

PALESTRAS NO DEPARTAMENTO DE QUÍMICA E BIOQUÍMICA@FCUP

no âmbito das Jornadas de Biotecnologia e Biologia Sintética 2024
11 de julho de 2024, 14:30-16:30, sala FC2 101

NanoBiomaterials and Neurosciences: A Revolutionary Alliance!

Ana Paula Pêgo

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One of the current challenges facing the neuroscience field is the development of effective therapies that can enhance the regenerative capacity of the nervous system based on the advances achieved in basic research.

At the nanoBiomaterials for Targeted Therapies group we have been dedicated to using nanobiomaterials to both, design new tissue engineered neural in vitro models for target/drug discovery and develop nano-enabled new therapeutic approaches towards the enhancement of the process of nerve regeneration.

In this talk, I will discuss how we are exploring bioengineering, and biomaterials in particular, to generate relevant macroglia tissue models to dissect new mechanobiology mechanisms and identify novel therapeutic targets, with expected impact in the treatment of neurodegenerative diseases. Furthermore, our strategies to design biomaterial-based nanoparticles for targeted nucleic acid delivery to neurons to promote neuroprotection and neuroregeneration will be presented.

About the speaker



Ana Paula Pêgo got her Ph.D. in Polymer Chemistry and Biomaterials from the University of Twente, the Netherlands, in 2002. In 2003 she moved to INEB – Instituto de Engenharia Biomédica, where she became a Principal Investigator in 2012. In 2015, INEB joined the i3S – Instituto de Investigação e Inovação em Saúde (Universidade do Porto), where Ana Paula Pêgo leads the nanoBiomaterials for Targeted Therapies (nBTT) Group. She is an Invited Associate Professor at the Instituto de Ciências Biomédicas Abel Salazar (ICBAS) of the University of Porto.

By using nanomedicine strategies, the nBTT Group aims at providing *in situ* and in a targeted manner the required signals to promote nervous tissue regeneration. The research on new biomaterials for application in neurosciences includes the development of new polymers for the design of alternative vectors to viruses for efficient nucleic acid delivery, the preparation of nerve grafts for spinal cord injury treatment and the design of brain tissue engineered platforms for therapeutic targets discovery and drug testing. Societal and ethical issues that concern Regenerative Medicine and NanoMedicine are also topics in which Ana Paula Pêgo is involved.

Pêgo is very proud of her mentoring/supervision duties actively contributing to the training of the next generation of bioengineers. To date more than 70 students (PhD and MSc) have been supervised by her.

Currently Ana Paula Pêgo is a member of the Board of Directors of i3S, being the Head of Strategy & Creation of Value Unit, serves as an Associate Editor of Biomaterials (Elsevier journal) and is part of the Board of Reviewing Editors of Science (AAAS). She has been in the Council of the ESB (European Society for Biomaterials) since 2015, having been the President of the Society from 2021-2023.

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Advanced biomaterials for cardiovascular and antimicrobial applications: from basic science to technology transfer

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GOTECH Antimicrobial, R. Alfredo Allen 208, 4200-135 Porto, Portugal.

In an aging population with increasing health challenges, medical devices will need to substantially improve performance.

Making use of graphene-based materials' outstanding mechanical strength, high area/thickness ratio, conductivity and light absorption, and by playing with their properties (thickness, lateral size and oxidation), we are designing new biomaterials and medical devices with enhanced performance, with primary focus on antimicrobial and cardiovascular applications.

We explore conjugation of graphene, polymers/matrices and production techniques according to the desired application and evaluate the interaction of the resulting graphene biomaterials with biological systems (mammalian cells, bacteria and blood components), both in vitro and in vivo.

Some examples are:

- i) reinforced hydrogels for load bearing applications, that we are using to develop synthetic vascular prosthesis, such as the GO-graft for coronary bypass surgery;
- ii) energy harvesting systems for implantable electronic medical devices, that we are using to develop the iGraft, an intelligent self-powered vascular graft that generates electricity from blood flow and sends wireless alerts before failure to allow medical intervention before occurrence of a second cardiovascular event;
- iii) antimicrobial 3D printed scaffolds for tissue engineering;
- iv) light-activated antimicrobial surfaces, that we are using to develop disinfection systems like the GOcap, a disinfection cap to prevent catheter-related infections.

About the speaker



Inês C. Gonçalves is Principal Investigator at i3S – Instituto de Investigação e Inovação em Saúde, and Leader of the Advanced Graphene Biomaterials Group. She is co-founder and CEO of GOTECH Antimicrobial, a MedTech startup dedicated to the development of disinfection systems to solve medical device-related infection. She is also board member of the Iberian Society of Biomechanics and Biomaterials (SIBB). From 2010 to 2021 she was invited professor at University of Porto (FEUP and ICBAS), teaching in Bioengineering courses.

Inês is a Microbiologist with PhD in Biomedical Engineering. She focuses on the development of graphene biomaterials and medical devices for antimicrobial and cardiovascular applications, ranging from fundamental

science to translational applications.

Her work has been recognized with over 30 national and international awards, including "Pulido Valente Science Prize", the "Medal of Honor L'Oreal for women in science", the "Welcome Trust Innovator Award", and "Dona Antónia – Revelação 2022" Prize.