Self-Assembling Nanoparticles Image Tumor Cells

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By taking advantage of the full range of ways in which molecules can interact with and bind to one another, a team of investigators at the Carolina Center of Cancer Nanotechnology Excellence has created nanoparticles that assemble themselves layer by layer. These nanoparticles, which contain two different types of imaging agents, also contain a peptide coating that targets tumor cells.

Wenbin Lin, Ph.D., of The University of North Carolina at Chapel Hill, led the research effort to develop a relatively simple and versatile strategy for creating multifunctional nanoparticles capable of targeting specific types of cells.

The investigators turned to a strategy known as layer-by-layer self-assembly, in which the various charged chemical components of a nanoparticle put themselves together in such a way that maximizes the interaction of positive and negative charges. The mild chemical environment required to trigger layer-by-layer assembly enabled the researchers to create multifunctional nanoparticles without worrying about damaging the targeting and imaging molecules they wanted to incorporate in the nanoparticles.

In the current work, Lin and colleagues created a silica-based nanoparticle containing a fluorescent dye and a magnetic resonance imaging (MRI) contrast agent. The researchers added a tumor-targeting targeting peptide, known as RGD, to the nanoparticle's surface.

Tests with the resulting nanoparticle showed that the nanoparticles were capable of distinguishing between human colon cancer cells and normal cells. In contrast, nanoparticles coated with a peptide that does not bind cancer cells did not show this type of cell specificity. The investigators were able to monitor nanoparticle uptake by both fluorescent imaging and MRI.

This work, which was supported by the National Cancer Institute's Alliance for Nanotechnology in Cancer, is detailed in the paper "Self-assembled hybrid nanoparticles for cancer-specific multimodal imaging." An abstract of this paper is available through PubMed.

Source: National Cancer Institute