Carbon Nanotubes Have Room for Multifunctionality

September 27 2007

In the quest to turn carbon nanotubes from nanoscale wonder into clinically useful drug and imaging agent delivery agents, researchers have often added polymer coatings to the outside of the nanotubes in order to render them biocompatible. Now, researchers at Stanford University have found that even when coated, carbon nanotubes retain the ability to bind extraordinarily large numbers of drug and imaging agent molecules in a stable yet reversible manner.

Reporting its work in the journal *ACS Nano*, a research team led by Hongjie Dai, Ph.D., an investigator in the Center for Cancer Nanotechnology Excellence Focused on Therapy Response, showed that polymer-coated single-walled carbon nanotubes spontaneously absorbed the cancer drug doxorubicin onto their surfaces when the drug was added to the nanotubes dissolved in water. The resulting construct contained approximately 50 to 60 percent doxorubicin by weight, far higher than the 8 to 10 percent obtained with either liposomes or dendrimers.

The investigators also found that the carbon nanotubes retained their drug payload when dissolved in normal physiological buffer and blood serum, but that the drug released quickly from the nanotubes in the acidic environment characteristic of the insides of tumor cells. The investigators showed, too, that they could permanently attach tumor-targeting molecules and imaging contrast agents to the nanotubes, raising the possibility of creating multifunctional nanoscale devices that could both detect and treat tumors.

This work, which was supported by the National Cancer Institute's Alliance for Nanotechnology in Cancer, is detailed in the paper, "Supramolecular chemistry on water-soluble carbon nanotubes for drug loading and delivery." An abstract of this paper is available at the journal's Web site.

Source: National Cancer Institute

Citation: Carbon Nanotubes Have Room for Multifunctionality (2007, September 27) retrieved 8 April 2024 from https://phys.org/news/2007-09-carbon-nanotubes-room-multifunctionality.html

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