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CELL AND NANOPARTICLE TRANSPORT IN TUMOR MICROVASCULATURE AND ITS UNCERTAINTY QUANTIFICATION

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Nanomedicine is a promising method to directly deliver drugs to diseased area. One of the most promising among these is the targeted delivery of drugs and imaging agents using drug carrier-based platforms. Such drug delivery systems can now be made from a range of different materials, in a number of different shapes, coated with an array of different ligands, all leading to enhancements in delivery efficiency and specificity compared to previous delivery methods. Emerging integrated multiscale experiments, models, and simulations opened the door for endless medical applications. The current bottleneck of the drug-carrying particle is lack of knowledge about the dispersion of drug-carrying particles in the microvasculature. We will show how drug carriers disperse in the microvessel. The immersed molecular finite element method (IMFEM) is used to simulate the whole blood including blood plasma, red blood cells and nanoparticles and in vitro and in vivo experiments are carried out to show how predictive IMFEM is in blood flow simulations [1,3]. Together with a Bayesian updating algorithm, nanoparticle transport in a tumor microvasculature is predicted by combining the blood flow in the short microvessel and statistical input conditions in the entire microvasculature [2,3].

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