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Smart Alginate-based Magnetic Platforms for Drug Delivery

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Extended Abstract

One of the top issues in the field of materials science is the development of controlled release systems for various applications, including medical applications. Targeted delivery and controlled release of active molecules at the target cell / tissues / organs assure some major benefits, the most important being linked to increased efficacy and reduction of systemic toxicity, which also involve reducing the dose of "administered drug", the protection of biologically active molecules from degradation in biologic environments, etc.

Polymer magnetic composites has been widely studied in order to be used in biomedical fields due to their distinctive size, morphology, and properties [1, 2].

In this study, smart alginate/magnetite/natural agents system were prepared by ionotropic gelation using alginate gel, 1-5%wt and 1, 3 and 5% magnetite. Natural agents such as pure polyphenols or essential oils containing polyphenols were loaded inside or in the wall of the alginate/magnetite microbeads with different characteristics. Microbeads were obtained by controlling the alginate gel flow, concentration of gelation agent ($CaCl_2$), as well as the diameter of the needle. Especially, hydrodynamic size of microbeads as well as magnetite content and alginate wall porosity were exploited in controlling delivery characteristics (drug delivery rate and profile). These systems can be considered smart because their delivery rate can be controlled by exposing them to certain alternating, electromagnetic fields. Once, alternating, electromagnetic fields are applied, due to the developed hyperthermia, the delivery rate can be intensified, as we have already proved for systems with other composition. The as obtained hybrid alginate/magnetite drug delivery platforms were characterized by FTIR, scanning electron microscopy (SEM), chemical stability and drug delivery profile. In addition, the biocompatibility of alginate/magnetite/polyphenols platforms was investigated by XTT assay after exposing the endothelial cells to different concentrations of platforms with various composition.

Keywords: Ionic gelation, Polyphenols, Natural agents, Magnetite / alginate hybrid systems.

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