Magnetic Nanocapsules for Smart Drug Delivery

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By combining peptide-based polymers with modified iron oxide nanoparticles, researchers at the Centre National de la Recherche Scientifique in Pessac, France, have developed nanoparticles that can be manipulated in a magnetic field and that can respond to changes in pH and other physiologic stimuli.

These nanoparticles, which can be modified to include targeting molecules, could serve as a versatile, smart platform for delivering drugs and imaging agents to tumors.

Writing in the journal Progress in Solid State Chemistry, Sébastien Lecommandoux, Ph.D., and his colleagues describe their use of what are called diblock copolymers, made of peptides to create stimuli-responsive nanoparticles. The investigators make these polymers by first stringing together short stretches of single amino acids to form peptide blocks.

They then link two of these blocks together in an alternating pattern to create the diblock copolymer. Through the careful choice of the amino acid constituents, and hence the two blocks, that go into a polymer the investigators are able create nanoparticles that can respond to a wide range of conditions.

When the investigators mixed the diblock copolymers with iron oxide nanoparticles modified to be compatible with either water or organic solvents, the components self-assemble into stable nanoparticles. Depending on the choice of polymer and the form of iron oxide used,

the resulting nanoparticles are either hollow or have a core-shell structure.

The investigators note that the conditions they used to prepare these various nanoparticles are amenable for encapsulating drug molecules, too. They also comment that they can deform these nanoparticles by changing pH and applying a magnetic field, an event that would release entrapped drug.

This work is detailed in a paper titled, “Smart hybrid magnetic self-assembled micelles and hollow capsules.” An abstract of this paper is available at the journal’s website.

Source: National Cancer Institute