



Politecnico
di Torino

DIMEAS SEMINAR

SUSTAINABLE TISSUE ENGINEERING: THE ROLE OF ELECTRICALLY CONDUCTIVE MATERIALS

SPEAKER



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Monday June 30th 2025
12 pm



Meeting room, III floor,
DIMEAS – Politecnico di Torino

PROGRAM

Abstract

Electrical response is an inherent property of different tissues, ranging from neural to bone, across the human body. Stem cells hold the promise of, through their ability to differentiate on specific lineages, support regenerative medicine and tissue engineering based therapies. While, initial studies used biomolecules to act on cells signaling pathways, later it has been recognized the importance of the extracellular matrix and materials properties, including mechanical on control of stem cells fate. Currently, it is a new trend to use of other physical stimuli, with focus on electrical and magnetic stimuli. Importantly, cancer and healthy somatic cells distinct bioelectrical properties have been reported. Here, we present our, and collaborators, research on using piezoelectric and electroconductive materials in regenerative medicine, cancer therapies and beyond to foster different scaffolding and tissue manufacturing approaches able to trigger cell responses to electrical or ultrasound stimulation.

The presentation delves in different directions:

- 1.starts with the development of electroconductive and piezoelectric nanofibers to direct induced pluripotent stem cells (iPSCs) differentiation towards neural and mesenchymal stem/stromal cells (MSC) towards bone formation, respectively;
2. scale to tridimensional structures providing examples of either integration of electroconductive materials on thermoplastics 3D printing or 3D bioprinting of hydrogels loaded with piezoelectric nanoparticles and MSC for to fabricate constructs responsive to wireless stimulation;
3. turns the attention to the possibility of using electrical stimulation, aided by piezoelectric and electrical responsive nanoparticles to develop therapies for cancer, and
- 4.ends by moving to the field of sustainable tissue engineering presenting work on the use of electrical stimulation and developing of edible vegan bioinks for prototyping tissue cultured seafood.

Overall, different complementary approaches are presented aiming to stimulate a discussion on new uses and needs to develop new electrically conductive materials for sustainable tissue engineering.

Biography

Prof Frederico Ferreira is an Associate Professor at the Department of Bioengineering at Instituto Superior Tecnico, Lisbon. He got his Ph.D. in 2004 from Imperial College London and holds a MBA (2006–2008) and a BSc on Chemistry, specialization in Biotechnology, both from Nova University of Lisbon.

Frederico Ferreira current research interests are focused on (i) Tissue engineering and cancer therapies using stimuli responsive material; (ii) Sustainable separations and biorefineries exploring unconventional yeasts for production; and (iii) Cellular Agriculture, with focus in novel strategies for texturizing cultured seafood.