Modification Turns Ultra-Short Nanotubes into Molecule-Like Drug Capsules

October 23 2006

While most research aimed at developing carbon nanotubes as tumor-targeting drug and imaging agent delivery vehicles has focused on full-length nanotubes, Lon Wilson, Ph.D., and his colleagues at Rice University have been working with ultra-short nanotubes that cells appear to take up more efficiently than their longer counterparts.

Now, this group of investigators has developed a method for modifying ultra-short carbon nanotubes so that they do not aggregate into bundles, one of the major problems in using this material in biomedical applications.

Reporting its work in the journal *Nanotechnology*, the Rice team describes the chemical technique it developed to change the surface properties of ultra-short carbon nanotubes so that they take on a negative charge. Since two objects that each have a negative charge will repel one another, the nanotubes remain as individual entities in solution. This enabled the researchers to further modify the nanotubes so that they can link targeting agents, anticancer drugs, or imaging agents to the nanotubes. This second modification also helps the nanotubes dissolve better in water than unmodified ultra-short nanotubes.

The researchers note that ultra-short carbon nanotubes can be filled with drugs and imaging agents. In fact, this group reported last year that it had successfully loaded the MRI contrast agent gadolinium into ultra-short nanotubes. With their new approach to creating nanotubes that do not aggregate, the investigators believe they have taken a significant step

forward in their efforts to develop clinically useful agents for imaging and therapy.

This work is detailed in a paper titled, “Functionalization of individual ultra-short single-walled carbon nanotubes.” An abstract of this paper is available at the journal’s website.

Source: National Cancer Institute