Advanced Microsystems for Musculoskeletal and Toxicological Research: Innovations in Joint-on-a-Chip and Multi-Organ Systems

Prof. Mario Rothbauer
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Date : 9 May 2025 (Friday)
Time : 2:30pm
Venue : ERB1122, William M W Mong Engineering, CUHK

Abstract

Recent advancements in microphysiological systems (MPS) are revolutionizing biomedical research, particularly in modeling complex human musculoskeletal biology and toxicological responses. This talk will explore cutting-edge microsystems designed to replicate critical aspects of joint physiology, emphasizing integrated joint-on-a-chip platforms that simulate interactions between cartilage, synovium, and tendon tissues. These microsystems leverage innovative microfabrication, biomaterials engineering, and controlled biomechanical stimuli, enabling precise interrogation of cellular behaviors, inflammation pathways, degeneration mechanisms, and regenerative strategies in a physiologically relevant context.

Additionally, the presentation will highlight developments in multi-organ-chip technologies tailored to environmental toxicology and chemical, biological, radiological, and nuclear (CBRN) threat assessment. Such integrated platforms provide novel approaches to evaluate ecotoxicological impacts and biohazard responses by simulating interconnected human organs, facilitating rapid, predictive, and ethically responsible toxicity screening.

Biography

Priv.-Doz. Dr. Mario Rothbauer is a leading researcher in musculoskeletal bioengineering, microphysiological systems, and non-animal testing methodologies. He heads the Orthopedic Microsystems Group at the Medical University of Vienna, where his research involves developing advanced joint-on-a-chip platforms to study diseases such as osteoarthritis and rheumatoid arthritis. Additionally, Dr. Rothbauer leads the Microtoxicology & Non-Animal-Methods Unit at the CellChipGroup of the TU Wien, focusing on innovative lab-on-a-chip technologies and microfluidic systems for improved toxicological assessments. His interdisciplinary approach integrates biotechnology, materials science, and microfabrication techniques to advance ethical and effective biomedical research and environmental safety assessments. He also actively engages in promoting ethical research practices as Vice President of the European Society for Alternatives to Animal Testing (EUSAAT), advocating the implementation of the 3Rs principles (Replacement, Reduction, and Refinement) across biomedical research.

***** ALL ARE WELCOME *****

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