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

Supplementary Information

A 3D human adipose tissue model within a microfluidic device

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Supplementary Figures:

Supplementary Videos:

Figure S1. CNC machined mold for the microfluidic device.

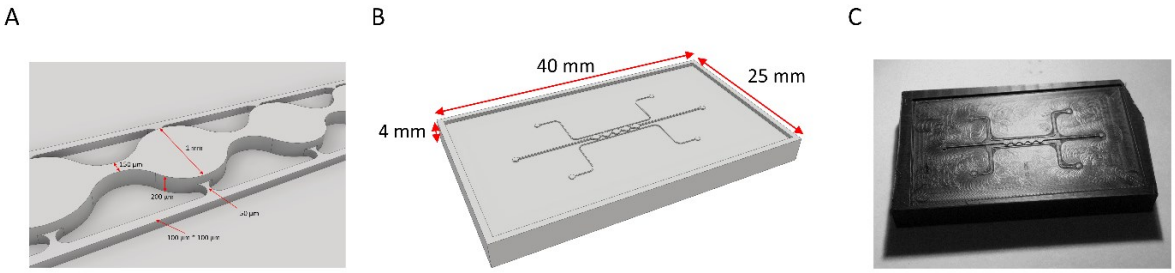

Figure S1. CNC machined mold for the microfluidic device. (A) Dimensions of the cell culture chamber and fluidic channels. (B) The microfluidic design was constrained to a 40 mm*25 mm surface as input for the CNC machine. (C) POM mold manufactured from CNC machine.

Figure S2. Perfusion of fluorescein isothiocyanate-dextran through the cell culture chamber.

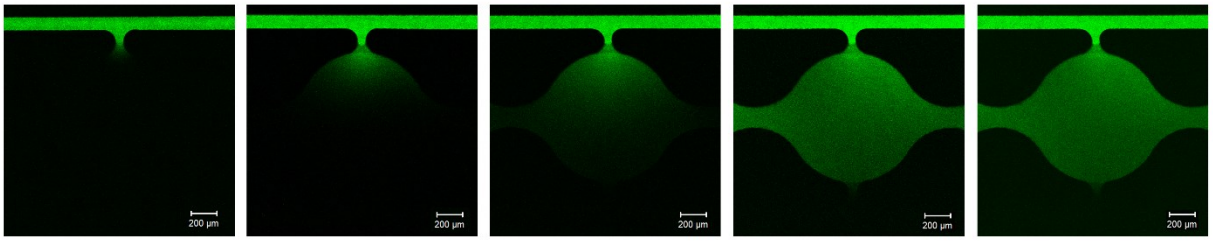

Figure S2. Perfusion of fluorescein isothiocyanate-dextran through the cell culture chamber. Fluorescein isothiocyanate-dextran (25 ug/mL, FD70S, Sigma) was added to one side of the cell culture chamber and allowed to perfuse through the chamber. After 2 hours, the dextran is evenly distributed in the chamber.

Figure S3. Reconstructed 3D image of adipocytes cultured within the microfluidic device.

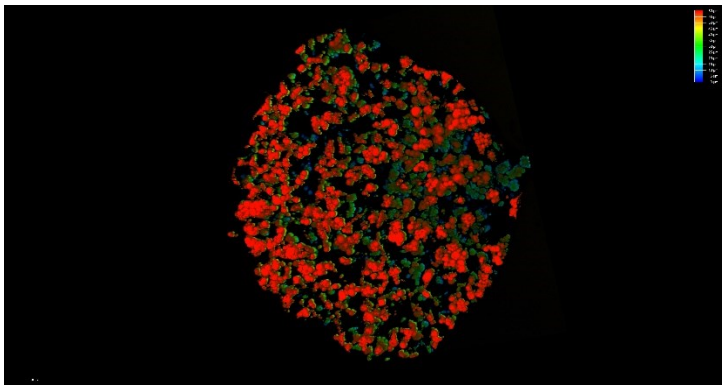

Figure S3. Reconstructed 3D image of adipocytes cultured within the microfluidic device. ADSCs were differentiated at 10 million/mL seeding density for 3 weeks before fixed and stained with BODIPY. A stack of 60 images with a step size of 1μm was taken using a confocal microscope and reconstructed to form a 3D image. Color bar indicates a different focal plane.

Figure S4. Brightfield image of adipocytes with different seeding densities.

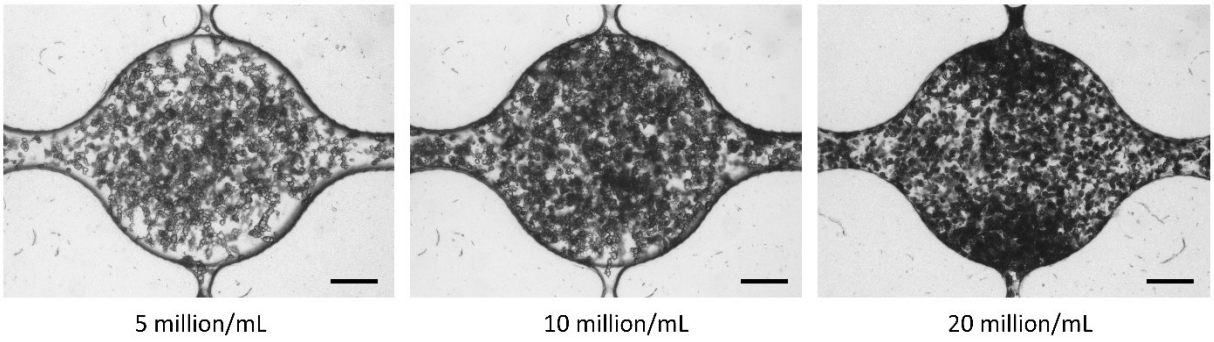

Figure S4. Brightfield image of adipocytes with different seeding densities. At 20 million/mL seeding density, adipocytes show uneven development within the chamber. Scale bar: 200 μm.

Figure S5. Uptake of fluorescently labeled fatty acid analog in live and dead cells.

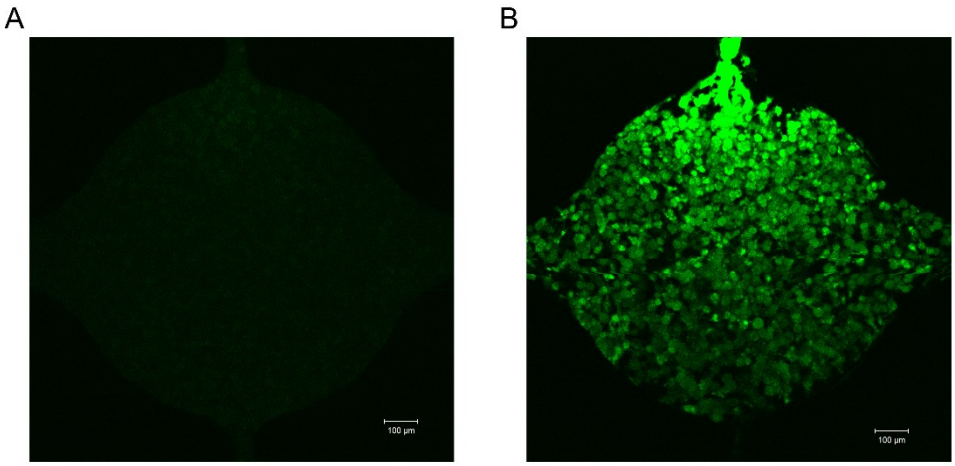

Figure S5. Uptake of fluorescently labeled fatty acid analog in live and dead cells. (A) uptake of the BODIPY 3823 in dead cells in the cell culture chamber. (B) uptake of the BODIPY 3823 in live cells in the cell culture chamber.

Figure S6. qPCR expression of adiponectin in 2D well plate and 3D microfluidic chambers.

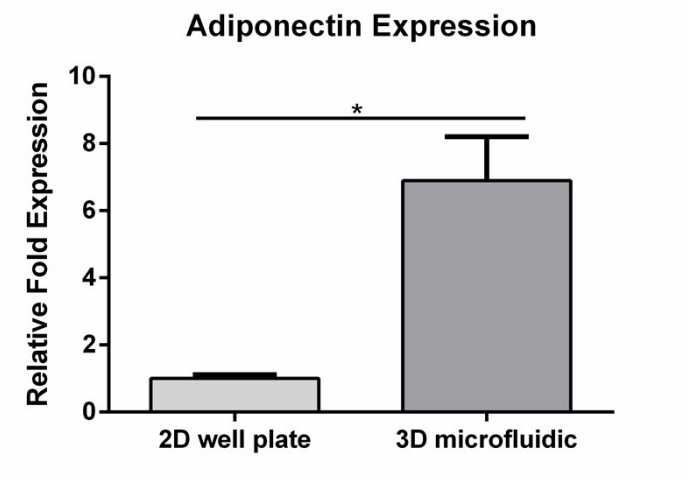

Figure S6. qPCR expression of adiponectin in 2D well plate and 3D microfluidic chambers. The expression of adiponectin is significantly upregulated in 3D microfluidic devices compared to 2D culture. Values are means ± SD, n = 5. Independent-samples t-test was used to compare the two groups. *denotes significant difference ($p < 0.05$).