

An *in vitro* intestinal absorption platform with 3-D hydrogel villi scaffold

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The process of drug absorption through the small intestine is an important factor in determining the pharmacokinetic-pharmacodynamic profiles of oral drugs. The current *in vitro* method for measuring the kinetics of drug absorption relies on 2-D monolayer culture of Caco-2 cells on a porous membrane, but it does not replicate *in vivo* behavior faithfully. In this study, a microfluidic platform integrated with the 3-D hydrogel villi scaffold can provide a physiologically realistic environment resembling the human intestine. The 3-D hydrogel scaffold was fabricated using novel microfabrication technique, and integrated into a microfluidic device with two-story structure to mimic the fluid flow in the apical and basolateral side. A gravity-induced flow was used to reproduce the various flow rates in the small intestine, and diffusion profile across the hydrogel scaffold was examined. When combined with intestinal cell culture model, this novel 3-D microfluidic system can serve as an *in vitro* platform that better mimics the *in vivo* environment.