

Abstract Submitted
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Multiscale Modeling of Angiogenesis and Predictive Capacity

SAMARA PILLAY, HELEN BYRNE , PHILIP MAINI, University of Oxford — Tumors induce the growth of new blood vessels from existing vasculature through angiogenesis. Using an agent-based approach, we model the behavior of individual endothelial cells during angiogenesis. We incorporate crowding effects through volume exclusion, motility of cells through biased random walks, and include birth and death-like processes. We use the transition probabilities associated with the discrete model and a discrete conservation equation for cell occupancy to determine collective cell behavior, in terms of partial differential equations (PDEs). We derive three PDE models incorporating single, multi-species and no volume exclusion. By fitting the parameters in our PDE models and other well-established continuum models to agent-based simulations during a specific time period, and then comparing the outputs from the PDE models and agent-based model at later times, we aim to determine how well the PDE models predict the future behavior of the agent-based model. We also determine whether predictions differ across PDE models and the significance of those differences. This may impact drug development strategies based on PDE models.

Samara Pillay
University of Oxford

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