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Brain Tumor Stem Cells.

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Primary malignant brain cancer, one of the most deadly diseases, has a high rate of recurrence after treatment. Studies in the past several years have led to the hypothesis that the root of the recurrence may be brain tumor stem cells (BTSCs), stem-like subpopulation of cells that are responsible for propagating the tumor. Current treatments combining surgery and chemoradiotherapy could not eliminate BTSCs because these cells are highly infiltrative and possess several properties that can reduce the damages caused by radiation or anti-cancer drugs. BTSCs are similar to NSCs in molecular marker expression and multi-lineage differentiation potential. Genetic analyses of Drosophila CNS neoplasia, mouse glioma models, and human glioma tissues have revealed a link between increased NSC self-renewal and brain tumorigenesis. Furthermore, data from various rodent models of malignant brain tumors have provided compelling evidence that multipotent NSCs and lineage-restricted neural progenitor cells (NPCs) could be the cell origin of brain tumors. Thus, the first event of brain tumorigenesis might be the occurrence of oncogenic mutations in the stem cell self-renewal pathway in an NSC or NPC. These mutations convert the NSC or NPC to a BTSC, which then initiates and sustains the growth of the tumor. The self-renewal of BTSCs is controlled by several evolutionarily conserved signaling pathways and requires an intact vascular niche. Targeting these pathways and the vascular niche could be a principle in novel brain tumor therapies aimed to eliminate BTSCs.

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