Multiphase modelling in cancer

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Solid tumors are composite materials comprising a range of interacting constituents that include tumor cells, blood vessels, immune cells, extracellular fluid and extracellular matrix. Multiphase models provide a natural framework with which to study the impact interactions between the constituent species have on the growth and response to treatment of solid tumors. In this lecture course, I will introduce the general framework for multiphase modeling and explain how it has been specialized for studying tumor growth. Attention will focus initially on two-phase mixture models of avascular tumor growth. I will then explain how to extend these models to include additional phases and complexity. The course will conclude with a summary of the current state-of-the-art and a discussion of open questions.