Modeling metastatic tumor evolution, numerical resolution and growth prediction

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In this work we have introduced a generalized metastatic tumor growth model that describes the primary tumor growth by means of an Ordinary Differential Equation (ODE) and the evolution of the metastatic density using a transport Partial Differential Equation (PDE), [3]. The numerical method is based on the resolution of a linear Volterra integral equation (VIE) of the second kind, which arises from the reformulation of the ODE-PDE model, [2]. The convergence of the method is proved and error estimates are given. The computation of the approximate solution leads to solve well conditioned linear systems. Here we focus our attention on two different case studies: lung and breast cancer. We assume five different tumor growth laws, [1], for each of them, different metastatic emission rates between primary and secondary tumors, and last that the new born metastases can be formed by clusters of several cells.

References

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