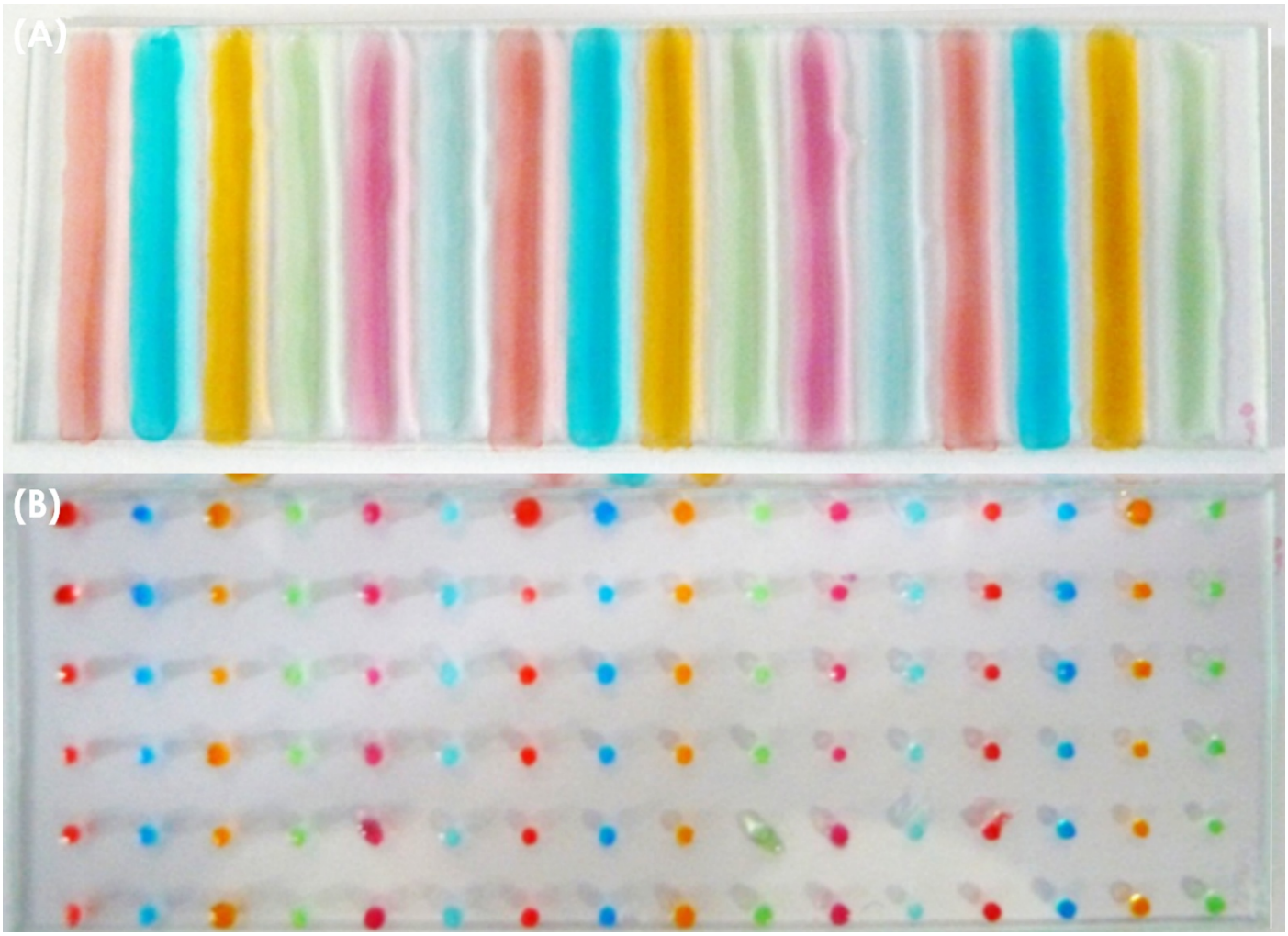
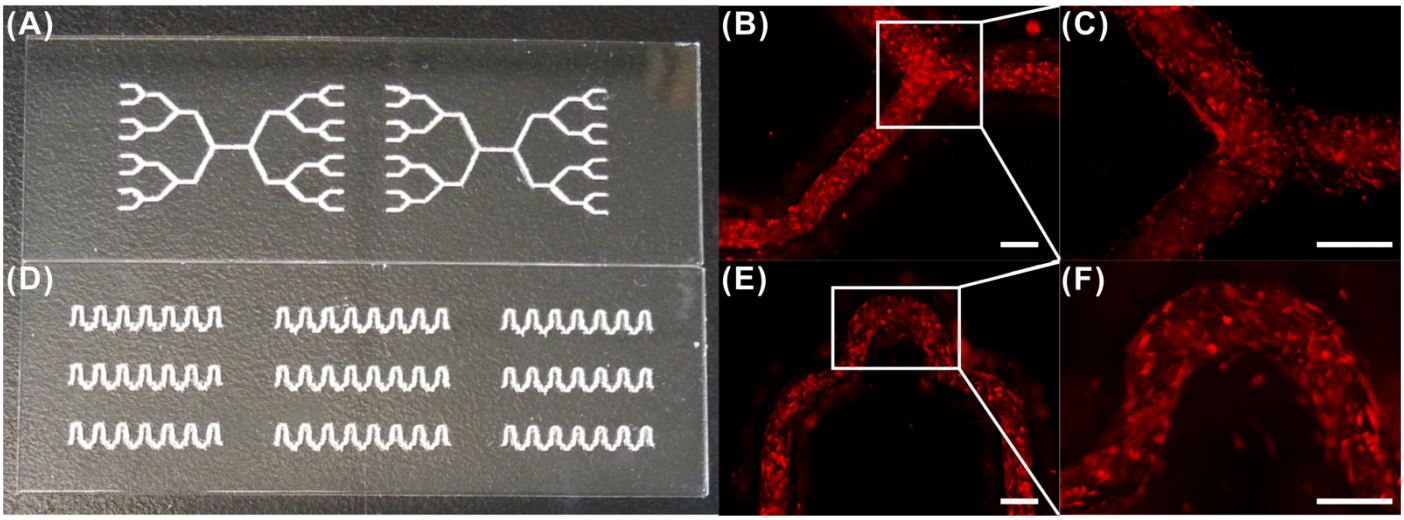


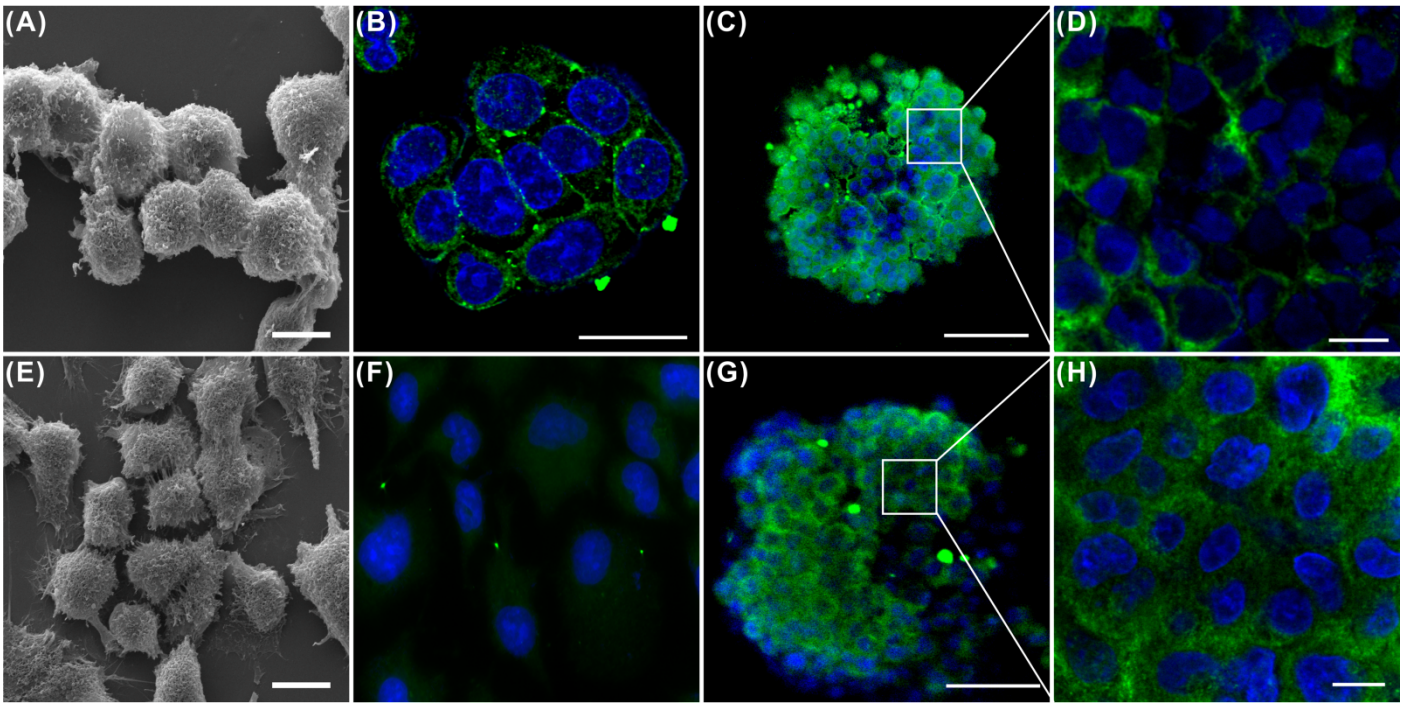
Supplementary Fig. 1 Parallel loading of food dye solution onto PEG microsponge arrays.

The parallel loading of drug solution onto PEG microsponge arrays was demonstrated using food dyes of different colors. (A) Alternate hydrophobic and hydrophilic regions (1×16 region array) were generated on a glass slide achieved by micro-contact printing. Dye solution was pipetted on the hydrophilic regions resulting liquid layer patterns, where each color represented different drug concentrations. (B) PEG microsponge array chip was then sandwiched onto the patterned liquid layer, achieving addressable delivery of dyes to PEG microsponge arrays.



Supplementary Fig. 2 Fabrication of different micro-scaffold patterns on the chip.

(A) vasculature-like and (D) villi-like structures on the chip. (B)-(F) Cell culture on the patterned chips. Cells would grow under the constraint of the patterned shapes.



Supplementary Fig. 3 Intrinsic E-cadherin expression in HepG2 and NCI-H460 cells.

(A) and (E) SEM images of HepG2 and NCI-H460 cells on 2D substrates. HepG2 cells grew in a compact colony form, expressed high amount of E-cadherin on cell membranes either on 2D culture (B) or within spheroid ((C) and (D)). NCI-H460 cells were deficient in E-cadherin expression on 2D culture (F), whereas when cultured as 3D spheroids, expression of E-cadherin was likely to be elevated ((G) and (H)).

Supplementary video 1 Demonstration of addressable drug loading onto PEG microsponge array chip.

Liquid patterns were generated by the pre-formed hydrophilic/hydrophobic regional constraints. Solutions were stained by food dyes of different colors, representing the drug solutions of different concentrations or different components.

Supplementary video 2 Operation process of the micro-scaffold chip for parallel auto-loading of cells, drug administration and high throughput drug cytotoxicity testing.

Supplementary video 3 Dynamic drug diffusion process within an isolated reaction chamber was simulated by COMSOL software. The duration for the diffusion to reach equilibrium cost 17300s, which is ~4.8h.