

Vascular network remodeling and fluid flow in growing tumors

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Growing tumors remodel the vascular network by generating new blood vessels (angiogenesis), by co-opting already existing vessels from the arterio-venous vasculature of the surrounding healthy tissue and by vessel regression. We want to understand the physical determinants of the emerging tumor vascularization patterns and the characteristics of the resulting blood and interstitial fluid flow. For this purpose we develop a theoretical model combining a dynamically evolving and blood flow carrying pipe network with a non-linear growth process, intercommunicating via oxygen, nutrient and growth factor fields. With the help of this model we discuss mechanisms leading to tumor compartmentalization, hot spot formation, vascular blood flow characteristics and interstitial fluid flow patterns including their consequence for drug delivery within the tumor.