FIOH Impact Sheet

Safety Research on Nanotechnology Needed

Engineered nanomaterials offer enormous potential in many areas of technology. The safety of engineered nanomaterials is the key to the success of the industry, because without customers' confidence, nanotechnology has no future. The operating culture of nanotechnology businesses must change in accordance with research findings: safety must be considered when new materials and technologies are designed.

A bright future for nanomaterials

Engineered nanomaterials can provide products with new revolutionary features at low cost. At the same time, less raw materials are required, the burden on the environment is reduced, and more jobs promote sustainable development.

Safe engineered nanomaterials have vast potential for use in, for instance, information technology, energy generation, medicine, the wood processing industry, and in the production of consumer goods.

A minute but powerful particle

Engineered nanoparticles are tiny, but they have a large surface area per unit of weight. They are also able to interact with the body's cells and molecules, such as proteins.

Laboratories have produced hundreds of thousands of different kinds of engineered nanoparticles, but only a fraction of them have commercial uses. Hardly anything is known about their hazards.

Uncertainty slows down adoption

The greatest suspicions associated with engineered nanoparticles and technologies concern their safety and health hazards. It is precisely this uncertainty that constitutes a barrier to their success in Europe.

Many unexplored particles

Most engineered nanomaterials are yet to be studied. Only a few have commercial value. The majority are most likely harmless, but some engineered nanomaterials have proven to be toxic, and have caused various health hazards in experimental studies.

It is not known how engineered nanomaterials affect people. The health hazards detected in experimental studies include pneumonia and fibrosis of the lungs, effects on the circulatory system and the brain, and genotoxicity. These studies have also shown that a certain type of engineered nanomaterial may potentially increase the risk of cancer.

More people exposed

The number of workers and consumers exposed to nanomaterials is rising rapidly: at present, a few million workers and hundreds of millions of consumers are exposed to engineered nanomaterials.

Health hazards must be determined

Some engineered nanomaterials cause health hazards if exposure is exceptionally high. Their properties and effects must be determined quickly, because the health and safety of consumers and workers is vital, both for the people themselves and for nanotechnology companies.

Finnish Institute of Occupational Health

Well-being through work
October 2012

It pays to study the health effects of nanomaterials

To date, little research on the health effects of engineered nanomaterials has been conducted in Finland. Most research and development is funded by the European Union.

Reliable assessment of the hazards and risks caused by engineered nanomaterials is still difficult because:

- It is hard to distinguish between engineered nanomaterials causing health hazards and harmless, ubiquitous background nanoparticles.
- There is not enough data on the exposure of workers or consumers.

Consumers and companies producing and using engineered nanomaterials are concerned about the safety and risk-free manufacture of products incorporating engineered nanomaterials**,** and about the magnitude of the potential risks associated with these materials. For this reason, research into the health effects of nanomaterials is a prerequisite for successful nanotechnology.

Finnish nanosafety research is first-rate

In the future, safe nanotechnologies can be Finland's trump card in global competition:

- Finnish nanotechnology jobs are safe.
- Consumers receive information on the safety of nanotechnologies and their positive impact on Finnish industry, and on the quality of consumer products.
- The authorities at both national and EU level receive help in administrative issues.
- Nanotechnology risks are regulated and managed efficiently.

Finnish safety and health research into engineered nanomaterials advances the safety and health perspective of all activities associated with engineered nanomaterials and technologies.

Nanotechnology and safety in numbers

- Engineered nanoparticles are small: For example, the diameter of an immunological phagocyte is about 20 µm (20,000 nm). If the diameter of a spherical nanoparticle is 20 nm, one phagocyte can hold about a billion such particles.
- Millions of workers worldwide will participate in the industrial production of nanoparticles and their applications by the year 2020.
- At present, nanotechnology directly employs 300,000 to 400,000 people in Europe.
- It is estimated that the market for products utilising nanotechnology will grow from 200 billion euros (2009) to above 2 trillion euros (2020).
- In Finland, the industry's turnover in 2011 was EUR 300-400 million euros.
- Worldwide, the private and public sectors provided a total of about 7 billion euros for nanotechnology research in 2007.
- Finland spent 130 million euros on nano-technology research in 2006–2010. In the same period, research into the health effects of nano-particles received about one million euros.

Contact details

Kai Savolainen, Research Professor and Director of Nanosafety Research Centre
Finnish Institute of Occupational Health,
Nanosafety Research Centre
tel.+358 30 474 2200, e-mail: kai.savolainen@ttl.fi
Topeliuksenkatu 41 a A, FI-00250 Helsinki

Nanosafety Research Centre of the Finnish Institute of Occupational Health

- The Institute of Occupational Health (FIOH) is Finland's leading research and expert body in the safety and risks of nanotechnology. It is natural that FIOH has the role of promoter and coordinator of national nanosafety operations.
- The Nanosafety Research Centre, a focal point for experts in nanosafety at the Finnish Institute of Occupational Health
  - produces information on the health effects of nanoparticles
  - promotes safe nanotechnology
  - contributes to well-being, occupational health and longer careers in both Finland and the whole of the European Union.
- http://www.ttl.fi/nanosafetycentre

Sources

High-Level Expert Group on Key Enabling Technologies: final report. European Community, June 2011.

Communication from the Commission to the European Parliament, the Council and the European Economic And Social Committee: Second Regulatory Review on Nanomaterials. Brussels, 3 October 2012. COM(2012) 572 final.

Nanotechnology Research in Finland 2011: Nano-technology Cluster Programme. Quickfire seminar - version 15.12.2011.

Savolainen K & Vainio H: Synteettisten nanohiukkasten ja nanoteknologian riskit. Lääketieteellinen Aikakauskirja Duodecim 127 (2011) 11: 1097–1104.

Well-being through work
October 2012