Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Information for "Cross-sectional focusing of red blood cells in a constricted microfluidic channel"

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Supplementary Figures

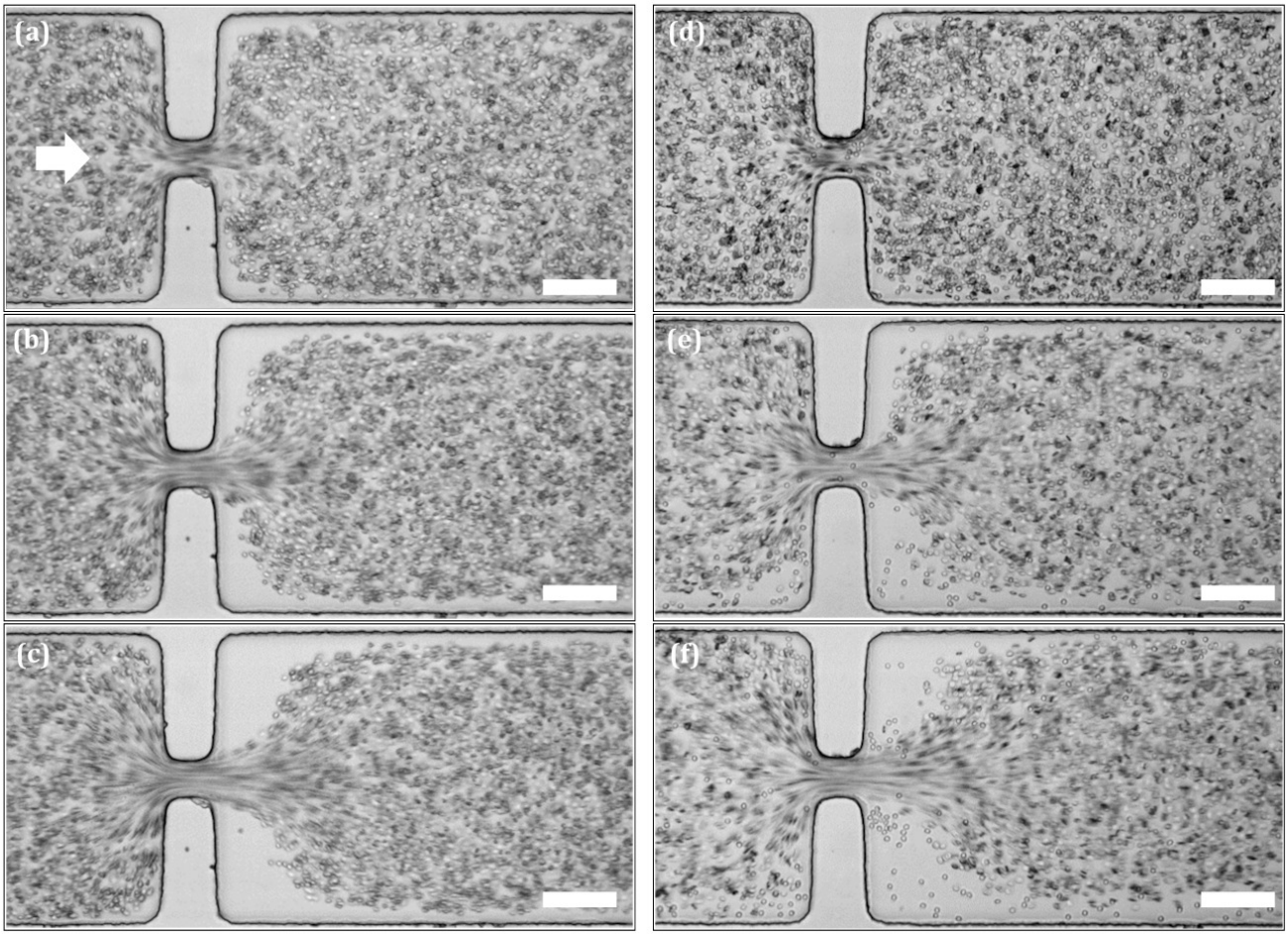

Fig. S1 Microscopic snapshots of (a-c) a $5\%\ Ht$ living RBC suspension and (d-f) a $5\%\ Ht$ rigid RBC suspension flowing through the microfluidic contraction-expansion channel. From top to bottom the pressure drops are $\Delta p = 40$ mbar, $\Delta p = 100$ mbar, and $\Delta p = 140$ mbar, respectively. The direction of flow is from left to right, as indicated by the white arrow. The white scale bars represent a length of $100\ \mu$m.

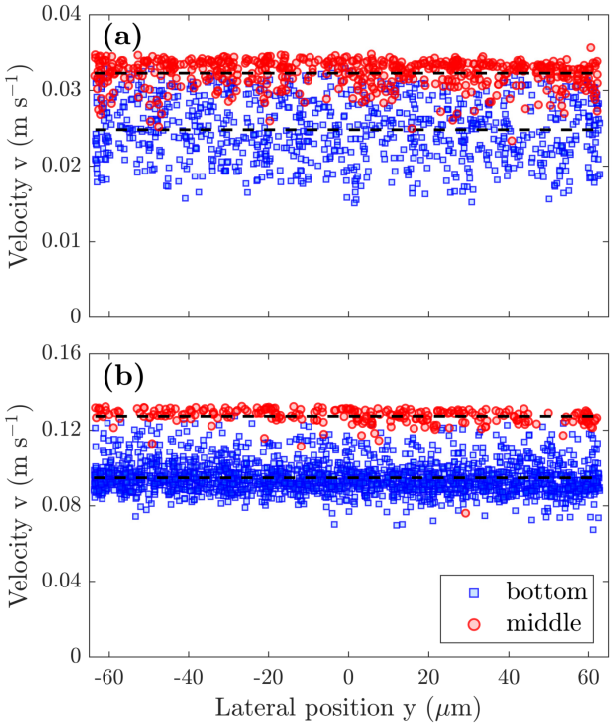

Fig. S2 Velocity of rigid RBCs (1% Ht) $x = 10$ mm post-contraction at a pressure drop of (a) $\Delta p = 40$ mbar and (b) $\Delta p = 140$ mbar. Cells are detected at channel center in y direction in two layers, close to the bottom ($z \approx -15$ μm) and in the channel middle ($z = 0$), represented as blue and red symbols, respectively. Dashed lines represent the mean velocities in each plane.

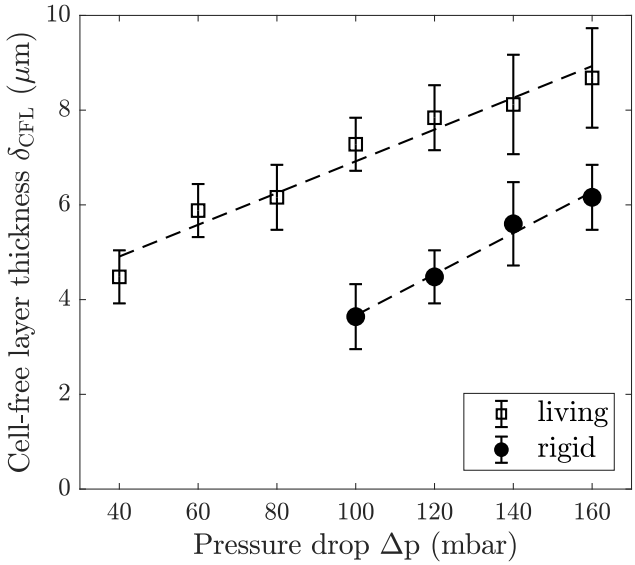

Fig. S3 Thickness of the cell-free layer for rigid and living RBCs (5% Ht) as a function of pressure drop. The thickness is calculated $x = 10$ mm post-contraction. Dashed lines are to guide the eye.

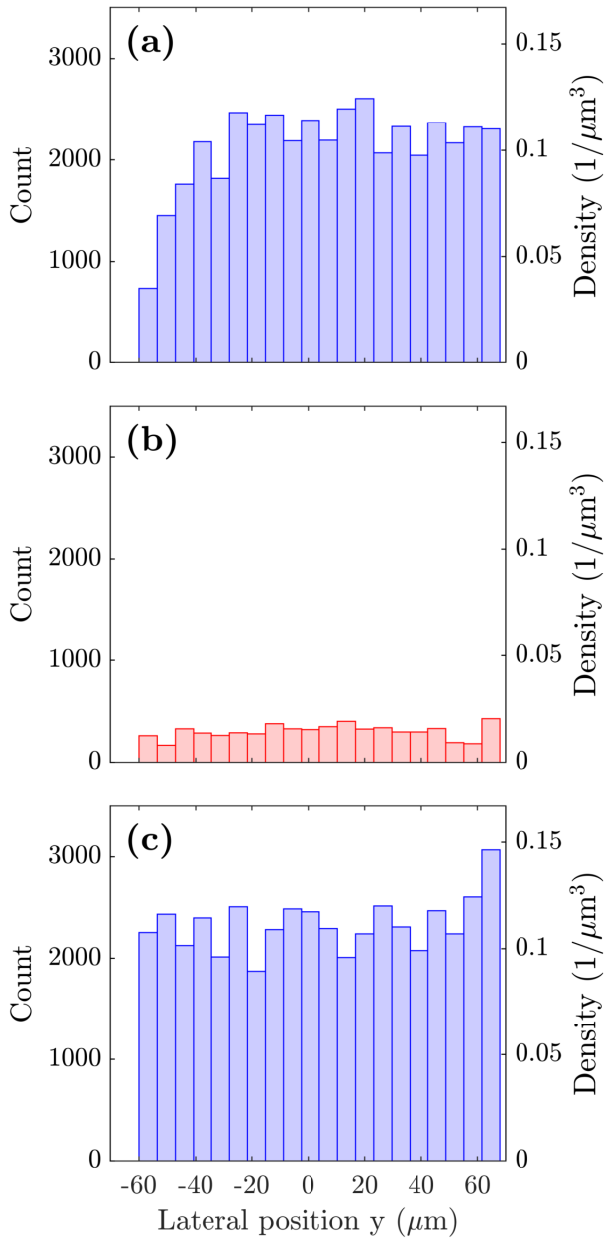

Fig. S4 Distribution of rigid RBCs ($1\%\ Ht$) $x = 10$ mm post-contraction along the channel width close to the top (a), in the channel middle (b), and close to the bottom (c) in z-direction. The pressure drop is $\Delta p = 140$ mbar. Data is accumulated over 4,000 frames.

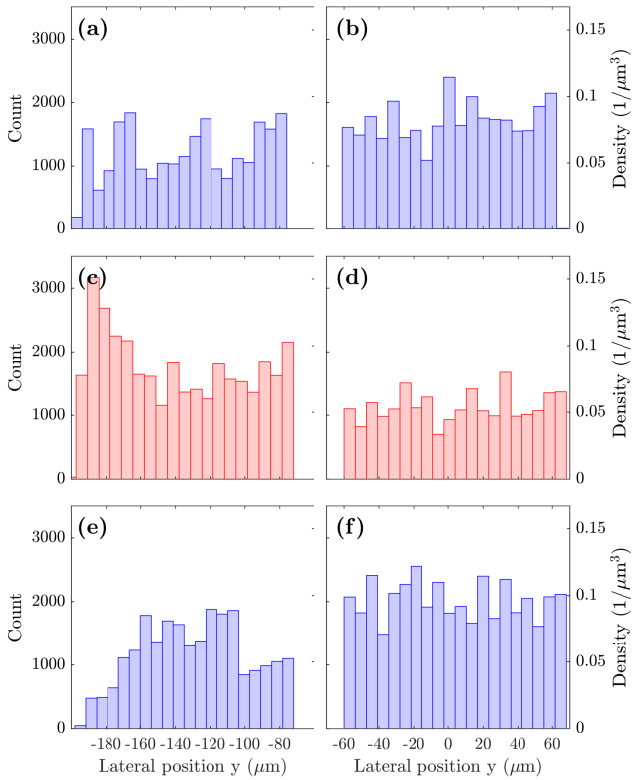

Fig. S5 Distribution of rigid RBCs ($1\%\ Ht$) $x = 10$ mm post-contraction along the channel width close to the top (top row), in the channel middle (middle row), and close to the bottom (bottom row) in z-direction. (a), (c) and (e) represent the channel border and (b), (d) and (f) show the channel center in y-direction. The pressure drop is $\Delta p = 40$ mbar. Data is accumulated over 4,000 frames.

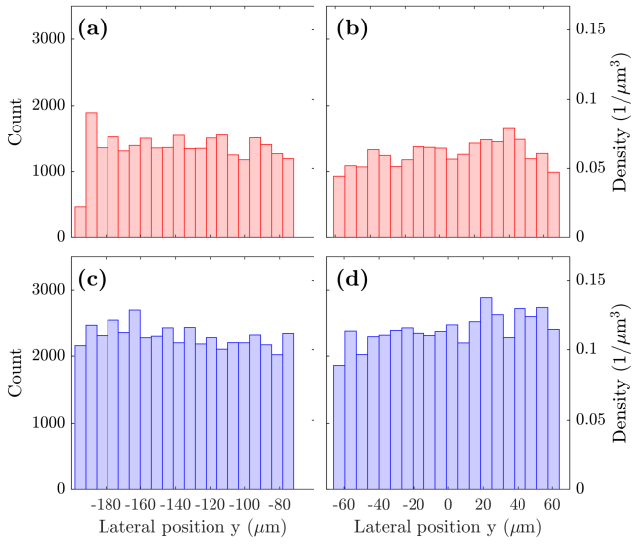

Fig. S6 Distribution of rigid RBCs ($1\%\ Ht$) $x = 10$ mm pre-contraction along the channel width in the channel middle (upper row), and close to the bottom (lower row) in z-direction. (a) and (c) represent the channel border and (b) and (d) show the channel center in y-direction. The pressure drop is $\Delta p = 140$ mbar. Data is accumulated over 4,000 frames.

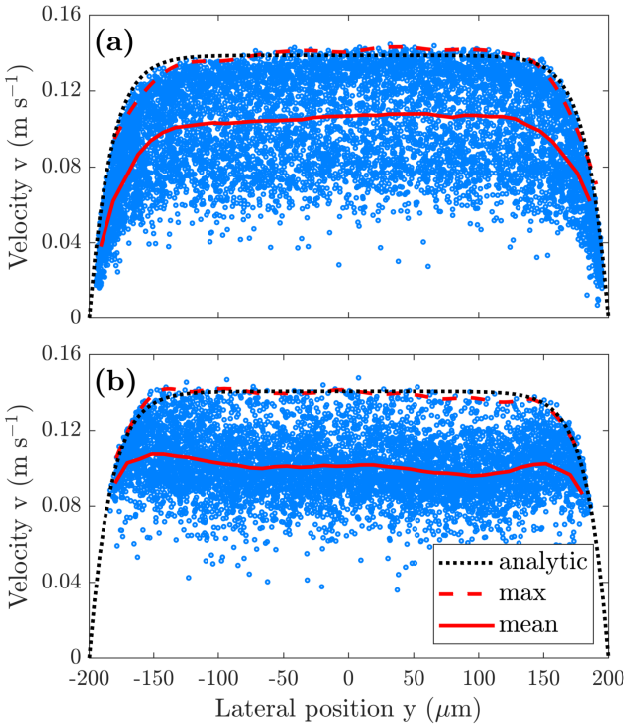

Fig. S7 PTV: Velocities of individual rigid RBCs (1% Ht), plotted as blue dots, at $\Delta p = 140$ mbar (a) $x = -10$ mm pre-contraction and (b) $x = 10$ mm post-contraction. Data is acquired across the whole channel height, using a $10\times$ lens with $NA = 0.3$. The dashed and solid red lines represent the maximum and mean velocities of all cells along the channel width, respectively. The dotted black line indicates the velocity profile for a Newtonian fluid across the channel middle $z = 0$.

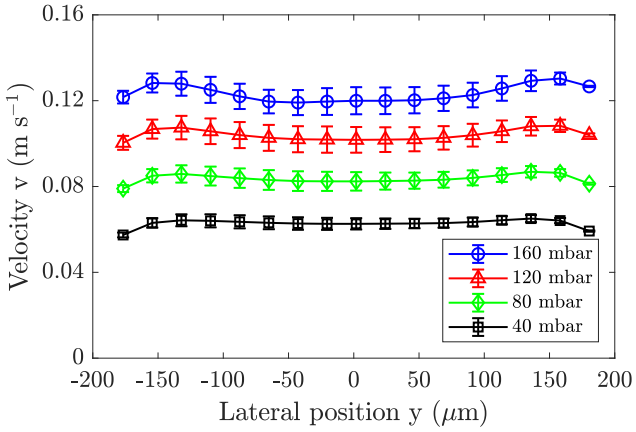

Fig. S8 PIV: Mean velocity profiles across the channel width at $x = 10$ mm post-contraction of living RBCs (5% Ht) at different pressure drops in a density-matched solution (35% OptiPrep™ and 65% PBS).

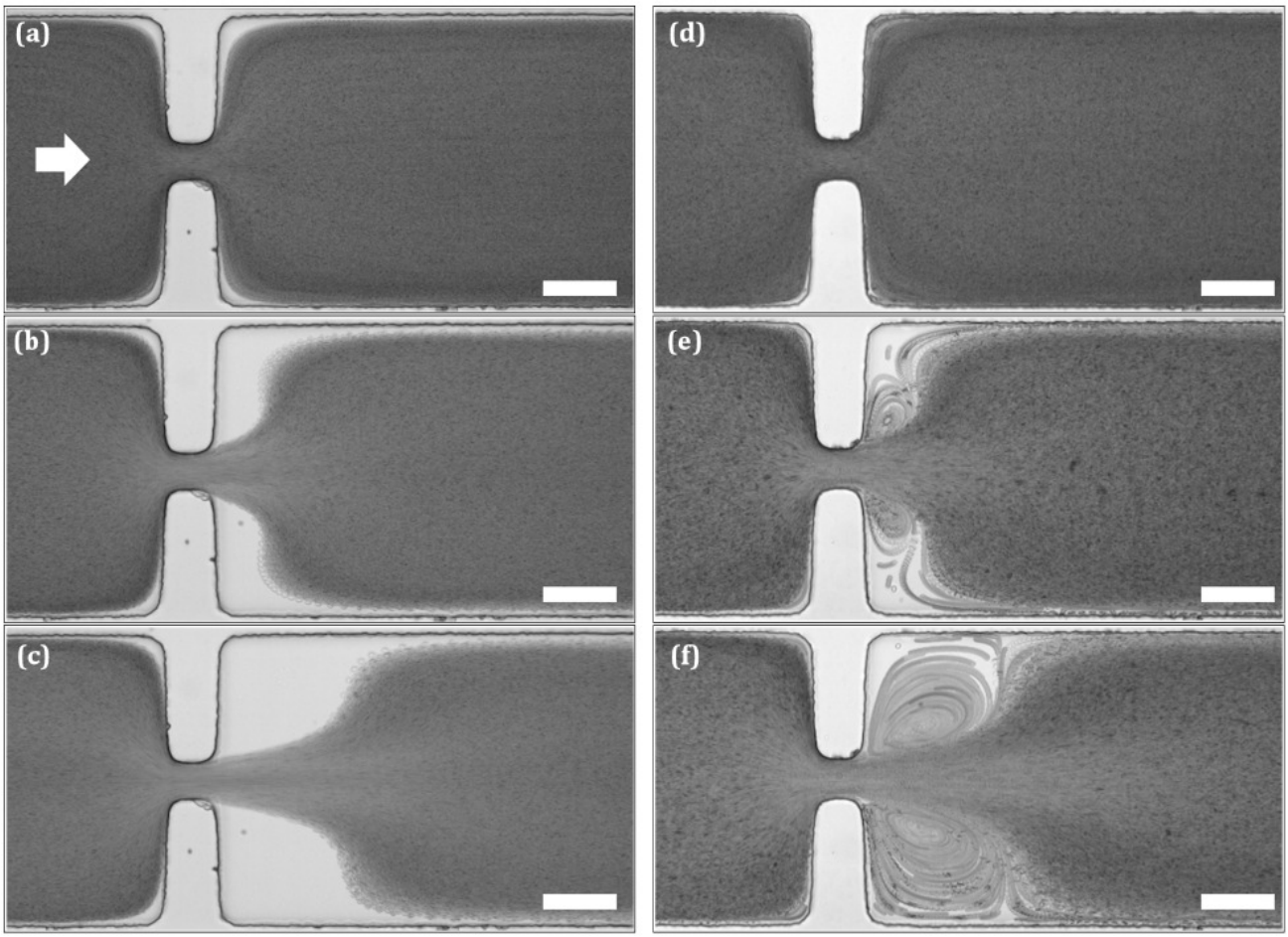

Fig. S9 Time stacks of 1,050 microscopic images of (a-c) a $5\%\ Ht$ living RBC suspension and (d-f) a $5\%\ Ht$ rigid RBC suspension flowing through the microfluidic contraction-expansion channel. From top to bottom the pressure drops are $\Delta p = 40$ mbar, $\Delta p = 140$ mbar, and $\Delta p = 240$ mbar, respectively. The direction of flow is from left to right, as indicated by the white arrow. The white scale bars represent a length of $100\ \mu$m.