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Quantitative imaging of RBC suspensions in bifurcating microchannels JOSEPH SHERWOOD[1], Imperial College London, DAVID HOLMES, Sphere Fluidics Limited, EFSTATHIOS KALIVIOTIS[2], STAVROULA BALABANI[3], University College London — The local velocity and concentration characteristics of both red blood cells (RBCs) and suspending medium flowing in a bifurcating microchannel were measured simultaneously. An imaging technique involving alternate bright field and laser light illumination was employed to capture both RBC and fluorescent PIV images of human healthy blood, flowing through a sequentially bifurcating 50 micrometer square PDMS microchannel. The acquired images were further processed using PIV algorithms to yield the velocity distribution of RBCs and suspending medium while the brightfield images also provided data on hematocrit distribution and cell-depleted layer. Various flow rates, aggregation states and proportions of flow entering each branch were considered. Asymmetric hematocrit distributions were quantified around the bifurcations and found to be enhanced by aggregation. The data were compared with computational fluid dynamics studies of continuous Newtonian and Non-Newtonian fluids in order to elucidate the impact of the two-phase nature of the flow, particularly RBC aggregation. The work is currently being extended to examine the role of RBC properties on microhemodynamics and the implications for disease.

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