Chemistry Central Journal

Poster presentation

Modelling of complex multicellular systems: tumour-immune cells competition

F Torrens* and G Castellano

Address: Institut Universitari de Ciència Molecular, Universitat de València, Edifici d'Instituts de Paterna, P. O. Box 22085, 46071 València, Spain
* Corresponding author

from 4th German Conference on Chemoinformatics
Goslar, Germany. 9–11 November 2008

Published: 5 June 2009

Chemistry Central Journal 2009, **3**(Suppl 1):P75 doi:10.1186/1752-153X-3-S1-P75

This abstract is available from: http://www.journal.chemistrycentral.com/content/3/S1/P75

This report deals with a critical analysis and some developments related to the mathematical literature on multiscale modelling of multicellular systems involving tumour-immune cells competition at the cellular level [1]. The analysis is focused on the development of mathematical methods of the classical kinetic theory to model the physical system above and to recover a macroscopic equation from the microscopic description. Various hints are given toward research perspectives, with special attention on the modelling of the interplay of microscopic (at the cellular level) biological and mechanical variables on the overall evolution of the system. Indeed, the final aim of this report consists of organizing the various contributions, available in the literature, into a mathematical framework suitable to generate a mathematical theory for complex biological systems. The report develops a variety of mathematical tools to model the dynamics of large systems of interacting cells [2]. Interactions are ruled not only by laws of classical mechanics, but also by some biological functions. The mathematical approach is the one of kinetic theory and non-equilibrium statistical mechanics. The report deals with both the derivation of evolution equations and the design of specific models consistent with the above-mentioned mathematical framework. Various hints for research perspectives are proposed in the last part of the report. This report deals with the development of new paradigms, based on the methods of the mathematical kinetic theory for active particles, to model the dynamics of large systems of interacting cells [3]. Interactions are ruled not only by laws of classical mechanics, but also by a few biological functions, which are able to modify the laws above [4]. The report technically shows, also by reasoning on specific examples, how the theory can be applied to model large complex systems in biology. The last part of the report deals with a critical analysis and with the indication of research perspectives concerning the challenging target of developing a biological-mathematical theory for the living matter. Cellular interactions generate both modification of biological functions and proliferating destructive events related to growth of tumour cells in competition with the immune system [5]. The asymptotic analysis refers to the hyperbolic limit to show how the macroscopic tissue behaviour can be described by linear and nonlinear hyperbolic systems.

References

1. Bellomo N, Bellouquid A, Delitala M: *Math Models Meth Appl Sci* 2004, **14:**1683.
2. Bellouquid A, Delitala M: *Math Models Meth Appl Sci* 2005, **15:**1639.
3. Bellomo N, Forni G: *Math Models Meth Appl Sci* 2006, **16:**1001.
4. Bellouquid A, Delitala M: *Mathematical Modeling of Complex Biological Systems: A Kinetic Theory Approach, Birkhäuser, Boston* 2006.
5. Bellomo N, Li NK, Maini PK: *Math Models Meth Appl Sci* 2008, **18:**593.