New nanotoxicology study delivers promising results

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Findings by a team of researchers from Oak Ridge National Laboratory and the University of Tennessee bode well for using single-walled carbon nanohorns, a particular form of engineered carbon-based nanoparticles, for drug delivery and other commercial applications.

In results to be published in the journal *Nanotoxicology* (www.nanotoxicology.net), a team led by Meng-Dawn Cheng of ORNL's Environmental Sciences Division reported no pulmonary toxicity issues for single-walled carbon nanohorns. These findings are contrary to numerous studies in rats involving single-walled carbon nanotubes that have different shapes and sizes than those of nanohorns.

"We think the difference could be due to the lack of metal contaminants in single-walled carbon nanohorns as compared to single-walled carbon nanotubes, although many factors could be the cause as well," said one of the co-authors, Brynn Voy of ORNL's Biosciences Division.

Nanohorns are short, horn-shaped tubular structures capped with a conical tip. Individual nanohorns tend to cluster and form a Dahlia, or star-like, structure between 50 nanometers and 100 nanometers in diameter with the tips of individual nanohorns projecting outward from the center in all directions.

Of particular relevance is the fact nanohorns can be produced through simple laser ablation of a pure carbon target without the use of transition metal catalysts. Researchers theorize that the metal contaminants might

be the cause of inflammatory responses and oxidative stress reported in inhalation studies using single-walled carbon nanotubes.

"Our primary objective in this study was to characterize the pulmonary response of single-wall carbon nanohorns and compare our results to published data concerning single-wall carbon nanotubes," the authors wrote. They acknowledge that the two forms of nanostructures can be vastly different in eliciting biological responses so they took great care in making the comparison.

In addition to nanohorns' potential for drug delivery purposes, researchers believe they can be useful for hydrogen storage in energy and fuel cell applications. Authors of the paper believe carbon nanohorns could find large-scale applications sooner than carbon nanotubes because they are easier to produce and because of the likelihood that they do not pose a health hazard.

Other authors of the paper, Assessing the Pulmonary Toxicity of Single-Walled Carbon Nanohorns, are Rachel Lynch of ORNL's Biosciences Division, Dana Glass and Shannon Mahurin of the Environmental Sciences Division, and Arnold Saxton and Robert Donnell of the University of Tennessee. This research was funded through the ORNL Laboratory Directed Research and Development program.

Source: ORNL