

On the Modeling the Immune Response to Cancer Cells: Asymptotic Analysis ¹

Mohamed CH-Chaoui, Abdelghafour Atlas, Abdelghani Bellouquid
Cadi Ayyad University, Morocco

mohamed.ch-chaoui@edu.uca.ma, a.atlas@uca.ma, a.bellouquid@uca.ma

Keywords: kinetic theory, immune competition, active particles, asymptotic analysis, nonlinearity.

This work deals with the modeling of immune activation and the immune response to the evolution of cancer cells. A mathematical model is proposed on the basis of mathematical methods of the Kinetic Theory for Active Particles (a KTAP approach). Firstly we focussed on the mathematical framework suitable for derivation of the model. Then a qualitative analysis is carried out to prove the existence of the solution of the Cauchy problem related to the model. We pay special attention to the dynamic of tumor cells contrasted by the immune system, which activates by Cytokinin signals. We show how parameters and initial conditions influence the asymptotic behavior of the solution.

References

- [1] Afraites A., Atlas.A, Bellouquid.A, CH-Chaoui.M, *Modelling the complex immune system response to cancer cells*, MESA Florida USA Vol.3, No.3, pp.269-283 (2012).
- [2] Bellouquid A. and Delitala M, *Mathematical Modeling of Complex Biological Systems. A Kinetic Theory Approach*, Birkäuser, Boston (2006).
- [3] Bellouquid.A, De Angelis E, Knopff D, *From the modelling of the immune hallmarks of cancer to a black swan in biology*, Mathematical Models and Methods in Applied Sciences, Vol.23, No.5 946-978 (2013).
- [4] Bellomo N., Bellouquid A., Nieto J., Soler J. *On the asymptotic theory from microscopic to macroscopic growing tissue models: an overview with perspectives*, Mathematical Models and Methods in Applied Sciences Vol.22, No. 1130001 (2012).

¹This work is supported by Hassan II Academy of Sciences and Technology (Morocco) project: ‘Methodes mathematiques et outils de modelisation et simulation pour le cancer’