

Abstract Submitted
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Computational modeling of leukocyte adhesion cascade (LAC)

KAUSIK SARKAR, XIAOYI LI, University of Delaware — In response to an inflammation in the body, leukocytes (white blood cell) interact with the endothelium (interior wall of blood vessel) through a series of steps—capture, rolling, adhesion and transmigration—critical for proper functioning of the immune system. We are numerically simulating this process using a Front-tracking finite-difference method. The viscoelasticity of the cell membrane, cytoplasm and nucleus are incorporated and allowed to change with time in response to the cell surface molecular chemistry. The molecular level forces due to specific ligand-receptor interactions are accounted for by stochastic spring-peeling model. Even though leukocyte rolling has been investigated through various models, the transitioning through subsequent steps, specifically firm adhesion and transmigration through endothelial layer, has not been modeled. The change of viscoelastic properties due to the leukocyte activation is observed to play a critical role in mediating the transition from rolling to transmigration. We will provide details of our approach and discuss preliminary results.

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