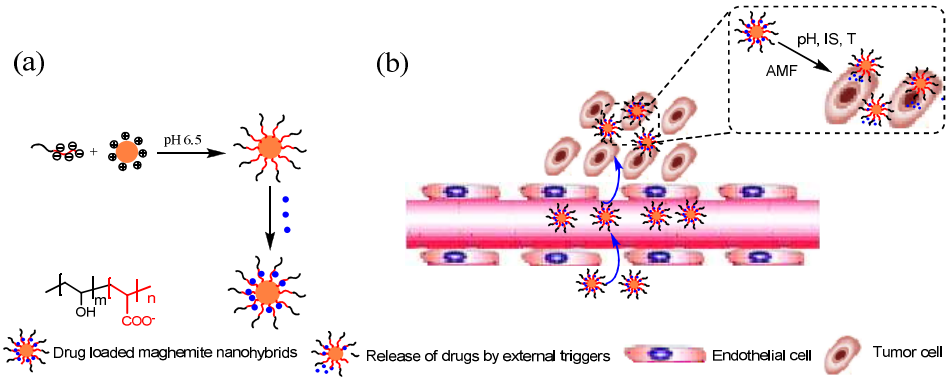
Stimuli-responsive Magnetic Nanohybrids for Triggered Drug Release and Potential Tumor Treatment via Hyperthermia

Ji Liu[1,2], Christophe Detrembleur[1], Stephane Mornet[2], Christine Jerome[1*], Etienne Duguet[2*]

[1]*Center for Education and Research on Macromolecules (CERM), University of Liege, Sart-Tilman, B6a, 4000 Liege, Belgium, jiliu@student.ulg.ac.be*
[2]*Institut de Chimie de la Matiere Condense de Bordeaux, CNRS/university of Bordeaux 1, 87 avenue du Dr Albert Schweitzer, F-33608 Pessac Cedex, France. liuji@u-bordeaux1.fr*

Stimuli-responsive organic/inorganic nanohybrids, with an inorganic core and a stimuli-responsive polymer coating, have been frequently suggested as a promising drug delivery system (DDS), due to their outstanding biocompatibility, versatile surface modification, specific responsive properties to external stimuli, *etc*. Due to the specific magnetic responsiveness, magnetic nanoparticles can penetrate body tissues under a magnetic guidance, providing a potential platform for magnetic-directed DDS. Furthermore, a sharp local heating can be obtained for superparamagnetic nanoparticles when exposed to an alternating magnetic field (AMF). This specific property opens up the possibility for application in tumor treatments [2].

Here, magnetic drug delivery vehicles consisting of maghemite nanoparticles and smart poly (vinyl alcohol)-*b*-poly (acrylic acid) polymer coating were fabricated via electrostatic binding. Sharp responsiveness to pH, ionic strength and magnetic field was observed. MTS assay with mouse L929 cells showed a good cytocompatibility, and also a good internalization into MEL-5 cells as confirmed by Fluorescence microscopy and transmission electronic microscopy. The triggered release behavior of uploaded methylene blue (MB) can be achieved by changing pH, temperature or ionic strength (IS). A local heating was detected when exposed to external AMF (755 kHz, 14 mT) treatment, resulting in a faster release. This kind of drug delivery vehicles can be envisaged for controlled release to a specifically urgent physiological need, such as tumors, as well as potential treatment of tumors via hyperthermia.



Scheme 1. Preparation of maghemite nanohybrids and drug loading (a), and triggered release by change in pH, IS, temperature or AMF treatment after internalization into the tumor sites (b).

Key Words: stimuli-responsive, magnetic, controlled release, hyperthermia, alternative magnetic field

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