Investigation on complex nutrient fluxes

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Abstract

Everything that lives, is born, eats, reproduces and dies. For the brain, the question is more complex because neurons have to survive and to support brain activity. Energy management is also particular because brain cells evolve together with no competition. Thanks to medical imaging,we know that neurons do not consume only glucose. They can use others energetic substrates such as lactate and glutamate as a power source. When a tumor appears, it changes the energetic metabolism to survive and support its own growth. In particular, cancer cells like to consume lactate. They also choose their favorite substrate based on the available oxygen.

Tumor microenvironment plays a key role on tumor development because it is the place of crucial substrates exchanges and mechanical actions between the tumor and its healthy surrounding structure. But most of the time on mathematical models, nutrients are only taken into account implicitely and only using one kind of nutrients while tumor cells are able to use different ressources. The ODE and PDE models we present here is a step on understanding nutrient fluxes between cells and capillaries in a view to describe tumor substrates kinetics and growth in 1D, 2D and 3D.

Joint work with Alain Miranville and Rémy Guillevin. Related publications [1, 2]

References

[1] C. Guillevin, R. Guillevin, A. Miranville and A. Perrillat-Mercerot. *Analysis of a mathematical model for brain lactate kinetics.* Mathematical Biosciences and Engineering, (2018).

[2] R. Guillevin, A. Miranville and A. Perrillat-Mercerot, A. *On a reaction-diffusion system associated with brain lactate kinetics.* (2017) Electron. J. Differ. Equ, 23, 1-16.