Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Microfluidics channel-coupled 3D quartz nanohole arrays for high capture and release efficiency of BT20 cancer cells

Jung-Taek Lim,[a] Yo-Seop Yoon,[a] Won-Yong Lee,[a] Jin-Tak Jeong,[a] Gil-Sung Kim,[a] Tae Geun Kim,[b] and Sang-Kwon Lee[a,†]

[a] Department of Physics, Chung-Ang University, Seoul 06974, Republic of Korea

[b] School of Electrical Engineering, Korea University, Seoul 02841, Republic of Korea

[†] Address correspondence to sangkwonlee@cau.ac.kr.

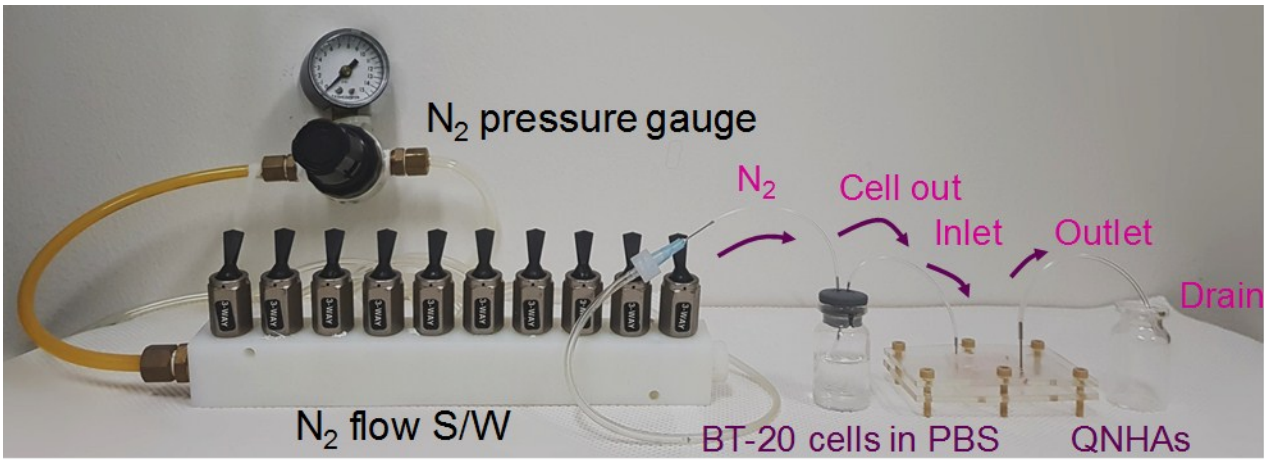

Fig. S1. Cell capture/release system. Photograph of cell loading system using N_2 flow (upper-left) and assembled STR-functionalized quartz nanohole arrays (STR-QNHA) cell capture/release chip. The flow rate of the fluids was controlled by N_2 pressure. For the cell capture and release study, flow rates of 0.5, 1, 2, 3, and 4 ml/h were used.

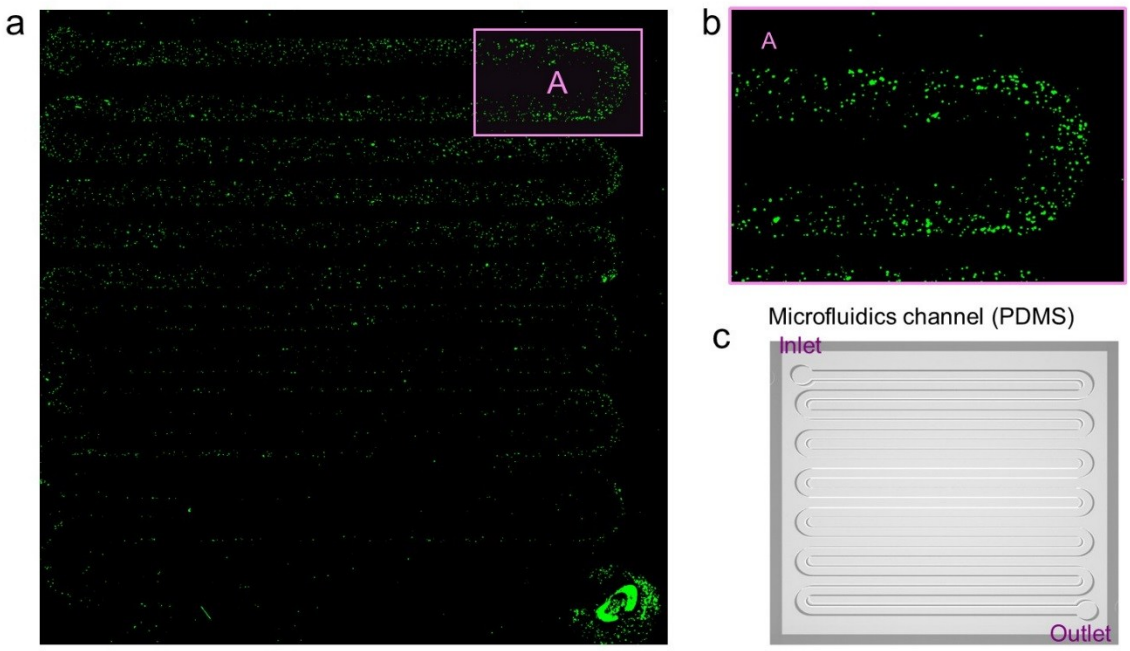

Fig. S2. Fluorescence images of substrate-bound BT20 cells on STR-QNHA cell chips. (a) Fluorescence image of substrate-immobilized BT20 cells on STR-functionalized QNHA cell capture chip. Before loading the BT20 cells into STR-QNHA cell chip, the BT20 cells were pre-stained using Vybrant cell-labeling solution (DiI, 532 nm, Invitrogen, USA) to quantify the captured cells on STR-QNHA cell capture and release chip. DiI-stained BT20 cells were then pre-treated with biotinylated anti-epithelial cellular adhesion molecule antibody (anti-EpCAM) as a universal biomarker for epithelial tumor cells, and then stored at 4 °C for 20 min. We loaded approximately 5,000 cells/ml into the four sizes of STR-QNHA cell chips, with widths of 100, 250, 500, and 1,000 μm using an N_2 loading system (Fig. S1) with a range of flow rates (0.5 to 4 ml/h). (b) Enlarged image of marked area A in (a). (c) Schematic image of PDMS-based microfluidics chamber for the experiments.

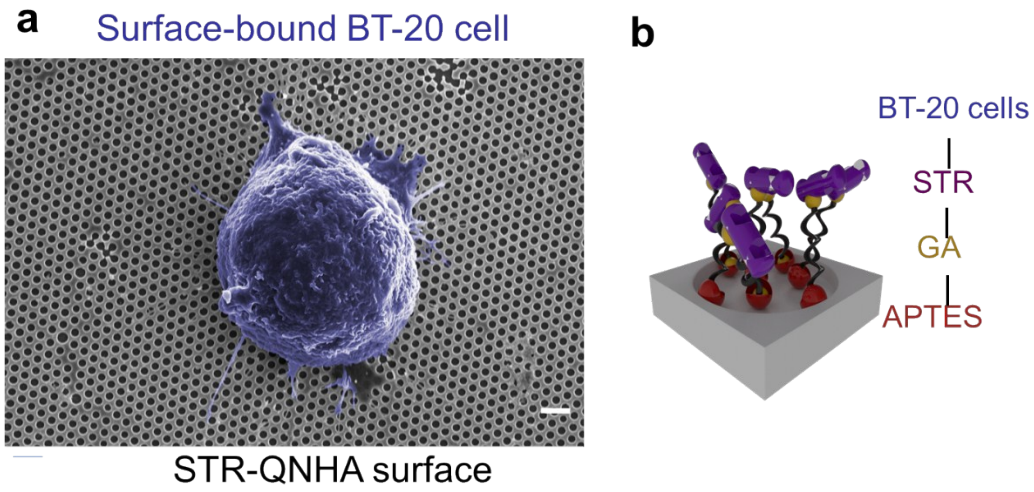

Fig. S3. Surface-bound BT20 cell. (a) Tilt-view of FE-SEM image of substrate-bound BT20 cell line on STR-immobilized QNHA cell chip. (b) Schematic image of surface functionalization of BT20 cell, APTES, GA, and STR on QNHA surface. For the capture of BT20 tumor cell, we used biotinylated anti-epithelial cellular adhesion molecule antibody (anti-EpCAM) with STR protein, which were immobilized on the surface of QNHA. The detailed information of cell preparation for FE-SEM images can be found in previous reports. [1]

[1] G. S. Kim, D. J. Kim, J. H. Hyung, M. K. Lee and S. K. Lee, *Analytical Chemistry*, 2014, **86**, 5330-5337.

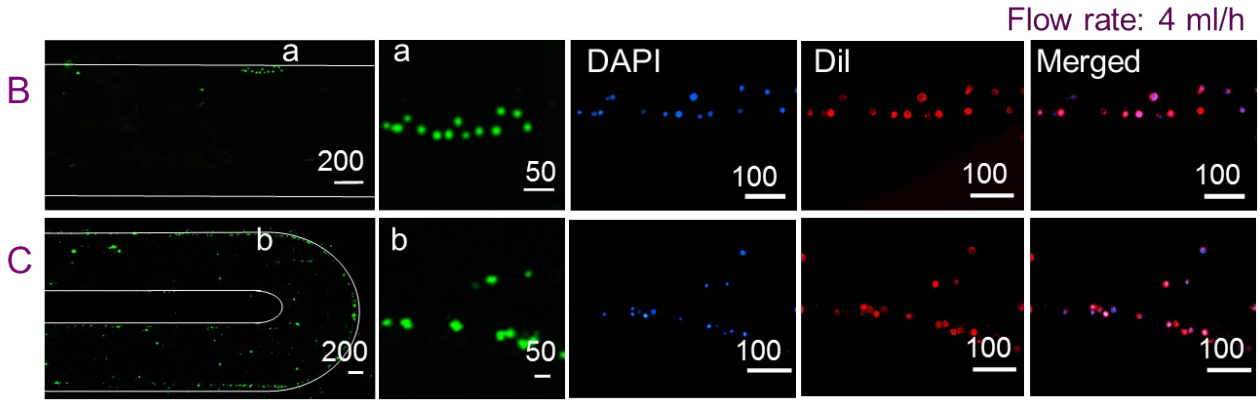

Fig. S4. Fluorescence images of surface-bound BT20 cell. Fluorescence images (i.e., DAPI, DiI, and merged) of substrate-bound BT20 cells stained on STR-QNHA cell chip at marked area B and C in (B) at a flow rate of 4 ml/h.

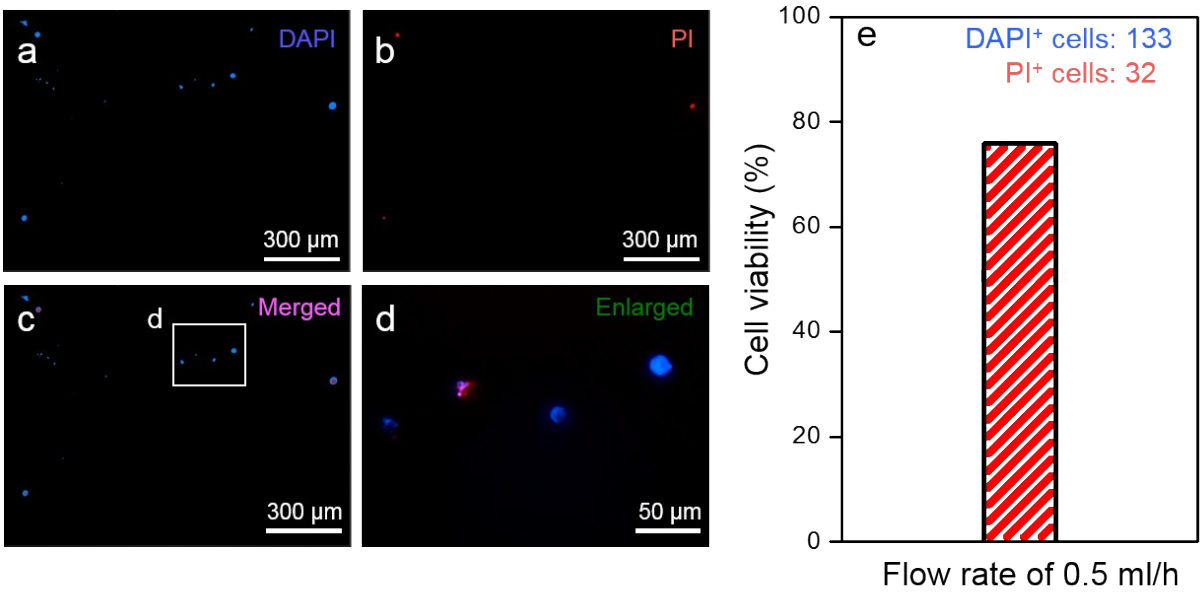

Fig. S5. Fluorescence images and viability of surface-released BT20 cell. (a)-(d) Fluorescence images (i.e., DAPI, PI, merged, and enlarged) of substrate-released BT20 cells. (e) Cell viability of the released BT20 cells from the STR-QNHA cell chip at a flow rate of 0.5 ml/h (The number of total counted cells were 133).