



The SAFENANO List 2009

Opinion and Resources for Nanotechnology Risk Issues

Compiled by Bryony Ross & the SAFENANO Team, July 2009

In summer 2007, we published the 'SAFENANO List' - a summary of what we saw as the most significant publications in the area of nanotechnology health and safety available at the time. This summarised highly relevant, opinion-forming pieces written over the years since publication of the Royal Society and the Royal Academy of Engineering 2004 Report 'Nanoscience and nanotechnologies: Opportunities and Uncertainties'.

Since then, increasing attention from governmental, regulatory & standardisation, academic, insurance, industry, NGO and consumer bodies has led to publication of a number of important review, opinion and guidance based documents, which provide further insight to the main areas of concern within the nanotechnology environment, health and safety field.

In the EMERGNANO report, a unique attempt to identify and assess worldwide progress in relation to nanotechnology risk issues, was published in early 2009. It identified over 670 and assessed over 260 unique research programmes in the nanotechnology EHS area, evaluating these against the 18 research objectives for nanotechnology risks laid out by the UK Nanotechnology Research Coordination Group (NRCG). Its conclusions summarise well issues both being addressed and those outstanding; a brief summary of which is outlined below:

- For characterisation and reference materials, identification of candidate materials & minimum characterisation specifications for development of reference nanoparticles for toxicological and other investigations is underway. Some commercial reference materials are now beginning to emerge.
- For exposure assessment and control, recent research has conclusively shown that filters, such as those used in respiratory protective equipment and in air cleaning systems, are highly effective in removing nanoparticles from the air.
- For toxicology, lack of mass balance toxicokinetics for any nanoparticle and the patchy nature of the published toxicokinetic data has proven a severe impediment to identifying extra-pulmonary hazards. In addition, testing to date has focussed on a very limited number of particle types and sizes, making it impossible to know whether all NP behave in the same way toxicokinetically, or whether (as seems more likely) a structure activity relationship will emerge that highlights certain sizes and surface chemistries as factors enhancing or limiting potential of any nanoparticle to translocate or be toxic;
- In ecotoxicology, work to date has improved understanding of kinetics of nanoparticle uptake in invertebrate and vertebrate models, and has related this to toxicity. In addition, recent studies which focus on microbial organisms help to provide information on nanoparticle effects at both an individual organism and greater community level.



Using this as a starting point, the updated SAFENANO list highlights what we consider to be some of the most important publications available by area of relevance.

The reports and papers are listed according to category:

- General Toxicology
- Characterisation for Toxicology
- Characterisation for exposure assessment
- Ecotoxicology
- Exposure
- Fate & Behaviour
- Occupational Hygiene
- Risk Assessment & Management

We will continue to update this page as further information emerges. However, in the meantime please get in touch & let us know if you think significant publications are missing.

General Toxicology

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De Jong WH, Hagens, WI, Krystek P, Burger MC, Sips AJAM, Geertsma RE. (2008), Particle size dependent organ distribution of gold nanoparticles after intravenous administration. [Biomaterials 29, 1912-1919](#)

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