Dynamics and Physics of Cancer: Tumor and Immune Cell Interactions

PL-09

J. Seoane[I]

[I]Nonlinear Dynamics, Chaos and Complex Systems Group Departamento de Física Universidad Rey Juan Carlos, Madrid, Spain

In this plenary talk we present our work in Dynamics and Physics of Cancer [1,2,3,4]. In particular, our study uses *in silico* experiments and mathematical analyses to characterize the transient and asymptotic dynamics of the cell-mediated immune response to tumor growth. An hybrid probabilistic cellular automaton model describing the spatio-temporal evolution of tumor growth and its interaction with the cell-mediated immune response is developed. The model parameters have been adjusted to an ordinary differential equation model, which has been previously validated [2] with in vivo experiments and chromium release assays. We utilize the cellular automaton model to investigate and discuss the capacity of the cytotoxic cells to sustain long periods of tumor mass dormancy, as commonly observed in recurrent metastatic disease. This is joint work with Alvaro G. López and Miguel A. F. Sanjuán (Spain).

[1] Alvaro G. López, Jesús M. Seoane, and Miguel A.F. Sanjuán. A validated mathematical model of tumor growth including tumor-host interaction, cell-mediated immune response and chemotherapy. Bulletin of Mathematical Biology 76, 2884-2906, 2014.

[2] Alvaro G. López, Jesús M. Seoane, and Miguel A.F. Sanjuán. Destruction of solid tumors by immune cells. Communications in Nonlinear Science and Numerical Simulation 44, 390-403 (2016)

[3] Alvaro G. López, Jesús M. Seoane, and Miguel A.F. Sanjuán. Decay dynamics of tumors. Plos ONE 11, e0157689 (2016).

[4] Alvaro G. López, Jesús M. Seoane, and Miguel A.F. Sanjuán. Dynamics of the cell-mediated immune response to tumor growth. Proc. R. Soc. A (Accepted)