tured with the mierofluidic device having grooves and control cells. To explore if the exposure of the cancer cells to the microfluidic device **800** had any impact on the cell phenotype, one marker, EpCAM, was studied. Specifically, expression levels between the cells captured on the device **800** and the control cells (prepared in the same manner, but never flowed through the device) were compared. Both cell populations were cultured for 3 weeks post-experiment. Flow cytometry results indicated that the capture and culture of the cancer cells did not change their expression levels of EpCAM. These results indicate that capturing with the microfluidic device **800** does not change the phenotype of the cell.

EXAMPLE 6

Cell Capture

FIG. **11**A shows a circulating tumor cell (CTC) captured from a prostate cancer patient using the microfluidic device **100**. As shown in FIG. **11**A, a CTC was captured on the grooves of the microfluidic device **100**. FIG. **11**B shows that the cell was intact, demonstrating the intact nucleus and cytoplasm. The cell was identified as a CTC because it stained positive for PSA (prostate-specific antigen, green), and a nuclear stain (DAPI, blue) and negative for CD45 (red), a traditional marker for white blood cells (see FIGS. **11**C and **11**D for a gray-scale representation). Also, there are no contaminating cells. FIG. **11**E shows the intact cell under reflected light.

EXAMPLE 7

Background CTC Levels

FIG. **12** show healthy donor controls. To confirm that the CTC counts observed using patient samples were higher than the background that would be observed in healthy donor samples, four distinct donors (3 male, 1 female) were tested using the microfluidic device **100** and stained with the PSA/CD45 stain. For all four cases, the healthy donor counts were ≤5 false positives/mL, with an average of 2 false positives/mL. Similar experiments with the silicon chip resulted in a higher number of false positives, presumably due to the increase in non-specific binding.

EXAMPLE 8

Capture Levels

FIG. **13** shows CTC capture from patient samples using the microfluidic device **100** having grooves. Initial results indicate that CTC capture from patient samples when using the microfluidic device **100** having grooves can be as high as 160 CTCs/mL.

FIGS. **14**A-**14**D show gray-scale representations of Wright-Giemsa staining of CTCs in the microfluidic device **100** having grooves. Because the substrates used to manufacture the microfluidic device **100** are transparent, the patient samples captured within the microfluidic channel **115** can be stained with histological stains, for example, Wright-Giemsa. FIGS. **14**A-**14**D show micrographs taken from a lung cancer patient sample run through the microfluidic device **100**. The cells selected are CTCs.

FIG. **15** shows a comparison of two microfluidic devices having different groove dimensions. Two microfluidic devices were compared to determine an effect of a height of the groove on capture efficiency. A first microfluidic device had a channel height of 70 μm and a second microfluidic device had a channel height of 50 μm. The first microfluidic device had a groove height of 35 μm and the second microfluidic device had a channel height of 25 μm. In comparison to the first microfluidic device, the second microfluidic device exhibited a three fold increase in capture efficiency with the low expressor cells, PC3, spiked into whole blood.

While this specification contains many specifics, these should not be construed as limitations on the scope of the specification or of what may be claimed, but rather as descriptions of features specific to particular implementations of the specification. Certain features that are described in this specification in the context of separate implementations can also be implemented in combination in a single implementation. Conversely, various features that are described in the context of a single implementation can also be implemented in multiple implementations separately or in any suitable subcombination. Moreover, although features may be described above as acting in certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a subcombination or variation of a subcombination.

Similarly, while operations are depicted in the drawings in a particular order, this should not be understood as requiring that such operations be performed in the particular order shown or in sequential order, or that all illustrated operations be performed, to achieve desirable results. In certain circumstances, multitasking and parallel processing may be advantageous. Moreover, the separation of various system components in the implementations described above should not be understood as requiring such separation in all implementations, and it should be understood that the described program components and systems can generally be integrated together in a single software product or packaged into multiple software products. Thus, particular implementations of the specification have been described. Other implementations are within the scope of the following claims. For example, the actions recited in the claims can be performed in a different order and still achieve desirable results.

Cells disposed in blood or in buffer solution can be flowed through the micro-channel in such an orientation to bind to adherents disposed in the channel. Techniques such as hot embossing, injection molding, and the like can be used form the micro-channel or the grooves or both. In such embodiments, the master, from which the substrates are manufactured, need not be silicon. In some embodiments, small molecules such as peptides, nucleotides, and the like can be used as adherents

In some embodiments, prior to flowing any blood through a micro-channel, non-specific binding can be reduced by the addition of a surfactant to a blocking buffer (typically 1-3% BSA in 1×PBS). After adding the blocking buffer (e.g., 0.05% TWEEN20 in 3% BSA in 1×PBS), the microfluidic device can be incubated for a duration, for example, one hour, at a temperature, for example, room temperature, to provide efficient blocking of the substrates. Blood flow can be initiated following the blocking step.

In some embodiments, decreasing the non-specific binding to a surface of the micro-channel can be achieved by contacting the surface comprising the analyte-binding moiety with a nonionic detergent prior to sample contact with the surface. The nonionic detergent can be a polysorbate surfactant such as a polyoxyethylene derivative of sorbitan monolaurate (for example, polysorbate 20, sold under the tradename TWEEN20). The nonionic detergent can be contacted with the surface at a concentration lower than the concentration