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DYNAMICS OF A CANCER TUMOR GROWTH MODEL WITH A DRUG TERM

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Abstract:

Here, we investigate Michaelis-Menten type dynamics of phase-space analysis to a mathematical model of tumor growth with an immune responses. We thenexplore the effects of adaptive cellular immunotherapy on the model anddescribe under what circumstances the tumor can be eliminated. The addition of a drug term to the system can move the solution trajectory into a desirable basin of attraction. We show that the solutions of the model with a time-varying drug term approach can be evaluated by a more fruitful way in down to earth style. This is the solutions of the system without drug treatment, in the condition of stimulated immune processes. Mathematical analysis of the Michaelis-Menten type equations, regarding to dissipativity, boundedness of solutions, nature of equilibria, local and global stability have been investigated. We studied some features of behavior of one of three-dimensional tumor growth models with dynamics described in terms of densities of three cells populations: tumor cells, healthy host cells and effector immune cells. We found sufficient conditions, under which trajectories from the positive domain of feasible multipoint initial conditions tend to one of equilibrium points. Here, cases of the small tumor mass, healthy, and “death” equilibrium points have been examined. Biological implications of our results are discussed.

Keywords: Cancer tumor model, mathematical modeling, immune system, stability of dynamical systems, Equilibrium point, multiphase attractors
General area of research: Mathematics, Applied Mathematics
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