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MATHEMATICAL MODELLING OF IMMUNE PROCESSES AND ITS APPLICATION

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The aim of the study was to develop a mathematical model to research hypoxic states in case of simulation of an organism infectious lesions. The model is based on the methods of mathematical modeling and the theory of optimal control of moving objects. The processes of organism damage are simulated with the mathematical model of immune response developed by G.I. Marchuk and the members of his scientific school, adapted to current conditions. This model is based on Burnet’s clone selection theory of the determining role of antigen. Simulation results using the model are presented. The dependencies of infectious courses on the volumetric velocity of systemic blood flow is analyzed on the complex mathematical model of immune response, respiratory and blood circulation systems. The immune system is shown to be rather sensitive to the changes in blood flow via capillaries. Thus, the organ blood flows can be used as parameters for the model by which the respiratory, immune response, and blood circulation systems interact and interplay.

Key words: mathematical model of immune response, functional respiratory system, simulation of infectious disease course, integrated mathematical model, interaction of functional systems of organism.


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