Electronic Supplementary Material (ESI) for Lab on a Chip.

Supporting Information

Rapid generation of Hybrid Biochemical/Mechanical Cues in Heterogeneous Droplets for High-Throughput Screening of Cellular Response

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Supplementary Figures

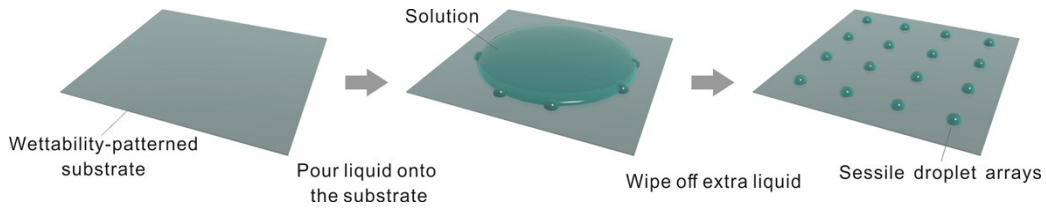

Figure S1. Schematic illustration of generation of homogeneous sessile droplet arrays.

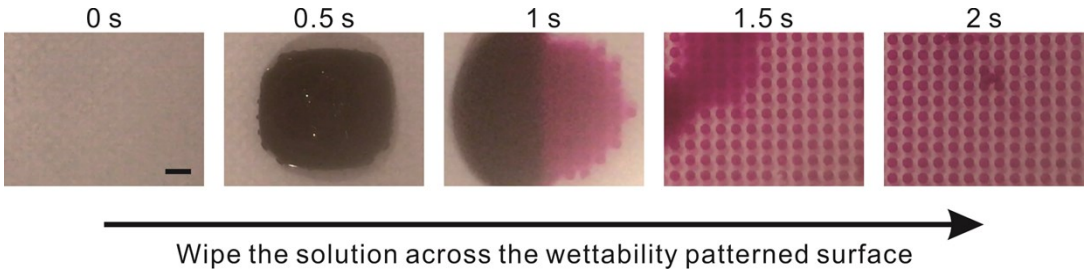

Figure S2. Sequential images of formation of homogeneous sessile droplet array, scale bar, 1.5 μm.

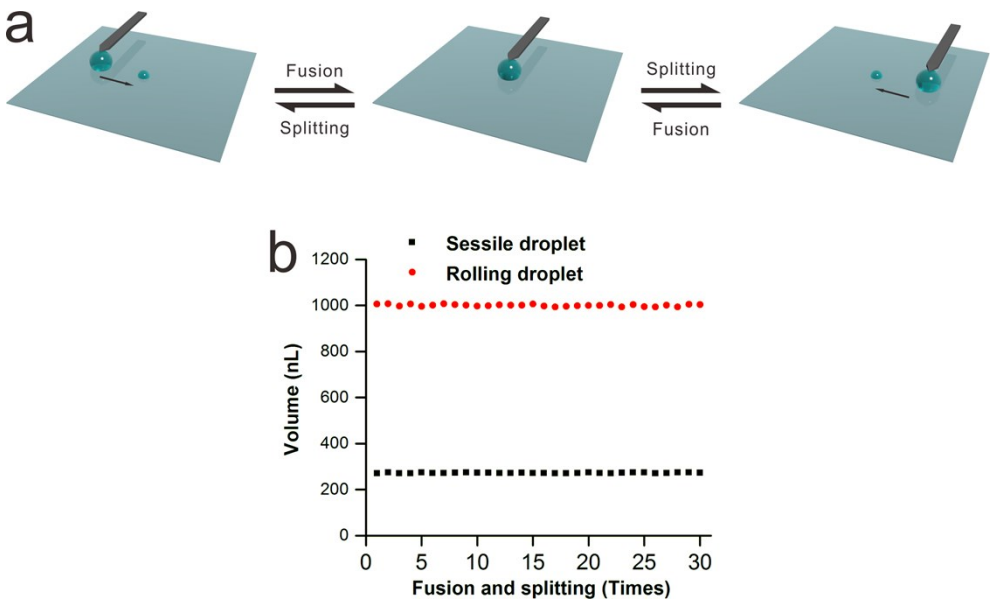

Figure S3. The volume of both the sessile droplet and the rolling droplet remains consistant during fusion and splitting. (a) Schematic illustration of repeatedly fusion and splitting of sessile droplet and rolling droplet. (c) Quantitative measuring the volumes of both the sessile droplet and the rolling droplet after each splitting for 30 times.

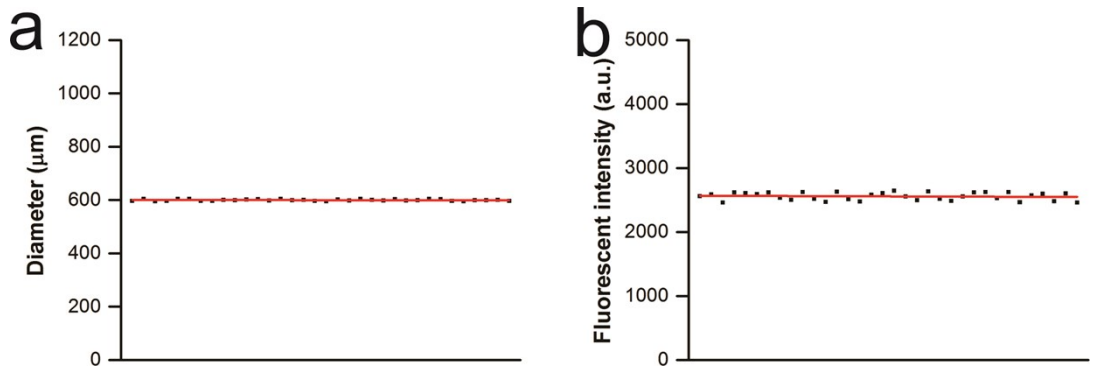

Figure S4. Uniformity of homogeneous droplets array. (a) Diameter of 35 randomly picked droplets in homogeneous sessile droplets array. (b) Total fluorescent intensity of 35 randomly picked droplets in homogeneous sessile droplet array.

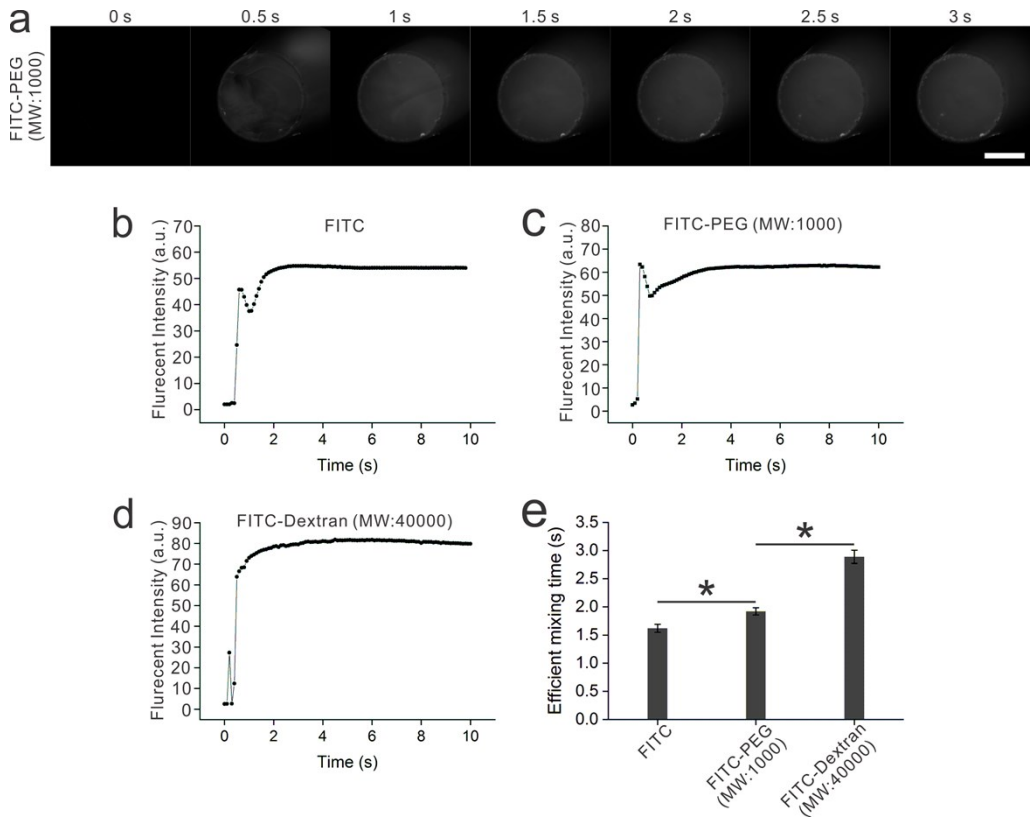

Figure S5. Study mixing time for various sizes of molecules during the fusion of sessile droplet and rolling droplet. (a) Sequential images show the mixing between sessile droplet and rolling droplet with FITC-PEG (MW: 1000). Scale bar, 1 mm **(b-d)** Increase in fluorescent intensity of sessile droplet indicates the diffusion of FITC (b), FITC-PEG (c), and FITC-dextran (d) respectively from the rolling droplet to sessile droplet. **(e)** Efficient mixing times for various sizes of molecules, including FITC, FITC-PEG, and FITC-dextran. Data was obtained from 5 independent experiments for each conditions.

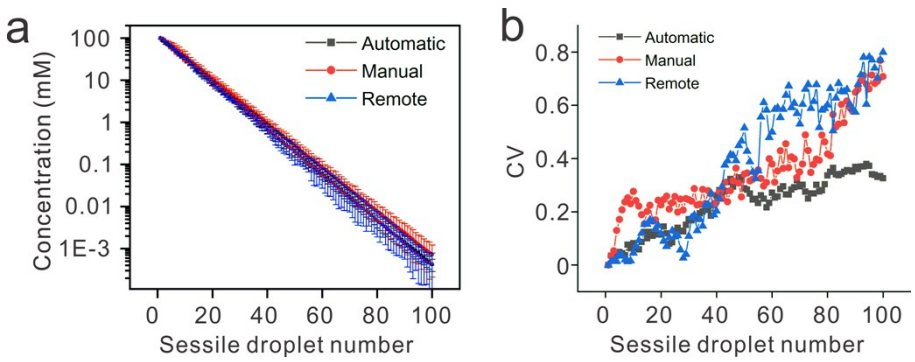

Figure S6. Quantitative comparison of generated gradients using three different modes: automatic mode (black dots), manual mode (red dots), and remote mode (blue dots). (a) Concentration profiles. The error bars represent Standard Deviation. (b) Coefficients of variation.

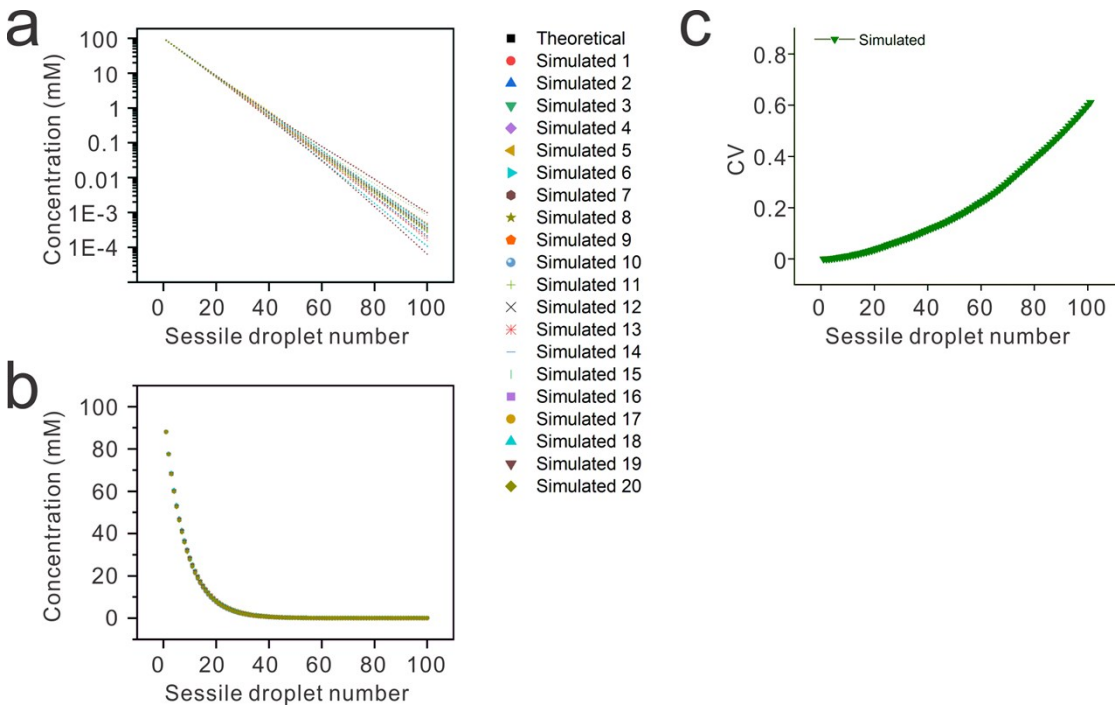

Figure S7. Simulation of generated gradient profiles using CV error that measured in one time operation (fusing, mixing, splitting). (a-b) 20 simulated results and theoretical result in Log scale (a) and linear scale (b). (c) Coefficients of variation calculated from 20 simulated results.

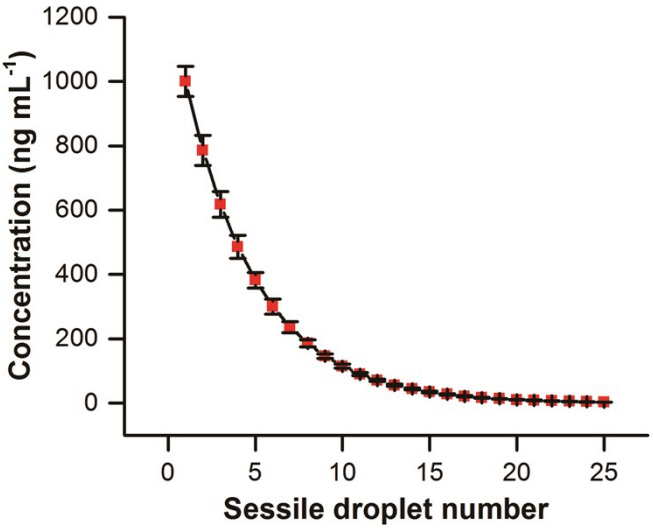

Figure S8. Quantitative analysis of BSA-FITC gradients in sessile droplet array. The error bars represent Standard Deviation.

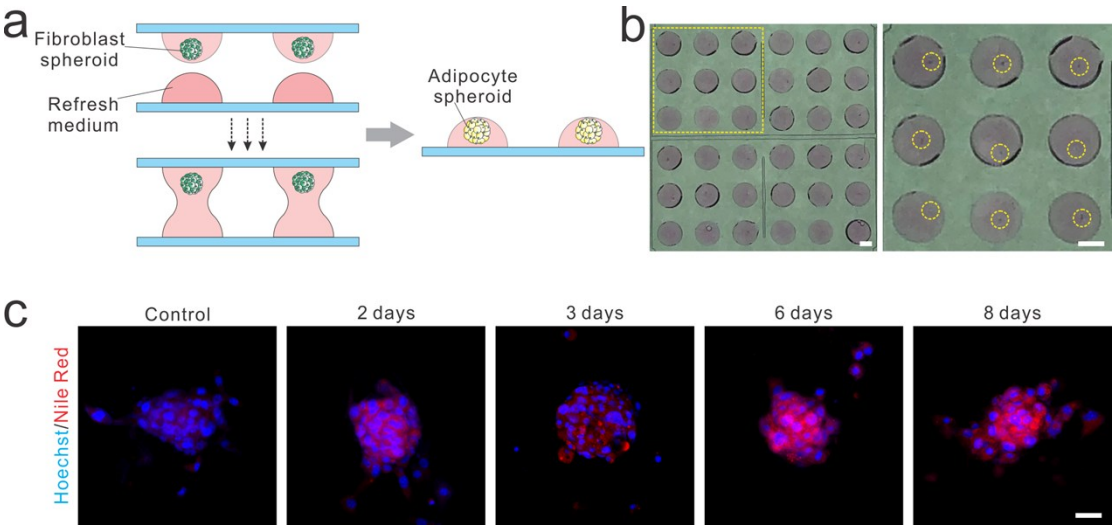

Figure S9. Long-term culturing and formation of adipocytes spheroid from fibroblast using the wettability-patterned microchip. (a) Schematic illustration of culturing spheroid and medium exchanging. (b) Optical images of cultured spheroids in sessile droplets array on wettability-patterned microchip. Yellow dot line circles indicate the spheroid in the droplet. Scale bar, 1mm. (c) Immunofluorescent images of adipogenesis of the spheroids during culturing. Red color indicates the genesis of intracellular lipid droplet and blue color indicates the nucleus. Scale bar, 30 mm.