Where do nanomaterials go in the body?

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Tiny, engineered nanomaterials can already be found in many consumer products, and have been hailed as having widespread future uses in areas ranging from medicine to industrial processes. However, little is known about what happens if these nanomaterials get into your body - where do they go? NC State researchers are working to answer that question under a grant from the National Institutes of Health (NIH).

"There has been a great deal of research into the use of manufactured carbon nanomaterials in various products, but there are still a lot of questions about how these materials will interact with biological systems," says Dr. Nancy Monteiro-Riviere, a professor of investigative dermatology and toxicology at the Center for Chemical Toxicology Research and Pharmacokinetics at NC State and lead investigator of the study. "There is a crucial need to understand how these manufactured carbon nanomaterials will act once they are in the body - particularly where environmental or occupational exposure can occur."

The two-year research project, which is being funded by NIH at approximately $658,000, has several specific goals. First, the researchers will determine how and whether the size and surface charge of four fullerenes - or specifically shaped carbon nanoparticles - effects how the fullerenes interact with the body. "Our hypothesis is that the size and charge of these fullerenes will dictate how the nanoparticles are absorbed by the body, how they are distributed within the body, how the body metabolizes the nanoparticles and - ultimately - how and whether the body can eliminate the nanoparticles," says Monteiro-Riviere.

A second goal is to determine how fullerene size and surface charge affect the distribution of the nanoparticles in the body's organs and plasma, when the fullerenes are injected intravenously. This component of the study will be performed in animal models that are well understood, and where the findings can then be extrapolated to humans. Researchers will also identify any adverse health effects resulting from acute exposure to the nanomaterials.

Finally, the researchers will assess how the body absorbs fullerenes when exposed to the nanomaterials orally or through abraded skin - two routes of exposure that are particularly relevant to real-world scenarios, such as exposure in the workplace.

"The work being done in this project will not only improve our understanding of how nanomaterials behave in the body, but will also help us identify in vitro assays, which can be performed in a laboratory, that predict how the nanomaterials will behave in the body," says Monteiro-Riviere.

Source: North Carolina State University (news : web)