Electronic Supplementary Material (ESI) for Sensors & Diagnostics.

Supporting information

High-throughput and high-purity separation of malignant tumor cells in pleural and peritoneal effusions using interfacial elasto-inertial microfluidics

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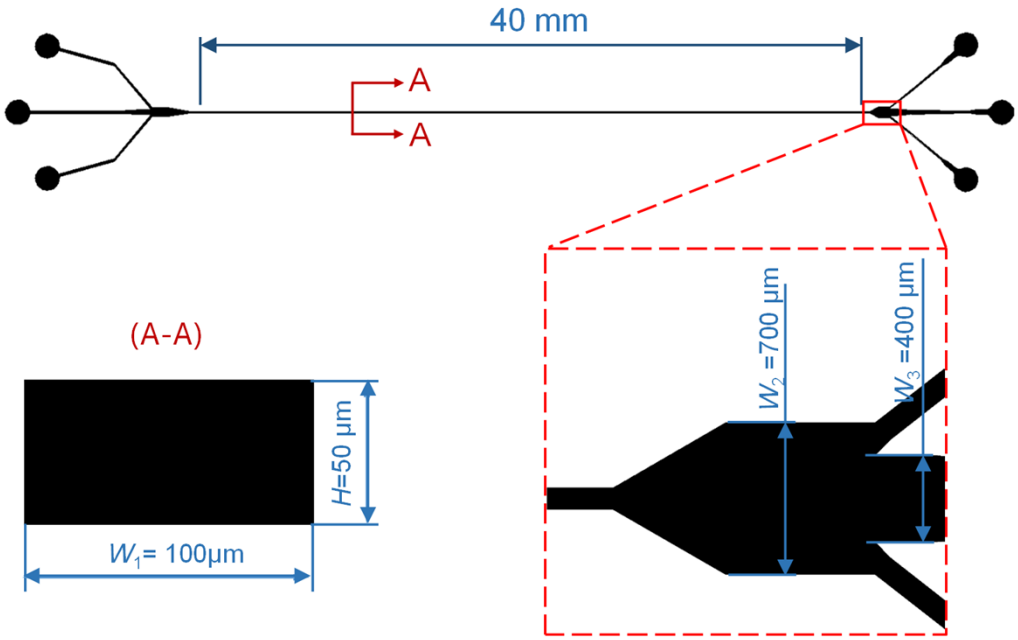

Figure S1. CAD drawing illustrating the detailed designs and structures of the channel. A-A showed the cross-sectional dimension. The enlarged view showed the designs and dimensions of the outlet system.

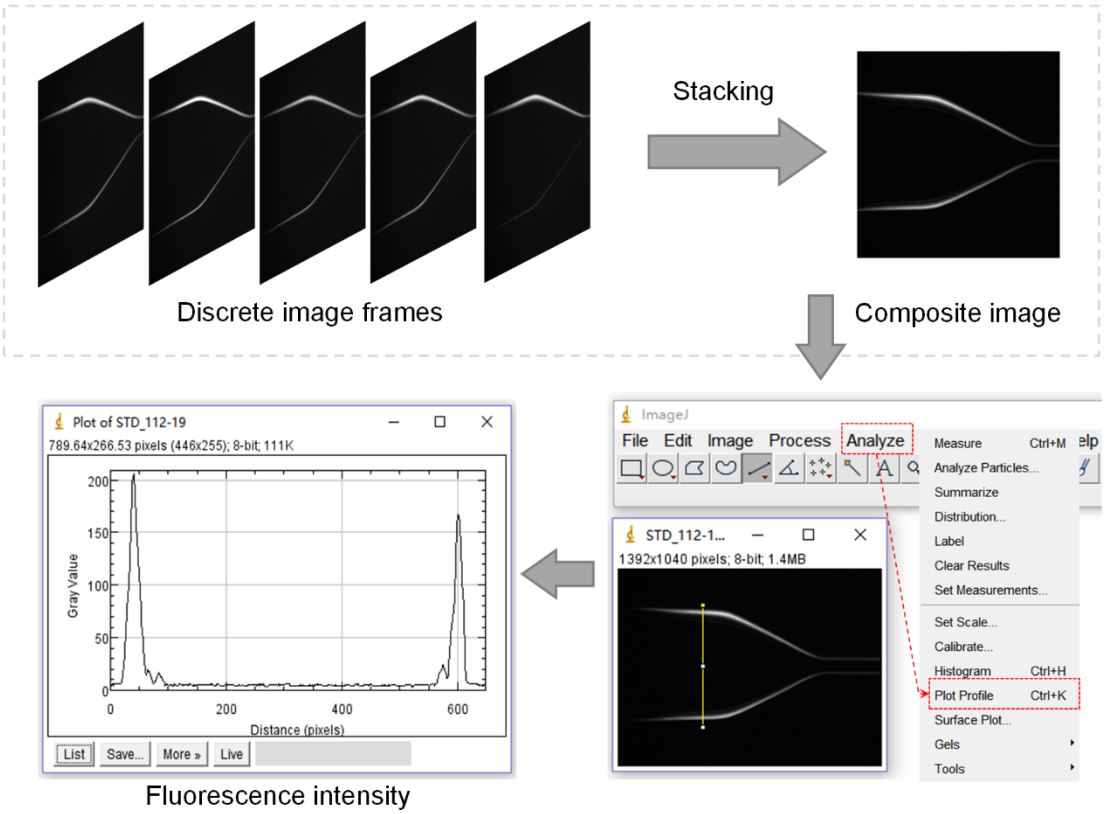

Figure S2. Image processing procedure. To obtain the statistical distributions of particles/cells, the captured image frames were stacked vertically to create the composite images using the ImageJ software (NIH). The fluorescence intensity profile across the channel width was also measured using this software.

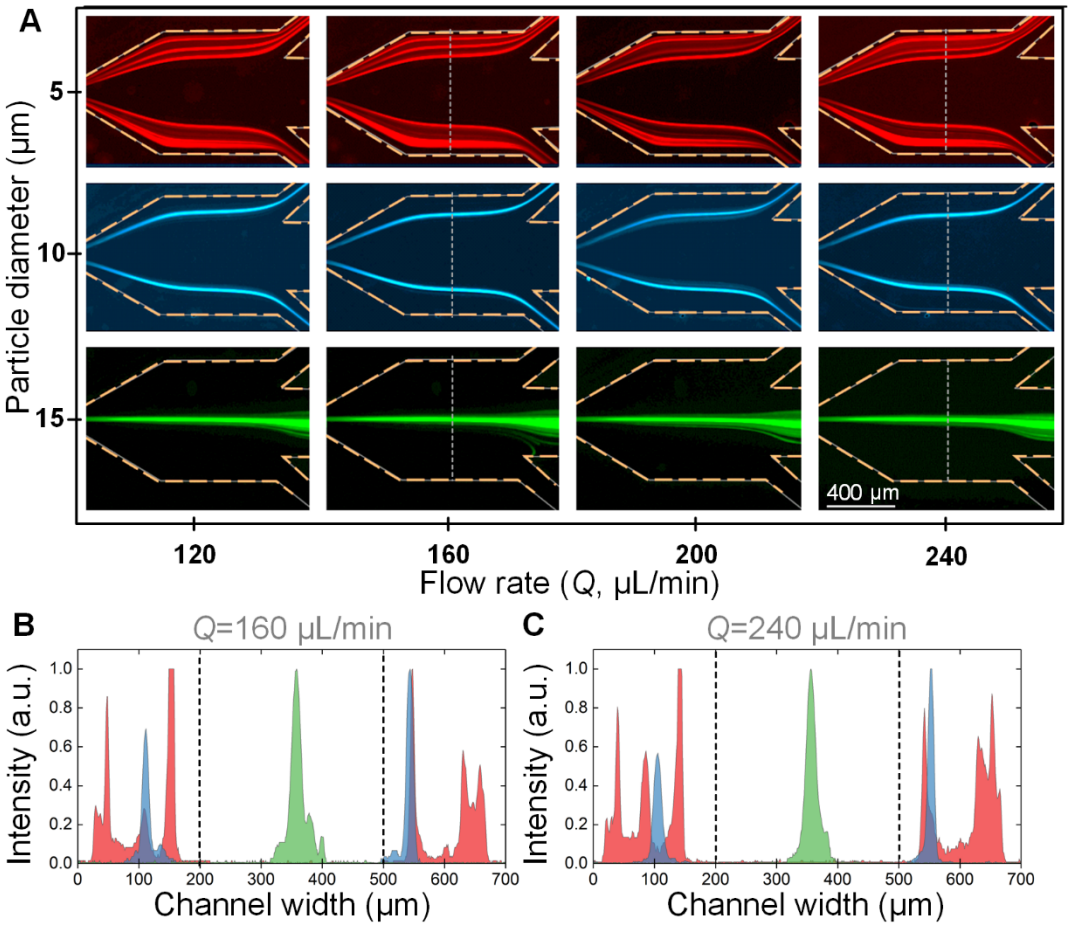

Figure S3. Effect of flow rate on particle separation. (A) Images illustrating the distributions of 5 μm, 10 μm, and 15 μm particles before the outlet system at different flow rates of 120-240 μL/min with an interval of 40 μL/min. The yellow dotted lines indicated the channel walls. The 5 μm, 10 μm, and 15 μm particles were pseudo-colored with red, blue, and green, respectively. (B, C) Fluorescence intensities across the channel width at the flow rates of 160 μL/min (B) and 240 μL/min (C). The fluorescence intensities were measured at the positions of white dotted lines in subfigure A. The intensities were normalized. The red, blue, and green represented the 5 μm, 10 μm, and 15 μm particles, respectively.

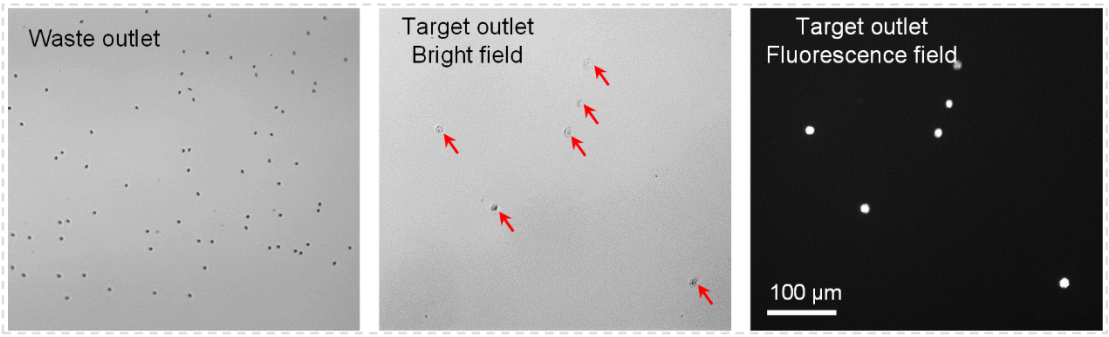

Figure S4. Microscopic images of the fluids collected from the waste and target outlets. To identify the tumor cells in the target outlet, the fluorescent image of fluids collected from the target outlet was also provided. The tumor cells were spiked into the diluted blood at a concentration of 10^4 cells/mL.

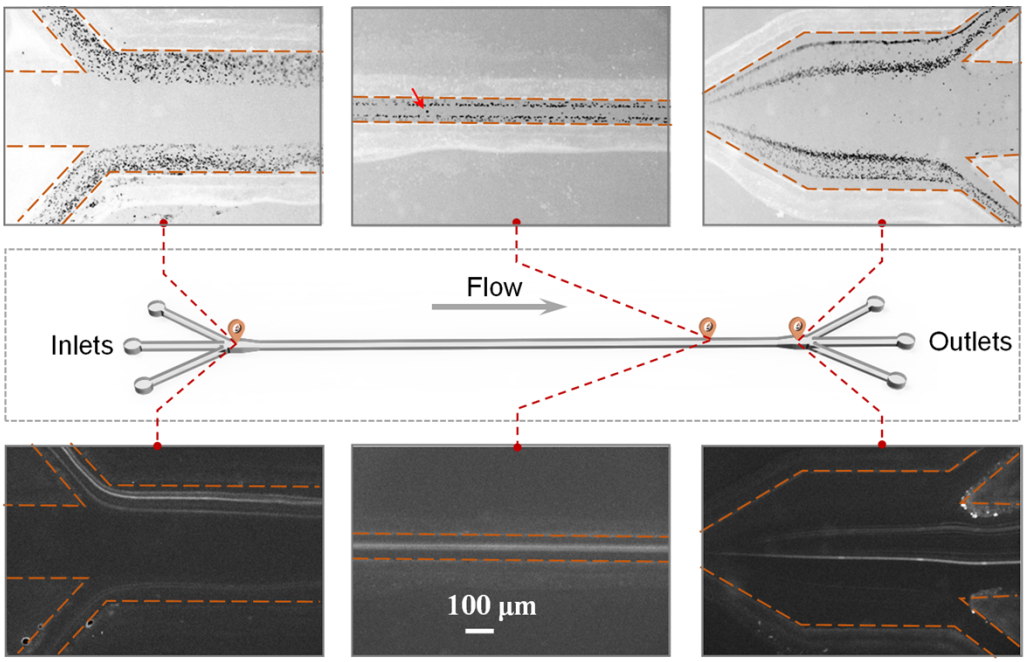

Figure S5. Characterization of cell separation performances using samples spiked with low-concertation tumor cells. Bright and fluorescent images illustrating the cell distributions near the inlet, at the main channel, and near the outlet. The yellow dotted lines indicated the channel walls. The tumor cells were stained before being spiked into the diluted blood samples. The fluorescent streams in the fluorescent images indicated the trajectories of the stained tumor cells.

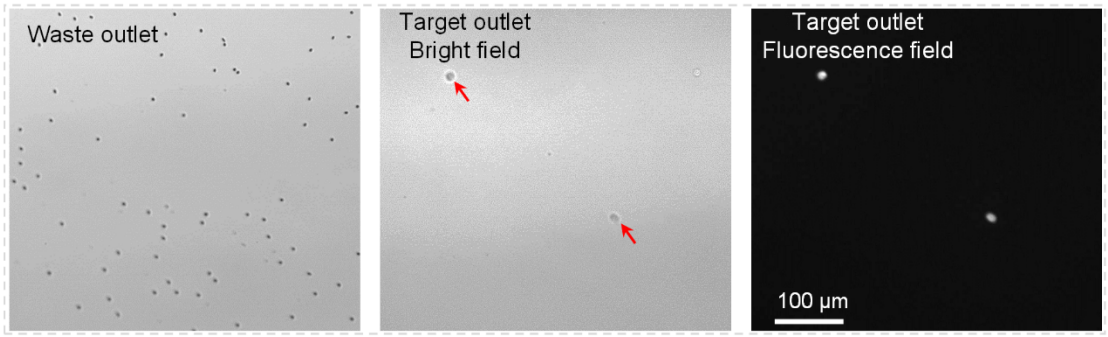

Figure S6. Microscopic images of the fluids collected from the waste and target outlets for the experiment using samples spiked with low-concertation tumor cells. To identify the tumor cells in the target outlet, a fluorescent image of fluids collected from the target outlet was also provided. The tumor cells were spiked into the diluted blood at a concentration of ~10^3 cells/mL.

Table S1. Clinical information of patients.

No.	Age/ Sex	Disease	Stage	Sample
1	58/M	Pancreatic cancer	IV	Peritoneal effusion
2	35/F	Ovarian cancer	NA	Peritoneal effusion
3	48/F	Breast cancer	IV	Pleural effusion
4	57/M	Liver cancer	IV	Peritoneal effusion
5	70/F	Lung cancer	IV	Pleural effusion