Scientists set 'Five Grand Challenges' for nanotechnology risk research

Society is in danger of squandering the powerful potential of nanotechnology due to a lack of clear information about its risks, conclude 14 top international scientists in a major paper published in the November 16th issue of the journal *Nature*. The paper, "Safe Handling of Nanotechnology," identifies Five Grand Challenges for research on nanotechnology risk that must be met if the technology is to reach its full promise.

The paper's lead author is Project on Emerging Nanotechnologies Chief Science Advisor Andrew Maynard. The co-authors are among the world's foremost nanotechnology risk and applications researchers from universities, government, and industry in the United States and Europe.

"The spectre of possible harm--whether real or imagined--threatens to slow the development of nanotechnology unless sound, independent and authoritative information is developed on what the risks are, and how to avoid them," Maynard and his co-authors write.

"We are running out of time to 'get it right.' Last year, more than $32 billion in products containing nano-materials were sold globally. By 2014, Lux Research estimates that $2.6 trillion in manufactured goods will incorporate nanotechnology," asserts Maynard. "If the public loses confidence in the commitment--of governments, business, and the science community--to conduct sound and systematic research into possible risks, then the enormous potential of nanotechnology will be squandered. We cannot let that happen."

"Fears over the possible dangers of some nanotechnologies may be exaggerated, but they are not necessarily unfounded," say the authors. "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 nanomaterials to cause harm."

The paper outlines Five Grand Challenges to "stimulate research that is imaginative, innovative, timely and above all relevant to the safety of nanotechnology." They include the development of:

1. instruments to assess environmental exposure to nanomaterials,
2. methods to evaluate the toxicity of nanomaterials,
3. models for predicting the potential impact of new, engineered nanomaterials,
4. ways of evaluating the impact of nanomaterials across their life cycle, and
5. strategic programs to enable risk-focused research.

Within the Five Grand Challenges, the authors set specific targets to achieve within specific timeframes. These include developing a "universal aerosol sampler" for measuring exposure to airborne nanomaterials, assessing whether fiber-shaped nanoparticles present a unique health hazard, and establishing ways of engineering nanomaterials that are "safe-by-design."

"It is generally accepted that, in principle, some nanomaterials may have the potential to cause harm to people and the environment," according to the authors. "Yet research into understanding, managing, and preventing risk often has a low priority in the competitive worlds of intellectual property, research funding and technology development."

"Ultimately, this is not just a question about nanotechnology," says Maynard. "It is about whether governments, industry and scientists around the world are willing to make safe nanotechnology a priority. Are they willing devote the resources necessary to develop a comprehensive research strategy, and to work

together with some urgency to implement and enable the technology to be safely applied?"

Maynard and his co-authors conclude that "if the global research community can take advantage [of the research opportunities before us] and rise to the challenges we have set, then we can surely look forward to the advent of safe nanotechnologies."

Source: Project on Emerging Nanotechnologies