Researchers focus on nanoparticles for delivery of cancer treatment

December 12 2013

At NYU Abu Dhabi's Center for Science and Engineering, assistant professor of chemistry Ali Trabolsi leads the Trabolsi Research Group, which focuses on supramolecular multifunctional systems: these are modified molecules developed by chemists for applications in a variety of fields, including medicine and engineering. In the past two years, the group has produced cutting-edge research that may help improve the effectiveness of drugs used for cancer treatment.

With postdoctoral associate Farah Benyettou and assistant professor of practice of biology Rana Al-Assah, Trabolsi recently published a paper in the *Journal of Materials Chemistry B* that describes the creation of a composite nanoparticle that may potentially be used to treat cancer.

They began the experiment with magnetic iron-oxide nanoparticles, which hold great potential in medicine because they are extremely small, non-toxic, and can be used as both imaging agents and for drug delivery. The researchers then attached a series of macrocycle "containers" to the iron-oxide nanoparticles. "By coupling a container to the surface, the new nanoparticles can be used for a dual application: for MRI and also to deliver an anti-cancer drug," Benyettou says. This is called a theranostic system, in that it would allow physicians to monitor and control the distribution of drugs in a patient.

The authors opted not to deliver a drug, but to test the delivery of a dye to prove the success of their idea. The dye, called Nile Red, is not fluorescent on its own, but when the dye is added to the macrocycle container, it becomes fluorescent. This fluorescence allows researchers to track the nanoparticle throughout cells.

Moreover, the dual action makes it possible for the nanoparticle to be used not only for MRI but also for treating cancers locally, as they are magnetic and physicians could potentially control the location and distribution of the particles. This would have positive application in chemotherapy cancer treatments.

"The nanoparticles can be guided with a magnet and thus can be localized in a particular part of the body. This may help reduce the side effects of cancer drugs," Benyettou explains. "That's the problem with chemotherapy: when you administer the drug it goes everywhere; it kills cancer cells, but it also kills healthy cells."

By controlling the distribution of cancer treatment chemicals in the body, this new development may also help prevent damage that is caused to healthy cells. Benyettou and Trabolsi have written a proposal to add a popular cancer drug to the nanoparticle to see how this modification affects cancer cells in living tissue.

Provided by New York University