Evaluating the cytotoxic potential of biocompatible superparamagnetic iron oxide nanoparticles as platinum based-drugs nanocarriers

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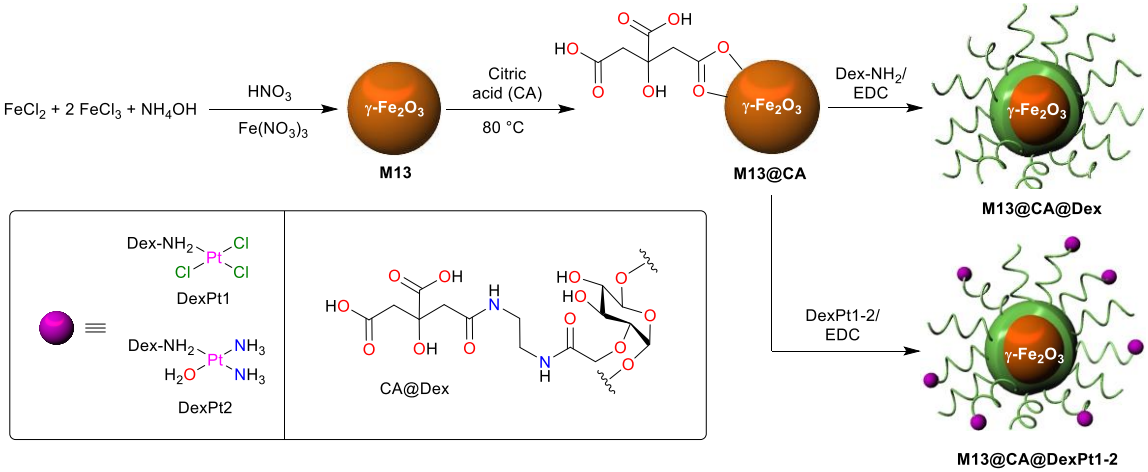
Superparamagnetic iron oxide nanoparticles (SPIONs) have become one of the most promising nanosystems for drug delivery. Thus, this work describes the synthesis of 13 nm SPIONs (**M13**) using a coprecipitation method, followed by acid treatment aiming to improve the colloidal properties. Funcionalization with citric acid (CA) and amino-modified dextran (Dex-NH_2) afforded the nanosystems **M13@CA** and **M13@CA@Dex**, respectively, with good aqueous stability. The Dex-NH_2 was further modified with platinum(II) complexes and attached onto SPIONs, affording the superparamagnetic nanosystems **M13@CA@DexPt1-2** (DexPt1 = [Pt(Dex-NH_2)Cl_3] and DexPt2 = [Pt(NH_3)$_2$(Dex-NH_2)(H_2O)]). They exhibited excellent aqueous colloidal stability where the hydrodynamic diameters (D_H) were kept below 150 nm over a large range of pH (2.0-12.0) and were unaffected by PBS addition. Cytotoxicity assays of the nanosystems were evaluated in Pan02 (pancreatic ductal adenocarcinoma) and MDA-MB-231 (human breast) cell lines. **M13@CA@DexPt1-2** and cisplatin (control) showed poor cytotoxicity in Pan02. However, all nanosystems were internalized. Interestingly, magnetic hyperthermia measurements were carried out in Pan02 cells and enhancement in the cytotoxicity of **M13@CA@DexPt1-2** was observed.



Scheme 1. Synthesis of dextran-coated SPIONs functionalized with platinum complexes.

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