increased risk of cancer and reproductive toxicity. Many drugs are metabolized by cytochromes P450 in the liver and other tissues, and these reactions can generate hard electrophiles. These hard electrophilic reactive metabolites may react with DNA and may be detected in standard in vitro genotoxicity assays; however, the majority of these assays fall short due to the use of animal-derived organ extracts that inadequately represent human metabolism. The current study describes the development of bacterial systems that efficiently detect DNA-damaging electrophilic reactive metabolites generated by human P450 biotransformation. These assays use a GFP reporter system that detects DNA damage through induction of the SOS response and a GFP reporter to control for cytotoxicity. Furthermore, since individual variations in cytochrome P450-mediated metabolism are believed to contribute to individual susceptibility to chemical carcinogenesis and CYP1A2 is one of the major forms of cytochrome P450 involved in drug metabolism and bioactivation of carcinogens. We have applied 8 nonsynonymous polymorphic variants of this CYP in the new developed assay.

Lecturer's resumé

Bernardo Brito Palma has a PhD in Chemistry and Pharmaceutical Sciences (specialty of Molecular Toxicology). He is an Assistant Professor at Universidade Lusófona. He has previously collaborated as a researcher in different academic institutions in the fields of Toxicology, Forensic Toxicology and Genetics.

He has experience in the private sector, namely as Team Leader of a Microbiology and Cellular Biology Laboratory GLP certified Lab in a company from the sector of agrochemicals, working as Study Director and consultant for technical and regulatory affairs. He is a qualified trainer for companies in the fields of Toxicology, Microbiology and Safety and Health at Work.

He has expertise in the Ames Test, mutagenesis assays, crop protection/crop nutrition, cytochrome P450; polymorphisms; high-throughput screening and microbiological quality control. His main research interest is the genotoxic potential of xenobiotics, especially in the context of metabolism and bioactivation using in vitro assays.

Functional characterization of neural circuits responsible for goal- directed behaviors in the healthy and Autistic brain

Miguel Remondes

Instituto de Medicina Molecular João Lobo Antunes, Faculdade de Medicina da Universidade de Lisboa
Faculty of Veterinary Medicine, Universidade Lusófona
Lisbon, Portugal

Abstract

The ability of selecting actions based on desired goals, according to knowledge stored previously in memory, is essential for survival. However, we must also be ready to adapt such behaviour to unexpected changes in context, often contrary to what would be supported by previous knowledge. The mechanisms behind these operations remain unknown, but available data strongly suggests that they rely on the synaptic connectivity associating the hippocampus with cortical structures. Thus-organized neural circuit is a frequent target of dysfunction in common neuropsychiatric conditions, namely Autism Spectrum Disorders (ASD), leading us to hypothesize that a malfunctioning cortico-thalamic-hippocampal circuit disrupts the translation of percepts between ego and allocentric reference frames, hindering behaviors directed at the outside world.

To dissect the mechanisms behind adaptive goal-directed behavior and dysfunctions thereof, we record and manipulate neural activity in rodents trained to perform goal-directed choices contingent on context, while we use, a) in vivo electrophysiology with 32-independently movable tetrodes targeting relevant brain areas, b) genetically- encoded neural actuators (Optogenetics and Chemogenetics) expressed in specific neuronal populations, and c) behavioral protocols using distinct contextual manipulations. By applying our experimental paradigm to VPA-ASD rodents we will characterize circuit malfunctions underlying behavioral deficits therein present, and test whether we can entrain native oscillatory and plasticity mechanisms to achieve a permanent reversal of ASD.

Lecturer's resumé

Miguel Remondes is originally a DVM (University of Lisbon), with 5 years of clinical activity in Portugal mainland and Azores. In 1998 he was selected for the Gulbenkian PhD Program in Biology and Medicine. After a first year of classes and courses, he headed to Pasadena to the California Institute of Technology (Caltech), to perform research on the mechanisms of memory and learning with Dr Erin Schuman. After graduating in Neuroscience, he moved to MIT (Brain and Cognitive Sciences Department, and Picower Institute), to study memory, learning and decision under the supervision of Dr Matthew Wilson. In 2014, after 15 years in the US, he arrived in Portugal to form his own research group. During this time, he established a Circuits/Systems Neuroscience Lab from empty ground, personally trained students in electronics, micromechanics, computer analysis, animal surgery, electrophysiology, animal behavior, and optogenetics. He found that cortical neurons respond to the recall of hippocampal memory (Cell Rep., 2015), and developed a novel implant to perform electrophysiology in rodents (Front. Neural Circuits, 2017). His first senior author article fills a critical gap in exploring the neural circuits and mechanisms supporting memory-guided behaviors (Cell Rep., 2019). His group then demonstrated that a section of the temporal lobe is necessary for rats to memorize time intervals (JNeurosci, 2021), and developed a novel surgical access to deep medial brain structures previously hard to access (eNeuro, 2021). Recently, in a collaboration with Dr Teresa Garcia-Marques, they found that humans solving a cognitive conflict perform better if perceptual effort is increased by dysfluency (Psych Res, 2022).

DiRhom2/ADAM17 pathways burning the fat

Marina Badenes

Faculty of Veterinary Medicine, University of Lisbon
Faculty of Veterinary Nursing, Polytechnic Institute of Lusofonia
Lisbon, Portugal

Abstract

Energy balance, the net outcome of caloric intake versus energy expenditure, is regulated by complex communication amongst metabolic organs (e.g. brain, nervous system, adipose tissues, liver, pancreas, immune system and skeletal muscles). Obesity has been rising in developed and middle-income countries. Therefore, extensive research efforts have been dedicated towards identifying pathways that can be drugged to promote weight loss to treat obesity.

iRhom1/2 are catalytically inactive Rhomboid proteases that modulate the maturation and activation of the ADAM17/TACE metalloprotease. This sheddase is an indispensable regulator of most cellular events, being required for the shedding of cytokines, growth factors, and their receptors, among other molecules.

My Research group found recently that iRhom2/ADAM17 pathway regulates adipocyte physiology, where deletion of this signaling on adipocytes protects mice from obesity and associated metabolic alterations. Our findings identify a novel iRhom2/ADAM17-dependent axis, regulated by beta-adrenergic receptors that may act to limit uncontrolled energy depletion during thermogenesis.

Lecturer's resumé

Since September 2022, Marina Badenes is a Professor of Citology and Histology at the Faculty of Veterinary Medicine, Lusofona University, and at the Faculty of Veterinary Nursing, Polytechnic Institute of Lusofonia. She has a Master of Veterinary Medicine at Veterinary Medicine Faculty of Lisbon (FMV, 2003-2009) and did an Internship in Biomedical research about the Evaluation of Delta like 4 functions in physiological and tumoural neoangiogenesis at FMV/CIISA/IGC(2008-2009). In addition, she has a PhD in Veterinary sciences, specialilty in biomedical sciences about the Evaluation of Dll4/Notch signaling in in the development of intestinal tumors, supported by FCT, at FMV/CIISA/IGC (2009-2016). After this, continued as a Postdoc at Membrane Traffic Lab, Gulbenkian Institute of Science (2015-2022) in the fields of metabolism; obesity; inflammation; cell signaling; cellular traffic. She has several papers published in international journals, such as Molecular Metabolism, Science Signaling, Clin Exp Metastasis, Cell Reports, BMC Cancer, PLOS ONE, Molecular Immunology.

Biobanco-iMM CAML- Tools for translational medicine

Ângela Afonso

Biobanco-iMM CAML (Instituto de Medicina Molecular Centro Académico de Medicina de Lisboa)
Lisbon, Portugal

Abstract

Biobanks are strategic tools for the development of medicine and translational research. The Biobanco-iMM CAML includes biological samples (from surgery, biopsies, blood samples, ...) which are voluntarily (upon filling an informed Consent) donated with permission for preservation and future use in biomedical research.

In 2022, Biobanco-iMM CAML has collected samples from 1163 new donors, aged between 1 and 91 years old, comprising 27500 donors at the biobank. Upon filling a specific informed consent form, the patients/donors provide blood, urine, tissue and saliva, as well as detailed clinical information. We established 4 new collections (depression, Angelman syndrome, multiple sclerosis and monkeypox).

The data is anonymized and made widely available to researchers around the world, contributing to new scientific discoveries about common and life-threatening diseases – such as cancer, heart disease and stroke – in order to improve public health.

Biobanks facilitates the study of the pathogenesis of multiple diseases with enormous impact on human health (such as neurological diseases, rheumatic disorders and cancer), contributing towards the development and establishment of new prognostic and diagnostic tests and identification of new therapeutic targets.

Lecturer's resumé

Ângela Afonso is the Area Manager of Biobanco-iMM of Academic Medical Centre- Biobanco-iMM CAML which brings together on the same campus a research institute (Instituto de Medicina Molecular João Lobo Antunes - iMM), a medical school (Faculdade de Medicina da Universidade de Lisboa - FMUL) and a university hospital (Centro Hospitalar Lisboa Norte - CHLN, Hospital de Santa Maria - HSM). Since 2012, 256 000 samples have been processed and stored, voluntarily donated by 25 000 donors, aiming to promote biomedical research. The samples are distributed in 60 collections that include 11 clinical and therapeutic areas, such as neurology, rheumatology, cardiology, oncology, and pediatrics.

Ângela is responsible for the management of the laboratory information management system (LIMS) database (developing new clinical questionnaires, samples request, and storage workflow), creating new sample collections with clinical doctors and researchers, implementation of OECD Principles of Good Laboratory Practice (GLP) and work according to the GDPR.

Targeting drug resistance in cancer stem cells: Hedgehog pathway inhibitors

Constantinos Athanassopoulos

University of Patras
Patras, Greece

Abstract

Cancer stem cells (CSCs) are a subpopulation of cancer cells with high clonogenic capacity and ability to reform parental tumors upon transplantation. Several types of CSCs have shown resistance to chemotherapy and therefore they have been "accused" for causing tunor relapse. In the last decade many efforts have been made to design molecules, able to specifically target CSCs and to differentiate or sensitize them to therapy.

Hedgehog (Hh) signaling is a highly conserved pathway that plays a vital role during embryonic development. Recently, uncontrolled activation of this pathway has been demonstrated in various types of cancer. Therefore, Hh pathway inhibitors have emerged as an important class of anti-cancer agents.

In this talk will be described the current research highlights about Hh pathway targeting, and our group's research results on the synthesis and biological evaluation of Taepeenin D analogs as downstream Hh inhibitors.

Lecturer's resumé

Prof. C.M. Athanassopoulos obtained his Diploma in Chemistry and his Ph.D in Organic Chemistry from the Chemistry Department, University of Patras. He has received three European fellowships in the frame of Human Capital & Mobility Program for post-doctoral research at the Universities of Calabria [IT] and Minho [PT]. Moreover, he received a grant from the Norwegian Research Council for post-doctoral research at the University of Bergen [NO]. He has delivered invited talks at La Sapienza University of Rome [IT] and the Universities of Calabria [IT], Palermo [IT], Bergen [NO], Insubria [IT], Paul Sabatier [FR], Catholic of Cordoba [AR], and Bio Bio [CL]. In 2017 he was appointed as "visiting professor" at Paul Sabatier's University, Toulouse, France and in 2018 at La Sapienza University, Rome, Italy to perform teaching and research (5 months). He has supervised 42 diploma, 24 MSc and 4 PhD theses. He has acted as Guest Editor for Special or Thematic Issues for the scientific journals: Molecules.; Antibiotics; Frontiers in Pharmacology and Food & Chemical Toxicology.

He is member of the Royal Society of Chemistry [UK], the American Chemical Society [USA], the American Society for Mass Spectrometry [USA], Hellenic Society of Medical Chemistry (HSMC) and the Association of Greek Chemists.

He is co-author in 58 original research papers in international peer reviewed journals with over 900 citations (h-index=19 and i10-index=31).

He is a management committee member or substitute of several COST actions related to his research activities (STRATAGEM, MECHSUSTIND, EURO-CHOLANGIO-NET, EURESTOP, PRESTO).

The BIOMATNANO4AD project: how long a way have we come?

Catarina Leite

CBIOS Lusófona's Research Center for Biosciences and Health Technologies, Universidade Lusófona
Lisbon, Portugal

Abstract

Atopic dermatitis (AD) is the biggest threat among skin conditions in terms of causing patients' disability and its prevalence is still rising every day. A hallmark of AD is the epidermal barrier dysfunction due to abnormal lipid metabolism causing alterations in the ceramides and fatty acid profiles. Gold standard approaches to treat AD include the daily administration of topical emollients together with the reactive administration of glucocorticoids (GC) during the crisis. This therapeutic approach is far from ideal due to corticophobia and the safety issues of GC therapy.

Sustainable technological approaches are hot topics in R&D&I and in current European Union and United Nations development policies. Europe needs locally produced biomaterials as the basis for innovative formulations, among which Hermetia illucens larvae oil seems to be particularly promising to tackle AD due to its fatty acid composition.

BIOMATNANO4AD aims to fulfil the current needs in AD management through a bioinspired, nanotechnological, and sustainable approach combining multifunctional biomaterials in lipid-based nanocarriers that can synergically perform as GC delivery systems and topical emollients.

The pentagonal coalition of ceramides, insect oil, ionic liquids, nanotechnology, and glucocorticoids in an innovative multifunctional nanoformulation will allow overcoming existing therapeutic limitations of AD.

The product development strategy has been based on the initial optimization and characterization of lipid-based nanocarriers, followed by enhancement of nanosystem performance using biobased ionic liquids. The optimized nanosystems by quality-by-design strategies have then proceeded to in vitro and in vivo safety assessments. Finally, the efficacy evaluation of the biocompatible nanoformulations are ongoing through in vitro and in vivo methodologies.

At the end of BIOMATNANO4AD, it is expected that at least one nanoformulation will have reached a preclinical stage, with potential to make a significant contribution towards a cost-effective treatment for AD patients.

Lecturer's resumé

Catarina Pereira-Leite (CPL) is currently an Assistant Professor at School of Health Sciences and Technologies of Lusófona University and she is an integrated member of CBIOS - Research Center for Biosciences & Health Technologies and a collaborator of LAQV, REQUIMTE. CPL received her PhD Degree in Pharmaceutical Sciences / Biological Sciences (Biochemistry) from Faculty of Pharmacy, University of Porto (FFUP) and Chemistry Institute, University of São Paulo (IQ-USP), under a cotutelle agreement, in December 2017. CPL graduated in Pharmaceutical Sciences (Integrated Master's) from FFUP in 2012. Understanding biological barriers and finding nanoways of overcoming them are the main research interests of CPL. Initially, her research was focused on understanding biological membranes for the development of more effective and safer anti-inflammatory drugs. More recently, her research line has also evolved towards the design of bioinspired nanosolutions for pharmaceutical and cosmetic applications. In 2021, the exploratory project "Bioinspired materials in nanosolutions to tackle atopic dermatitis" submitted by CPL as principal investigator was recommended for funding by FCT. CPL published more than 20 full articles in peer-reviewed international journals, as well as participated in various (inter)national conferences with oral and poster communications. She has been involved in the supervision of PhD, MSc, and BSc students and in teaching activities for graduation programs and advanced training. She has also been involved in the coordination and participation of various scientific outreach activities for general society and high school students.

Relationship between body composition and cardiovascular risk factors: comparison between vegetarian and omnivorous individuals

Cíntia Pêgo

CBIOS Lusófona's Research Center for Biosciences and Health Technologies, Universidade Lusófona
Lisbon, Portugal

Abstract

In the last years, nutrition's role in the prevention of non-communicable diseases has been widely studied, and the reduced consumption of animal products has been associated with better body composition and better lipid profile, and, consequently, with a lower cardiovascular risk. For all these reasons, the main objective of this study was to evaluate body composition and relate it with cardiometabolic parameters and cardiovascular risk, in vegetarian and omnivorous individuals. Body composition was assessed using a dual-energy x-ray absorptiometry, biochemical parameters were obtained from capillary blood and the 10-year risk for cardiovascular disease (10RCVD) was calculated using the QRISK ® 3 score. A cross-sectional observational study, including a total sample of 176 participants (61 vegetarians and 115 omnivores), with a median weight of 64.10 kg, and a median BMI of 22.53 kg/m2 was designed.

Lecturer's resumé

Cíntia Ferreira-Pêgo graduated in Human Nutrition and Dietetics from the Universitat Rovira i Virgili, Spain, and a master's in Training and Sports Nutrition from the Universidad Europea de Madrid, Spain. She obtained her Ph.D. with International Mention in Nutrition and Metabolism from the Universitat Rovira i Virgili, Spain, and the University of Arkansas, USA. Assistant researcher at CBIOS, and Director of the Nutrition Sciences Bachelor at Universidade Lusófona. Currently, her main interest resides in the relationship between different dietary habits (mainly plant-based diets, such as vegetarianism and the Mediterranean diet) and body composition, metabolic markers, and cardiovascular risk. Her main epidemiological research interests reside in studying dietary patterns, the consumption of specific food and beverages, and their relationship with health and disease.

New class of PKC modulators: from ethnopharmacological studies to nanotechnology

Vera Isca

CBIOS Lusófona's Research Center for Biosciences and Health Technologies, Universidade Lusófona
Lisbon, Portugal

Abstract

Cancer is one of the most common causes of death worldwide. Protein kinase C (PKC) are a class of enzymes often linked to carcinogenesis. Additionally, the development of multidrug resistance (MDR), mainly associated with P-glycoprotein (P- gp) is the major cause of failure in traditional cancer chemotherapy.

Plectranthus spp. have been used in traditional medicine for various ailments, including cancer, and its bioactive components have been investigated for their potential anticancer effects. In particular, the compound 7α-acetoxy-6β- hydroxyroyleanone (Roy, 1) displayed promising antiproliferative activity against several cancer cell lines.

This study embarks on an exploration of Roy 1, as a lead compound for the development of novel drugs. The acetonic ultrasound-assisted extraction optimization of Roy 1 (46.8 µg.mg -1) from P. grandidentatus was reported. Moreover, the reactivity of Roy 1 was explored to prepare new bioactive esters. Consequently, a new ester derivative and four known compounds were prepared, pointing to the most reactive hydroxyl group at position C12. Moreover, Roy 1 and its selected derivatives 20 and 21, aqueous stability was evidenced. Furthermore, a prediction molecular docking study was done to select the potential royleanone derivatives to modulate PKC. The synthesis of 30 derivatives was building upon molecular docking predictions, and the reactivity findings, including 23 new ester derivatives. Likewise, the synthesis of Roy 1 gold NPs was done, as a preliminary study to improve the low water solubility of these compounds. All derivatives were tested in cancer cells, pointing to the selection of four derivatives (52, 53, 64, and 66) to test in a PKC yeast-based assay, and finally one hit derivative (53) was assessed in PKC enzymatic assay. Notably, promising cytotoxic effects were observed in several derivatives, including 20 (as a PKC-δ activator), 21, and 22 (functioning as P-gp inhibitors), as well as 52, 53, 64, and 66 (in breast cancer cell lines). The analog 53 exhibited remarkable PKC-α activation. The findings described contribute to the expansion of more potent and selective antitumoral agents.

Lecturer's resumé

Vera M. S. Isca, PhD of Pharmacy, in the field of Pharmaceutical and Therapeutic Chemistry, October 2023. Vera serves as an Assistant Professor at Universidade Lusófona de Lisboa and has received seven scientific awards. She has published eighteen scientific articles and a book chapter in the field of natural products chemistry and medicinal chemistry. She has also delivered thirty-six oral presentations at scientific meetings.

Application of ionic liquids in the development of sustained delivery systems

Ana Júlio

CBIOS Lusófona's Research Center for Biosciences and Health Technologies, Universidade Lusófona
Lisbon, Portugal

Abstract

The development of drug delivery systems, namely for controlled release, presents some issues, so finding new strategies and/or excipients to surpass these challenges is crucial and ionic liquids (ILs) may be key materials in this matter. Hence, the aim of the work was to explore the applicability of ILs in the development of more effective sustained drug delivery systems, namely polymeric nanoparticles, lipidic implants, and transfersomes, all containing ILs.

Firstly, IL-polymer nanoparticle hybrid systems containing rutin were prepared using the polymer poly(lactic-co-glycolic acid) (PLGA) and two biobased ILs, (2-hydroxyethyl)-trimethylammonium-L-phenylalaninate [Cho][Phe] and the (2-hydroxyethyl)- trimethylammonium-L-glutaminate [Cho][Glu]. The hybrid systems presented good physicochemical properties, with an enhance of the drug association efficiency. Results also indicated that the developed systems may be suitable for skin topical applications since no relevant skin permeability was observed and no toxicity was shown in the cell viability study in HaCaT, human keratinocytes.

Lipidic implants containing caffeine, salicylic acid, or rutin, were also prepared. Different compositions were studied, namely the incorporation of the ILs [Cho][Phe] and [Cho][Glu], and of two different release adjuvants, Gelucire® 50/02 and sucrose. Results demonstrated that both ILs were valuable materials by facilitating the formulation procedure, improving drug loading and allowing a more suitable release profile.

New transfersomes containing ILs (TransfersomILs) were developed, taking into account an optimized formulation obtained herein from a 15-run, 3-factor, 3-level Box–Behnken factorial design (BBD). The TransfersomILs were prepared in the presence of 1-ethyl-3- methylimidazolium bromide [Emim][Br], 2-hydroxyethyl-trimethylammonium glycinate [Cho][Gly], 1-ethyl-3-methylimidazolium glycinate [Emim][Gly] and also using ILs combinations, to incorporate rutin. These TransfersomILs presented a smaller size, had better drug loading, and released more total drug amount compared to transfersomes without ILs. The ILs also improved the stability of the nanovesicles during storage.

In summary, this work highlights the remarkable potential of ILs, even at low and safe concentrations, to act as key multifunctional materials to optimize the performance of sustained delivery systems in multiple ways.

Lecturer's resumé

Ana Júlio is a PhD Student in Health Sciences at the Research Center for Biosciences and Health Technologies (CBIOS), from Lusófona's University, Portugal.

She has already published 17 articles in national and international peer-reviewed journals and she is also author/co-author of several oral/poster communications. She has also won 3 awards with her work and/or in collaborations. Her research interests focus on producing hybrid systems that combine drug delivery systems and ionic liquids.

Estudo da influência da atividade física na posição ortostática sobre a fisiologia vascular dos membros inferiores

Margarida Florindo

Portuguese Red Cross Superior Health School (ESSCVP-Lisboa)
CBIOS Lusófona's Research Center for Biosciences and Health Technologies, Universidade Lusófona
Lisbon, Portugal

Abstract

A atividade física tem um papel crucial na promoção da saúde cardiovascular, beneficiando especialmente a função e a perfusão dos membros inferiores, considerada a região do corpo mais suscetível a doenças vasculares ligadas à postura ortostática e ao envelhecimento. Os estudos sobre a hemodinâmica dos membros inferiores durante a atividade física, não são claros sobretudo em indivíduos saudáveis. O objetivo principal foi estudar a dinâmica na perfusão periférica e na função cardiocirculatória dos membros inferiores, durante a atividade física na posição ortostática. A metodologia experimental utilizou tecnologias óticas não invasivas: fluxometria por laser Doppler para avaliar a perfusão, a fotopletismografia para análise do volume sanguíneo e a espectroscopia por luz polarizada para obter imagens da perfusão em tempo real. A pressão arterial sistólica e diastólica, a média da pressão arterial e a frequência de pulso também foram monitorizados como indicadores-chave da saúde cardiovascular. A metodologia envolveu um protocolo dividido em três fases: a fase um em pé parada; a fase dois durante a realização de atividade física; e a fase três de recuperação na posição de pé parados. Os resultados foram organizados em três marcos de investigação: O marco 1, identificou as tecnologias não-invasivas para estudar a perfusão e a sua importância na compreensão da fisiologia vascular; No marco 2, foram exploradas as assimetrias de fluxo sanguíneo entre os membros inferiores, especialmente em indivíduos saudáveis e destacando determinantes como a idade, o sexo, o índice de massa corporal (IMC) e a posição ortostática; No marco 3, o estudo concentrou-se em indivíduos mais velhos e sedentários com co-morbilidades que, após um programa regular de atividade física, mostraram um aumento significativo na perfusão dos membros inferiores, sugerindo melhorias na perfusão e na saúde cardiovascular. Os resultados indicaram que, mesmo exercícios leves, podem ter um impacto positivo na saúde vascular, reforçando a importância da atividade física regular.

Lecturer's resumé

Margarida Maria Esteves Florindo, Physiotherapist since 1984, specialized in the area of neurological conditions, with clinical practice to date. She has obtained her master (2007) in Évora University in Social and Management health Intervention and is teaching as an assistant professor at Portuguese Red Cross Superior Health School (ESSCVP-Lisboa). PhD student at the School of Health Sciences and Technologies of Lusófona University and researcher at CBIOS - Research Center for Biosciences & Health Technologies. Special interest in the areas of normal movement, motor control, physiotherapy in neurology and areas related to peripheral circulation and microcirculation.

Emulating the complexity of human skin with organ-on-a-chip technology for nanotoxicity assessment

Ana Ribeiro

INL – International Iberian Nanotechnology Laboratory, Nanosafety Research Group
Braga, Portugal

Abstract

The body's largest organ, the skin, is continually exposed to and influenced by both natural and human-made nanomaterials, which are materials with dimensions in the nanoscale range. This wide range of exposures can lead to irreversible health effects, ranging from skin corrosion to the development of cancer. Organ-on-chip systems have the potential to accurately replicate skin physiology and could revolutionize the assessment of the safety of nanomaterials. In this presentation, recent advancements in skin-on-chip models and their ability to uncover biological mechanisms will be explored. Additionally, strategies for mimicking skin physiology on these chips, enhancing control over the exposure and transport of nanomaterials within cells will be covered. Lastly, future opportunities and challenges, encompassing aspects from design and fabrication to gaining acceptance from regulatory bodies and the industry will be highlighted.

Lecturer's resumé

Ana Ribeiro has a graduation in Materials Engineering from the University of Minho, an MSc in Processing and Materials Characterization obtained at the same university and a PhD in Biomedical Engineering obtained from the University of Porto. She has broad international postdoctoral and teaching experience in the field of nanotoxicology, bioengineering, and biomaterials (Instituto Nacional de Metrologia Qualidade e Tecnologia, Brazil; University of Illinois Chicago, US; Universidade do Grande Rio, Brazil; Vellore Institute of Technology, Vellore, India). In 2018 she joined the Nanosafety group at the International Iberian Nanotechnology Laboratory as a staff researcher working on organ-on-chip, nanotoxicology and cell communication. Her research focuses on developing bioengineered organ-on-chip platforms (e.g., skin) for the nanomaterials risk assessment. In summary, her experience in research ranges from biomaterials, surface modification and degradation to biomimetics, advanced cell culture models for nanotoxicology, and diagnostic biomarkers for bone diseases. During her academic path, she has developed novel technologies combining advanced tissue engineering approaches with nanotoxicology. Her innovative findings have been well accepted within the scientific community, with translatable societal, clinical, and industrial impact, resulting in numerous highly relevant top-tier publications and excellence awards. She has > 80 contributions to conferences (> 20 invited), 41 peer-reviewed publications (h-index=20 GoS), and three book chapters.