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Targeted Multifunctional Nanoparticles cure and image Brain Tumors: Selective MRI Contrast Enhancement and Photodynamic Therapy[1]

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Aimed at targeted therapy and imaging of brain tumors, our approach uses targeted, multi-functional nano-particles (NP). A typical nano-particle contains a biologically inert, non-toxic matrix, biodegradable and bio-eliminable over a long time period. It also contains active components, such as fluorescent chemical indicators, photo-sensitizers, MRI contrast enhancement agents and optical imaging dyes. In addition, its surface contains molecular targeting units, e.g. peptides or antibodies, as well as a cloaking agent, to prevent uptake by the immune system, i.e. enabling control of the plasma residence time. These dynamic nano-platforms (DNP) contain contrast enhancement agents for the imaging (MRI, optical, photo-acoustic) of targeted locations, i.e. tumors. Added to this are targeted therapy agents, such as photosensitizers for photodynamic therapy (PDT). A simple protocol, for rats implanted with human brain cancer, consists of tail injection with DNPs, followed by 5 min red light illumination of the tumor region. It resulted in excellent cure statistics for 9L glioblastoma.

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