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Exploring miRNA therapies and gut microbiome-enhanced CAR-T cells: advancing frontiers in glioblastoma stem cell targeting

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Abstract

Glioblastoma multiforme (GBM) presents a formidable challenge in oncology due to its aggressive nature and resistance to conventional treatments. Recent advancements propose a novel therapeutic strategy combining microRNA-based therapies, chimeric antigen receptor-T (CAR-T) cells, and gut microbiome modulation to target GBM stem cells and transform cancer treatment. MicroRNA therapies show promise in regulating key signalling pathways implicated in GBM progression, offering the potential to disrupt GBM stem cell renewal. CAR-T cell therapy, initially successful in blood cancers, is being adapted to target GBM by genetically engineering T cells to recognise and eliminate GBM stem cell-specific antigens. Despite early successes, challenges like the immunosuppressive tumour microenvironment persist. Additionally, recent research has uncovered a link between the gut microbiome and GBM, suggesting that gut dysbiosis can influence systemic inflammation and immune responses. Novel strategies to modulate the gut microbiome are emerging, enhancing the efficacy of microRNA therapies and CAR-T cell treatments. This combined approach highlights the synergistic potential of these innovative therapies in GBM treatment, aiming to eradicate primary tumours and prevent recurrence, thereby improving patient prognosis and quality of life. Ongoing research and clinical trials are crucial to fully exploit this promising frontier in GBM therapy, offering hope to patients grappling with this devastating disease.

Keywords: Chimeric antigen receptor T cells; Glioblastoma multiforme; Glioblastoma stem cells; MicroRNA therapies; Tumour recurrence prevention.