A B S T R A C T

Title: Mathematical modeling of systemic inhibition of angiogenesis and tumor-tumor interactions in metastatic cancers

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Cancer is an actual major disease that carries major public health and scientific challenges, both at the level of biological understanding and clinical treatment. Of particular importance is the development of metastases (secondary tumors) as 90% of deaths by cancer are due to them. Non-trivial biological dynamics govern the metastatic development of the disease and among them we focused our interest on molecular communications between a primary tumor and the metastases as well as between the metastases themselves. Based on the actual biological understanding of such interactions and some experiments performed in our lab, we developed a mathematical model for description of the development of metastatic colonies at the organism scale. The model is a nonlinear transport partial differential equation with nonlocal boundary condition, belonging to the theory of structured population dynamics. Simulation studies of the dynamics of the model yield interesting insights on biological phenomena such as global dormancy that yields to "cancer without disease" (large number of occult metastases that don't develop into a symptomatic state) and medical problematics about surgery of the primary lesion. Indeed, in some situations removal of the primary tumor can impair the metastatic state of the patient by provoking accelerated growth of the secondary tumors. In this context, our model could yield a powerful numerical tool for prediction of the post-surgery metastatic development, as well as a theoretical framework for study of metastasis biology. In the major part of this talk I will present the modeling approach for this problem and some interesting numerical simulations about the model's dynamics.