Communicating Risk Management Strategies to Practitioners

Presented by
Bruce C. Stockmeier, CIH
Center for Nanoscale Materials
Argonne National Laboratory at
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- Argonne National Laboratory or its management
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- The U. S. Department of Energy
- The speaker's wife

Background

- Previous employment
- Currently ES&H Manager for a Department of Energy Nanoscale Science Research Center at Argonne National Laboratory

Practitioner of What?

- I am trying to represent practitioners and their needs
  - Not researchers' needs
  - Not regulators' needs
- In particular, the needs of the typical industrial (occupational) hygienist
- I am also trying to represent the workers and their right to a workplace reasonably free of hazards

What Risks?

- Work-related illness

- Costs and other negative implications associated with non-compliance with related regulations and sometimes compliance with regulations

Conceptual Foundations of Industrial Hygiene

For most practitioners, two concepts form the foundation for their work

1. *Exposures* to agents can be measured, i.e., expected dose can be estimated

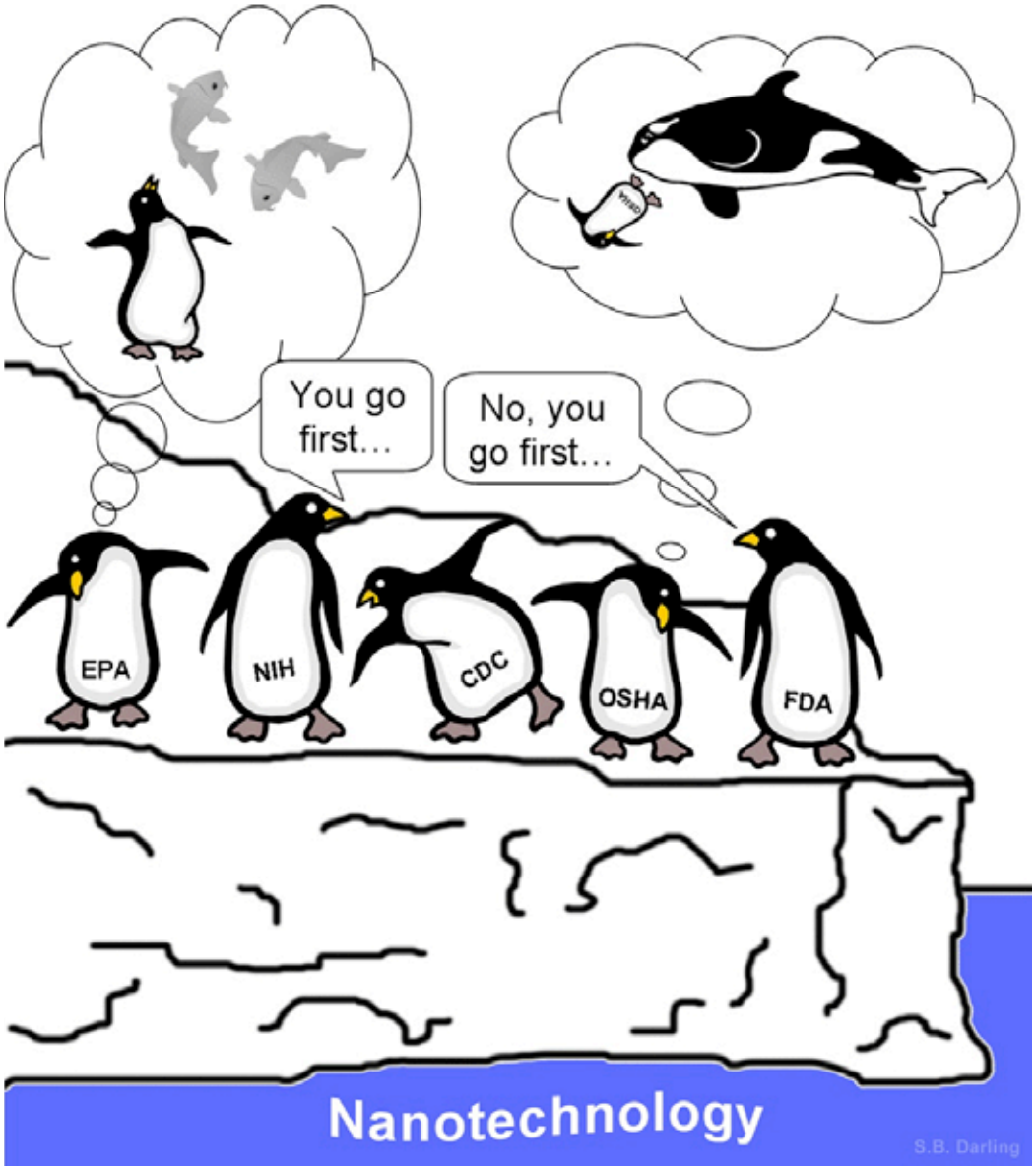
2. For each agent, there is a threshold level of exposure below which workers may be exposed without suffering ill health effects

I just have two questions

- How should I sample for nanomaterials?
- What is the permissible exposure limit?

- Substitutions:
  - nanoparticles for nanomaterials
  - TLV or safe level of exposure for permissible exposure limit

Oh…, well then, I have one more question, where are the regulations?



Effective Risk Management for the Practitioner - 1

Practitioners should not be lulled into thinking that they understand nanotechnology simply because they know some terminology

- Practitioners should be less concerned about nanoparticles than about nanoscale effects.
- Some of the terminology that's now being used might be insufficient or even misleading.

Effective Risk Management for the Practitioner - 2

Practitioners should understand that:

- The problem solving approaches they have relied on in the past might be insufficient.
- The questions they are accustomed to asking:
  - Might be a distraction,
  - Might not be appropriate, might lead to bad decisions

Living with Uncertainty

The message is that there are known "knowns." There are things we know that we know. There are known unknowns. That is to say there are things that we now know we don't know. But there are also unknown unknowns. There are things we don't know we don't know. So when we do the best we can and we pull all this information together, and we then say well that's basically what we see as the situation, that is really only the known knowns and the known unknowns. And each year, we discover a few more of those unknown unknowns.

Donald Rumsfeld - Press Conference at NATO Headquarters, Brussels, Belgium, June 6, 2002

Effective Risk Management for the Practitioner - 3

- Practitioners should apply and be prepared to defend the application of a “precautionary principle” or precautionary approach.
  - They must accept and defend the precept that cautionary actions are appropriate even in the absence of conclusive empirical evidence of a problem or potential problem.
  - It would help matters if there was just one clearly worded precautionary principle.
- Practitioners should not be lulled into a false sense of security because of the successful application of a “precautionary principle.” The dangers still might be real.

Effective Risk Management for the Practitioner - 4

Practitioners who have not already done so must broaden their perception of their job and profession.

- Ethical, legal and societal implications (ELSI)
- Stewardship
- Sustainability
- Bad journalism, bad fiction

Effective Risk Management for the Practitioner - 5

Practitioners should ask themselves:

- How did we get to this point?
- Has this happened before?
- Might it happen again?
- Who should we be talking to now to avoid having to deal with a situation like this again in the future?

Research Needs - 1

- Some research needs relate to the two fundamental concepts, i.e.:
  - Finding meaningful ways of estimating exposure
  - Understanding what level of exposure appears to be safe for the majority of exposed workers
- Other research need relates to:
  - Validation of the effectiveness of hazard controls
  - Developing new more effective and less costly controls
- An emerging concern relates how enhance attempts to confirm the effectiveness of hazard control schemes....

  without intentionally using workers as test animals

Research Needs - 2

- The practitioner doesn't need more data as much as information (knowledge)
  - Conclusions
  - Recommendations
- The practitioner doesn't need more journal articles as much as easier access to articles of interest that have already been written

Research Needs - 3

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COMMENTARY

Safe handling of nanotechnology

The pursuit of responsible nanotechnologies can be tackled through a series of grand challenges, argue **Andrew D. Maynard** and his co-authors.

When the physicist and Nobel laureate Richard Feynman challenged the science community to think small in his 1959 lecture "There's Plenty of Room at the Bottom", he planted the seeds of a new era in science and technology. Nanotechnology, which is about controlling matter at nanometre scales to produce unique or enhanced materials, products and devices, is now maturing rapidly with more than 300 claimed nanotechnology products already on the market[1]. Yet concerns have been raised that the very properties of nanostructured materials that make them so attractive could potentially lead to unforeseen health or environmental hazards[2].

The spectre of possible harm — whether real or imagined — is threatening to slow the development of nanotechnology unless sound, independent and authoritative information is developed on what the risks are, and how to avoid them[3]. In what may be unprecedented pre-emptive action in the face of a new technology, governments, industries and research organizations around the world are beginning to address how the benefits of emerging nanotechnologies can be realized while minimizing potential risks[4]. Yet despite a clear commitment to support risk-focused research, opportunities to establish collaborative, integrated and targeted research programmes are being missed[5]. In September, Sherwood Boehlert, chair of the US House Science Committee, commented in a hearing that "we're on the right path to dealing with the problem, but we're stuttering down it when a sense of urgency is required". And in October, Britain's Royal Society raised concerns that the UK government had not made enough progress on reducing the uncertainties surrounding the health and environmental impacts of nanomaterials[6].

Potential health risks from exposure to engineered nanomaterials must be understood and minimized.

"Understanding and preventing risk often has a low priority in the competitive world of research funding."

The risks

As research leaders in our respective fields, we recognize that systematic risk research is needed if emerging nano-industries are to thrive. We cannot set the international research agenda on our own, but we can inspire the scientific community — including government, industry, academia and other stakeholders — to move in the right direction. So we propose five grand challenges to stimulate research that is imaginative, innovative and above all relevant to the safety of nanotechnology.

Fears over the possible dangers of some nanotechnologies may be exaggerated, but they are not necessarily unfounded. Recent studies examining the toxicity of engineered nanomaterials in cell cultures and animals have shown that size, surface area, surface chemistry, solubility and possibly shape all play a role in determining the potential for engineered nanomaterials to cause harm[7]. This is not surprising: we have known for many years that inhaled dusts cause disease, and that their harmfulness depends on both what they are made of and their physical nature. For instance, small particles of inhaled quartz lead to lung damage and the potential development of progressive lung disease, yet the same particles with a thin coating of clay are less harmful[8]. Asbestos presents a far more dramatic example: thin, long fibres of the material can lead to lung disease if inhaled, but grind the fibres down to shorter particles with the same chemical make-up and the harmfulness is significantly reduced[9].

It is generally accepted that, in principle, some nanomaterials may have the potential to cause harm to people and the environment. But the way science is done is often ill-equipped to address novel risks associated with emerging technologies. Research into understanding and preventing risk often has a low priority in the competitive worlds of intellectual property, research funding and technology development. And yet there is much at stake in how potential nano-specific risks are understood and managed. Without strategic and targeted risk research, people producing and using nanomaterials could develop unanticipated illness arising from their exposure; public confidence in nanotechnologies could be reduced through real or perceived dangers; and fears of litigation may make nanotechnologies less attractive to investors and the insurance industry.

The science community needs to act now if strategic research is to support sustainable nanotechnologies, in which risks are minimized and benefits maximized. Our five grand challenges are chosen to stimulate such research, as well as bring focus to a range of complex multidisciplinary issues. The challenges span the next 15 years, and their successful achievement will depend on coordination, collaboration, resources and ingenuity. They are not comprehensive — there is essential research that is not covered here — but they do form a framework on which others can build.

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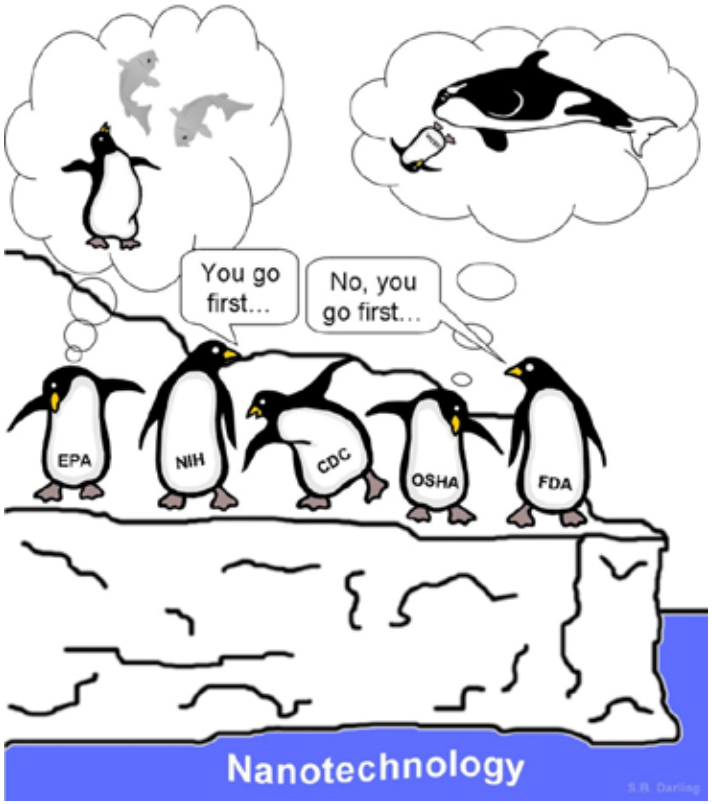
"We highlight three areas that we believe are critical to the success of such risk research: collaboration, communication and coordination."

Nature, Vol. 444, p267 – 269, 16 November 2006, Maynard, Andrew et al.

Does anyone else feel like things are heating up?



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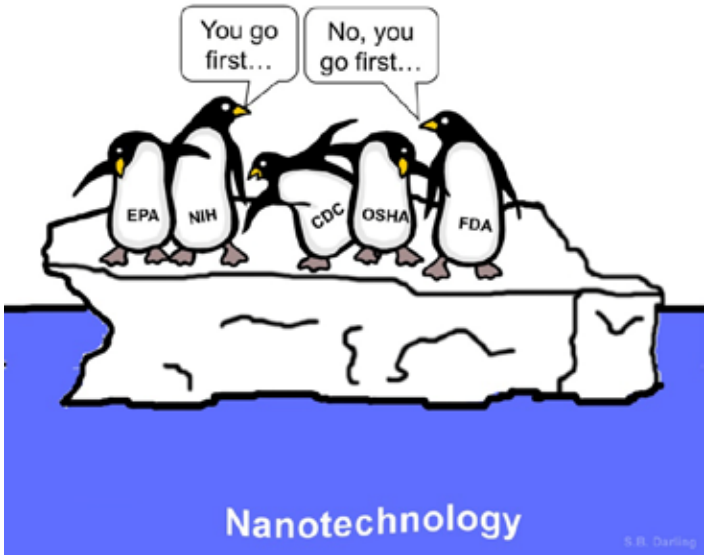

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Closing

- Today we are dealing with questions that many practitioners would say should have been answered years ago.
- Tomorrow's technologies are on the horizon today.
  - What concerns should we anticipate?
  - Are we preparing?

Acknowlegement

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