Role of Microenvironment in Glioma Invasion: What We Learned from In Vitro Models.


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The invasion properties of glioblastoma hamper a radical surgery and are responsible for its recurrence. Understanding the invasion mechanisms is thus critical to devise new therapeutic strategies. Therefore, the creation of in vitro models that enable these mechanisms to be studied represents a crucial step. Since in vitro models represent an over-simplification of the in vivo system, in these years it has been attempted to increase the level of complexity of in vitro assays to create models that could better mimic the behaviour of the cells in vivo. These levels of complexity involved: 1. The dimension of the system, moving from two-dimensional to three-dimensional models; 2. The use of microfluidic systems; 3. The use of mixed cultures of tumour cells and cells of the tumour micro-environment in order to mimic the complex cross-talk between tumour cells and their micro-environment; 4. And the source of cells used in an attempt to move from commercial lines to patient-based models. In this review, we will summarize the evidence obtained exploring these different levels of complexity and highlighting advantages and limitations of each system used.

KEYWORDS: 3D culture; glioblastoma; glioma-associated stem cells; invasion assay; microfluidic systems; mixed culture; personalized medicine; tumour microenvironment

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