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Parallel and Passive Distribution to Arrayed Microwells Using Self-Regulating Pinched Flow

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A parallel and passive (without any actuators or electrodes) cell distribution method for a cellular diagnostic microwell array was developed. This method can be used to simultaneously distribute cells evenly to arrayed microwells only by introducing cell suspensions into the inlet. To regulate the dispersion of the number of distributed cells into each microwell, we conceived a novel concept, the self-regulating pinched flow. The self-regulating pinched flow is realized in a functional microchannel, which consists of center micropillar colonnades and side channels. Computational fluid dynamics (CFD) simulations were carried out to optimize the design of the pinching area. We developed a prototype device that can be used to successfully distribute the beads uniformly in eight parallel microwells. The coefficient of variation (CV) of the distributed beads in the microwells was 29.3%.

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