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### Functional and molecular characterization of glioblastoma multiforme-derived cancer stem cells.

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#### Abstract

**Purpose:** Brain tumors are the leading cause of cancer mortality in children and remain incurable despite advances in surgery and adjuvant therapies. The failure of malignant gliomas to respond to conventional treatment reflects the unique biology of these tumors, linked to a small population of stem-like precursors. This study describes the characteristics of stem cells isolated from glioblastoma multiforme (GM) and gives insight into the mechanism of brain tumorigenesis.

**Methods:** Tumor stem-like precursors were identified from primary human GM-derived cell culture using immunocytochemistry and reverse transcription polymerase chain reaction (RT-PCR). Cells were cultured in vitro in stem cell medium supplemented with growth factors and then the capacity of the surviving stem-like precursors to form tumor spheres and to continue to proliferate after chemoradiotherapy were tested. **Results:** The tumor cells expressed the cellular markers CD133, CD105, CD90, Nanog, Oct 3/4, CXCR4, nestin, glial fibrillary acidic protein (GFAP), neurofilament protein (NF) and human glyceraldehyde 3-phosphate dehydrogenase (GAPDH). Cells also displayed a high proliferative potential despite chemotherapy and irradiation and also had the ability to form spheroids in suspension.

**Conclusion:** High grade gliomas contain stem-like precursors, which exhibit neural stem cell properties with tumorigenicity, establishing a novel developmental paradigm in the study of brain carcinogenesis and providing a powerful tool to develop patient-tailored therapy for this devastating disease.

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