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Simulation of flow in the microcirculation using a hybrid Lattice-Boltzman and Finite Element algorithm ANDRES GONZALEZ-MANCERA, DIEGO GONZALEZ CARDENAS, Universidad de los Andes — Flow in the microcirculation is highly dependent on the mechanical properties of the cells suspended in the plasma. Red blood cells have to deform in order to pass through the smaller sections in the microcirculation. Certain deceases change the mechanical properties of red blood cells affecting its ability to deform and the rheological behaviour of blood. We developed a hybrid algorithm based on the Lattice-Boltzmann and Finite Element methods to simulate blood flow in small capillaries. Plasma was modeled as a Newtonian fluid and the red blood cells' membrane as a hyperelastic solid. The fluid-structure interaction was handled using the immersed boundary method. We simulated the flow of plasma with suspended red blood cells through cylindrical capillaries and measured the pressure drop as a function of the membrane's rigidity. We also simulated the flow through capillaries with a restriction and identify critical properties for which the suspended particles are unable to flow. The algorithm output was verified by reproducing certain common features of flow int he microcirculation such as the Fahraeus-Lindqvist effect.

Andres Gonzalez-Mancera
Universidad de los Andes

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