The cancer stem cell niche(s): The crosstalk between glioma stem cells and their microenvironment.

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Abstract

BACKGROUND: The initiation and progression of various types of tumors, including glioma, are driven by a population of cells with stem cell properties. Glioma stem cells (GSCs) are located in specialized microenvironments (niches) within tumors. These niches represent the hallmarks of malignant gliomas (vascular proliferations, hypoxia/necrosis) and bear analogy to the microenvironments in which physiological stem cells in the brain are found.

SCOPE OF THE REVIEW: Here we review the progress that has been made towards uncovering the function of the perivascular and the hypoxic niche and the molecular pathways that control the properties of GSCs within them. We propose models of how the different niches and GSC pools in them interact with each other.

MAJOR CONCLUSIONS: GSCs are not merely passive residents of their niches, but actively contribute to the shaping of the niches through a complex crosstalk with different components of the microenvironment. For example, GSCs play a dominant role in promoting new blood vessel formation through a variety of mechanisms, including the hypoxia dependent stimulation of angiogenesis, recruitment of endothelial progenitor cells and direct transdifferentiation into endothelial cells. Recent work has also revealed that GSCs can recruit and modulate the function of various immune cells to suppress anti-tumor immune responses and to foster tumor-promoting inflammation, which in turn could support the maintenance of GSCs.

GENERAL SIGNIFICANCE: These findings underscore the central role of the GSC microenvironment in driving glioma progression making the GSC niche a prime therapeutic target for the design of therapies aimed at eradicating GSCs. This article is part of a Special Issue entitled Biochemistry of Stem Cells.

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