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**Different strategies in the liver regeneration processes. Numerical experiments on the mathematical model.** (English) [Zbl 1474.92029](#)

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Summary: There is considered the generalized mathematical model which describes the processes of maintaining / restoring dynamic homeostasis (regeneration) of the liver and obviously depends on the control parameters. The model is a system of discrete controlled equations of the Lotka - Volterra type with transitions. These equations describe the controlled competitive dynamics of liver cell populations' (hepatic lobules) various types in their various states and controlled competitive transitions between types and states. To develop this model there were accepted such assumptions: homogeneous approximation; independence of biological processes; small toxic factors. In the mathematical model the process of the liver regeneration occurs due to hyperplasia processes, replication, polyploidy and division of binuclear hepatocytes into mononuclear and controlled apoptosis. All these processes are necessary for adequate modeling of the liver regeneration. For example, single and constant toxic functions show that the above processes are not able to cope with the toxic factors that are accumulated in the body. The process of restoring the body's functional state requires the non-trivial strategy of the liver regeneration. Numerical calculations revealed that the mathematical model corresponds to biological processes for different strategies of the liver regeneration. Based on the calculations in the case of partial hepatectomy it is concluded that the mixed strategy of regeneration should be used for the regeneration process. Henceforward it is planned to extend the mathematical model in the case of the liver regeneration, which occurs under the influence of strong toxins, that is, using the stem cells and fibrosis. It is also supposed to justify the principles and criteria for optimal regulation of the processes of maintaining / restoring liver's dynamic homeostasis.

**MSC:**

[92C37](#) Cell biology

[65Y99](#) Computer aspects of numerical algorithms

**Keywords:**

[mathematical model](#); [liver regeneration](#); [numerical experiment](#)

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