Starch-based magnetic nanocomposite for targeted delivery of hydrophilic bioactives as anticancer strategy

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Abstract
Magnetic nanocomposites were synthesized for the targeted delivery of hydrophilic bioactives through guidance generated by a magnetic field. Superparamagnetic iron oxide nanoparticles (SPIONs) were used to generate hydroxyethyl starch magnetic nanocapsules (HES MNCs). This synthesis allowed the co-encapsulation of oncocalyxone A (onco A) and surface-modified magnetite nanoparticles (Fe_3O_4@citrate) into the same nanostructure. The synthesized nanocapsules exhibited a core-shell morphology, with an average diameter of 143 nm. This nanocomposite showed potential anticancer activity (IC_{50}) against four human tumor cell lines: glioblastoma SNB-19 (1.010 μgmL^{-1}), colon carcinoma HCT-116 (2.675 μgmL^{-1}), prostate PC3 (4.868 μgmL^{-1}), and leukemia HL-60 (2.166 μgmL^{-1}). Additionally, in vivo toxicity and locomotor activity were evaluated in a zebrafish (Danio rerio) model. The nanocomposite exhibited in vitro cytotoxicity, prolonged drug release profile and also responded to an applied magnetic field, representing a versatile compound with perspectives for highest concentration of different hydrophilic bioactives in a target tissue through magnetic vectorization.

Author keywords
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