

Chlorogenic acid intercalated Gadolinium–Zinc/Aluminium layered double hydroxide and gold nanohybrid for MR imaging and drug delivery

ABSTRACT

A theranostic nanodelivery system for simultaneous therapeutics and magnetic resonance imaging (MRI) diagnostic agents' delivery was successfully synthesized, using Zn/Al-layered double hydroxide (LDH) as the nano-carrier, chlorogenic acid (CA) as the therapeutic agent and gadolinium as the diagnostic contrast agent. The contrast of the MR image was improved with gold nanoparticles (AuNPs), which were coated on the surface of the nanohybrid (ZAGCAu). The kinetic release study was conducted with UV–Vis spectrophotometer and high release was observed (up to 90%). Other characterizations conducted on the nanohybrid include; HRTEM, XRD, FTIR, FESEM and Elemental analysis, which all confirmed the theranostic nanohybrid development (ZAGCAu). Cell viability test (in vitro) was also carried out with ZAGCAu on normal cell lines (3T3) and liver cancer cell lines (HepG2). The results indicated relative cytotoxicity against HepG2 and slight toxicity on the 3T3. The preliminary MRI contrast property of the ZAGCAu was tested to ascertain the inherent signal optimization on a 3 T MRI machine. Various concentrations of the ZAGCAu indicated enhanced T1 and T2 signals in comparison with the Gd and water references used. The preliminary studies conducted on the ZAGCAu nanohybrid developed in this work shows its potentiality as a future theranostic agent for simultaneous diagnostic and therapeutic functions in cancer treatment.

Keyword: Zn/Al-layered double hydroxide; Chlorogenic acid; Nano-carrier; Gadolinium; Theranostics