Density-dependent migration/proliferation plasticity is critical for glioma tumor development

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ABSTRACT

Tumor cells switch over different strategies to cope with fluctuating microenvironmental conditions.

A prominent example is the migration/proliferation plasticity, i.e. the adaptive phenotypic switching between cell migration and proliferation. Here, we investigate the influence of migration-proliferation plasticity on tumor initiation and persistence. To address this problem, we formulate and study a mathematical model of spatio-temporal tumor dynamics which incorporates the microenvironmental influence through a local cell density dependence. Our analysis reveals that two dynamic regimes can be distinguished. If cell motility is allowed to increase with local cell density, any tumor cell population will persist in time, irrespective of its initial size. In contrast, if cell motility increases with cell density the tumor inevitably grows.