

Developing *in vitro* models of human tissues

Biomedical engineering at the Faculty of Medicine, University of Maribor

The presentation will establish basic concepts of tissue engineering, 3D biofabrication and the development of microphysiological systems, and provide insight into some of the work in progress at the Institute of Biomedical Sciences, Faculty of Medicine, University of Maribor (IBV).

The development of advanced *in vitro* models of human tissues stands at the forefront of advancing medical sciences by developing innovative solutions to complex health issues and requires an interdisciplinary approach combining different fields such as cell and molecular biology, biochemistry, materials science, additive technologies. The development process can vary substantially depending on the target tissue/application and the expected functional characteristics.

At IBV different aspects of *in vitro* tissue model development are explored in parallel and in synergy in the hopes of obtaining new insights into the (patho)physiology of human tissues and organs and creating new ways for the treatment of complex diseases and personalized medicine.

Our research activities include the cell culture of immortalized and primary cell lines, which are also isolated and characterization in-house. In parallel, polymer-based hydrogel formulations are developed to mimic the physico-chemical properties of native tissues and are combined with cells to form bioinks. Using extrusion-based, microfluidics and lithographic 3D printing techniques, tissue scaffolds and custom-made microfluidic devices are developed and integrated into microphysiological systems (organ-on-a-chip devices) which allow prolonged maturation, continuous monitoring and functional analysis.