

INFECTIOUS DISEASES

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Effect of noise on tumor growth cancer model

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Recently cell-mediated immunity plays an important role in immune responses against cancer. Cancer cell development and survival is a multifactor process, involving genetic mutation of normal cells as well as physiological changes within both cancer cells and also the body's defence mechanisms. In the present study we have considered a tumor growth three dimensional ordinary non-linear differential equation model. We considered the special effect of tumor-immune interaction along with the two immune components – resting (helper) T-cells which stimulate CTLs and convert them into hunting (active) CTL cell which attack, destroy, or ingest the tumor cell. We have also discussed the qualitative behavior of the solution of our system. Critically we have examined the existence of the system with local and global stability analysis at different equilibrium points. We have also developed a theoretical framework to understand the complex behavior of the tumor growth cell under the influence of stochastic fluctuations by adding the effects of additive white noise of the immune system to study real situation of the interaction between these two groups of cells. Using various sensitive parameter values and different initial densities, the numerical simulations show that the dynamical behavior of the tumor cells, together with the resting and hunting cells, lead to a variety of interesting patterns in the evolution of the tumor and immune cell populations.

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