Development of Non-Nanotoxic PGCS(Proteinticle/Gold Core/Shell) Nanoparticle and Therapeutic Applications Using PGCS-NP

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PGCS-NP shows non-nanotoxic characteristics because of spontaneous denaturation of protein. Unlike chemically-synthesized nanoparticles, proteinticles are biological nanoparticles, i.e. nano-scale protein particles (e.g. viral capsid) that are self-assembled inside cells with constant structure and surface topology. We engineered their surface topology for presenting cancer targeting peptides through genetic modification of the N- or C-terminus region of the protein constituent. Both hexa-tyrosine with high reduction potential and affibody peptides with specific affinity for human epidermal growth factor receptor I (EGFR) were presented on the surface of hepatitis B virus capsid, and the Au-ion reduction formed PGCS-NP (40 nm) that is dotted with many small gold NPs (1-3 nm). PGCS-NP shows great photothermal and magnetic hyperthermal activity. After intravenously injection of PGCS-NP, PGCS-NP effectively reached the EGFR-expressing tumor cells. When tumor was locally treated by NIR (near infrared) laser, PGCS-NP caused severe tumor cell necrosis and significant reduction in tumor size. And PGCS-NP don't caused any histological lesions in major organs of mice.