

Assay for flavonoid metabolism and biological activity in liver using *in vitro* microfluidic device with immobilized microsomes in 3-D hydrogel

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Flavonoids, polyphenol produced by plants, play various beneficial roles against diseases such as heart diseases and cancer. This beneficial effect is thought to come from the anti-oxidant activity, but the detailed mechanisms of absorption, metabolism and bioactivity are not fully known. A microfluidic device was developed to mimic *in vitro* the metabolism and subsequent biological activity of flavonoids *in vivo*. UV-polymerizable hydrogel, poly(ethylene glycol) diacrylate (PEGDA) was used to immobilize liver microsomes inside a microfluidic channel which reproduces the blood flow in the human liver. The kinetics of metabolism in the microfluidic channel was examined and quantified with a mathematical simulation. The biological activity of the flavonoid metabolites was examined by using 1,1-diphenyl-2-hydrazyl(DPPH) assay commonly used for determination of anti-oxidant capacity. This microfluidic system can be helpful in clarifying the mechanism underlying the beneficial effect of flavonoids and improve the efficiency of the screening process for developing dietary supplement from plants.