

## A Multi-Scale Cell-Based Model of Tumor-Induced Angiogenesis

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Tumor-induced angiogenesis, which is the formation of new blood vessels from existing vasculature in response to chemical signals from a tumor, is a crucial step in cancer invasion and metastasis. Although the sequential steps involved in tumor-induced angiogenesis are well known, the interplay between the biochemical and biomechanical mechanisms (e.g., cell-cell and cell-matrix interactions, and intracellular signaling pathways) that affect angiogenesis is largely unresolved. In this talk, I will introduce a novel multi-scale cell-based model of tumor-induced angiogenesis and present results from numerical simulations that elucidate some mechanisms controlling vascular formation in the context of pro- and anti-angiogenesis treatment strategies. In particular, I will discuss how the topology of the extracellular matrix influences cell migration and vascular structure, and the relationship between external stimuli, cell phenotype, and vascular morphology. This model is the first to simulate branching, anastomosis, and the brush border effect without prescribing any rules for the formation of such complex structures. These results translate and synthesize a large body of compartmentalized research on angiogenesis and are meant to inform and advance efforts to develop new approaches for treating cancer and other angiogenesis-dependent diseases.