Eur. J. Oncol., vol. 13, n. 1, p. 61-64, 2008

Short conference report
Breve resoconto di convegno

Knowledge as defence: conclusions of the European NanOSH Conference Nanotechnologies: a critical area in occupational safety and health, Helsinki, Finland, December 2007

La conoscenza come difesa: le conclusioni del Convegno Europeo NanOSH Nanotecnologie: un'area critica nella sicurezza negli ambienti di lavoro e nella salute occupazionale, Helsinki, Finlandia, dicembre 2007

The European NanOSH Conference – Nanotechnologies: a Critical Area in Occupational Safety and Health Conference was held on 3-5 December 2007 in Helsinki, Finland. The EuroNanOSH Conference was the first European Conference with a main focus on occupational safety and health of nanotechnologies and engineered nanoparticles (ENP) in workplaces. The Conference discussed how the safety of nanotechnologies is currently handled in Europe and elsewhere, and how global and European experience could support each other. At the opening, European and global dimensions of nanotechnologies were emphasized by Mr Hurmalainen from the Ministry of Social Affairs and Health, by Dr Ivanov from the

Press conference

World Health Organization, Ms Gonzales from the Organization for Economic Co-operation and Development (OECD) as well as Mr Dancet from the recently established European Chemicals Agency. They all underlined the urgent need of more knowledge on ENP including exposure assessment, standards, the importance of novel approaches for safety evaluation of ENP and preventive measures. Dr Aquar-Fernandez presented the views of the European Commission on the topical need for safe utilization of nanotechnologies. She emphasized the importance of regulatory toxicology in support of regulatory decision making on ENP and nanotechnologies.

Dr Maynard from the Woodrow Wilson International Centre for Scholars emphasized the promotion of safe nanotechnologies. Nanotechnologies enable major improvements to the civil society in many areas of life both in developed and developing countries including novel materials, production of clean water and energy and major medicinal innovations. These technologies are associated with huge economic expectations and promises to the society, and therefore also the preparedness for unpleasant surprises becomes increasingly important for involved industries. He also noted the importance of public trust toward nanotechnologies. His conclusions were that there are a number of issues that strongly justify immediate and marked increases of funding of research on safety on ENP and nanotechnologies. In addition, there is also an imminent need to shape strategies for the guiding of nanosafety research and also for intensified international collaboration because otherwise the challenges ahead are too large to be faced by any given party (see also Maynard *et al*[1]).

Even though the production of ENP and the number of consumer products utilizing nanotechnologies increase rapidly both in Europe and globally, very little is known about the safety of these products. Moreover, there is no consensus about rules for characterizing ENP, and methods for testing their safety are missing. Rapid clarification of the future steps towards assuring the safety of ENP in

Professor Kai Savolainen commenting on a lecture

occupational environments and consumer products is essential. Safe nanotechnologies benefit both workers and industries all over the world[1-3]. Furthermore, exposure of workers to ENP increases rapidly and continuously, but OELs regulating these exposures are based on bulk products, the effects of which are not comparable with their chemically identical nano-sized counterparts[4, 5]. However, current occupational standards, e.g. OELs do not consider the size of particles or the characteristics of the differently-sized particles, the nature of which may fundamentally differ[1, 6, 7].

Results reported at the EuroNanOSH Conference provided further understanding, for example, of the effects and mechanisms of carbon nanotubes. Drs Shvedova and Castranova from the National Institute for Occupational Safety and Health (NIOSH) in USA reported that during repeated inhalational exposure of mice to single-wall carbon nanotubes (SWCNT), the formation of interstitial fibrosis rather than that of granulomas predominates. These findings clearly point to the direction that exposure to SWCNT carries the potential of production of morphological persistent pulmonary alterations. However, and perhaps slightly surprisingly, more recent observations[8] in a highly sensitive p53 heterozygous mouse model provide evidence that intraperitoneal injection of SWCNT produce mesotheliomas and lethality at a higher incidence than identical exposure to chrocidolite asbestos at comparable doses. This recent finding together with the earlier findings, also presented at the EuroNanOSH Conference, will most likely lead to markedly intensified research efforts to clarify the mechanisms whereby SWCNT and also MWCNT produce their inflammatory and other effects in biological organisms and whether these effects are unique to them, or can more generally characterize the possible effects of high-aspect ratio ENP. These findings also emphasize the urgent need to come up with novel approaches for testing the health effects of ENP utilizing a tiered approach yet to be developed and agreed on. In agreement with these remarks, Dr Silbergeld from Johns Hopkins University emphasized the importance of adapting novel technologies for testing the huge number of ENP continuously entering into the market. She also emphasized the need to quickly adapt for example high through-put technologies for the safety assessment of ENP.

Dr Schulte from NIOSH discussed ENP and nanotechnologies that carry a special significance in the occupational environment in relation to workers' health. Grouping of different ENP into different classes based on their characteristics will become more important, to allow more effective safety evaluation of different ENP as all of the ENP cannot be tested separately, but read across and comparable approaches may have to be used. He also stressed the importance of gathering more actual exposure data from different workplaces. Dr Schulte emphasized that our current understanding does not yet justify establishing medical surveillance programmes for workers occupationally exposed to ENP because so far no ENP-specific markers of disease have been identified. These observations are supported by some of the observations of other investigators[9]. Thus, currently the best available method to protect workers from potential health hazards of ENP is the prevention of exposure from occurring. This is an especially challenging task because easy-to-use online monitors are not yet available and because specific problems such as background distinction of the process-derived ENP from the background NP needs to be solved (Schulte *et al*, in preparation).

The Conference was arranged by the Finnish Institute of Occupational Health (FIOH) in collaboration with the Tekes – Finnish Funding Agency for Technology and Innovation, and the VTT Technical Research Centre of Finland. In addition, the Conference was supported by the National Institute for Occupational Safety and Prevention (ISPESL) in Italy and the NIOSH in USA. The Conference was attended by almost 200 participants from 29 countries. During the Conference 20 keynote lectures, 16 oral and 34 posters, free communications were given. In general terms one can conclude that the Conference served well the goals its organizers wanted to achieve. It provided an excellent platform for open scientific stakeholder discussion, updated our understanding of where we now are in terms of knowledge base on ENP, and provided guidance for future directions on nanotechnology safety and health research.

In his concluding remarks Dr Savolainen from FIOH considered that the aims set for the Conference had been well met. The presentations were of the highest quality and contained novel information.

He summarized the main conclusions of the congress as follows:

– knowledge is our first defence in protecting workers and consumers from the potential health hazards of ENP;
– there is an urgent need to jointly find out aspects and characteristics of nanoparticles that impact their safety;
– there is also an urgent need to identify key ENP targets at molecular, cellular and target organ levels, and to identify the behaviour of ENP in different media as well as in the organisms;
– potential risks of ENP need to be managed and controlled, but the issue at stake is how much is enough as there is not yet foundation to set regulatory limits to exposure to ENP – one needs to assess how much protection is enough when workers and consumers are concerned;
– there was also a consensus at the meeting that public trust is a prerequisite for successful nanotechnology, and that the achieving of this goal of open dialogue between scientists, regulators, the industry and the public at large is a necessity.

Kai Savolainen
New Technologies and Risks
Finnish Institute of Occupational Health
Helsinki, Finland
E-mail: Kai.Savolainen@ttl.fi

References

1. Maynard AD, Aitken RJ, Butz T, *et al*. Safe handling of nanotechnology. Nature 2006; 444 (16): 267-9.
2. Borm PJ, Robbins D, Haubold S, *et al*. The potential risk of nanomaterials: a review carried out for ECETOC. Part Fibre Toxicol 2006; 3: 11.
3. Schulte PA, Salamanca-Buentello F. Ethical and scientific issues of nanotechnology in the workplace. Environ Health Perspect 2007; 115: 5-12.
4. Shvedova AA, Kisin ER, Mercer R, *et al*. Unusual inflammatory and fibrogenic pulmonary responses to single-walled carbon nanotubes in mice. Am J Physiol Lung Cell Moll Physiol 2005; 289 (5): L698-708.
5. Pylkkänen L, Alenius H, Tuomi T, *et al*. The effect of nanoparticles on the expression of mRNA and proteins of chemokines and cytokine in inflammatory cells in the lungs. The Sixth Princess Chulabhorn International Science Congress, Bangkok, Thailand; Nov 25-29, 2007, 237-41.
6. Maynard AD, Aitken RJ. Assessing exposure to airborne nanomaterials: current abilities and future requirements. Nanotoxicology 2007; 1 (1): 26-41.
7. Schulte PA, Trout D, Zumwalde RD, *et al*. Options for occupational health surveillance of workers potentially exposed to engineered nanoparticles: state of the science. J Occup Environ Med, in press.
8. Takagi A, Hirose A, Nishimura T, *et al*. Induction of mesothelioma in p53+/- mouse by intraperitoneal application of multi-wall carbon nanotube. J Toxicol Sci 2008; 33 (1): 105-16.
9. Nasterlack M, Zober A, Oberlinner C. Considerations on occupational medical surveillance in employees handling nanoparticles. Int Arch Occup Health 2007; 81 (6): 721-6.