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Stochastic Intravasation Model for Cancer Metastasis[1] ANGELA LEE, STEPHEN LIAO, PAUL NEWTON, University of Southern California — We develop a two-part model that simulates circulating tumor cells (CTCs) entering and then traveling through the human vasculatory system. The first part of our model explores a three-dimensional cluster of CTCs attached to a blood vessel wall in a linear shear flow. The surface of the cells is represented by a 2D Gaussian probability distribution function, and it is discretized with regularized Stokeslets at each grid point. As the system of cells grows stochastically over time, one or more of the cells can detach from the system when the shear forces on the surface exceed a maximum threshold value. In the second part of our model, the newly free-floating CTCs are treated as a dynamical system of multiple, interacting point particles. These particles are represented by singular Stokeslets that are serially introduced into the flow, and the trajectory of each is calculated. The influence of the blood vessel wall is included using the method of images for Stokeslets for a plane boundary. Additional regularized Stokeslets without images are included to represent ambient white blood cells in the bloodstream.

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