Mathematical modeling and simulation of mechano-chemical effect on two-phase avascular tumor

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We derive the mathematical model that allows chemotaxis in avascular tumour growth in a two-phase medium. The two phases are the viscous cell phase and the inviscid fluid phase. The conservation of mass-momentum is incorporated in each phase, and appropriate constitutive laws are applied to formulate the governing equations. Further, these equations are simplified into three main variables : cell volume fraction, cell velocity, and nutrient concentration. These variables generate a coupled system of non-linear partial differential equations. A numerical scheme based on the finite volume method is applied to approximate the solution of cell volume fraction. The finite element method is applied to approximate the solutions of cell velocity and nutrient concentration. We investigate tumour growth when when tumour cells move along a fluid containing a diffusible nutrient to which the cells are drawn. We perform some numerical simulations to show the effect of the parameters. The findings of this literature are compatible with the existing literature.

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