Supporting Information

Aptamer-enabled Efficient Isolation of Cancer Cells from Whole Blood Using a Microfluidic Device

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Aptamer Immobilization

To demonstrate the immobilization of DNA aptamers onto the surface of a microchannel, biotinylated aptamers labeled with fluorescein isothiocyanate (FITC) was introduced into the channel and confocal microscope images were taken to measure the fluorescence intensity on the surface. As shown in **Figure S1**, the fluorescence signal increased with the increasing FITC-aptamer concentration (after thorough washing), proving that aptamers were successfully immobilized on the avidin-modified surfaces and the amount of aptamers immobilized is dependent on the aptamer concentration.

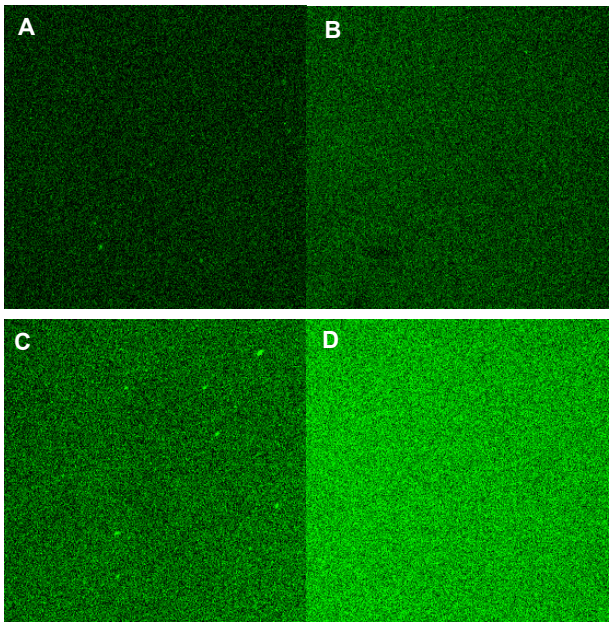
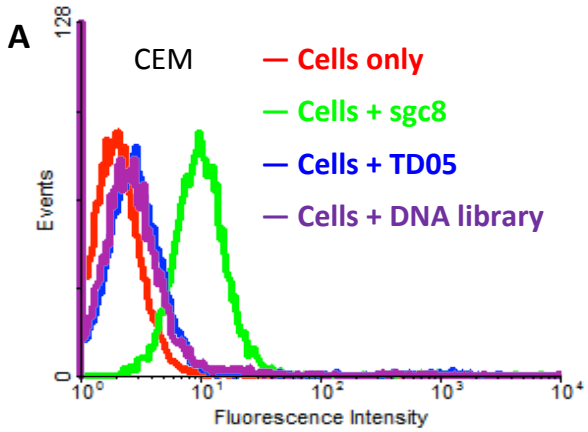
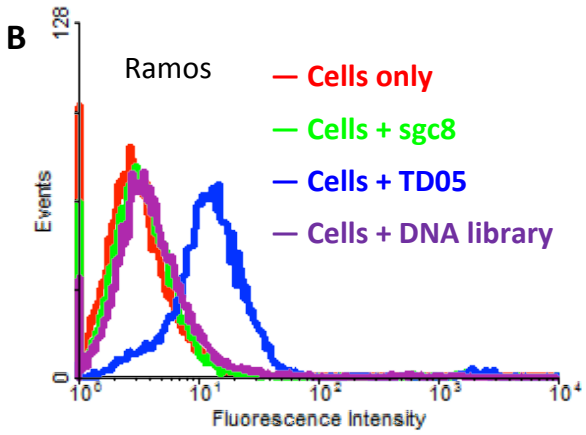


Figure S1. Confocal fluorescence images of FITC-modified aptamers immobilized on the surfaces of a microfluidic channel. 1 mg/mL of avidin was introduced into the channel and incubated for 1 min, followed by three times of washing using the binding buffer. FITC-labeled sgc8-poly(T)-biotin aptamers were then introduced into the channel, incubated for 1 min, and washed three times with the binding buffer. The concentrations of aptamers are: **(A)** 2.5 μM, **(B)** 25μM, **(C)** 50 μM, and **(D)** 100 μM.

Flow Cytomerty

To ascertain if a poly(T)-modified aptamer preserves its binding affinity and specificity to its target cells, flow cytometry analysis was carried out. **Figure S2A** shows the histogram of CEM cells from the flow cytometer. Compared to cells only, a large shift in the fluorescence signal was observed for those cells conjugated with sgc8 aptamers. The result suggests that poly(T)-appended sgc8 aptamers still have specific binding with CEM cells. A random single strand DNA library or TD05 aptamer had non-specific binding with CEM cells, showing a tiny shift in the fluorescence signal compared to cells only. Similarly, **Figure S2B** shows that poly(T)-modified TD05 aptamers bound selectively with Ramos cells while sgc8 aptamer or a DNA library did not have specific binding. **Figure S2C** shows that the comparison of the flow cytometry between the cell-aptamer binding in the binding buffer and that in the capturing buffer. As detailed in the Experimental Section, the capturing buffer was prepared by adding Histopque-1119 to the binding buffer for matching the density of blood. The flow cytometry results indicate that the addition of Histopque-1119 to the binding buffer did not have any adverse effect on the binding of sgc8 aptamer with CEM cells.





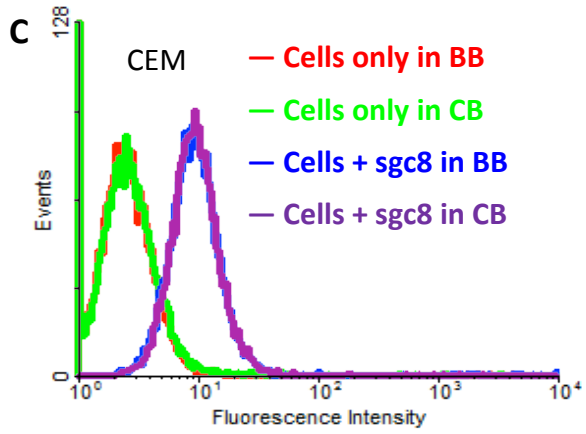


Figure S2. Flow cytometry histograms showing the selective binding of target cells with corresponding aptamers. **(A)** CEM cells selectively bind with sgc8 aptamers. **(B)** Ramos cells selectively bind with TD05 aptamers. **(C)** Comparison of cell-aptamer binding in the binding buffer (BB) and in the capturing buffer (CB).