

Microfluidic gut-liver-on-a-chip for studying the first-pass metabolism

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Due to the difficulty of directly testing animal or human subjects, cell-based in vitro model systems are widely used in pharmaceutical industry. However, currently available in vitro systems are far from a faithful reproduction of an organism. For example, the effect of a xenobiotic compounds is tested in vitro by incubating a monolayer of cells in the presence of the drug, whereas in human body the drug goes through a dynamic process of metabolism and excretion, which result in complex whole-body response. Combination of microscale technology, mathematical modeling, and biomaterials can contribute to developing an in vitro system that mimics the human body better. Herein we introduce the concept of microfluidic system aimed at reproducing the pharmacokinetic profiles of drugs in the body. In particular, we focus on reproducing the first-pass metabolism of drugs after passing the gut and the liver. This type of device can contribute to improving the accuracy of screening for pharmaceutical and health-promoting compounds.