Lacking appropriate model impedes basic and preclinical researches of brain tumors. Organoids technology applying on brain tumors enables great recapitulation of the original tumors. Here, we compared brain tumor organoids (BTOs) with common models including cell lines, tumor spheroids, and patient-derived xenografts. Different BTOs can be customized to research objectives and particular brain tumor features. We systematically introduce the establishments and strengths of four different BTOs. BTOs derived from patient somatic cells are suitable for mimicking brain tumors caused by germline mutations and abnormal neurodevelopment, such as the tuberous sclerosis complex. BTOs derived from human pluripotent stem cells with genetic manipulations endow for identifying and understanding the roles of oncogenes and processes of oncogenesis. Brain tumoroids are the most clinically applicable BTOs, which could be generated within clinically relevant timescale and applied for drug screening, immunotherapy testing, biobanking, and investigating brain tumor mechanisms, such as cancer stem cells and therapy resistance. Brain organoids co-cultured with brain tumors (BO-BTs) own the greatest recapitulation of brain tumors. Tumor invasion and interactions between tumor cells and brain components could be greatly explored in this model. BO-BTs also offer a humanized platform for testing the therapeutic efficacy and side effects on neurons in preclinical trials. We also introduce the BTOs establishment fused with other advanced techniques, such as 3D bioprinting. So far, over 11 brain tumor types of BTOs have been established, especially for glioblastoma. We conclude BTOs could be a reliable model to understand brain tumors and develop targeted therapies [1)].

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da Silva et al. demonstrated that human Glioblastoma spheroids possess the ability to spontaneously infiltrate early-stage cerebral organoids (eCOs). The resulting formation of hybrid organoids demonstrated an invasive tumor phenotype that was distinct from noncancerous adult neural progenitor (NP) spheroid incorporation into eCOs. These findings provide a basis for the modeling and quantification of the Glioblastoma infiltration process using a stem-cell-based organoid approach, and may be used for the identification of anti-Glioblastoma invasion strategies [2)].

To validate the preclinical applications of a 3D organoid model and mechanistic findings of inflammation-driven angiogenesis, Cui et al. screened a novel dual integrin (αvβ3) and cytokine receptor (TGFβ-R1) blockade that suppresses Glioblastoma tumor neovascularization by simultaneously targeting macrophage-associated immunosuppression, endothelial-macrophage interactions, and altered ECM. Hence, they provide an interactive and controllable Glioblastoma tumor microenvironment and highlight the importance of macrophage-associated immunosuppression in Glioblastoma angiogenesis, paving a new direction of screening novel anti-angiogenic therapies [3)].

1)
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