Superparamagnetic iron oxide nanoparticles

Superparamagnetic iron oxide nanoparticles (SPIONs) conjugated with recombinant human epidermal growth factor (SPION-EGF) were studied as a potential agent for magnetic resonance imaging contrast enhancement of malignant brain tumors. Synthesized conjugates were characterized by transmission electron microscopy, dynamic light scattering, and nuclear magnetic resonance relaxometry. The interaction of SPION-EGF conjugates with cells was analyzed in a C6 glioma cell culture. The distribution of the nanoparticles and their accumulation in tumors were assessed by magnetic resonance imaging in an orthotopic model of C6 gliomas. SPION-EGF nanosuspensions had the properties of a negative contrast agent with high coefficients of relaxation efficiency. In vitro studies of SPION-EGF nanoparticles showed high intracellular incorporation and the absence of a toxic influence on C6 cell viability and proliferation. Intravenous administration of SPION-EGF conjugates in animals provided receptor-mediated targeted delivery across the blood-brain barrier and tumor retention of the nanoparticles; this was more efficient than with unconjugated SPIONs. The accumulation of conjugates in the glioma was revealed as hypotensive zones on T2-weighted images with a twofold reduction in T2 relaxation time in comparison to unconjugated SPIONs (P<0.001). SPION-EGF conjugates provide targeted delivery and efficient magnetic resonance contrast enhancement of EGFR-overexpressing C6 gliomas [1].

[1]

Shevtsov MA, Nikolaev BP, Yakovleva LY, Marchenko YY, Dobrodumov AV, Mikhrina AL, Martynova MG, Bystrova OA, Yakovenko IV, Ischenko AM. Superparamagnetic iron oxide nanoparticles conjugated with epidermal growth factor (SPION-EGF) for targeting brain tumors. Int J Nanomedicine. 2014;9:273-87. doi: 10.2147/IJN.S55118. Epub 2014 Jan 3. PubMed PMID: 24421639.