Electronic Supplementary Information (ESI) for Lab on a Chip

Electronic Supplementary Information

Facile construction of a 3D tumor model with multiple biomimetic characteristics using a micropatterned chip for large-scale chemotherapy investigation

Meilin Sun,[a] Jinwei Zhang,[a] Wenzhu Fu,[a] Tingting Xuanyuan[a] and Wenming Liu*[a]

[a]*Departments of Biomedical Engineering and Pathology, School of Basic Medical Science, Central South University, Changsha, Hunan 410013, China. E-mail: liuwenming0229@csu.edu.cn*

Abstract. This supplementary information provides all the additional information as mentioned in the text.

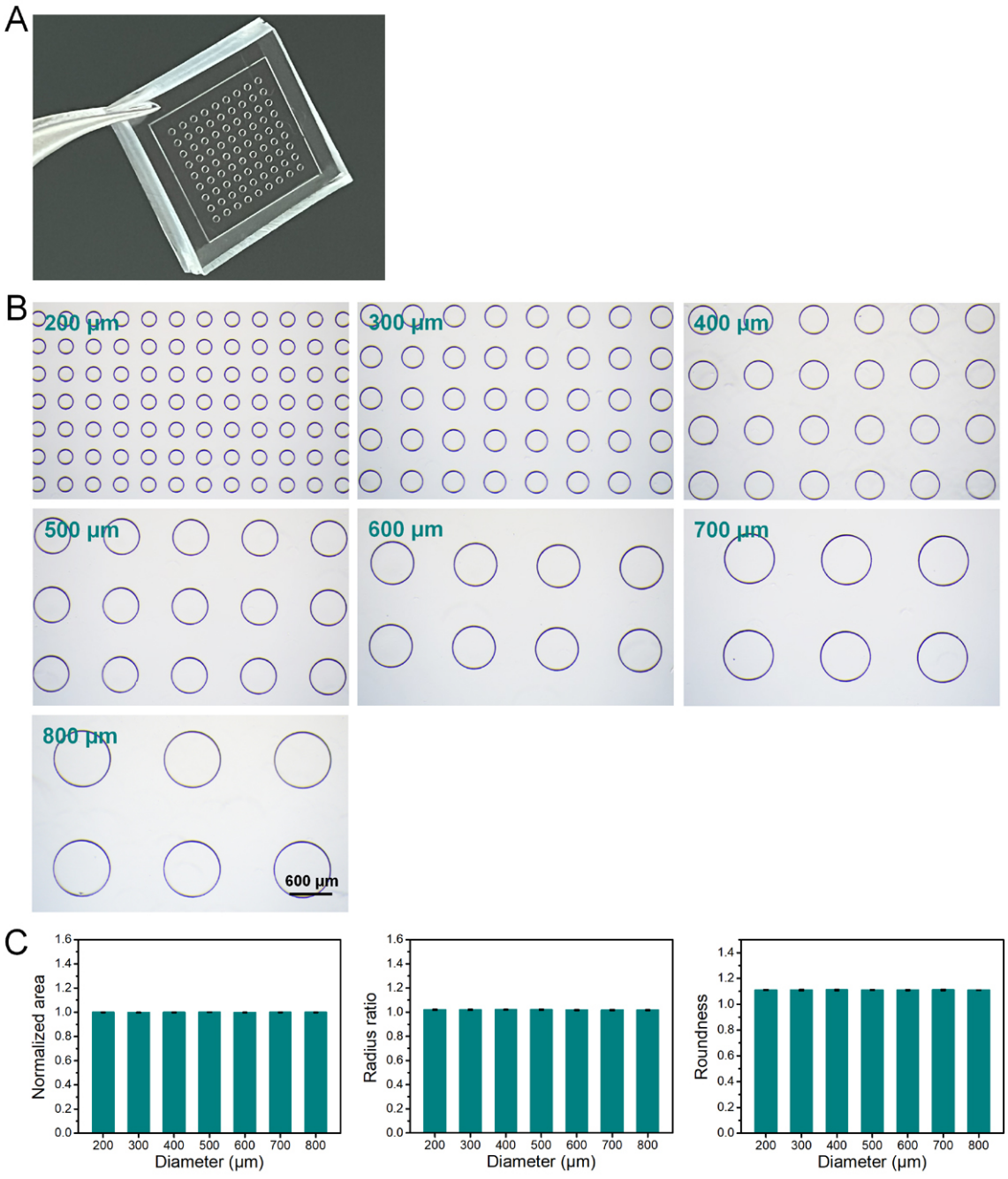

Fig. S1. High-quality PDMS stamps. (A) The actual stamp. (B) Optical images of stamps with various concave reliefs (i.e., circular microwell arrays with different diameters: 200 to 800 μm). (C) Quantitative evaluation of area, radius ratio, and roundnesss of microwells in different stamps. The results showed that the dimensional geometry of microwells was nearly the same as the prior design, verifying the high-quality of PDMS stamps.

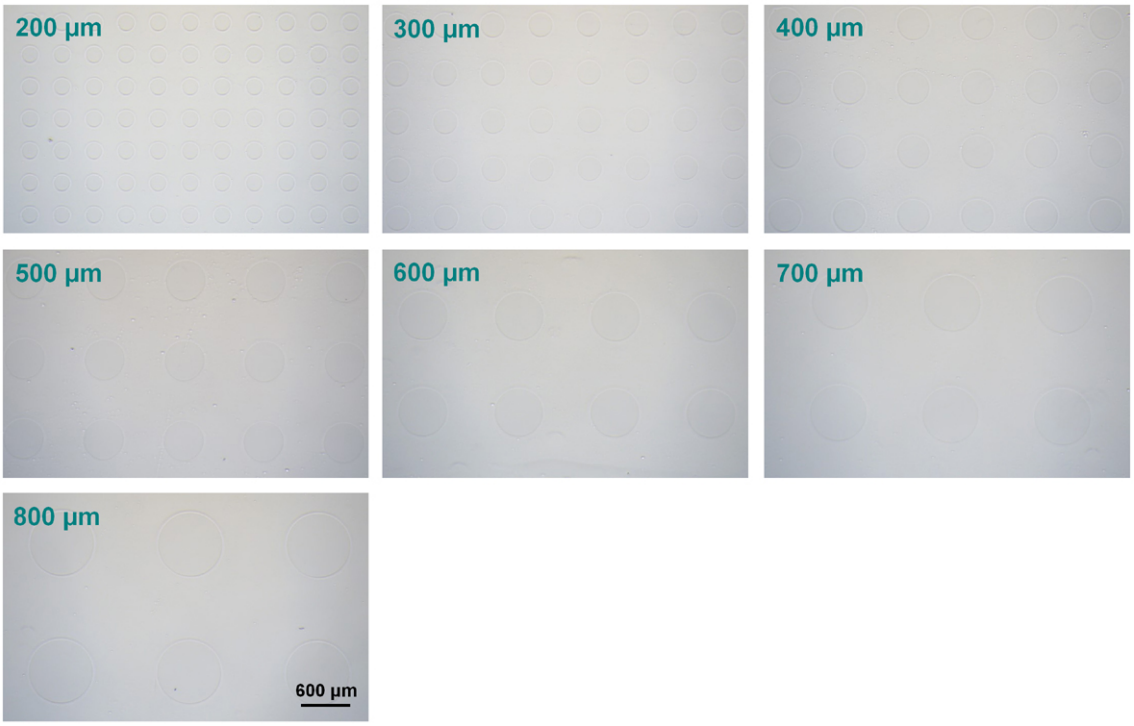

Fig. S2. Optical images of PDMS micropatterns with different sizes (diameter: 200–800 µm) of microwells fabricated based on the optimized printing.

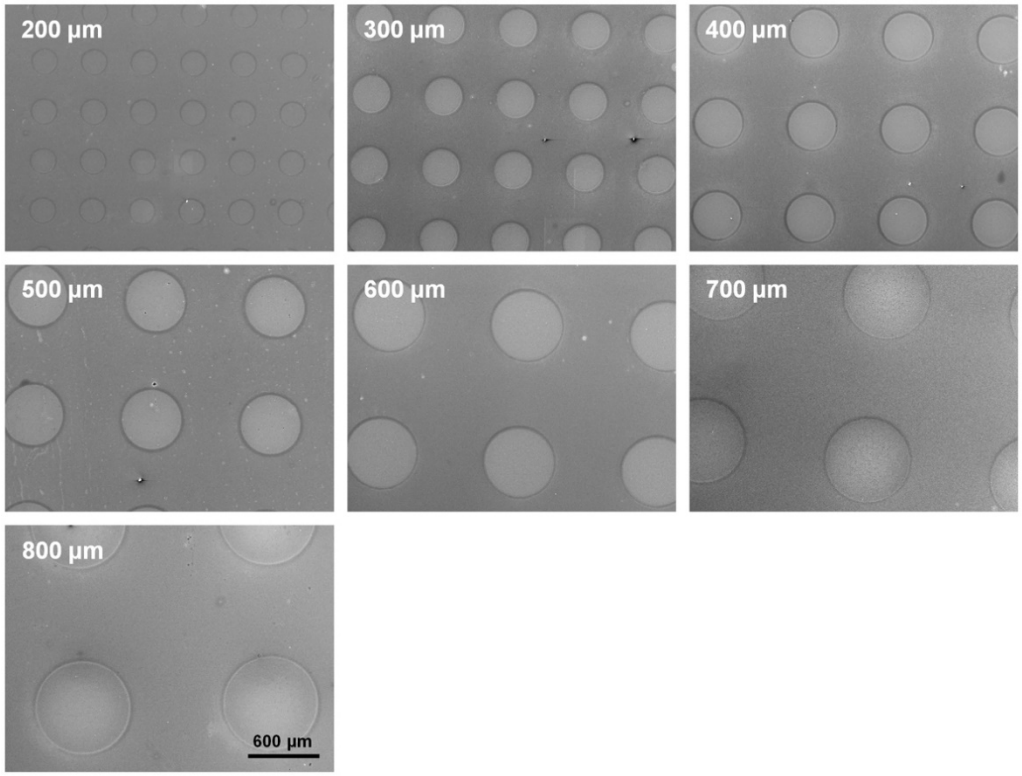

Fig. S3. SEM images of PDMS micropatterns with different sizes (diameter: 200–800 µm) of microwells fabricated based on the optimized printing.

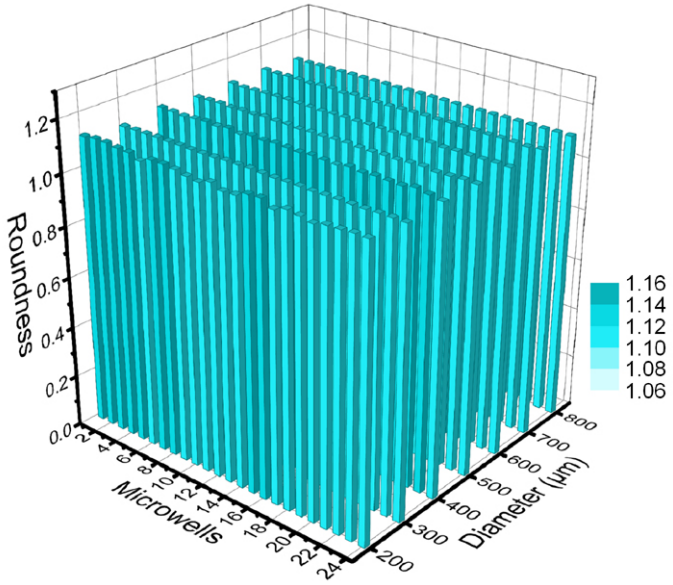

Fig. S4. Roundness of microwells with various diameters (200–800 μm) in respective PDMS patterns of chips from the fourth printing.

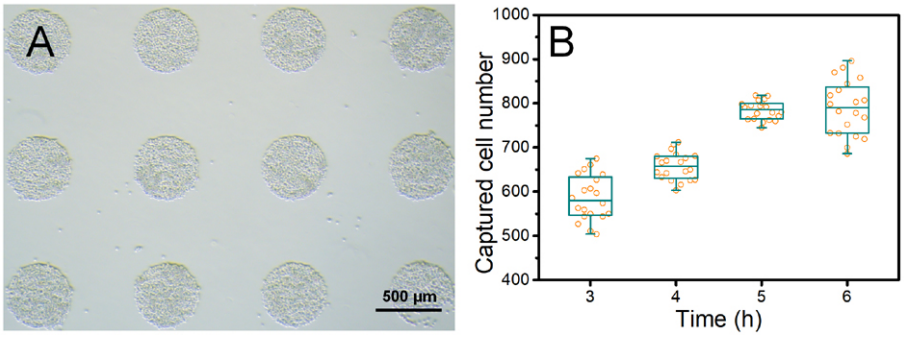

Fig. S5. Hela cell localization on the chip. (A) On-chip Hela cell capture. (B) Quantitative Hela cell capture in microwells of the chip after loading for different times (3–6 h).

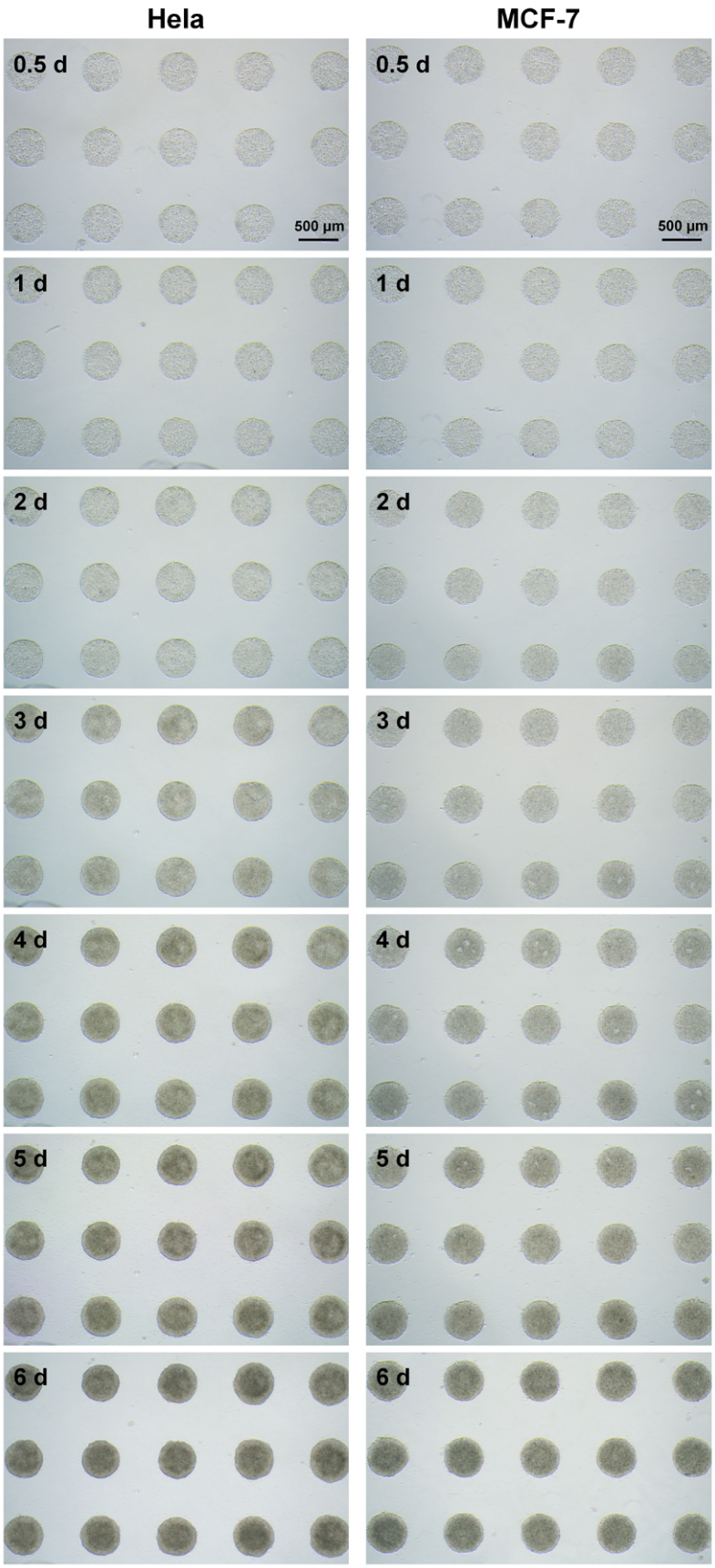

Fig. S6. Optical images of Hela and MCF-7 tumors at different times of culture on chips.

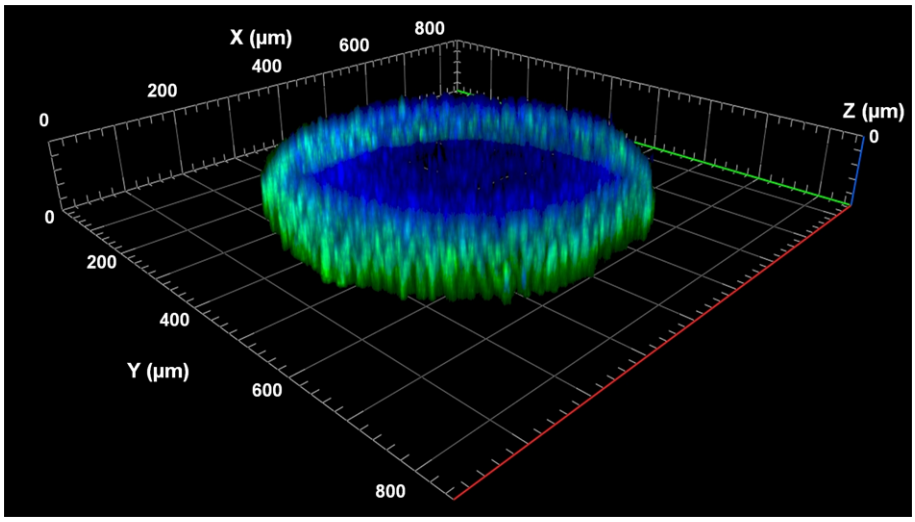

Fig. S7. Three-dimensional image of a Hela tumor obtained using the confocal microscope. The tumor was fluorescently visualized using Ki67 (green) and nuclear (blue) staining. It was showed that the tumor was disc-shaped.

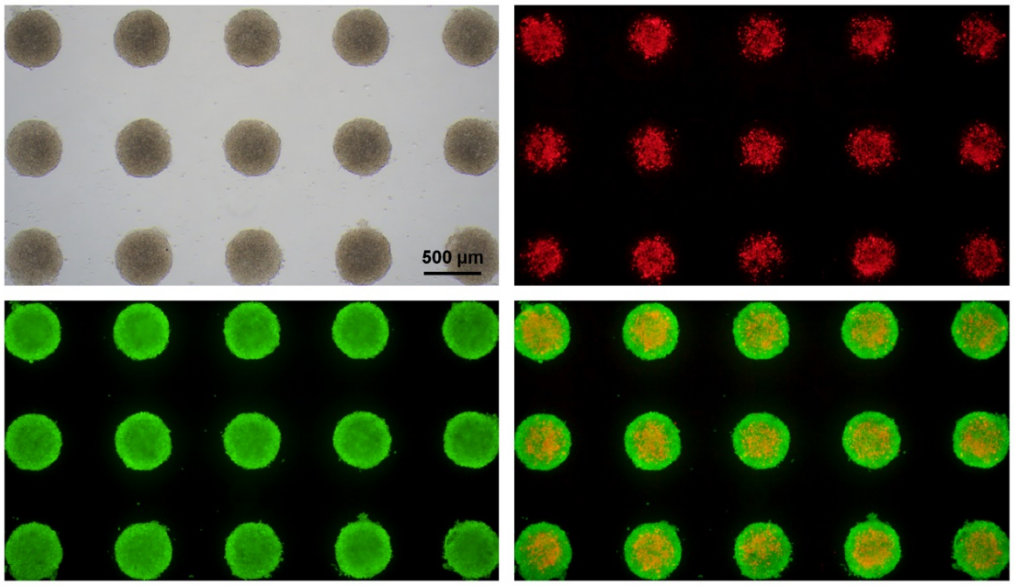

Fig. S8. A MCF-7 tumor array after 6 d in culture. Live (green) and dead (red) cells were fluorescently detected using FDA/PI staining. FDA was used as a viability and metabolic activity probe and PI was applied to label cell death.

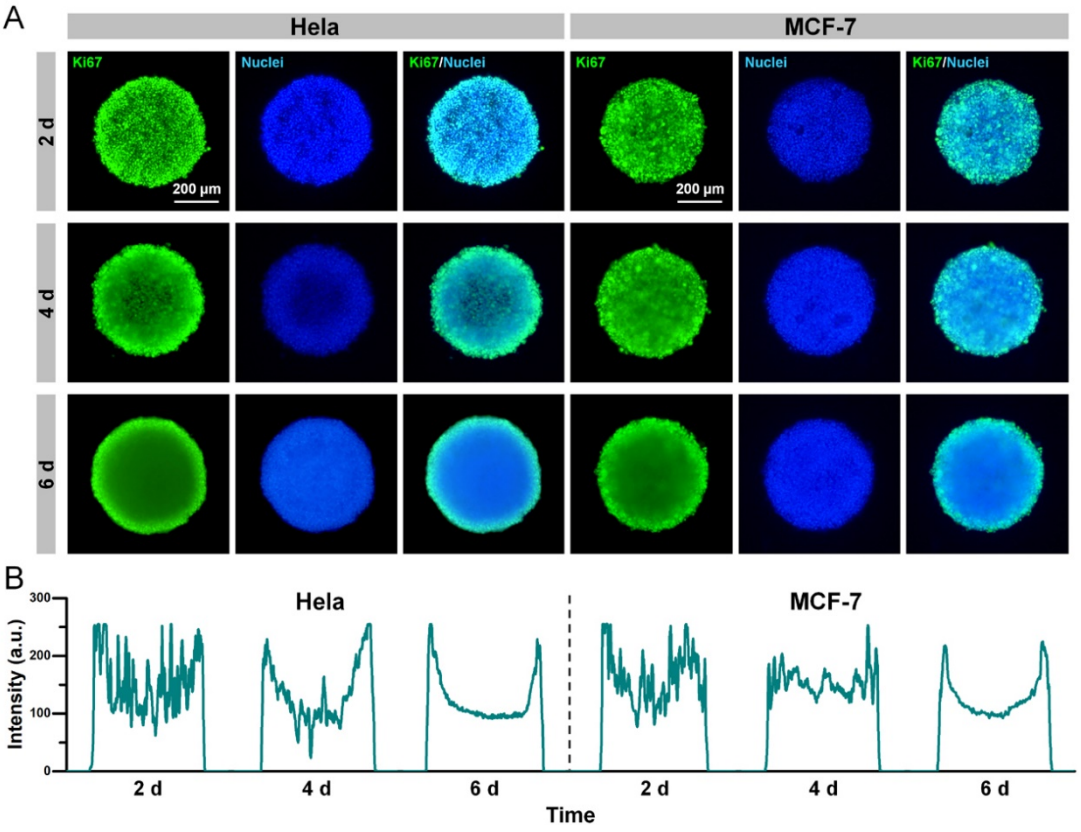

Fig. S9. Cell proliferation in Hela and MCF-7 tumors at different culture times. (A) Cell proliferation in tumors was detected using Ki67 (green) and nuclear (blue) staining. (B) Quantitative distribution dynamics of cell proliferation in different tumors during culture.

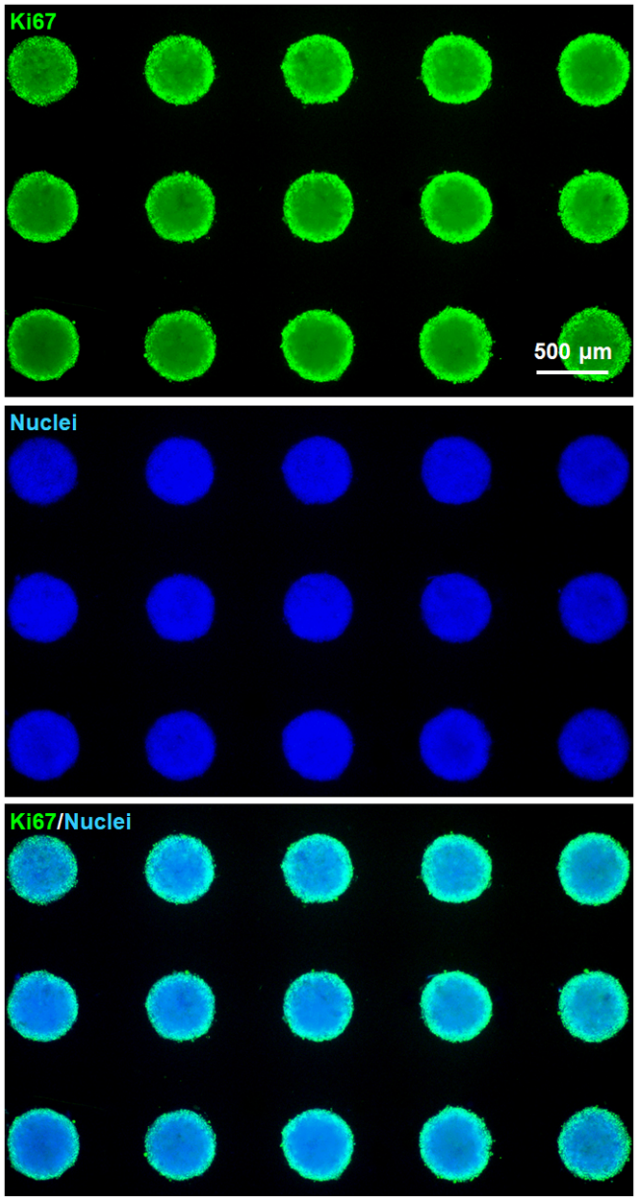

Fig. S10. Fluorescence images of a MCF-7 tumor array after culture for 6 d. Cell proliferation in MCF-7 tumors was visualized using Ki67 (green) and nuclear (blue) staining.

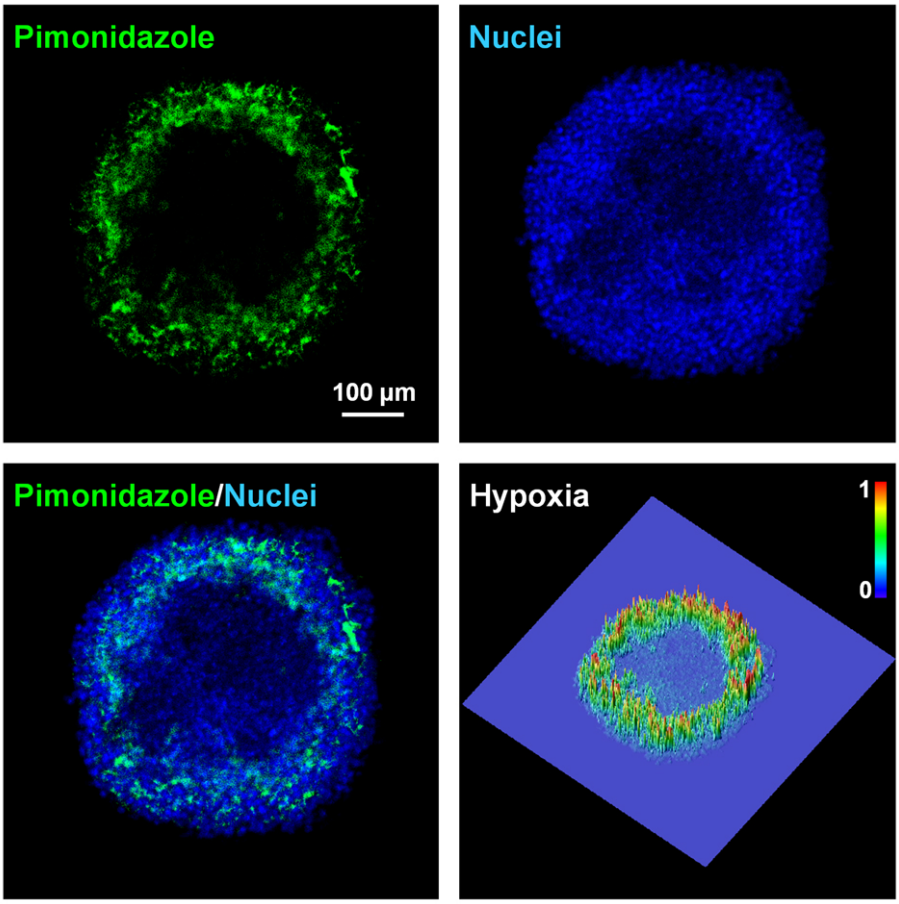

Fig. S11. Tumor hypoxia was visualized using Hypoxyprobe-1 (pimonidazole). Fluorescent images show cell hypoxia in the MCF-7 tumor after 6 d in culture. Cell nuclei were marked by Hoechst 33258. The pseudocolor image exhibits the hypoxic cell distribution in the tumor.

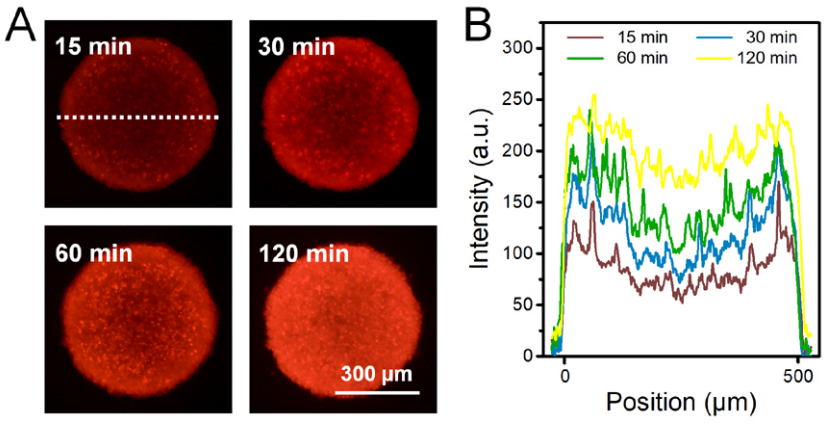

Fig. S12. Fluorescent detection (A) and quantitative analysis (B) of DOX distribution in Hela tumors after incubation for different times. The tumor position marked by the white dotted line on the picture (A) was used for quantification (B) of DOX molecule distribution.

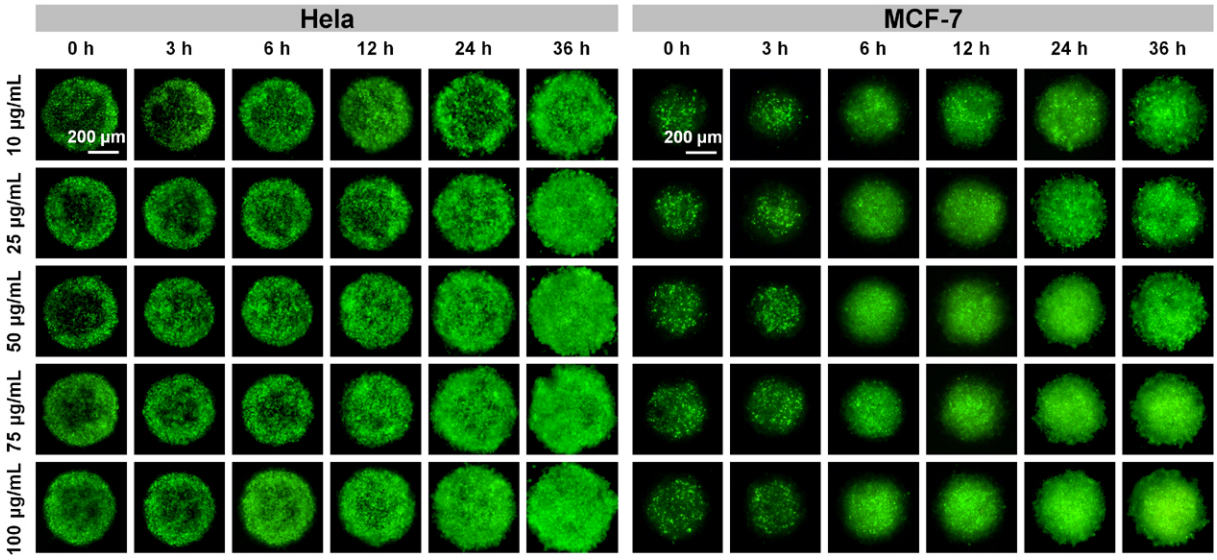

Fig. S13. Fluorescent images of caspase-3^{+} cells in Hela and MCF-7 tumors treated with VLBT at different concentrations (10, 25, 50, 75, and 100 μg mL^{-1}) and at various treating times (0, 3, 6, 12, 24, and 36 h).