

Figure S-2

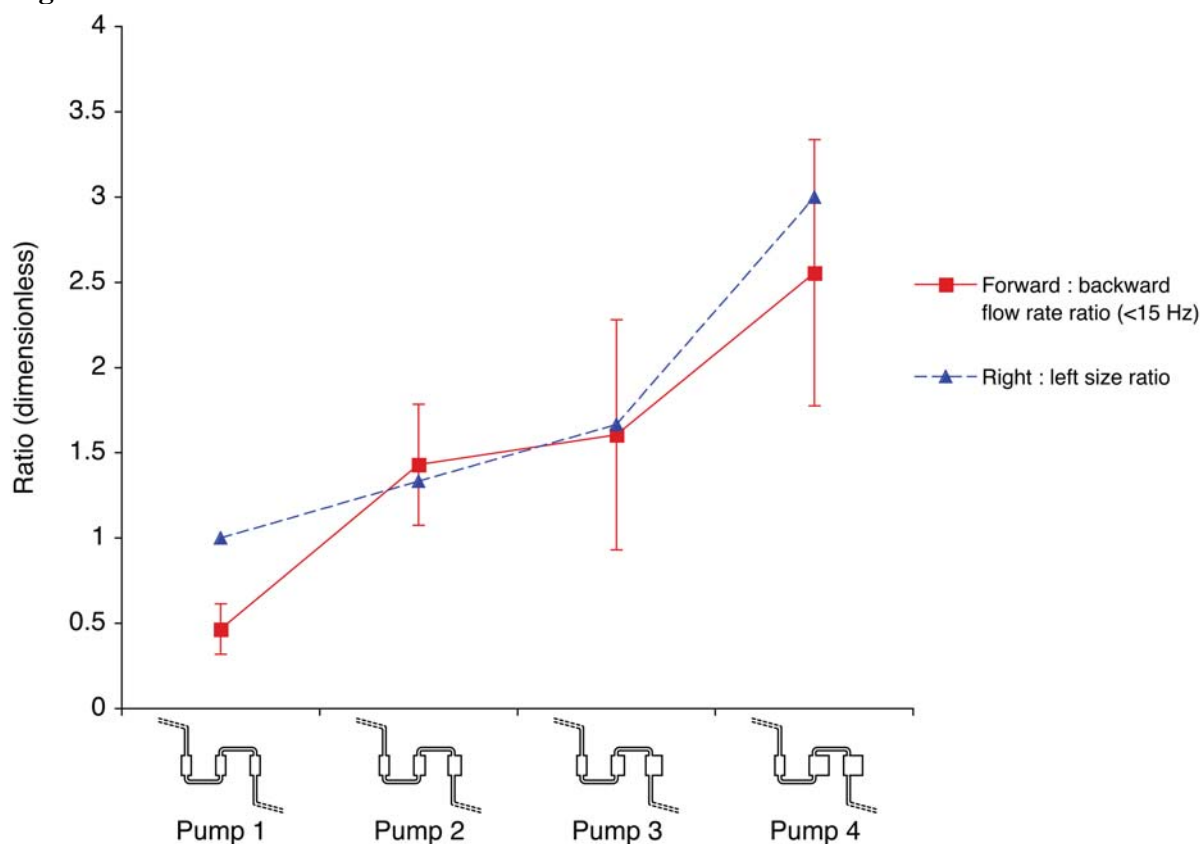


Figure S-2. Relationship between flow rate and effective element size. (Red solid line, ■) Ratios of forward and backward (F:B) flow rates of three-element single-stroke micropumps (SS μ P) from 1 Hz to 12 Hz is averaged and plotted over their corresponding designs. Ratio at 15 Hz is not included in the average above because it is outside of the operating frequency range of the SS μ P, where incomplete strokes contribute to a sharp drop-off in flow rate. (Blue dashed line, σ) Right-to-left (R:L) size ratio is defined as the combined volumes of the three elements downstream (right) of the valves' centerline to combined volumes of the three elements upstream (left) of the valves' centerline. The size ratios for are – 1:1 (Pump 1, symmetric elements), 4:3 (Pump 2), 5:3 (Pump 3), and 3:1 (Pump 4). The F:B flow ratio is proportional to the R:L size ratio, indicating a bias in favor of downstream flow as a result of the asymmetric position of the valve seat, where downstream element volume is greater than the volume upstream.