

Organs-on-a-Chip: A new tool for studying human physiology

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Between 60 to 90% of the drugs that successfully pass animal trials fail in human clinical trials. This poor statistic demonstrates the urgent need for a human-relevant model. Micro-engineered cell culture models, termed Organs-on-Chips, have emerged as a new tool to recapitulate human physiology and drug responses. Multiple studies and research programs have shown that Organs-on-Chips can capture the multicellular architectures, vascular-parenchymal tissue interfaces, chemical gradients, mechanical cues, and vascular perfusion of the body. Accordingly, these models can reproduce tissue and organ functionality and mimic human disease states to an extent thus far unattainable with conventional 2D or 3D culture systems. In this talk, we will present two approaches of using this technology. The first, will demonstrate how drug can be tested by linking of 8 human-Organ-on-a-Chip and showing results that are comparable to clinical data. Furthermore, we demonstrate how to exploit the micro-engineering technology in a novel system-level approach to decompose the integrated functions of the neurovascular unit into individual cellular compartments, while retaining their paracellular metabolic coupling.