

Abstract Submitted
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A Comprehensive Fluid Dynamic-Diffusion Model of Blood Microcirculation with Focus on Sickle Cell Disease FRANCOIS LE FLOCH, WESLEY L. HARRIS, MIT — A novel methodology has been developed to address sickle cell disease, based on highly descriptive mathematical models for blood flow in the capillaries. Our investigations focus on the coupling between oxygen delivery and red blood cell dynamics, which is crucial to understanding sickle cell crises and is unique to this blood disease. The main part of our work is an extensive study of blood dynamics through simulations of red cells deforming within the capillary vessels, and relies on the use of a large mathematical system of equations describing oxygen transfer, blood plasma dynamics and red cell membrane mechanics. This model is expected to lead to the development of new research strategies for sickle cell disease. Our simulation model could be used not only to assess current researched remedies, but also to spur innovative research initiatives, based on our study of the physical properties coupled in sickle cell disease.

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