

Mathematical Modeling of Cancer Cells Populations Behavior

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The talk will describe how mathematical modeling of biological processes can address the important questions which can not be solved by experimental approaches. Two examples from cancer biology will be discussed: (1) the phenomenon of Cancer Stem Cells population stabilization and (2) the phenomenon of post-irradiation induction of Cancer Stem Cells.

Cancer Stem Cells (CSC) is a small population in heterogeneous cancer cells population which is resistant to conventional cancer therapies (chemo- or radio therapies), and thus responsible for tumor relapses. The model considers different possible modes of stem and non-stem cancer cells population behavior in different conditions with different sets of experimentally measured parameters. The results obtained by the model allow determination of time-varying corridors of probabilities for different cell fates of CSC in a given experimental system, and determination of cell-cell communication factors influencing these time-varying probabilities of cell behavior scenarios. The analysis of these results provides as theoretical insights into the phenomena of CSC behavior, so a set of biomedical suggestions, essential for cancer therapy.