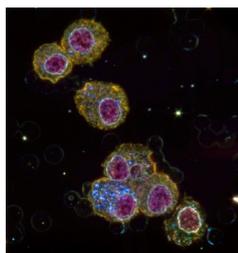


New toxicity knowledge of porous nanoparticles and nanoparticles doped with copper

Background:

The introduction of pores into silica nanoparticles holds promise for applications such as medical devices or catalysts. The introduction of copper doping potentially improves catalysis of nanomaterials. When manufacturing and utilising these materials it is important to know at what levels they are toxic to workers. Also it is important to know at which levels such materials become toxic to the ecological environment. As

part of the caLIBRAte project silica materials of various sizes—with or without porosity and copper doping—were manufactured. The materials were physico-chemically characterised and the toxicity of porous silica nanoparticles with or without copper doping was tested. For this, both cutting edge in cell culture *in vitro* methods as well as gastrointestinal, pulmonary and ecotoxicity *in vivo* methods were used.



Cells from the lung lining fluid of mice dosed with porous copper doped silica nanoparticles. The blue color observed in dark field microscopy is induced by the nanoparticles



Daphnia were 1 out of 4 tested organisms for the testing of ecotoxicity

¹curid=1428600

Findings:

We have successfully tested the materials and determined levels at which toxicity occurs:

- 1) It is important to observe that with the introduction of porosity—there is a risk of increasing the human toxicity of nanomaterials.
- 2) The introduction of copper into nanomaterials increases their toxicity to humans and to the ecosystem; and this is likely due to the release of toxic copper ions from the surface.
- 3) There is a risk of synergistic effects occurring when combining such functionalities as porosity and copper doping are combined
- 4) The data will be available in detail in the scientific literature

New data for the understanding of the toxicity to humans and to the environment were produced. These new findings are particularly valuable for hazard assessment of nanomaterials.

This fact sheet is based on caLIBRAte Deliverable 5.6 *Finalised generation of in vivo dataset* as the result of a collaboration between National Research Centre for the Working Environment (DK), Swiss Federal Institute of Aquatic Science and Technology (CH), GAIKER (ES), Misvik Biology Oy (FI), University of Helsinki (FI), Finnish Institute of Occupational Health (FI), LEITAT (ES), Natural Environment Research Council (UK), National Institute for Public Health and the Environment (NL) and National Institute for Occupational Health (ZA).

www.nanocalibrate.eu

Keld Alstrup Jensen
kaj@nfa.dk

¹(Photo: Paul Hebert) - Functional Genomics Thickens the Biological Plot. Gewin V, PLoS Biology Vol. 3/6/2005, e219. doi:10.1371/journal.pbio.0030219, CC BY 2.5.

