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A state-of-the-art liposome technology for glioblastoma treatment

Ikram Hasan [1], Shubham Roy [2 3], Ehexige Ehexige [1], Runling Wu [1], Yu Chen [2 3 4], Zhengyuan Gao [1], Bing Guo [2 3], Chunqi Chang [1]

Affiliations

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Abstract

Glioblastoma (GBM) is a challenging problem due to the poor BBB permeability of cancer drugs, its recurrence after the treatment, and high malignancy and is difficult to treat with the currently available therapeutic strategies. Furthermore, the prognosis and survival rate of GBM are still poor after surgical removal *via* conventional combination therapy. Owing to the existence of the formidable blood-brain barrier (BBB) and the aggressive, infiltrating nature of GBM growth, the diagnosis and treatment of GBM are quite challenging. Recently, liposomes and their derivatives have emerged as super cargos for the delivery of both hydrophobic and hydrophilic drugs for the treatment of glioblastoma because of their advantages, such as biocompatibility, long circulation, and ease of physical and chemical modification, which facilitate the capability of targeting specific sites, circumvention of BBB transport restrictions, and amplification of the therapeutic efficacy. Herein, we provide a timely update on the burgeoning liposome-based drug delivery systems and potential challenges in these fields for the diagnosis and treatment of brain tumors. Furthermore, we focus on the most recent liposome-based drug delivery cargos, including pH-sensitive, temperature-sensitive, and biomimetic liposomes, to enhance the multimodality in imaging and therapeutics of glioblastoma. Furthermore, we highlight the future difficulties and directions for the research and clinical translation of liposome-based drug delivery. Hopefully, this review will trigger the interest of researchers to expedite the development of liposome cargos and even their clinical translation for improving the prognosis of glioblastoma.