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Red Blood Cell Dispersion in Morphologically-Inspired Microfluidic Models of Alveolar Capillary Networks HAGIT STAUBER, RAMI FISHLER, Technion-IIT, DAN WAISMAN, Department of Neonatology Carmel Medical Center Faculty of Medicine - Technion IIT, JOSUE SZNITMAN, Technion-IIT — Microfluidics is frequently used to study blood flow characteristics in microcapillary networks and investigate transport properties of red blood cells (RBC). To date, most of microfluidic studies have not focused on the specific morphology of alveolar capillary networks (ACN), with characteristic length scales of ~ 5 μm, known to give rise to organ-specific blood flow characteristics. To better understand flow characteristics and dispersion of RBCs in ACNs, we have designed morphologically-inspired microfluidic models of alveolar capillary beds at a real scale. We fabricate lab-on-chip devices featuring confined staggered pillar arrays with diameters of $\sim$ 10 μm, representative of the dense ACN capillary meshes. Devices are supplied by an external reservoir containing whole blood at various hematocrit levels, to mimic RBC perfusion (Re<0.01) within alveolar capillaries. Whole-field velocity patterns are imaged (PIV) and RBC motion is tracked using particle tracking velocimetry (PTV) from which dispersion coefficients are extracted. Our efforts are aimed at delivering a real-scale quantitative description of the pulmonary ACN microcirculation.

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