Development of microfluidic cell sorting system with Weir Structure-Based Filter

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Sorting and separation of cells from a heterogeneous mixture is a vital process in any cell-related research. The biophysical characteristics of the cell such as morphology, size, density, and dielectric susceptibility are commonly utilized in a label-free sorting method but often lacks specificity. The use of labels or biological markers is common alternative but succeeding processes can have an influence on the cellular phenotype.

In this study, we designed the micro fluidic chip with weir structured-based filters. There are two important flow in the chip. First flow exists in the bottom of the chip and proceed toward the outlet. Another one exist in the dent of the weir and proceed outside. Cells smaller than the gap go through to the outlet smoothly. However, when the larger cells interact with the weir, they are influenced by flow in the dent and brought to the outside. The design (A) has been further modified based on the tests using microbeads and cancer cells (B). We successfully separated two type of cells from dilution blood (C). By establishing the evaluation method, we can further improve the sorting capability of the chip. With this result, an alternative sorting method can be realized that can be utilized for low concentration volume of the cell suspension. To enhance the sorting capability, optimized coating will be needed which can interact with the different integrin or binding molecules present on the cell surface.



(A) Our chip design and sorting plan.
(B) The image that 6 µm beads are removed from sample
(C) Time lapse image when we flow blood in our chip.
White point and red point show the two type of cells observed.