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Functionalizable peptide-coated PtNPs for targeting liver cancer cells

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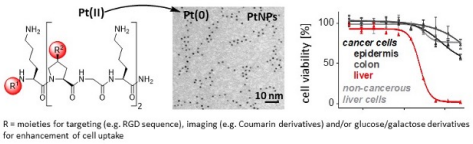
Hepatocellular carcinoma (HCC) is the sixth most frequent cancer and the second leading cause of death from cancer worldwide.1 FDA approved drugs (e.g. Sorafenib) suffer from low efficacy and severe side effects.2 Platinum-based drugs – with cisplatin as the most used chemotherapeutic – are very effective but also toxic to healthy organs. Functionalized platinum nanoparticles (PtNPs) are promising alternatives, but previous studies have neither shown improved cytotoxicity nor tumour selectivity of PtNPs over cisplatin.3,4 Recently our group developed peptide-coated PtNPs that have significantly greater toxicity against hepatic cancer cells (HepG2) than other cancer cells and non-cancerous liver cells, most likely due to the formation of cytotoxic Pt(II) ions under the oxidative conditions in liver cancer cells.5 The nanoparticle-stabilising peptidic additive H-Lys-[Pro-Gly-Lys]2-NH2 was discovered through a combinatorial screening of more than 3000 different peptides followed by further optimisation. This peptide enables the formation of water-soluble, monodisperse PtNPs with average diameters of 2.5 nm that are stable for years. Here we present that this heptapeptide can further be used as a platform for the functionalisation of PtNPs. Different functional moieties were attached to the PtNPs for targeting liver cancer cells as well as monitoring or enhancing cellular uptake. The results show the robustness and versatility of the peptide-coated PtNPs.



R = moieties for targeting (e.g. RGD sequence), imaging (e.g. Coumarin derivatives) and/or glucose/galactose derivatives for enhancement of cell uptake

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