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Progress on the functions and mechanisms of natural products in anti-glioma therapy

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Abstract

Glioma, the most prevalent primary tumor of the central nervous system (CNS), is also the most lethal primary malignant tumor. Currently, there are limited chemotherapeutics available for glioma treatment, necessitating further research to identify and develop new chemotherapeutic agents. A significant approach to discovering anti-glioma drugs involves isolating antitumor active ingredients from natural products (NPs) and optimizing their structures. Additionally, targeted drug delivery systems (TDDSs) are employed to enhance drug solubility and stability and overcome the blood-brain barrier (BBB). TDDSs can penetrate deep into the brain, increase drug concentration and retention time in the CNS, and improve the targeting efficiency of NPs, thereby reducing adverse effects and enhancing anti-glioma efficacy. This paper reviews the research progress of anti-glioma activities of NPs, including alkaloids, polyphenols, flavonoids, terpenoids, saponins, quinones, and their synthetic derivatives over the past decade. The review also summarizes anti-glioma mechanisms, such as suppression of related protein expression, regulation of reactive oxygen species (ROS) levels, control of apoptosis signaling pathways, reduction of matrix metalloproteinases (MMPs) expression, blocking of vascular endothelial growth factor (VEGF), and reversal of immunosuppression. Furthermore, the functions and advantages of NP-based TDDSs in anti-glioma therapy are examined. The key information presented in this review will be valuable for the research and development of NP-based anti-glioma drugs and related TDDSs.

Keywords: Anti-glioma; Mechanisms; Natural products; Synthetic derivatives; Targeted drug delivery systems.

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