July, 2016

NANOSAFE

AUSA NanoSafety Group Newsletter

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Welcome!

Dear AUSA NanoSafe Group members,

Welcome to the first NanoSafety newsletter! The purpose of the newsletter is to provide specialized information and news updates to the group. It is aimed to gradually build the group with knowledge on nanotechnology and safety. Hope you enjoy reading it!

Xin, Julie and Maria

Group News

The AUSA Conference 2016 was held in Gold Coast from June 14 - 17. Two sessions were presented from the NanoSafe Group during the concurrent sessions. Xin and Olivia discussed about their practices and research on risk management on engineered nanomaterials. The presentation slides can be found on AUSA Conference site.

In July, we welcome two new members to the group. Please join us to welcome Lee Dewhurst, Associate Director Health Safety and Wellbeing, The University of Auckland, and Christian Rantzau, Specialist Chemical Adviser, University of Melbourne and Dr Ilse Scharfbillig, HSO, School of Physical Sciences, The University of Adelaide to join the group. For group membership enquiry, please contact Xin directly.

Research Updates

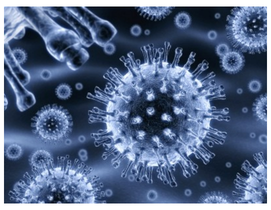
A book, *Assessing Nanoparticle Risks to Human Health*, edited by G Ramachandran, was published in 2016 with its second edition, which contained reviews of most of the up-to-date research literatures in nanoparticles hazard management. The book can be accessed via Science Direct through your university's subscription.

The debate in the use of control banding in the risk assessment is still going on in 2016. One of the latest review in control banding effectiveness and models can be found here.

For Universities which has nanotechnology uses in agricultural practices, you may be interested in reading this paper.

In addition to its 2009 report on nanosafety in work health hazards and toxicology, Safework Australia has published an update on the topic in 2015.

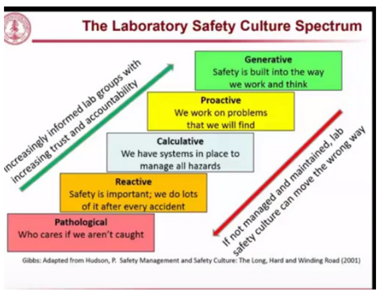
Members Contributions

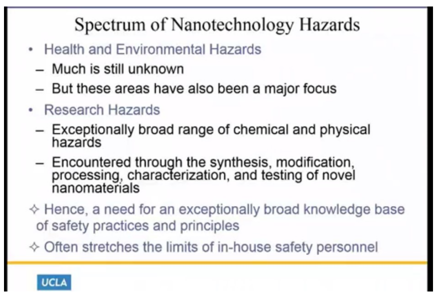


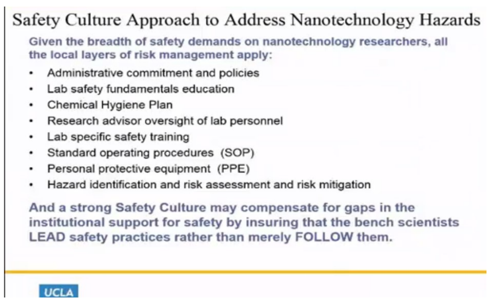
Christian from University of Melbourne has offered to share their guidelines on safety management of nanotechnology. The document has been uploaded onto the group's online portal.

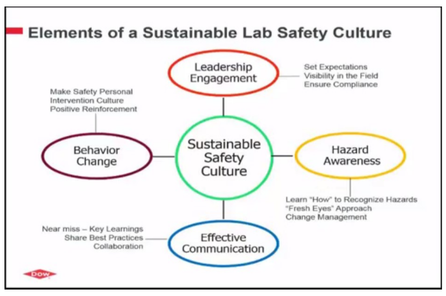
A new youtube channel, NanoTube, by nano.gov, an US government initiative, has been up and running from 2016.

On the management side, an interesting webinar on nanotechnology, safety culture and hazard management can be accessed here. The presentation focused on the safety culture building and application in the nanomaterials hazard management and provided one of the many approaches towards managing nanotechnology and WHS of workers. Below are some of the screenshots by Maria and copy right belongs to the content owner.









Another interesting youtube video—NanoSafety Mission Impossible? By A/Prof. Kristina Jakobsson. In this presentation, she expressed her opinion, based on academic proof, that nanotechnology is safe. She also provided some strategies on workplace exposure reduction.

Table 2. BSI categorisation of nanoparticle hazard types and example materials

Nanoparticle characteristic as per the BSI Guide grouping	Suggested Benchmark Exposure Level (BEL)	Some types of engineered nanomaterials in each group
Fibrous nanomaterials	0.01 fibres/ml	Carbon nanotubes, nanowires
CMAR nanomaterials	0.1x *WEL bulk material	Ni nanoparticles
Insoluble nanomaterials	0.066 x *WEL bulk material	Nanocrystals, quantum dots, ceramic oxides, metals
Soluble nanomaterials	0.5 x * WEL	Lipid-type nanoemulsions, dendrimer-type drug delivery systems

*WEL bulk material: Workplace Exposure Limit (i.e. Exposure Standard) for the bulk form of the chemical

Nanoparticles have not been set by the government with a workplace exposure limit (WEL). However, in a report that SafeWork Australia published, a table of benchmarking exposure levels was included. The report can be accessed here. The table is also included on the left.

A research paper with a proposed model on nanomaterials management has been published in 2016. Engineered nanomaterials: toward effective safety management in research laboratories. The paper has been sent to all group members before the conference. A copy has been uploaded to the group's online portal.

You may also be interested in reading a publication by Health and Safety Executive UK in 2013 on using nanomaterials at work.

Frequently Asked Questions?

1. What are the exposure route for all nanomaterials?

Inhalation, ingestion, Skin absorption and ocular pathways but not all nanomaterials can go through the skin. Current understanding is that there are three pathways via the skin absorption, intercellular, transcellular and trans-appendageal.

2. Are all nanomaterials as bad as asbestos?

Some safety professionals advise to treat all nanomaterials as asbestos while some advise to treat as infectious diseases. This is correct with nanomaterials which can induce cytotoxicity, cell and DNA damage and release reactive oxygen species (ROS). However, the endpoint of the materials in the body are different. Many nanomaterials can end in lungs, brain and other cells while respirable asbestos ends in the lungs. Asbestos can interact with chromosome to cause the above mentioned problems while some nanoparticles are likely to target both cytoplasm and nucleus. The interaction mechanism is similar but human phagocytic cells cannot remove the fibrous asbestos while the phagocytes can encapsulate many nano metal oxides and deliver a worse outcome. Most species of asbestos can be collected by class M or H HEPA filtered vacuum cleaners while specially fabricated HEPA filters are required for effective nanomaterial collections.

In summary, the hazardous effects of some nanoparticles can be much worse than asbestos. The safety management of certain nanoparticles should not only reply on the knowledge and experience with asbestos. A case-by-case approach should be used in nanosafety management.

3. Why are nanomaterials (NMs) are so reactive and potentially hazardous?

This is due to their nanoscale sizes and surface area. Of course there are other properties of NMs which contribute to the health concerns but the nanoscale size is one of the key factor than NMs can pass through cell barriers. Also due to their nanosizes, the surface area of these materials are much higher than their parent chemicals which leads to more collision and reacting site in the molecular level and hence causing their high reactivity in the biological systems. Most literatures agree that many NMs induce cytotoxicity via oxidative stress. In other words, they are likely to undergo redox reactions to release ROS such as hydrogen peroxides and other free radicals.

Suggestions

Our next newsletter will focus on metal oxides nanoparticles. Please email your suggestion/contribution to Xin, Maria or Julie by July 24, 2016 for inclusion.