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Axial dispersion in flowing red blood cell suspensions[1] THOMAS PODGORSKI, SYLVAIN LOSSERAND, GWENNOU COUPIER, LIPhy, CNRS - Université Grenoble Alpes — A key parameter in blood microcirculation is the transit time of red blood cells (RBCs) through an organ, which can influence the efficiency of gas exchange and oxygen availability. A large dispersion of this transit time is observed in vivo and is partly due to the axial dispersion in the flowing suspension. In the classic Taylor-Aris example of a solute flowing in a tube, the combination of molecular diffusion and parabolic velocity profile leads to enhanced axial dispersion. In suspensions of non-Brownian deformable bodies such as RBCs, axial dispersion is governed by a combination of shear induced migration and shear-induced diffusion arising from hydrodynamic interactions. We revisit this problem in the case of RBC pulses flowing in a microchannel and show that the axial dispersion of the pulse eventually saturates with a final extension that depends directly on RBC mechanical properties. The result is especially interesting in the dilute limit since the final pulse length depends only on the channel width, exponent of the migration law and dimensionless migration velocity. In continuous flow, the dispersion of transit times is the result of complex cell-cell and cell-wall interactions and is strongy influenced by the polydispersity of the blood sample.

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