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WATCH COMMITTEE

New and Emerging Issues 2006

Occupational Health Aspects of Nanotechnologies

Issue

1. An update on HSE's perspective on the potential human health hazards and the potential for exposure, in an occupational context, with nanotechnologies - should any further work be done in the context of a "new and emerging issue"?

Background

2. At its meeting on 13-14 January 2005 WATCH considered a substantial package of information on occupational health aspects of nanotechnologies and the nanoparticles involved in such industries (WATCH/2005/2). Positions were discussed and agreed with WATCH on toxicological hazard, occupational exposure, risk assessment and appropriate risk management approaches. A copy of the cover paper of WATCH/2005/2 is attached here as Annex 1; and the relevant minutes of the January 2005 meeting are attached as Annex 2.

3. Since that time HSE specialists have tracked the appearance of new research findings in these fields and have monitored the impact of further data and thinking on the positions established at WATCH. The "new and emerging issues" session of the November 2006 meeting of WATCH, expanded by additional invitees into the chemicals/health COPI, is an appropriate time to reconsider the position and future plans for activity on this topic.

Argument

Toxicological hazard

4. The draft conclusions on toxicological hazard presented to WATCH in January 2005 are at paragraphs 9-12 in Annex 1; and sections 3.4-3.17 of the minutes attached here at Annex 2 reflects the views of WATCH in relation to the draft conclusions and associated documentation presented at that time.

5. Since then, the perspective of HSE's regulatory toxicologists is that the new data that have appeared in the literature leads to four key points:

- i. A lot of recent studies, conducted mostly *in vitro*, have pursued the potential mechanism(s) involved in nanoparticle toxicity and the possibilities for screening and predictive tests. The results obtained have shown considerable variability between different laboratories, such that as yet no clear general conclusions can be drawn or utilised.

- ii. Skin absorption: new studies, performed mostly on nano-sized titanium dioxide, have supported the view that there is little or no absorption across the skin of such particles.
- iii. Early claims that first appeared at about the time of the 2005 review, for direct axonal transport of inhaled nanoparticles from the nasal epithelium to the central nervous system, are now disputed; certainly the evidence is not yet convincing.
- iv. Although many new studies have appeared in the literature since the beginning of 2005, HSE considers that the overall position on nanoparticle toxicity agreed with WATCH in January 2005 remains valid.

Occupational exposure and control

6. The draft conclusions on the occupational exposure and control issues presented to WATCH in January 2005 are at paragraphs 13-16 in Annex 1; and sections 3.18-3.25 of the minutes attached here at Annex 2 reflects the views of WATCH in relation to the draft conclusions and associated documentation presented at that time.
7. HSL has completed a project “An investigation into the relationship between mass, number and surface area, and the influence of particle composition and morphology, for instruments measuring laboratory simulated workplace aerosols containing ultrafine and nanoparticles”. The report from the project will be available shortly on the HSE website. The purpose of this project was to determine what relationships exist between the mass, number and active surface area for current instrumentation and to determine how these relationships are affected by particle characteristics such as composition and morphology.
8. In brief, no simple relationship was found for predicting active surface area and mass from the results of measurements made with the benchmark instrument, the SMPS. In view of this finding, there is still a need for instruments to measure each parameter (mass, number and surface area) separately, despite the difficulties associated of arranging this in the workplace. It is unwise to make measurements in terms of just one parameter when assessing the potential exposure to engineered nanoparticles.
9. HSE has contributed to the Government Review of Progress on Nanotechnologies, which has been compiled for the Council for Science and Technology’s review of Government progress in taking forward the actions it set out in the Government’s Response to the Royal Society/Royal Academy of Engineering report “Nanoscience and nanotechnologies: opportunities and uncertainties”. This contribution is attached as Annex 3.

Action

10. WATCH/COPI is asked to consider this paper, and to incorporate and rank appropriately “nanotechnology” alongside all other “new and emerging issues”.

Contact

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References / Attachments

- Annex 1 WATCH/2005/2 Occupational health aspects of nanotechnologies
- Annex 2 Relevant extract of minutes of WATCH meeting January 2005
- Annex 3 HSE’s review of progress on Nanotechnologies