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Public Meeting on “Research Needs Related to the Environmental, Health, and Safety Aspects of Engineered Nanoscale Materials”

Sponsored by the National Nanotechnology
Coordination Office on behalf of the Nanoscale
Science, Engineering, and Technology (NSET)
Subcommittee of the Committee on Technology,
National Science and Technology Council (NSTC)

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FDIC Auditorium, Arlington, Virginia

Thank you Dr. Alderson.

Good Afternoon. I would like to thank the distinguished panel, as well as the National Nanotechnology Coordination Office (NNCO), for holding this public meeting on “Research Needs Related to the Environmental, Health, and Safety Aspects of Engineered Nanoscale Materials” on behalf of the Nanoscale Science, Engineering and Technology (NSET) Subcommittee of the Committee on Technology, National Science and Technology Council (NSTC). I appreciate the opportunity to provide comment here today on these issues generally and on the NNI September 2006 report *Environmental, Health, and Safety Research Needs for Engineered Nanoscale Materials* specifically. In addition to my prepared statement, CTA will also be providing detailed written comments by the January 31, 2007 deadline.

My name is George Kimbrell and I’m a staff attorney with the International Center for Technology Assessment (CTA), where I work on legal, policy, and regulatory issues related to nanotechnology. CTA is a non-profit, bi-partisan organization committed to providing the public with full assessments and analyses of technological impacts on society. To that end, CTA explores the economic, ethical, social, environmental, and political impacts that can result from the applications of technology or technological systems like nanotechnologies. You may have heard of our legal petition filed with FDA this past May on the risks of nanomaterials in consumer products, the first legal action on the human health and environmental risks of nanotechnology.

First, CTA applauds the effort that went into this report and into these EHS research issues generally. Unfortunately, the report is lacking in several serious respects. First and foremost, an express primary purpose of the report was to identify specific EHS research needs related to understanding and managing the potential risks of nanomaterials and thereby informing and guiding research programs. Yet the document fails *to actually prioritize* these EHS research needs¹ or to make any sort of cohesive research plan or strategy. Rather, the document reads more like a partial scientific review of known and unknown risks of nanomaterials and a laundry list of needed information and research. At times the report points out gaps that seem to cry out to be made urgent research priorities. For example, it notes that there is currently no federal program surveillance of nanomaterial releases into the environment,² yet this is not made a research priority. Similarly, the report notes that there are no studies on the effectiveness of personal protective equipment for manufacturing workers;³ yet again this is not a research priority. The NNI report notes that research on nanomaterials properties’ effects on skin penetration has “just begun,”⁴ yet many skin-applied personal care products containing these nanomaterials are already on market en masse. Still, this is not a research priority. Finally, the report notes that the lifecycle impacts of

¹NNI, *Environmental, Health, and Safety Research Needs for Engineered Nanoscale Materials*, p.8.

²*Id.* at 40.

³*Id.* at 47.

⁴*Id.* at 26.

nanomaterials are “generally unknown,”⁵ yet again, not a priority. There are many more examples throughout the report.

Instead there are a copious amount of “might be’s,” and “possible research approaches” throughout the report. And there are no final conclusions or recommendations.

This approach is wholly inadequate as a risk research framework. Risk research prioritization and a corresponding risk research plan or framework is a basic and necessary step in order to protect human health and the environment.

While prioritization and a strategic research plan are promised in the future, that this document continues to lack these foundational necessities betrays--as the House Science committee chairman said at the September 26, 2006 Congressional hearing--a lack of the “sense of urgency [that] is required.”⁶ CTA urges the panel to remedy that overarching failing as soon as possible.

Now, to touch on a few specifics. CTA recommends three major areas of EHS research high priority: nanomaterial manufacturing worker and workplace health and safety; public health and safety with regard to nanomaterial consumer products; and the environmental impacts from nanomaterials.

Worker and workplace health and safety risks

First, with regard to worker and workplace health and safety risks: Exposures are occurring and protection is required. More than 2 million people work in the development, production or use of nanomaterials. Studies clearly document hazard potential and the need for immediate protective action. Current federal approaches do not manage risks arising from thousands of new materials developed each year. A new paradigm is essential for worker and public health protection. Public and worker exposures should not be allowed unless safety has been demonstrated by producers.

Public health risks can be managed and research can occur in tandem, if a protective approach is taken. Research into public & worker exposures is necessary for protective actions and prudent resource allocation. Protective measures combined with research into their efficacy serves multiple needs. Primary preventive methods such as avoiding hazardous feedstock, processes & the generation of hazardous materials, and secondary preventive methods, such as keeping hazards away from people & the environment, should be priorities.

Research should focus on the efficacy of protective strategies, best practices and policies, and identification of ongoing exposures, emphasizing the idea of research in tandem with protective actions. Rather than laboratory tests to study various options, if we have workers already exposed to likely hazards, it makes more sense to provide the best available protective equipment and

⁵*Id.* at 53.

⁶Weiss, *Nanotechnology Risks Unknown; Insufficient Attention Paid to Potential Dangers, Report Says*, Wash. Post, A12, September 26, 2006.

workplace designs to mitigate exposures and study how well they are working. Research can be guided, to some extent, by what we learn about the efficacy of current best options.

While agencies conduct meetings and plan research, sufficient knowledge exists to justify protective action. Research can be used as an excuse for inaction. Instead, research should be used now to identify and support development of healthy practices and identify the most protective & efficient policy options. Substantial research should focus on protective strategies that can be implemented in 2007 to insure the health of workers and the public.

Nanomaterial Consumer Products

Next I will briefly discuss nanomaterial consumer products. Worker health and safety is connected to public health and safety. Nanomaterial commercialization continues at lightening speed: according to Lux Research's 2006 Nanotechnology Report: more than \$32 billion in nano-products were sold in 2005, 2X the total of 2004. Wilson Center's Project on Emerging Nanotechnologies Consumer Product Database lists more than 300 self-identified nano-products now on U.S. market shelves.

Nowhere are nanomaterials reaching the public faster than in personal care products. They are the Wilson Center Product Database's largest single category (125 products). A May 2006 Friends of the Earth Report found 116 cosmetics, sunscreens, and personal care products containing nanomaterials commercially available. These nanomaterials are "free", not fixed in product matrix, used daily and directly on the skin, and may be inhaled and are often ingested. Because of this broad and intrusive exposure, these nanomaterials should be a very high research priority, in conjunction with regulatory and oversight action from responsible agencies. Here I am alluding to the relief requested in our legal petition, filed with FDA this past May. More specifically with regard to research priorities, dermal exposures and skin penetration of these nanomaterials used in personal care products should be at the top of the list.

Environmental Impacts

Third, environmental impacts must be a EHS research priority. Nanomaterials represent a new class of manufactured non-biodegradable pollutants, with pathways during manufacturing, transport, use, and disposal, as well as planned intentional release of some nanomaterials. One common and now occurring release is consumer products such as nano-cosmetics or other nano-personal care products that are washed off in the shower and join water waste streams, or washed off directly into rivers or lakes.

Existing studies indicate potential serious environmental impacts and point to urgent need for further study. Potential environmental hazards and research priorities include:

- *Mobility: The ability to persist; reach places larger particles cannot; move with great speed through aquifers and soils; settle slower than larger particles.
- *Transportation: Nanomaterials have a large and active surface for absorbing smaller contaminants. Due to the bonding and mobility, fertilizers or pesticides could "hitch a ride" over long distances.
- *Reactivity: Interactions with substances present in the soil could lead to new and possibly toxic

compounds.

And *Durability and Bioaccumulation

Finally, nanomaterial environmental releases create unique management challenges: New protocols and cost-effective technologies for detecting, measuring, monitoring, controlling and/or removing nanomaterials are required and must be an immediate research priority.

Unfortunately, the NNI report devotes only four pages⁷ to these important issues, without setting any research priorities.

A case study of the urgent necessity of such research and action can be seen with silver nanoparticles, which are being used in numerous products for their anti-microbial properties, yet these same enhanced properties are harmful to microorganisms and ecosystems. Due to concerns over the environmental impacts of silver nanoparticles, in February 2006 several public utilities and their national umbrella organization (NACWA) requested EPA regulate certain of these “silver ion” consumer products as pesticides under FIFRA. EPA has now said it will act with regard to at least one such product, a washing machine, although it has taken no action as of yet. Moreover a universe of products containing (or purporting to contain) silver nanoparticles exist and are widely available, including food storage, refrigerator lining, shoe lining, air filters and fresheners, drywall, paint, medical coatings, and wide range of other products.

Finally, with regard to the release of nanomaterials into the environment, the UK Royal Society and Royal Academy of Engineering seminal 2004 Report, upon which the NNI counts as a reference in its report, concluded that

“Until more is known about their environmental impact, we are keen that the release of nanoparticles and nanotubes in the environment be avoided as far as possible. Specifically we recommend as a precautionary measure that factories and research laboratories treat manufactured nanoparticles and nanotubes as hazardous, and seek to reduce or remove them from waste streams.”⁸

Conclusions

In closing, CTA points to the recent article in *Nature* by Dr. Maynard and 13 others explaining the nano-safety “grand challenges” that must be tackled in the near future, including: develop air and water detection/tracking; develop methods to evaluate nano-toxicity; and develop systems for evaluating and models for predicting health and environmental impacts over

⁷NNI, *Environmental, Health, and Safety Research Needs for Engineered Nanoscale Materials*, at 29-33.

⁸See The Royal Society and the Royal Academy of Engineering, *Nanoscience and nanotechnologies: Opportunities and uncertainties*, London, July 2004, p. 31, available at <http://www.nanotec.org.uk/finalReport.htm>.

product lifecycle.⁹ CTA urges the committee to consider adopting research priorities and a research plan rooted in this solid underpinning.

Finally, the FY07 NNI Budget: only \$44 million of the NNI's \$1 billion is slated to go towards EHS research, a paucity that hampers the ability of the federal agencies to carry out a preventive and thorough research strategy, assuming the NNI develops such a framework. CTA as well as parties from all sectors have called for this number to be substantially increased, to at least \$100 million annually. Relevant members of the committee should push for that to occur as soon as possible.

Thank you once again for the opportunity to comment here today. More information, including this statement, is available on our website, at www.icta.org

⁹Maynard *et al.*, *Safe Handling of Nanotechnology*, 444 NATURE 267-269, (November 16, 2006).