

Suélia Fleury Rosa

University of Brasilia

Lecture Topic 1: Essential Aspects Applied to the Development and Innovation of Technological Solutions

Keywords: translational research, regulatory system, industry

This lecture aims to demonstrate the experience of generating scientific results and building solutions through the direct action of academics with STEM (Science, Technology, Engineering and Mathematics) characteristics and concepts that require interaction and knowledge in some essential and collaborative pillars. The renewed awareness of the concepts and methods of the adjustments we can apply can optimize resources and drive innovation and development with real results and translate bench results. Decades of preclinical, clinical and translational research adapted to the technological development scenario provide a roadmap that can be used to align society's needs and the deliverability of science, strengthening the scientific indicators of universities. We will discuss how the construction of engineering and innovation development bridges will provide the necessary pillars of paths and actions to build effective and feasible solutions.

Lecture Topic 2: Utilizing Organs-on-a-Chip in Biomedical Engineering and Biotechnology as an Alternative to High-Throughput Models

Keywords: tissue regeneration, diabetic ulcer, latex application

In this lecture, we will discuss the process of tissue regeneration, which has been studied in different lines of research with the aim of optimizing it. We will cover various aspects, such as pathophysiology, risk factors, anti-inflammatory drugs, and chemicals that may interact with healing. Among these resources, there are two methods that have demonstrated efficacy in aiding wound healing: low-intensity LED therapy and the use of natural latex derived from the *Hevea brasiliensis* rubber tree. We will present the use of organ platforms, which are tissue models on a chip within a microfluidic platform, and simulate the circulation and physiological behavior of the system, utilizing the latest "organ-on-chip" technology (created in his lab). We will discuss how this technology can contribute to our understanding of development, as well as serve as a valuable tool for disease modeling and drug development. Finally, we will show that the use of microfluidic systems by Biomedical Engineering and Biotechnology can serve as an alternative to high-throughput models.

Lecture Topic 3: Mathematical Modelling of Dynamic Biological Systems using Bond Graph

Keywords: systems, space state, control

Mathematical modelling and simulations of biological phenomena are a way to minimize clinical trials, because through simulations, analysis and discussion of the findings we can reduce and improve the expected clinical outcome of the technology. Knowing how biological systems respond is essential in the development of solutions. With the introduction of new tools for simulation and analysis the techniques of modern control and modelling of mechatronic systems are migrating their applications in biological systems. In this Lecture will be presented the introduction to dynamic modelling techniques used in contemporary research in Biomedical Engineering and Bioengineering.