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DPD simulation on the dynamics of a healthy and infected red blood cell in flow through a constricted channel SAZID ZAMAL HOQUE, D. VIJAY ANAND, B.S.V. PATNAIK, Indian Inst of Tech-Madras — The state of the red blood cell (either healthy or infected RBC) will influence its deformation dynamics. Since the pathological condition related to RBC, primarily originates from a single cell infection, therefore, it is important to relate the deformation dynamics to the mechanical properties (such as, bending rigidity and membrane elasticity). In the present study, numerical simulation of a healthy and malaria infected RBC in a constricted channel is analyzed. The flow simulations are carried out using finite sized dissipative particle dynamics (FDPD) method in conjunction with a discrete model that represents the membrane of the RBC. The numerical equivalent of optical tweezers test is validated against the experimental studies. Two different types of constrictions, viz., a converging-diverging type tapered channel and a stenosed microchannel are considered for the simulation. The effect of degree of constriction and the flow rate effect on the RBC is investigated. It was observed that, as the flow rate decreases, the infected RBC completely blocks the micro vessel. The transit time for infected cell drastically increases compared to healthy RBC. Our simulations indicate that, there is a critical flow rate below which infected RBC cannot pass through the micro capillary.

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