

Competition driven cancer immunoediting

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Abstract:

It is a well-established fact that in an actively proliferating state tumors up-regulate glucose consumption to meet increasing energy demands by switching to glycolysis. What is often neglected is that actively proliferating cells of the immune system also switch to glycolysis and thus also have increased energy demands. Moreover, while cancer cells can revert back to aerobic metabolism, rapidly proliferating cytotoxic lymphocytes are incapable for performing their function when adequate resources are lacking. Consequently, in the tumor microenvironment there must exist competition for the common resources between cancer cells and the cells of the immune system, which may drive a lot of the tumor-immune dynamics. In this paper we formulate a model of tumor-immune-glucose interactions as a predator-prey-common resource type system and investigate possible dynamical behaviors that may arise depending on intrinsic parameter values and the initial state of the system, including tumor elimination, tumor dormancy and unrestrained tumor growth. We propose that competition for common resources can be a possible mechanism that underlies the phenomenon of immunoediting, i.e., tumor elimination, equilibrium and escape.