Delivery of Doxorubicin to Glioblastoma Multiforme Using Solid Lipid Nanoparticles with Surface Aprotinin and Melanotransferrin Antibody for Enhanced Chemotherapy

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Abstract : Solid lipid nanoparticles (SLNs) conjugated with aprotinin (Apr) and melanotransferrin antibody (Anti-MTf) were used to carry doxorubicin (Dox) across the blood-brain barrier (BBB) for glioblastoma multiforme (GBM) chemotherapy. Doxentrapped SLNs with grafted Apr and Anti-MTf (Apr-Anti-MTf-Dox-SLNs) were applied to a cultured monolayer comprising human brain-microvascular endothelial cells (HBMECs) with regulation of human astrocyte (HAs) and to a proliferated colony of U87MG cells. Based on the average particle diameter, zeta potential, entrapping efficiency of Dox, and grafting efficiency of Apr and Anti-MTf, we found that 40% (w/w) 1,2-dipalmitoyl-sn-glycero-3-phosphocholine in lipids were appropriate for fabricating Apr-Anti-MTf-Dox-SLNs. In addition, Apr-Anti-MTf-Dox-SLNs could prevent Dox from fast dissolution and did not induce a serious cytotoxicity to HBMECs and HAs when compared with free Dox. Moreover, the treatments with Apr-Anti-MTf-Dox-SLNs can be a promising pharmacotherapeutic preparation to penetrate the BBB for malignant brain tumor treatment.

Keywords : solid lipid nanoparticle, glioblastoma multiforme, blood-brain barrier, doxorubicin

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