Computational and Mathematical Methods in Medicine

Special Issue on

Mathematical Modeling of the Adaptive Immune Responses

CALL FOR PAPERS

The immune system (IS) is a complex network of cells and signals that have evolved to respond to the presence of pathogens (such as bacteria, virus, and fungi) and protect the body from cancer cells. The immune system basically works by keeping track of all substances normally found in the body. Any new substance in the body that the IS does not recognize raises an alarm, causing the IS to attack it. Substances that cause an IS response are called "antigens." The IS can lead to destruction of anything containing antigens, such as pathogens or cancer cells. Pathogens have substances on their outer surfaces such as certain proteins that are not normally found in the human body. The immunity has basically two categories, innate (natural or nonspecific) immunity and adaptive (acquired or specific) immunity, which are generally carrying out mutual and collaborative functions to eliminate pathogens. The innate immune system recognizes molecules produced by foreign invaders, or pathogens. Adaptive immunity is very specific and does lead to an increase in response with repeated exposures. Exposure to a particular antigen will lead to a faster, more effective response to that particular antigen in the future, but not to any other antigens. It will lead to the creation of memory T lymphocytes and memory B-cells that will then be available to "remember" a particular species of pathogen or another antigenic substance, so that the response will be more effective and rapid on subsequent exposure.

Mathematical models, based on ordinary differential equations, delay differential equations, and partial differential equations, have proven to be useful tools in analyzing and understanding the IS interactions with viral, bacterial infections and cancerous cells. Also, numerous aspects of the immune system operate on the basis of complex regulatory networks that are amenable to computational modeling. The aim of this special issue is to invite overview and original papers that investigate different mathematical models of adaptive immunity.

Potential topics include, but are not limited to:

- Mathematical modeling of T-cells in infectious diseases such as HIV, influenza, HBV, HCV, malaria, corona viral infection, and cancerous cells
- Qualitative study (including stability, sensitivity, and bifurcation analysis) of the dynamics of the adaptive immune response with specific repose function
- Mathematical modeling of the different therapeutical approaches such as immunotherapy and chemotherapy
- Optimal control of the treatments and control strategies which enhance host cellular responses and generally promote clearance of virus and host recovery from infection

Authors can submit their manuscripts via the Manuscript Tracking System at http://mts.hindawi.com/submit/journals/cmmm/mmai/.

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Nasser H. Sweilam, Cairo University, Giza, Egypt
nsweilam@sci.cu.edu.eg

Guest Editors
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a-tridane@uaeu.ac.ae

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frihan@uaeu.ac.ae

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yafia1@yahoo.fr

M. A. Aziz Alaoui, Normandie Université, Caen Cedex, France
aziz.alaoui@univ-lehavre.fr

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