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INVESTIGATION OF MICRO-CIRCULATION FOR RED BLOOD CELL DEFORMABILITY

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Blood analysis is a common clinical exam used to diagnose the patient health state. Often the solute chemical or relative quantity of solid suspension constituents of whole blood are examined, however it is known that the deformability of red blood cells can be used to identify several diseases such as diabetes and malaria. Furthermore, the deformability properties are important in the transport and migration phenomena of the cells in vessels, and have therefore been linked to processes such as thrombosis.

In this work we use experimental data of micro-circulation and numerical simulations in order to study the deformability properties of red blood cells. Experimental data is used both to benchmark simulations, and develop mirco-channel geometries that make use of the cell deformability to separate healthy and diseased cells [1, 2]. Numerical simulations are used to provide more detailed information regarding the problem, including mechanical stresses and flow field description. The Moving Particle Semi-implicit method is used as the numerical tool, well suited to the problem being a Lagrangian particle method to solve the incompressible Navier-Stokes equations and has been successfully used to model red blood cells [3].

The physical complexity of the problem, involving fluid interaction with soft bodies, is carefully analysed and discussed using the support of both the experimental and computational results.

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