Supplementary Materials

A Microfluidic Dual-well Device for High-throughput Single-Cell Capture and Culture

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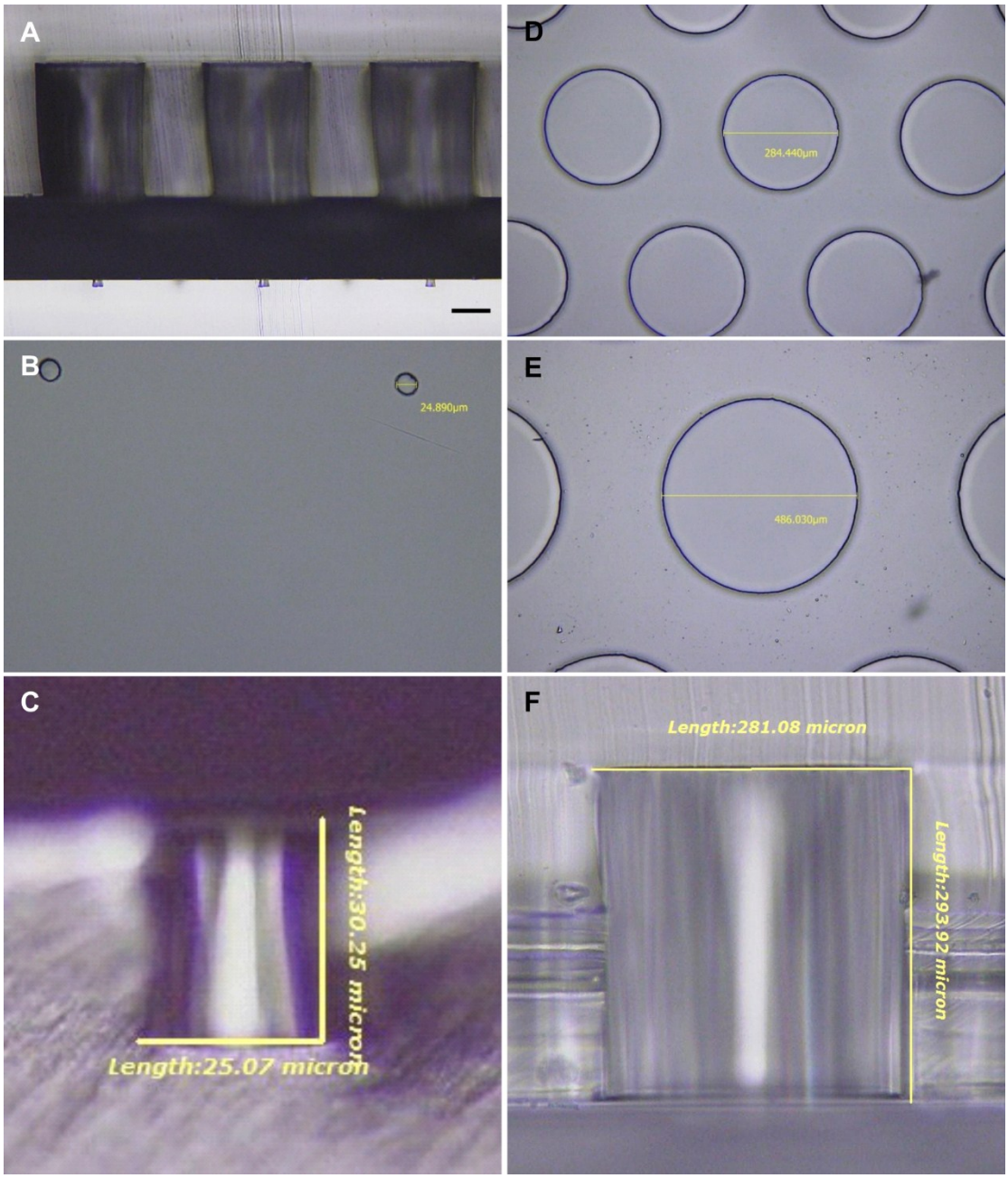

Figure S1. Characterization of capture-wells and culture-wells of DW device.

(A) A cross-sectional image of DW device which assembled by small microwells (captured-wells) and big microwells (culture-wells). (B) Small microwells (captured-wells) were designed with 25 µm of diameter for single-cell capturing (top-view). (C) The dimensions of small captured-well with a depth of 30 µm (side-view). (D, E) Big microwells (culture-wells) were designed with 285 and 485 µm of diameter for DW

single-cell culture. (F) The dimensions of big culture-well (side-view).

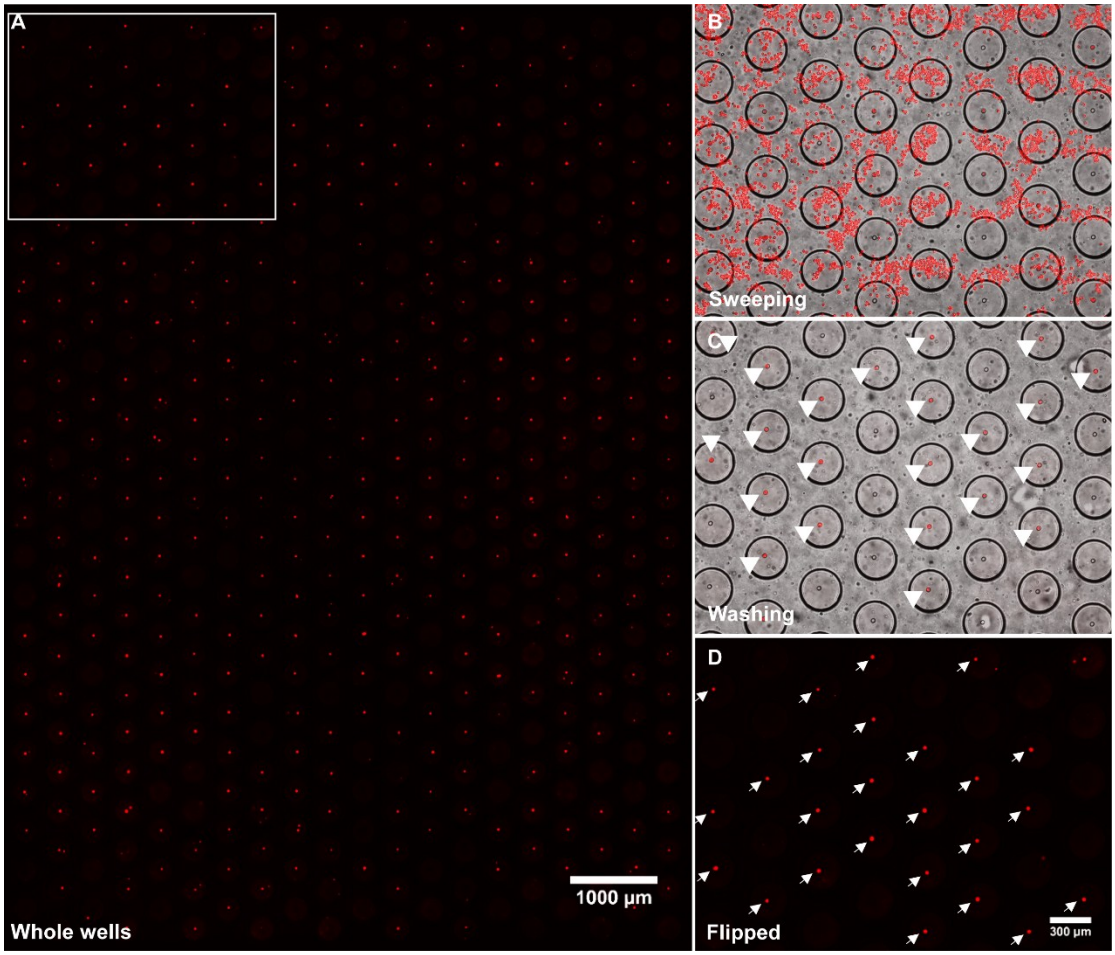

Figure S2. Single-cell capture of DW device with A549 cells.

(A) Image showing all culture-wells with A549 cells after flipping. Scale bar: 1000 μm. (B) Captured A549 cells in capture-wells after sweeping (C) Captured A549 cells in capture-wells after washing; arrowheads indicate cells in the capture-wells. (D) Enlarged image from the rectangle area of Figure S2A. Arrowheads indicate single-cells in culture-wells. Scale bar: 300 μm.

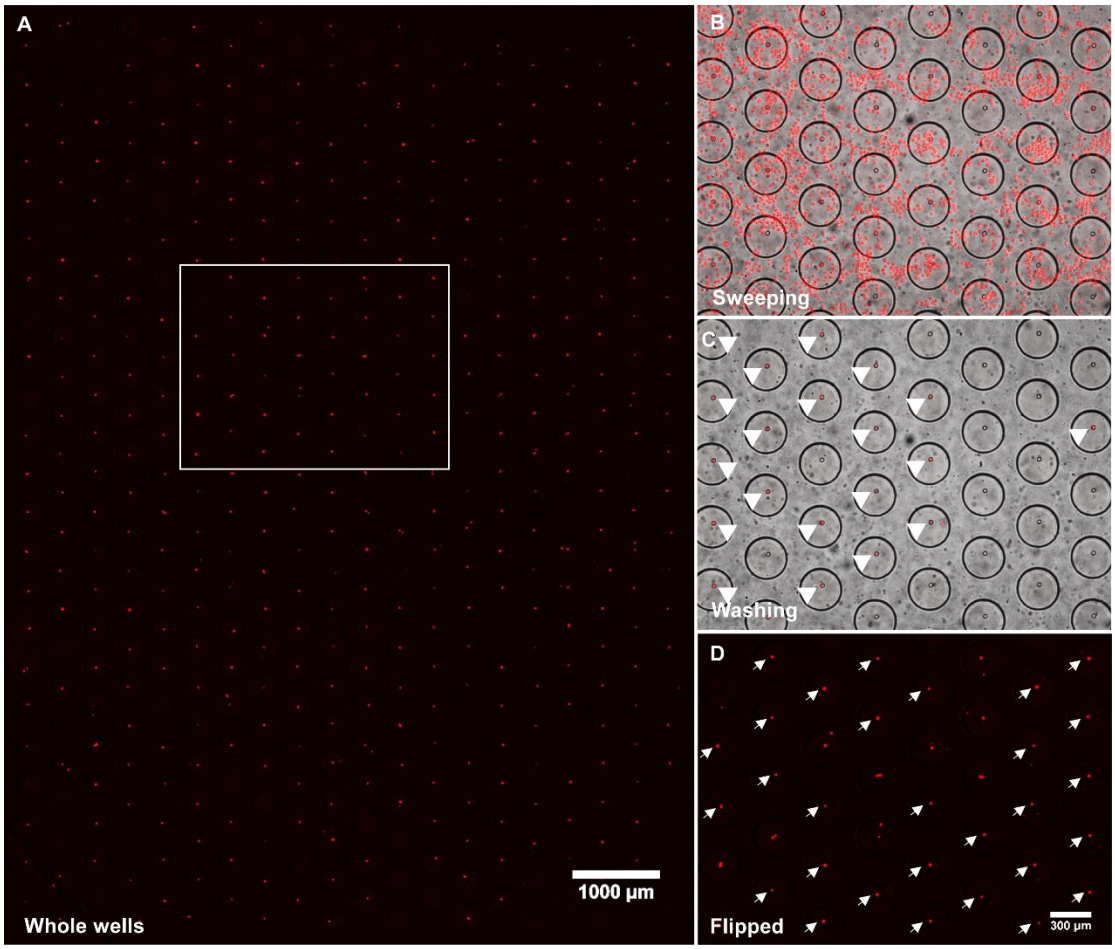

Figure S3. Single-cell capture of DW device with MDA-MB-435 cells.

(A) Image showing all culture-wells with MDA-MB-435 cells after flipping. Scale bar: 1000 µm. (B) Captured MDA-MB-435 cells in capture-wells after sweeping (C) Captured MDA-MB-435 cells in capture-wells after washing; arrowheads indicate cells in the capture-wells. (D) Enlarged image from the rectangle area of Figure S3A. Arrowheads indicate single-cells in culture-wells. Scale bar: 300 µm.

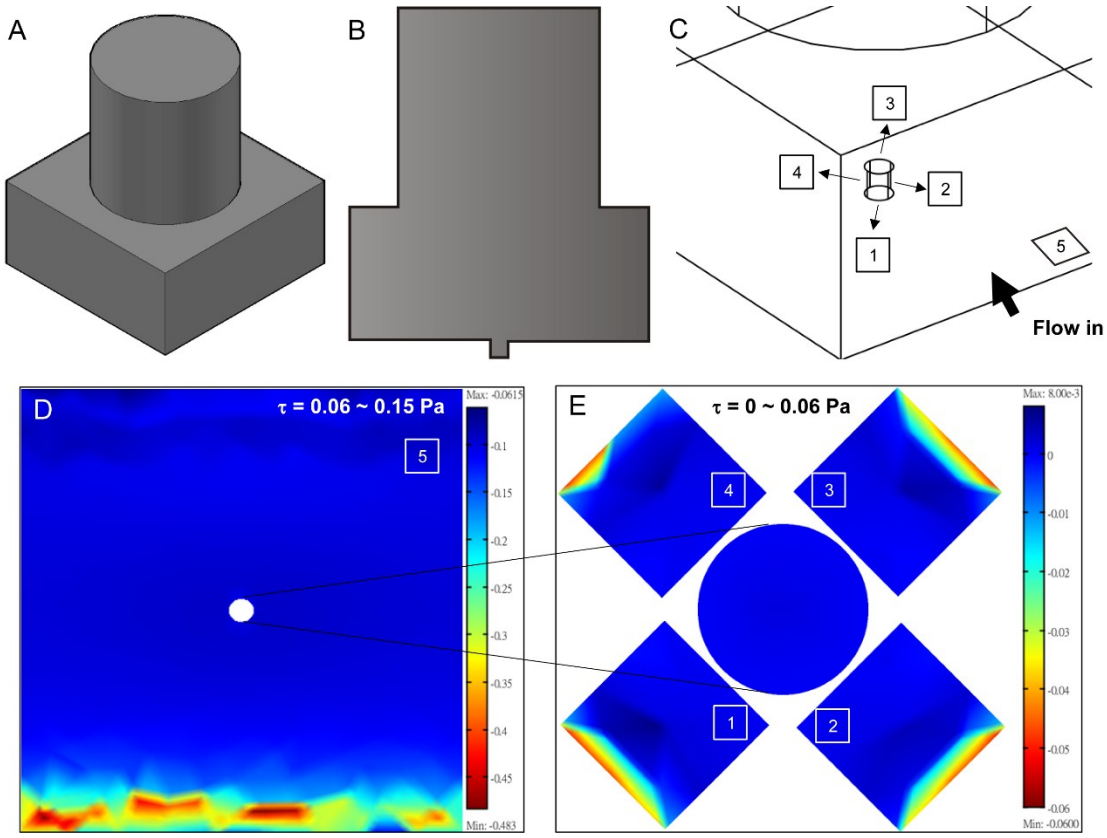

Figure S4. Finite element simulation of the capture-well and microchannel bottom. (A-B) Constructed model and side-view of one unit of the dual-well set containing a capture-well, a culture-well and a microchannel. (C) Schematic illustration of the capture-well and microchannel. The number indicated the location of the capture-well walls and the microchannel bottom. (D) The shear stress on the microchannel bottom ranges from 0.06 – 0.15 Pa when a fluid is introduced into the device at a volumetric flow rate of 600 μL/min. (E) The wall shear stress of the capture-well ranges from 0 to 0.06 Pa at the flow condition. The proximal side is set as the inlet and the opposite side as the outlet (pressure = 0). The entire left and right sides of the outside channel are set as symmetric boundaries, while other surfaces of

this model are set as walls (non-slippery). The properties of the fluid used in the simulation were: density = 1×10^3 kg·m^{-3}, viscosity = 1×10^{-3} Pa·s.

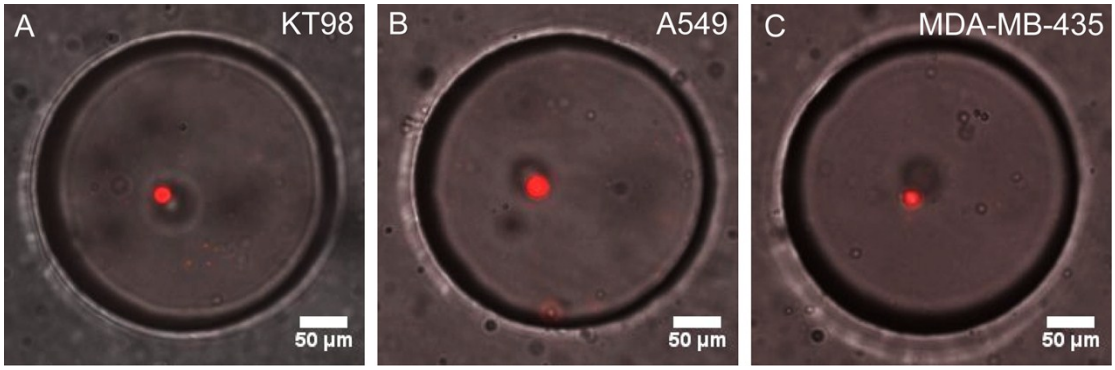

Figure S5. Representative images of loaded cells in culture wells showing different cell sizes. (A) KT98, (B) A549 and (C) MDA-MB-435 single-cell in a culture-well.