



NATURAL RESOURCES DEFENSE COUNCIL
THE EARTH'S BEST DEFENSE

Nanomaterials: *health and policy considerations*

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NANO DEFINITIONS:

Nanotechnologies are the convergence of chemistry, physics, and engineering at the nanoscale, to take advantage of unique physical properties associated with small size.

NANOTOXICOLOGY: basic assumptions

Small size facilitates easier access to the lungs, passage through cell membranes, and possibly skin penetrance.

Once inside the body, they seem to have access to all tissues and organs, including the brain and fetal circulation.

Animal studies suggest that some nanomaterials cause inflammation, damage brain cells and cause pre-cancerous lesions.

Ultrafine (nano) air pollution, is associated with size-dependent reduced lung function and increased likelihood of asthma, respiratory disease, and deaths from lung and heart disease



NANO TITANIUM DIOXIDE

A 2009 study reported that when TiO₂ nanoparticles were administered to mice in drinking water (300-3,000 µg/day for five days), they induced DNA damage and genetic instability. (Trouiller et al, Cancer Res 2009;69(22):8784)

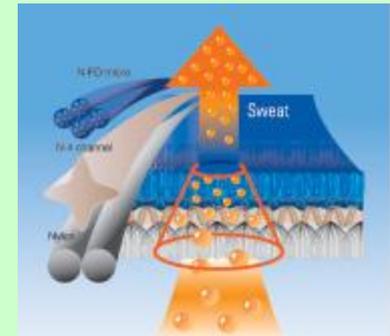


A 2008 study of TiO₂ nanoparticles administered subcutaneously to pregnant mice (0.1 mg at 3, 7, 10, and 14 days postcoitum) reported that the nanoparticles were transferred to the offspring and caused reduced sperm production and cranial nerve cell death in the male offspring analyzed at 4 days and 6 wks after birth. (Takeda et al, J Health Sci, 55(1):95).

NANO TITANIUM DIOXIDE



...Z-Cote (transparent zinc oxide) and T-Cote (transparent titanium dioxide), that do not deposit this chalky residue



***“YOUR BOOBS HAVE A MIND OF THEIR OWN.
BUT WE KNOW WHAT THEY’RE THINKING”***

...antibacterial and odorless through the application of silver dioxide fiber technology, preserving garment freshness. Finally, integrated titanium oxide fiber technology protects against ultraviolet rays providing UPF 50+. <http://cw-x.com/GearTechnology.aspx>

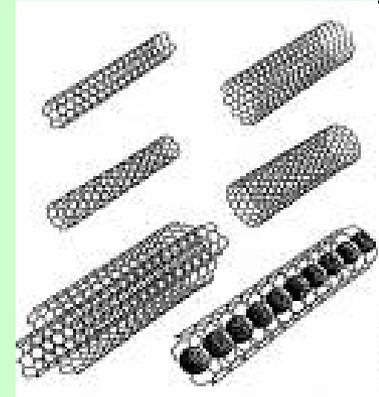
CARBON NANOTUBES: the new asbestos?

Both are long, rigid, fiber-like tubes.

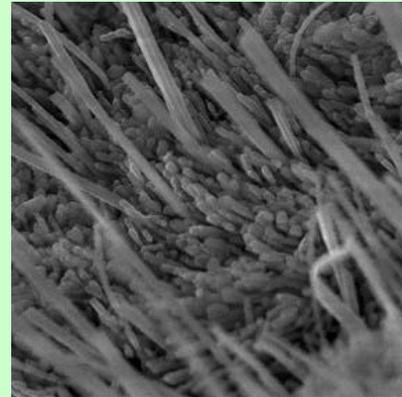
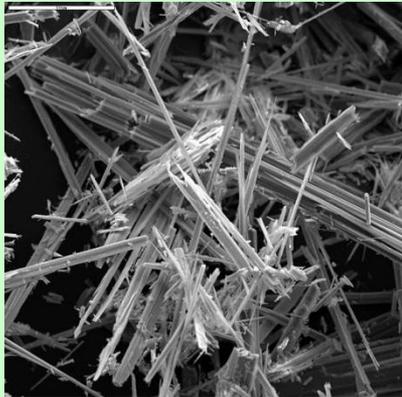
Both have a diameter of about 100-200 nm.

Both cause cytotoxicity, DNA damage, mutation.

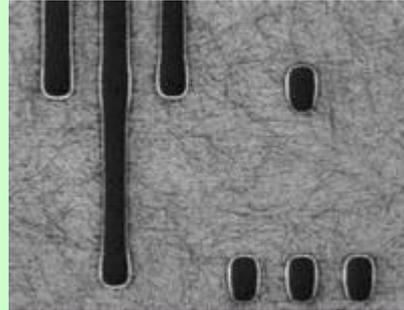
Both cause size-dependent inflammation, granulomas, fibrosis



Review by Jaurand et al, 2009. <http://www.biomedcentral.com/content/pdf/1743-8977-6-16.pdf>



CARBON NANOTUBES



NANTERO

<http://www.nantero.com/index.html>

Carbon nanotubes in coating make a 'heatable paint' to prevent ice buildup

*Columbus, OH—Shakespeare wrote it in his play *The Winter's Tale*: "Everything freezes." At Battelle, an ingenious innovation using carbon nanotubes may prove the Bard of Avon wrong."*

<http://www.battelle.org/SPOTLIGHT/1-26-10icing.aspx>

NANOCHEMICALS IN MEDICINE

Emend® (Merck, USA) approved by FDA in 2003 as an anti-nausea drug for chemotherapy patients. Nanocrystals.

Doxil® (ALZA Corp, USA) approved by FDA in 2005 to treat ovarian cancer and Kaposi's sarcoma. Lipid nanoparticles.

Estrasorb™ (Novavax, Inc, USA) approved by FDA in 2003 as topical estradiol lotion to treat menopause. Micellar nanoparticles.

Rapamune® (Wyeth, USA) approved by FDA in 2000 as an immunosuppressant for renal transplant patients. Nanocrystal form.

Zirconium Oxide® (Altair Nanotechnologies, Inc, USA) commercially available since 2003 for dental fillings

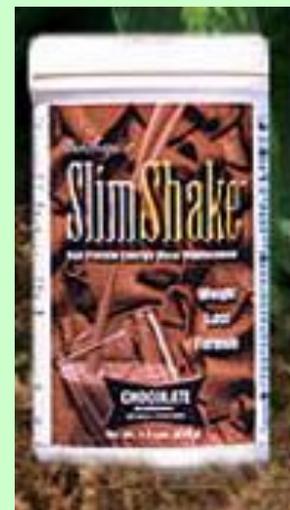


NANOCHEMICALS IN FOOD AND BEVERAGES

Nanoceuticals TM Slim Shake Chocolate (RBC Life Sciences, USA). Pure cocoa is added to a nano-cluster

Canola Active Oil (Shemen Industries, Israel). Uses Nano-sized self assembled structured lipids, NSSL, to deliver insoluble vitamins through the cellular membrane

Nanotea (Shenzhen Become Industry&Trade Co., China)



NANOCHEMICALS IN FOOD CONTACT MATERIALS

Kitchen cutting board (S Korea) nanosilver

Home and garden spray (ABL, USA) nanosilver



Adhesive for McDonald's burger containers (Ecosynthetix, USA) **NO LONGER** use nano-scale starch molecules that require less water and less energy to form adhesives and dry.

Aluminum foil (Melitta, Germany). With non-stick coating. "Put simply, is that the black coating material to carbon, in a glass matrix is embedded. The black area reached up to 100 degrees Celsius higher surface temperatures when cooking ... the food is prepared quickly."



FOOD AND DRUG ADMINISTRATION (FDA)

- FDA does not have authority to require cosmetic companies to submit safety data
- FDA does not have authority to obtain post-market health and safety data for any products

CONSUMER PRODUCT SAFETY COMMISSION

- CPSAct prohibits the agency from imposing mandatory safety standards if the industry agrees to write its own standards
- CPSAct prohibits the agency from informing the public about a product without pre-approval of the manufacturer
- CPSC has no authority to require pre-market testing; only has authority to implement post-market product recalls

NANOSILVER: EPA attempts to register it

On August 12, 2010, the EPA proposed to “conditionally register” a pesticide product containing nanosilver. This conditional registration would allow this product to be sold in the US for 4 years on the condition that the company provides data now lacking on toxicology, exposure, and environmental impacts.

It is being advertised in “antibacterial” personal care products and stink-free clothing.



In order to grant a pesticide product a conditional registration for any period of time, EPA must show three things:

1. the company has not had sufficient time to generate the data since EPA “first imposed” the data requirement
2. the use of the pesticide during this time will not cause any unreasonable adverse effect on the environment, and
3. the use of the pesticide is in the public interest.

In the case of nanosilver, EPA has failed to these criteria.

First, the missing data include those that EPA has always required for registration applications since the regulations were written in 1986. Therefore, the registrant has had sufficient time to generate these data for the application.

Second, the missing data represent information that EPA needs to make a safety finding. Without these required data, EPA has no way to make an educated estimate about how nanosilver will move through our bodies, what organs or systems it might target, and the health effects that might result from that. As such, EPA cannot say with any confidence that the use of nanosilver will not cause an unreasonable adverse effect on the environment.

Third, there is no measurable medical or health benefit to consumers from this untested use of nanosilver. Rather than be in the public interest, allowing the use of this pesticide puts the public in harm's way by increasing exposure to an inadequately tested chemical.

THE PROBLEM OF CR PESTICIDES IS BIGGER THAN NANOSILVER

Although the proportion of active registrations that are conditional is disturbing, it is not a new occurrence. This is a long-standing pattern with EPA's pesticide office. Based on our research through the registration database, of the 16,000 active products registrations:

- Almost 8,200 products have been conditionally registered (“CR status”) since 2005,
- Approximately 5,400 products have had CR status since 2000,
- Over 3,200 products have had CR status since 1995.
- Over 2,100 products have had CR status since 1990.
- Over 800 technical products (that is, pure active ingredient), currently have CR status.

NRDC RECOMMENDATIONS

- **Retailers and formulators** should request full life-cycle environment, health, and safety (EHS) impact assessments from suppliers;
- **Workplace** procedures should be set to prevent exposure to staff and patients, and to prevent environmental releases
- **Regulators** should evaluate the potential hazards of nanomaterials as distinct from normal scale materials.

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