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Targeting cancer stem cells in the central nervous system: Therapeutic opportunities and challenges

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Identification and characterization of 'cancer initiating cells' or 'cancer stem cells' in brain tumors has provided novel insights into the biology of malignant gliomas. Although the true identity and exact role of cancer stem cells has not been fully elucidated, several studies have suggested that this subpopulation is critical for tumor initiation, tumor progression, angiogenesis and resistance to available therapies. The study of signaling pathways critical to normal neural stem and progenitor cells has increased our understanding of the mechanisms that drive cancer stem cell associated tumorigenesis and tumor progression. Novel treatment strategies are being developed to selectively target the molecular pathways relevant to cancer stem cells. Molecular targeted therapies hold great promise and have already become an important component of combined treatment strategies to fight brain cancer. An important issue of concern has come from recent experimental studies on the vulnerability of normal neural progenitor cells to anti-cancer therapy. As normal neural stem and progenitor cells are critical for the integrity and maintenance of nervous system plasticity, novel strategies to specifically target signaling pathways employed by cancer stem cells will have to take into considerations concerns on increased toxicity to normal neural stem and progenitor cells.