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Computational modeling of cell-cell adhesion and cell-endothelium peeling KENG-HWEE CHIAM, RAYMOND QUEK, A*STAR Institute of High Performance Computing — We describe the use of computational modeling to study the behavior of cells adhering to one another as well as to the circulatory endothelium. These cells are subjected to shear stress imposed by the circulatory plasma, and may peel from the endothelium as a result. Cells that peel have a higher chance to enter circulation and hence pose a greater threat in cancer metastasis. We use the immersed interface method to model the cells and solve for its biomechanical response. We quantitatively study the peeling dynamics as a function of the cells' material properties and the surrounding fluid's dynamics. We show how cell peeling from the endothelium is hampered by its adhesive interaction with surrounding cells. In addition, a larger aggregate of cells, such as a tumor embolus, peels more readily from the endothelium than smaller ones. These result may give us insight into the concept of cancer metastatic efficiency.

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