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Current strategic arsenal and advances in nose to brain nanotheranostics for therapeutic intervention of glioblastoma multiforme

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Abstract

The fight against Glioblastoma multiforme (GBM) is ongoing and the long-term outlook for GBM remains challenging due to low prognosis but every breakthrough brings us closer to improving patient outcomes. Significant hurdles in GBM are heterogeneity, fortified tumor location, and blood-brain barrier (BBB), hindering adequate drug concentrations within functioning brain regions, thus leading to low survival rates. The nasal passageway has become an appealing location to commence the course of cancer therapy. Utilization of the nose-to-brain (N2B) route for drug delivery takes a sidestep from the BBB to allow therapeutics to directly access the central nervous system (CNS) and enhance drug localization in the vicinity of the tumor. This comprehensive review provides insights into pertinent anatomy and cellular organization of the nasal cavity, present-day diagnostic tools, intracranial invasive therapies, and advancements in intranasal (IN) therapies in GBM models for better clinical outcomes. Also, this review highlights groundbreaking carriers and delivery techniques that could revolutionize GBM management such as biomimetics, image guiding-drug delivery, and photodynamic and photothermal therapies for GBM management.

Keywords: Glioblastoma; cancer; challenges; in vivo models; nanocarriers; nose to brain; olfactory.

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