



Finnish Institute of
Occupational Health

NANOSH

**Inflammatory and genotoxic
effects of engineered
nanomaterials**

Nanotechnology – good and bad ?

Benefits

- Electronics, optics
- Nanomedicine
- Consumer products
- Alternative energy
- Soil/water remediation
- etc.

Risks

- Safety:
 - potential health effects
- Environmental contamination

Health effects of nanoparticles

- Still very little is known about the potential health risks of nanoparticles
- Not a uniform group of substances, many factors should be considered when evaluating possible toxicity:
 - size
 - shape
 - surface properties (area, charge, coating)
 - crystallinity
 - solubility
 - activity
 - etc.

Human exposure

- manufacture
 - processing
 - use, consumer products
 - disposal
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- respiratory tract – inhalation
 - skin – dermal
 - GI-tract – ingestion
 - injection – medical application

Nanotoxicology

- Supplies information for:
 - risk assessment
 - risk management
 - communication

6 FP: Specific targeted research or innovation project (STREP)

- **EU funding:** 2,4 m €
- **Duration:** 36 months
- **Start date:** 1st November 2006
- **End date:** 31.10.2009

Partners

- Co-ordinator Prof. Kai Savolainen, FIOH
- FIOH - Finnish Institute of Occupational Health, Helsinki, Finland
- LMU - Institute for Surgical Research, University of Munich, Germany
- CIOP - Central Institute for Labour Protection, National Research Institute, Warsaw, Poland
- TNO - Netherlands Organisation for Applied Scientific Research, Zeist, Netherlands
- HSL - Health and Safety Laboratory, Buxton, UK
- BGIA - BG Institute for Occupational Safety and Health, Sankt Augustin, Germany
- ULEIC - Cancer Biomarkers and Prevention Group, University of Leicester, UK

Project objectives

- **CHARACTERIZATION AND EXPOSURE**
 - Characterization of nanoparticles and definition of exposure levels in laboratory conditions and in workplaces

- **HEALTH EFFECTS**
 - Assessment of the genotoxic, inflammatory and microcirculatory effects of nanoparticles

WP1 Characterization of nanoparticles (FIOH, HSL)

- Chemical and microscopy analysis of bulk material
- Characterization of the test materials selected for toxicological tests (WPs 3-5):
 - Preparation of dispersions and aerosols
 - Analysis of air and tissue samples
- Analytical manual for nanomaterials (method descriptions, electron microscopy images and X-ray spectra)
- Improved guidelines and recommendations for users

WP2 Exposure to nanoparticles (HSL, CIOP, TNO, BGIA)

- Exposure monitoring strategy for nanomaterials:
 - sampling methodology and plan for the workplace measurements
- Nanomaterial exposure measurements in various workplace settings
- Nanomaterial exposure database
- Elaboration of respiratory protective equipments and ventilation control systems

WP3 Genotoxicity of nanoparticles (ULEIC, FIOH)

- Induction of DNA and chromosome damage by nanomaterials *in vitro*
- Induction of DNA and chromosome damage by nanomaterials *in vivo*
- Mechanisms of the possible genotoxicity
- Role of oxidative DNA damage

WP4 Pulmonary inflammation (FIOH, LMU)

- *In vivo* models for studying the inflammatory properties of nanomaterials
 - direct effects of nanomaterial exposure on airway inflammation in mice
 - effects of nanomaterial exposure on airway inflammation in mice with allergic asthma
- *In vitro* models for inflammatory studies
 - macrophages and human pulmonary epithelial cells
- Mechanisms underlying the possible respiratory effects

WP5 Microvascular effects (LMU, FIOH)

- *In vivo* mouse models for studying microvascular effects of nanoparticles
- Microvascular thrombus formation by nanomaterials
- Prothrombotic and proinflammatory changes in microvasculature *in vivo*
- Mechanisms of nanoparticle induced microvascular effects

Specific challenges and expected impact

- Useful methods to assess exposure to nanoparticles
- Useful methods to assess health effects of nanoparticles
- Better understanding of the characteristics, behaviour, and toxicity of nanoparticles
- To create a reliable and sound foundation for the safety assessment of new nanomaterials

European NanOSH Conference

3-5 December 2007, Helsinki, Finland

European NanOSH Conference -

Nanotechnologies:
A Critical Area in
Occupational Safety and
Health

3-5 December 2007
Marina Congress Center,
Helsinki, Finland

The Conference will discuss global safety issues surrounding nanoparticles and nanotechnologies, in occupational safety and health in particular; and will provide an insight into future actions for assuring the safety, and thereby the future success of nanotechnologies.



Why it is critical now?

Nanoparticles provide a qualitatively new basis for a number of industries. The technologies that utilize them, i.e. deal with matter on a nanometer scale, do so in a large number of industrial and consumer applications. These applications present huge potential for both technological and economic benefits. Nanotechnologies may also provide important means to save raw materials and to promote sustainable development. The growth rate of nanoparticle research, the rapidity of nanotechnology development, and the speed of new industrial and consumer products is dramatic. This area is currently critical, because we are surrounded by nanoparticles all the time, and must hence act without delay. We need to identify the next steps toward assuring the safe research of nanoparticles, and their safe use in occupational environments and consumer products as soon as possible. Safety is the key for future success of nanotechnologies worldwide.

Main themes of the Conference

- A global view of the significance and safety of nanotechnologies, particularly in occupational environments
- Toxicity of given nanoparticles, including carbon nanotubes, metal nanoparticles, quantum dots and photocatalytic nanoparticles, and the characterization and evaluation of the critical features of nanoparticles, the so-called 'metrics'
- Chemical and physical characterization of selected (above) nanoparticles, and how these characteristics affect exposure assessment and its interpretation

- Views on the safety of nanoparticles in different parts of the world.

Who should attend?

Scientists and experts interested in the safety and health effects of nanoparticles; in their characterization and exposure assessment; representatives of the nanotechnology industry; employers and employee organizations; regulators at national, regional and international levels; organizations funding nanotechnology research; and all other key-stakeholders in this area.

Organizer

The Conference is organized by the Finnish Institute of Occupational Health

More information

EuroNanOSH Secretariat
Leila Ahlström
Finnish Institute of Occupational Health
Topelluksenkatu 41 A a
FI-00250 Helsinki, Finland
Tel: +358 30 474 2851
Email: euronanosh@ttt.fi
www.tti.fi/euronanosh

