

Nanotube risk assessment

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Italian scientists suggest that we need a much more detailed toxicological approach to hazard assessment before judgement regarding the long-term safety of carbon nanotubes can be made. They outline their results in the *International Journal of Environment and Health*.

Although nanotechnology is a relatively new field of research, already there are claims that its products could be harmful to human health and damaging to the environment. In particular, concerns have been raised about the safety of carbon nanotubes, minute hollow fibres of the carbon. Carbon nanotubes are just one group of materials being developed under the umbrella term of nanotechnology, which focuses on materials comprising particles between 1 and 100 nanometres in size. A nanometre is a billionth of a metre.

According to Enrico Bergamaschi of the Department of Clinical Medicine, at the University of Parma Medical School, carbon nanotubes are among the most promising [nanomaterials](#), with potential in engineering, molecular electronics and as drug-delivery agents that could significantly reduce side-effects for countless medications.

In spite of their innovative properties, the small size of carbon nanotubes has led some observers to hypothesize that they may have similar detrimental effects to the sooty particles from vehicle exhausts known as PM10 particulates. Others suggest that toughness and fibrous nature of carbon nanotubes is reminiscent of [asbestos](#) fibres and follow the same fibre paradigm.

Bergamaschi and colleagues point out that carbon nanotubes are a recent invention only now finding commercial applications and so clinical and [epidemiological evidence](#) for any long-term effects they may have on human health are entirely lacking.

The researchers explain that, despite the occasionally exaggerated headlines seen in the media regarding research studies into the effects of nanotechnology, their novelty means that no one has yet established whether they represent a long-term health risk, or whether they can exacerbate certain pre-existing medical conditions.

"As more of these materials are produced, there is an urgent need to refine strategies to assess their possible effects on employees who represent the main exposed population, along with characterizing exposure, so that appropriate safety regulations can be put in place if needed," says Bergamaschi.

Accepted and standardised tests and models have been set up and are in place to allow for an evaluation of any new chemical or material against existing benchmarks and to categorise their associated risk level, the team explains. However, we don't know whether they also work for such a heterogeneous class of nanomaterials.

As such, researchers have already demonstrated acute toxic effects caused by inhalation of carbon nanotubes. Several teams have focused on the way these substances interact with our cells at the molecular level. Their small size and surface chemistry and reactivity are the most important factors affecting their biological interactions and toxicity as they could remain intact in the lung or, after systemic translocation, in other organs for extended periods. However, it is common to modify the surface of carbon nanotubes for specific applications by adding different chemical groups. On one hand this seems to reduce cytotoxicity, and increase their metabolic clearance, but on the other doesn't necessarily

allow cells to break down such structures more readily.

Nevertheless, the Parma team, having reviewed all the available data, suggests that in order to meet an acceptable level of certainty regarding the safety or otherwise of carbon nanotubes, we should combine experimental, clinical and epidemiological evidence. They add that it is time to set up preventive measures as well as assess the need to implement periodic health examinations of employees exposed to carbon nanotubes.

More information: "A toxicological approach to hazard assessment of carbon nanotubes: implications for workers' health protection" in Int. J. Environment and Health, 2009, 3, 249-263

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