Role of metals in the toxicity of nanoparticles: informing the regulation of nanoparticulate safety

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Introduction
Providers of metal ions or is structure important

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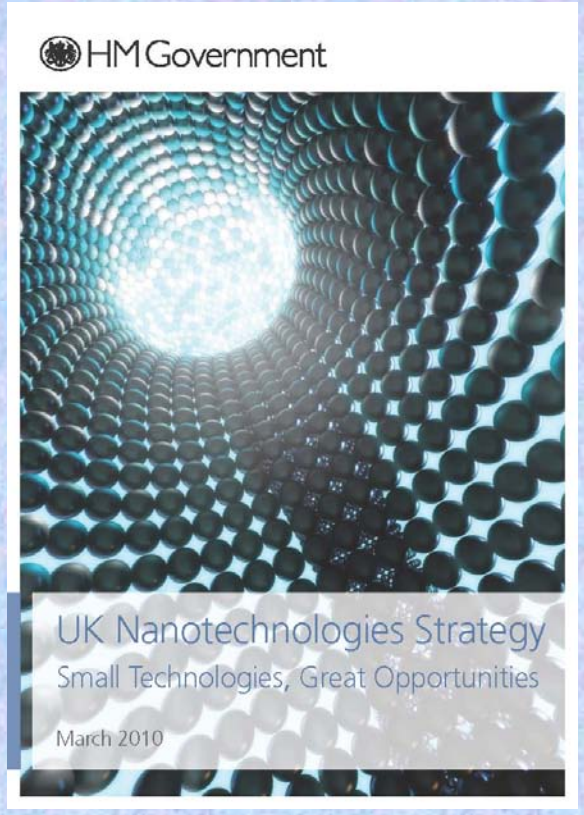

Nanoparticles

- Many different chemical types under this umbrella (metal oxides, silver, atmospheric particulates, novel carbon based entities)
- Atmospheric particles have been studied for a long time but a lot less is known about other chemical species
- Imperative that we know the mechanistic basis of any toxic actions not just distribution
- Many will exist in mixtures

Mechanisms of action

- There is a great deal of knowledge still needed to understand and appreciate the toxicity of nanoparticles in order to estimate risk

- The concern over the potential toxicity of nanoparticles is often based on presumptions of their mechanisms of action

Today's focus

- Many nanoparticles contain metals
- How might these contribute to toxic and carcinogenic processes?
- Does the nano state have a specific role to play, other than as a provider of metallic ions?

- Do we already have all the mechanistic knowledge we need or are their new mechanisms?
- Fenton chemistry leading to ROS is frequently invoked as a mechanism of toxicity- but is this true for some of these metals?
- Does surface chemistry play a role in specific biological environments?

Hazard v risk

- Clearly, there are probably multiple mechanisms of action for metal-containing nanoparticles
- Can groupings be made, such as in the ‘mode of action’ approach to assess risk of cancer for humans from drugs and chemicals at realistic exposures?
- In fact for iron overload this has already been done