Olivier Frey

Olivier Frey is VP of Technologies & Platforms at InSphero and leads the activities for Microphysiological Systems and Organ-on-Chip Technologies. Before joining InSphero, he was group leader and Ambizione fellow at the Department of Biosystems Science and Engineering of ETH Zurich, Switzerland. In the Bio Engineering Laboratory of Prof. Andreas Hierlemann he was responsible for the development of integrated microfluidic systems for single cell handling and 3D tissue cultures. Included are in particular multi-tissue systems, or so-called "Body-on-a-Chip" configurations based on 3D microtissue spheroids for perfusion culturing, on-chip and off-chip analysis and interaction. Olivier Frey received his Doctoral degree in Micro Engineering from EPF Lausanne, Switzerland, Laboratory of Prof. Nico de Rooij, and a Diploma in Microtechnology, Mechanics and Economics from ETH Zürich.

Abstract:

Studying and understanding the etiologies of diseases, with the goal of developing novel therapeutic approaches translated into safe and efficient drugs, presents manifold challenges. In-vitro cell-based assays represent one of the key group of techniques and with the evolution of complex 3D tissue models receive more and more attention and a greater share in the drug discovery process. Routine implementation of novel in-vitro systems requires control over the sometimes complex tissue- and disease-relevant parameters and at the same time simple and robust methods for handling, experimentation and readout. This becomes particularly true when studying organ-organ interactions involving tissue models from different types in fluidic communication.

Our new generation of readily available and screening-compatible 3D microtissues models are able to emulate the healthy and various diseased states of different organ models including human liver and pancreatic islets as well as a large set of tumors. Accessing the biology of the models in a reliable and reproducible way to a large extend depends on the platforms, in which the microtissues are cultured and handled in. We therefore specially engineered and matched our 96 and 384-well plates to the microtissue morphology considering easy, but highest quality optical inspection, reliable and efficient medium exchange and compound dosing preserving maximal functionality and allowing seamless integration into automation systems. Together with the uniform, functionally robust, and long-lived characteristics of the microtissues a complete screening platform for a wide set of efficacy and safety testing can be offered.

The next steps toward more complex in-vitro models includes the combinations of such advanced microtissues in a microphysiological system to study their interactions. We extended our technology platform by a microfluidic plate based on SBS standards, which enables culturing of the same microtissues also under physiological flow conditions, and with the flexibility to interconnect and culture different types of microtissues multi-tissue configurations. Up to 10 same or different microtissues can be interconnected and cultured in 8 identical or different conditions in parallel per plate.

Providing continuity of the microtissue models enables maximal translatability between the different pre-clinical applications and control over the increasing model complexity along the drug discovery process.