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required to lyse mammalian cells. For example, an aqueous solution comprising polysorbate 20 at a concentration of up to about 0.05% can be used to pre-treat a surface before contact with a biological sample.

The aqueous solution can further comprise components to reduce non-specific surface binding from blood components. For example, the surface can be contacted with a mixture of 0.05% polysorbate 20, 1% BSA and 1× phosphate buffered saline (PBS) (calcium ion and magnesium ion—free). The volume of the pre-treatment solution can be selected based on the dimensions of the channel. For example, about 3 mL of the 0.05% polysorbate 20 solution described above can be passed through a microfluidic channel at a rate of about 30 ml/hr. The microchannel can be incubated in the polysorbate 20 solution for about 1 hour before introducing the biological sample to the channel.

In some embodiments, the micro-channel having a surface containing a biotin-binding conjugate is contacted with a solution comprising 0.05% Tween20 in 1% BSA in 1×PBS (Ca<sup>2+</sup>/Mg<sup>2+</sup>—free) (for example, 3 mL of the surfactant solution at a flow rate of about 30 mL/hr) prior to contact with the biological sample containing CTCs, a biotinylated EpCAM antibody, biotin and streptavidin. Pluronic, poloxamer, PEG, and other similar surfactants can be similarly used instead of or in combination with polysorbate 20.

What is claimed is:

1. A method for capturing cells suspended in a blood sample, the method comprising:

flowing the blood sample including the cells to be captured through a microchannel comprising an inner wall surface, wherein at least one V-shaped groove is defined in the inner wall surface of the microchannel, wherein the at least one V-shaped groove comprises an apex and two arms connected to the apex and is oriented such that the apex points in the direction of flow through the microchannel, and wherein an adherent is disposed on the inner wall surface in which the at least one V-shaped groove is defined;

contacting at least some of the cells against the adherent; and

capturing at least some of the cells contacting the adherent.

2. The method of claim 1, further comprising disposing the adherent on the inner wall surface in which the at least one V-shaped groove is defined.

3. The method of claim 1, wherein the at least one V-shaped groove is defined in the inner wall surface such that flowing the blood sample past the at least one V-shaped groove forms microvortices in the blood sample .

4. The method of claim 1, wherein flowing the blood sample comprises flowing the blood sample at an average flow rate between 0.12 ml/hr and 2.0 ml/hr.

5. The method of claim 1, wherein the cells are cancer cells and the adherent is an antibody configured to bind to the cancer cells, and wherein the method further comprises culturing the captured cancer cells.

6. The method of claim 1, wherein the flow rate is at least 0.24 ml/hour.

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7. The method of claim 1, wherein the flow rate is at least 0.48 ml/hour.

8. The method of claim 1, wherein the cell viability is at least about 90 percent.

9. The method of claim 5, wherein the cancer cells are lung cancer or prostate cancer cells.

10. The method of claim 1, wherein the cells are captured with a capture efficiency of at least about 40%.

11. A microfluidic device comprising:

a microchannel comprising:

an inner wall surface,

an inlet,

an outlet positioned at a distance from the inlet, wherein fluid flows from the inlet to the outlet over the inner wall surface,

a groove defined in the inner wall surface of the microchannel, wherein the groove comprises an apex and two arms, each comprising an end arranged one on either side of and connected to the apex and wherein the groove is oriented such that the apex points in a direction of fluid flow; and

an adherent disposed on the inner wall surface in which the groove is defined to selectively bind to an analyte of interest.

12. The device of claim 11, wherein the adherent is an antibody.

13. The device of claim 11, where in the adherent is an aptamer.

14. The device of claim 11, wherein the groove spans less than a width of the microchannel.

15. The device of claim 11, wherein each of the two ends are equidistant from the apex.

16. The device of claim 11, wherein the groove is formed symmetrically in the surface of the wall such that the apex is positioned on an axis passing through a center of the microchannel and the two ends are equidistantly positioned from the apex.

17. The device of claim 11, wherein a first of the two ends is positioned nearer to the apex than a second of the two ends.

18. The device of claim 11, wherein the microchannel comprises a plurality of grooves defined in the inner wall surface of the microchannel, wherein each of the plurality of grooves comprises an apex and two ends arranged one on either side of and connected to the apex, wherein the plurality of grooves are disposed in a first column of grooves.

19. The device of claim 18, further comprising an additional column of grooves formed adjacent the first column of grooves.

20. The device of claim 19, wherein an apex and two ends of a groove in the first column of grooves are aligned with an apex and two ends of a groove in the additional column of grooves on a plane that is perpendicular to an axis passing through the microchannel.

21. The device of claim 19, wherein the additional column of grooves is offset from the first column of grooves.

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