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Isolation and characterization of stem cell-like precursor cells from primary human anaplastic oligoastrocytoma

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Abstract

A small population of stem cell-like precursors in solid tumors are linked to histological composition, progression, angiogenesis, metastasis, recurrence and drug resistance of a variety of malignant tumors. Oligoastrocytoma is the most common brain mixed glioma composed of mixed cells of oligodendroglial and astrocytic phenotypes. Identification and characterization of stem cell-like precursors in oligoastrocytoma may shed light on the oncogenesis of this unique type of tumor and assist in the design of novel therapeutic strategy. Here, tumor stem cell-like precursors were identified from primary human anaplastic oligoastrocytomas by labeling of the tumor sections with nestin and CD133. Tumor cells were cultured *in vitro* in stem cell medium with growth factors and the capacity of the surviving stem cell-like precursors to form tumor spheres was tested. The tumor spheres were further injected subcutaneously into nude mice to observe the contribution of stem cell-like precursors to histological composition and tumor progression. We found that primary human oligoastrocytoma tissues contained nestin⁺/CD133⁺ stem cell-like precursors. These cells differentiated into tumor cells with both oligodendroglial and astrocytic characteristics and formed tumor spheres *in vitro*, which upon implantation in nude mice, grew into tumor nodules containing nestin⁺/CD133⁺ cells at levels higher than in the primary tumor tissues. This study revealed for the first time that anaplastic human oligoastrocytomas contained stem cell-like precursors, which exhibit neural stem cell properties with tumorigenicity. These stem cell-like precursors may be responsible for the oligodendroglial and astrocytic components of human oligoastrocytoma and should be considered as therapeutic targets.

Keywords: oligoastrocytoma, cancer stem cell, CD133, nestin, differentiation

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