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NON-LINEAR MODEL FOR THE EVOLUTION OF GLIOBLASTOMA CELLS IN MICROFLUIDIC DEVICES

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The growth of the glioblastoma (GBM) tumor involves an extremely complex interaction between GBM cells, the tumor micro-environment (TME), chemotactic gradients and physical cues. Achieving a deeper knowledge on this interaction is of the utmost importance for the development of new drugs and therapies that may lead to a better prognosis. Unfortunately, it is extremely complex to reproduce specific conditions or isolate the effects produced by a single variable or a specific phenomenon using *in vivo* experiments. However, a new type of *in vitro* experiments using microfluidic devices [1] allows better control of some variables, which can lead to a better understanding of the mechanisms and relationships that govern the growth of these tumors.

In this work we present a non-linear diffusion-convection-reaction computational model for the 3D simulation of the growth of GBM cells in microfluidic devices. The numerical resolution of this model is carried out using high-order finite elements and high-order Runge-Kutta Diagonal and Implicit (DIRK) temporal integration schemes [2]. This leads to a non-linear problem in each state of the DIRK scheme that is solved by Newton's method. Several examples will be presented to illustrate the capabilities of the model to predict the evolution of GBM cells in various microfluidic devices and under different operating conditions.

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