

Crucial to innovation in NANO  
via annual 2010/08

## NANOSILVER

### KEY POINTS

- Silver nanoparticles are one of the fastest growing product categories using nanotechnology. The greatest growth is in consumer products, some of which are available in Australia.
- Nanotechnology allows silver to be incorporated into fabrics, plastics and onto surfaces.
- Silver is highly toxic to bacteria, but bacterial resistance to silver can also occur.
- Silver toxicity to humans can occur for all forms of silver, including colloids.
- Another concern with nanosilver is its risk to the environment.
- The environmental risk posed by nanosilver is increased as the mass of silver dispersed to the environment from new products becomes substantial.
- Knowledge of silver's past behaviour in the environment provides a starting point for science-based decision making.
- There are no examples of adverse effects from nanosilver technologies occurring in the environment.
- The Australian Government has put in place a program of work to examine the potential environmental, health and safety impacts of nanotechnology.
- Some actions of the Government to further understand the risks of nanosilver include
  - Commissioning a review of the literature on the environmental fate of nanoparticles including nanosilver. (*Dept of the Environment*)
  - Participating in the OECD program to test the human health and environmental safety effects of a number of nanomaterials. Australia has a particular interest in nanosilver (*Dept of Health and Ageing*)

### Relevant to previous Estimates questions

- Colloidal silver was apparently sprayed on surfaces of the Hong Kong underground transport system as a public health measure. A colloid may or may not be a nanoparticle with its size ranging from 1nm to 1,000nm.
- We are unaware of any nanosilver in use on any public transport systems in Australia at this time.

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## **BACKGROUND**

Silver is effective in killing a wide range of bacteria. This behaviour is attributed to the silver ions (positively charged silver atoms) which are more efficiently released by nanosilver than from the bulk material.

Most products that use nanosilver are household items where this is more of a marketing feature than a major breakthrough (see **Attachment A** for a list of some products available in Australia). The Project on Emerging Nanotechnologies in the USA has a database of 240 products using nanosilver identified in September 2007.

Silver can be toxic to humans when intake is high. If enough silver is consumed, the silver can be deposited under the skin and turn it to a blue-gray colour (called 'argyria'), which is not reversible. Other harmful effects can also accompany silver exposure. .

### **Will the silver ions released from nanosilver into the environment cause unwanted effects?**

Nanosilver is being engineered to release silver ions, which are toxic to bacteria. Fortunately, silver ions do not remain long in the environment as they react readily with negatively charged ions. Thus, the anti bacterial effect remains localised and does not occur on a widespread basis in the environment.

There is a risk if substantial releases of nanosilver into the environment occur. Internationally, levels of silver emissions have peaked in the past, and the characteristic was for a halo of silver contamination to surround domestic waste treatment plants. Silver emissions will be required to be monitored as the nanosilver applications grows.

### **Can we identify and manage any new risks from nanosilver?**

Nanosilver poses questions common across nanomaterials. How does size, shape, charge state, etc alter its toxicity. Work is underway to answer these questions. The OECD program plans to test nanomaterials for their physical-chemical properties; environmental degradation and accumulation; environmental toxicology; and mammalian toxicology. We cannot currently provide certainty regarding the safety of nanosilver, this will be influenced by potential applications and exposure circumstances.

### **Australian exposure to nanosilver**

The OASCC conducted a review of organisations using nanomaterials from data available in the public domain. They identified eight universities working with nanosilver and five companies.

The National Industrial Chemical Assessment and Notification Scheme (NICNAS) located within the Department of Health and Ageing, conducted a voluntary call for information on the use of nanoparticles in commercial sector during 2005-06. No usage of nanosilver was recorded.

Agencies are conducting further workplace and company surveys currently to update data in this area.

### Excerpts from last Senate Estimates

**Senator MILNE**—Can anyone tell me whether nanosilver is being used in any of the public transport systems in Australia at this time?

**Dr Besley**—I cannot.

**Mr Pennifold**—I cannot comment. I do not know.

**Senator MILNE**—Since China is manufacturing a lot of whitegoods that come into Australia, can you tell me whether there are any fridges coming into Australia that use nanoparticles of silver coating on their inner surface, and as well similarly so for cutlery, chopping boards et cetera?

**Mr Pennifold**—I am not able to answer that.

**Senator MILNE**—Would that come under the Therapeutic Goods Administration or under FSANZ? If I went to buy a fridge, how would I know whether it has nanoparticles in it, given that nanosilver kills all bacteria, good and bad? That is why it is being used in public transport systems and that is why people are terrified of it. I am concerned that this is getting away from us and consumers do not know. Who can tell me, as to the regulatory framework in Australia, whether any whitegoods coming into the country are lined with nanosilver particles?

**Mr Pennifold**—That would be a question that you would need to put to the regulators.

**Senator MILNE**—Which one?

**Mr Pennifold**—It is probably best to direct it to the Health portfolio.

**Mr Paterson**—There was a question raised by Senator Milne yesterday concerning the regulation of refrigerators containing nanosilver. Refrigerators for sale in Australia are subject to the provisions and protection afforded under part 5A of the Trade Practices Act, which relates to product liability. The Trade Practices Act is administered by the Australian Competition and Consumer Commission, which is appearing before the committee later today.

## Extract from Friends of the Earth submission to Minister Carr: July 2008

Product type	Nanomaterial	Manufacturer	Brand names/products	Purpose	Source
Clothing	Silver	Healthy Channels	Antibacterial socks	Antibacterial/ odour repellent	<a href="http://www.australianuggs.com/complimentary-site-links-footwear.htm">http://www.australianuggs.com/complimentary-site-links-footwear.htm</a>
Clothing	Silver	Australian Wool Innovation Ltd	"Nanotech AB" antibacterial woollen garments	Antibacterial/ odour repellent	<a href="http://www.wool.com.au/attachments/Publications/Corporate/AWI_annualreport06_production_mar_dev.pdf">http://www.wool.com.au/attachments/Publications/Corporate/AWI_annualreport06_production_mar_dev.pdf</a>
Dishwashing cloth and kitchen wipe	Silver	Merino Pty Ltd	"Antibacterial wipes with natural silver"	Antibacterial	<a href="http://www.ultrafresh.com/tra/includes/DocumentViewing.cfm?ID=401">http://www.ultrafresh.com/tra/includes/DocumentViewing.cfm?ID=401</a>
Household appliances	Silver	Samsung	Samsung appliances, including refrigerator, air conditioner, washing machine, vacuum cleaner	Antibacterial	<a href="http://www.samsung.com/ph/silvermano/">http://www.samsung.com/ph/silvermano/</a>
Refrigerator	Silver	LG Electronics	Model: GR-R579JQA Top-mount refrigerator	Antibacterial	<a href="http://au.lge.com/products/model/detail/from_appliance_refrigerator_topmount_grr579jqa.html">http://au.lge.com/products/model/detail/from_appliance_refrigerator_topmount_grr579jqa.html</a>
Rubbish bin	Silver	LG Electronics	BioTank Nano-Silver Hygienic Dust Bin	Antibacterial	<a href="http://www.lge.com/products/model/detail/v-kc402ctu.html">http://www.lge.com/products/model/detail/v-kc402ctu.html</a>