Supplemental information

An Integrated Microfluidic System for On-Chip Enrichment and Quantification of Circulating Extracellular Vesicles from Whole Blood

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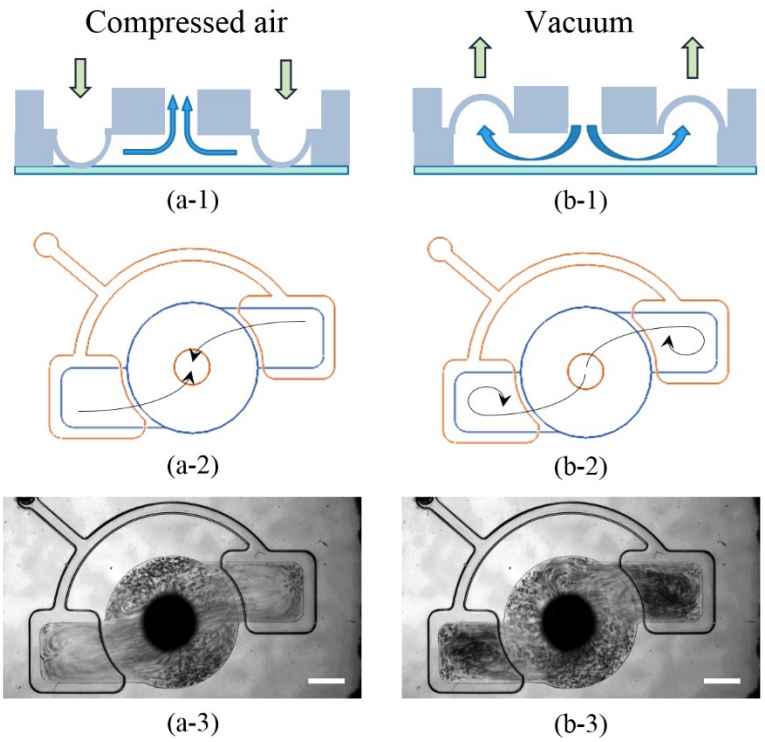
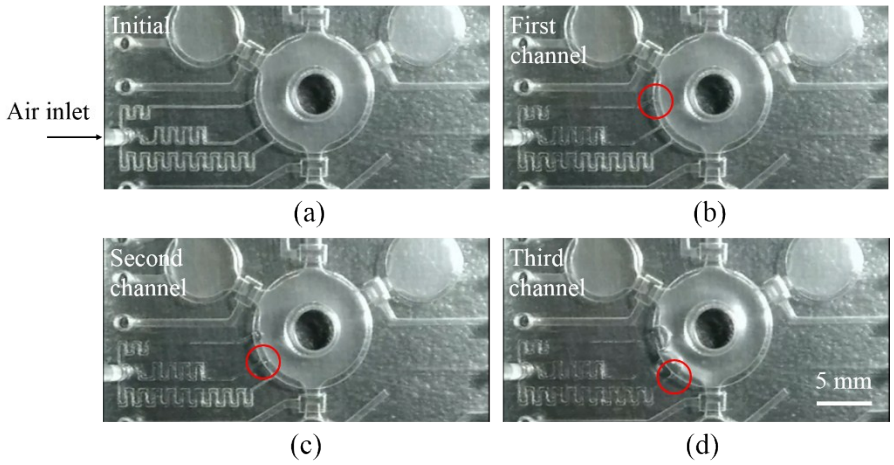
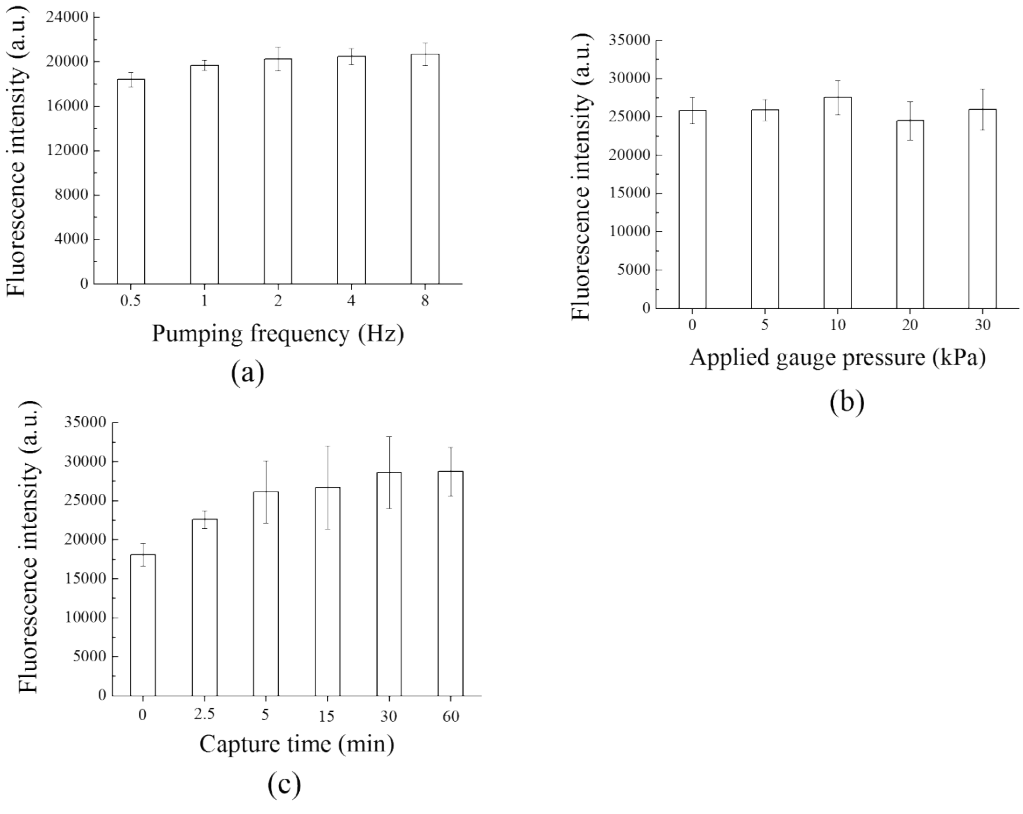


Supplementary figure 1. The operation of the micro-stirrer as controlled by (a) compressed air (positive applied gauge pressure) and (b) a vacuum (negative applied gauge pressure). When compressed air was applied (a-1 to a-3), the PDMS membrane was actuated and deformed downwards to push the liquid towards the center hole from the two reservoirs. Alternatively, the PDMS membrane could be deformed upwards to cause liquid to flow from the center to the two reservoirs when a vacuum was applied (b-1 to b-3). Upon alternating compression and vacuum, a vortex flow was induced in the micro-stirrer, thereby increasing the filtration efficiency.



Supplementary figure 2. Three-stage pressure changes via a three-channel air division design. Water was used for simulating the applied compressed air and (a) loaded into an air inlet. Water reached the air chamber of the micro-mixer from the first channel (b) and then subsequently from the second (c) and third (d) channel. Compressed air was divided into three stages to fill the air chamber; this led to gentle mixing of antibodies and extracellular vesicles.



Supplementary figure 3. Optimization of the operating conditions for the micro-mixer during extracellular vesicles (EVs) enrichment. After on-chip incubation of magnetic beads and plasma, the captured plasma EVs were immunofluorescently stained and quantified on a microplate reader. The fluorescence intensity increased with increasing pumping frequency and saturated at 2 Hz (a), but did not change with increasing applied gauge pressure (b). Moreover, it increased with increasing capture time (saturating at 5 min, c). All the experiments were triplicate and error bars represent standard deviation.