Silicon nanocrystals map location of spreading tumors

January 19 2011

Nano-sized fluorescent particles known as quantum dots have shown promise as powerful imaging agents capable of detecting a wide range of diseases, but these nanoparticles are usually made with toxic metals such as cadmium. Now, researchers at the University of Buffalo have developed a novel synthetic method that enables them to design and create biocompatible fluorescent nanocrystals made of non-toxic silicon. More importantly, the investigators have used these silicon nanocrystals to image tumors and spot spreading cancer in lymph nodes.

Reporting its work in the journal *ACS Nano*, a team of investigators led by Paras Prasad describes the two-step process they use to prepare polymer-coated, fluorescent silicon nanoparticles to which they can attach a variety of tumor-targeting molecules, including a small peptide known as RGD that binds to the new blood vessels that surround tumors. This synthetic process allowed the researchers to prepare silicon nanocrystals of well-defined sizes, each with its own characteristic fluorescent emission peak. The polymer coating prevents the nanocrystals from being eliminated rapidly inside the body, a fate that normally awaits unprotected silicon particles in the body.

After demonstrating that RGD-derivatized nanocrystals were non-toxic in both cultured cell and whole animal studies, the investigators showed that they could use the nanocrystals to image pancreatic tumors growing in mice, and to detect tumors in tissue specimens removed for biopsy. The investigators also showed that they could use non-targeted silicon nanocrystals to map sentinel lymph nodes in mice, the lymph nodes

where metastatic cells first accumulate when spreading through the body.

This work, which is detailed in a paper titled, "*In vivo* Targeted Cancer Imaging, Sentinel Lymph Node Mapping and Multi-Channel Imaging with Biocompatible Silicon Nanocrystals," was supported in part by the NCI Alliance for Nanotechnology in Cancer, a comprehensive initiative designed to accelerate the application of nanotechnology to the prevention, diagnosis, and treatment of cancer. At the time of this work, Dr. Prasad was the principal investigator of one of 12 Cancer Nanotechnology Platform Partnerships funded during the NCI' Alliance's first five-year phase. An abstract of this paper is available at the journal's website.

More information: View the complete abstract here: doi:10.1021/nn1018945" target="_blank">dx.doi.org/doi:10.1021/nn1018945

Provided by National Cancer Institute