Abstract Submitted
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Plasma protein induced clustering of red blood cells in micro capillaries[1] CHRISTIAN WAGNER, MATHIAS BRUST, OTHMANE AOUANE, DANIEL FLORMANN, Experimental Physics, Saarland University, MARINE THIEBAUD, CLAUDE VERDIER, GWENNOU COUPIER, THOMAS PODGORSKI, CHAOUQI MISBAH, Laboratoire Interdisciplinaire de Physique, CNRS - UMR 5588, Université Grenoble I, HASSIB SELMI, Laboratoire d'Ingénierie Mathématique, Ecole Polytechnique de Tunisie — The plasma molecule fibrinogen induces aggregation of RBCs to clusters, the so called rouleaux. Higher shear rates in bulk flow can break them up which results in the pronounced shear thinning of blood. This led to the assumption that rouleaux formation does not take place in the microcapillaries of the vascular network where high shear rates are present. However, the question is of high medical relevance. Cardio vascular disorders are still the main cause of death in the western world and cardiac patients have often higher fibrinogen level. We performed AFM based single cell force spectroscopy to determine the work of separation. Measurements at low hematocrit in a microfluidic channel show that the number of size of clusters is determined by the adhesion strength and we found that cluster formation is strongly enhanced by fibrinogen at physiological concentrations, even at shear rate as high as 1000 1/s. Numerical simulations based on a boundary integral method confirm our findings and the clustering transition takes place both in the experiments and in the simulations at the same interaction energies. In vivo measurements with intravital fluorescence microscopy in a dorsal skin fold chamber in a mouse reveal that RBCs indeed form clusters in the micrcapillary flow.

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