

On the law governing the lysis of solid tumors

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In this talk we present our work in Dynamics and Physics of Cancer [1,2,3]. In particular we will focus mainly in our work on in silico experiments and mathematical analyses supporting several hypotheses that explain the saturation expressed in the fractional cell kill law that governs the lysis of tumor cells by cytotoxic CD8⁺ T cells (CTLs). An hybrid 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 are adjusted to an ordinary differential equation model, which has been previously validated [2] with in vivo experiments and chromium release assays. When the CTLs eradicate efficiently the tumor cells, the model predicts a correlation between the morphology of the tumors and the rate at which they are lysed. As the effectiveness of the effector cells is decreased, the saturation disappears in practice. This limit is thoroughly discussed and a generalized fractional cell kill is proposed. This is joint work with Alvaro G. López and Jesús M. Seoane.

[1] Alvaro G. López, Jesús M. Seoane, and Miguel A.F. Sanjuán. On the law governing the lysis of solid tumors. *Journal of The Royal Society Interface*, 2015.

[2] 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.

[3] Alvaro G. López, Juan Sabuco, Jesús M. Seoane, Jorge Duarte, Cristina Januário, and Miguel A.F. Sanjuán. Avoiding healthy cells extinction in a cancer model. *Journal of Theoretical Biology* **349**, 74-81, 2014.