

nanoRISK

OPTIMIZING THE BENEFITS OF NANOTECHNOLOGY
WHILE MINIMIZING AND CONTROLLING THE RISKS

Insider Report

Scientists argue that the costs and efforts associated with assessing the risks of nanomaterials require research into how more timely yet informed decision making can be achieved.

REDEFINING THE RISK RESEARCH PRIORITIES FOR NANOMATERIALS

In a [nanotechnology risk assessment study](#) published last year, researchers concluded that the costs associated with nanomaterial risk assessment in the United States alone could range anywhere from \$249 million to \$1.18 billion and might take decades to complete at current levels of investment in nano-hazard testing. While research in quantitative risk characterization of nanomaterials is crucially important, and no one advocates abandoning this approach, scientists and policy makers must face the reality that many of these knowledge gaps cannot be expected to be closed for many years to come – and decision making will need to continue under conditions of uncertainty. At the same time, current chemical-based research efforts are mainly directed at establishing toxicological and ecotoxicological and exposure data for nanomaterials, with comparatively little research undertaken on the tools or approaches that may facilitate near-term decisions.

A group of scientists suggests that this situation requires a significant research program in a fundamental area of timely, yet informed decision making regarding the potential risks of nanomaterials. In a perspectives article in *Journal of Nanoparticle Research* ("[Redefining risk research priorities for nanomaterials](#)") they highlight some of these issues as well as outline some of the currently available tools and approaches for decision making regarding the potential risks of nanomaterials.

Areas of Further Research Proposed

"We are proposing some areas for further research efforts to redress this imbalance, such as the development of more adaptive risk governance frameworks, alternative/complementary tools to risk assessment, and health and environment surveillance," [Khara Deanna Grieger](#), a PhD

student in DTU's Department of Environmental Engineering, says. "Ultimately, we hope to highlight some of the available tools and frameworks for decision making which are alternative or complementary to traditional risk assessment procedures for nanomaterials, as well as suggest some critical research areas in this field."

In their article, Grieger, Anders Baun, who heads DTU's Department of Environmental Engineering, and Richard Owens from the Policy Studies Institute in the UK, argue that there has not yet been a significant amount of attention dedicated to the field of timely and informed decision making for near term decisions. "We see this as the central issue for the responsible emergence of nanotechnologies" says Grieger.

The Emergence of a Consensus

After reviewing the available data for risk assessment of nanomaterials, the authors conclude that a consensus is beginning to emerge: "Risk assessment frameworks for chemicals should be appropriate for nanomaterials, but they most likely need some methodological modifications. Exactly what modifications are needed is not consistently made clear, and how long it will take to make these modifications is also not often stated."

The analysis by Grieger and her collaborators shows that despite the recognized serious challenges that nanomaterials present for fulfilling traditional chemical-based risk assessment frameworks and the time this will likely take, the large majority of decision support research is directed to fit ultimately within this framework.

Grieger points out that, given this situation, decision

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New research concludes that it is highly relevant who provides the information. Target-oriented communication should take this into account.

COMMUNICATING NANOTECHNOLOGY

The benefits of new technologies, whether they are novel medical treatments, innovative ways of generating energy, or new approaches to improve farm yields, almost always come with some new risks as well. In the emerging stages of a new technology – as is the case with nanotechnologies today – the public usually is either unaware or uninformed. This leaves a lot of room for extreme opinion makers to either hype or vilify all or aspects of the new technology. As risk perception and acceptance of a technology go hand in hand, risk communication is a key instrument in informing a largely unaware public.

Not surprisingly, experts and the public generally differ in their perceptions of technology risk. While this might be due to social and demographic factors, it is generally assumed by scientists who conduct risk research that experts' risk assessments are based more strongly on actual or perceived knowledge about a technology than lay people's risk assessments.

Nevertheless, whether the risks are real or not, the public perception of an emerging technology will have a major influence on the acceptance of this technology and its commercial success. If the public perception turns negative, potentially beneficial technologies will be severely constrained as is the case for instance with gene technology. It is not surprising that a new study found that, in general, nanoscientists are more optimistic than the public about the potential benefits of nanotechnology. What is surprising though, is that, for some issues related to the environmental and long-term health impacts of nanotechnology, nanoscientists seem to be significantly more concerned than the public (see: "[Some nanotechnology risks worry scientists more than the public](#)").

Arguing that risk communication on nanotechnologies requires target-specific approaches, a group of researchers in Germany advocate the development of communication strategies that help people to comprehend nanotechnology, to differentiate between the fields of application and to gain an understanding of the cause and effect chains.

"This approach prevents people from feeling powerless and being at the mercy of a technology which they can neither control nor understand," Johannes Simons, a researcher at the [Institute for Food and Resource Economics](#) at the University Bonn, says. "Providing information is not enough. Information must be offered in such a way that it helps interested people to be informed about nanotechnology in spite of their limited knowledge about engineering and natural sciences."

Writing in a paper published in the *Journal of Nanoparticle Research* ("[The slings and arrows of communication on nanotechnology](#)"), Simons and his co-authors recommend a broad approach. "Even if people gain more insight into the concept of nanotechnology and its different fields, the problem of information overload and ambiguous information remains. Therefore, it is important to involve trusted institutions in the risk communication process. This could help people to accept the information because they do not suspect the communicator of having some hidden

interests or of deceiving them with misleading information."

Based on studies that were done in Germany, and comparing them with findings of other surveys conducted in the United States and Australia, the team addresses the general problems of risk communication on nanotechnology.

In addition to a literature analysis, the authors draw on a qualitative study and a standardized questionnaire used in Germany in a project of the Federal Institute for Risk Assessment ("[Public Perceptions about Nanotechnology](#)"; pdf download).

Simons points out that the results of various surveys back the hypothesis that nanotechnology is a technology which is indeed widely accepted but not when it is linked to food, and that the attitude to nanotechnology is driven by determinants other than knowledge.

"Given the lack of knowledge and the growing distribution of products based on nanotechnology, public attitudes may suddenly change when news of risks is disseminated" he says. "Nanotechnology may no longer be perceived as a friendly technology but as an all embracing threat."

As mentioned above with regard to food, the overall positive perception of nanotechnology does not hold for all areas of application. Even though there is hardly any concrete knowledge about risks, there are different degrees of rejection depending on the application area. The questionnaire used by the German Federal Institute for Risk Assessment addressed the acceptance of nanotechnology in different consumer products and the willingness to buy them. According to the report, the results provide evidence that people use typical schemata to evaluate products and to decide whether to buy them or not: "Acceptance depends primarily on the areas of application. Differences exist in relation to the distance between the nano products and the human body. The closer the nano products come to the body, the lower the level of acceptance. If products based on nanotechnology enter the body, then acceptance falls markedly." Interestingly though, in a medical context, it is accepted that nanotechnology acts within the body and there is perceived as a positive.

Simons and his colleagues note that in an environment of information overload and gaps in knowledge about nanotechnology, people are faced with the challenge of assessing whether the risks are serious and real. "People know from other fields of discussion that information on the relevance of risks differs considerably between different stakeholders and that even science does not speak with one voice. If people wish to decide whether to take part in the public debate or vary their purchasing behavior, then they face the problem of dealing with imperfect, contradictory information. Therefore, trust in the institution providing the information plays a key role in the perceived credibility of that information." A key message here is that for consumers and citizens, it is highly relevant who provides the information. Target-oriented communication should take this into account.

A GLOBAL DATABASE ON GOVERNMENT DOCUMENTS ON NANOTECHNOLOGY

The [Nanotech Regulatory Document Archive](#) is a free resource built and maintained by the Center for the Study of Law, Science, & Technology at the Sandra Day O'Connor College of Law. Over the past year, Gary Marchant, the center's executive director, and center Faculty Fellows Douglas Sylvester and Kenneth Abbott, developed the database as part of a multiyear grant from the U.S. Department of Energy's Genomic Science Program.

The project is a natural fit for the center, which is housed in the first U.S. law school to offer a regular course in nanotechnology, has several faculty members who actively publish in the area and has amassed a cluster of law student researchers in the emerging technology, Marchant said.

The archive will enable government regulators, industry officials, public-interest groups, educators, students and the public to search for a variety of documents from every country in the world, and from every level of government. Its creation comes at a time when the worldwide regulation of nanotechnology is expected to ramp up considerably, in an attempt to keep pace with the science, Marchant said.

"There's going to be a lot of activity in this area, and it's very important for people to be able to keep up," he said. "Every country is in the same place, going through the same steps, starting to put into place regulatory programs. We need to promote harmonization among these countries, and one way to do that is to have access in other jurisdictions, and to see what other people are doing."

Sylvester expects the Web site will become an essential resource for the latest news on nanotechnology regulation and a great tool for researching and comparing regulatory approaches around the world.

"As the pace and scope of nano regulation grows, the need for international collaboration in projects like these also will grow," he said.

The value of the database extends even beyond nanotechnology, Abbott added. "Biotechnology, cognitive science and other technologies are developing just as rapidly, and will have equally significant social impacts," he said. "We need to learn how countries can and do respond to innovations like these."

The center was assisted by the Centre of Regulatory Studies at Monash University Law School in Australia and the Institute of Environmental and Energy Law at K.U. Leuven in Belgium. Diana Bowman, a senior research fellow in the Monash Centre, said the archive is a much-needed resource that will become a hub for those interested in exploring the evolving debates and understanding nanotechnology policy and regulatory developments.

"While scientists and industry have been increasingly focused on manipulating matter at the nanoscale in order to produce increasingly sophisticated and novel applications, governments, academics, civil society and other key stakeholders have dedicated significant time and resources to considering the broad implications of the technology," Bowman said. "The speed of these debates has moved swiftly,

resulting in an overwhelming volume of literature. And this is only the beginning."

Geert Van Calster, co-director of K.U. Leuven's Institute, pointed out the paradox in the nanotechnology regulatory debate, in that there are few regulations on the books, yet a plethora of analysis, opinions, government resolutions and other information exist.

"This archive will allow the user quickly to find the trees of the debate, and subsequently to dig for the sources that will give you the forest for the trees – a tour de force, and one that is very timely," Van Calster said.

In the database, each entry provides a direct link and/or an attached copy of a specific document, an abstract of that document prepared for the database, and a listing of other pertinent information including author, date and document type. Documents for a specific jurisdiction can be accessed by clicking on a map or on a region, nation or entity.

"The Web site is intended to operate as an edited wiki, and we urge users from around the globe to edit, add, delete and comment on the Web site," Sylvester said. "It's a great tool, but it will require users to keep it up-to-date."

NIOSH UPDATES ITS NANOTECH WEB RESOURCES

The [National Institute for Occupational Safety and Health](#) (NIOSH) has updated and enhanced several web resources containing NIOSH's research results and recommendations on the work-related health and safety implications of nanotechnology.

The updated resources describe the latest scientific information available from NIOSH in its studies to help determine whether nanomaterials pose risks for occupational illness or injury. The enhancements are intended to help stakeholders find information more easily and quickly.

"The body of scientific information on the health and safety implications of nanotechnology has grown substantially in the past five years, and continues to do so," said NIOSH Director John Howard. "We are pleased to reflect this ongoing evolution of the science by regularly updating and augmenting the widely used and widely cited resources on our web page."

For more than five years, NIOSH has conducted groundbreaking research pertaining to nanotechnology, established partnerships with diverse stakeholders, and contributed to U.S. leadership in international efforts to determine if nanomaterials pose occupational risks. The new web resources include these:

- [Progress Toward Safe Nanotechnology in the Workplace](#)
- [Strategic Plan for NIOSH Nanotechnology Research and Guidance](#)

NIOSH also redesigned and reformatted its [nanotech topic page](#) to highlight links for specific audiences.

RISK RESEARCH...

Continued from page 1

makers may not be well equipped to make decisions concerning nanomaterials under conditions of extensive uncertainty in relation to environmental and human health protection in the near term.

"It is clear, in our view, that there is a need for a program of research and knowledge transfer specifically aimed at supporting near- and medium-term decision making, in real time and at the same pace as nano-innovation itself" she says. "Furthermore, since there are already a number of nanomaterials on the market with varying degrees of potential for exposure, we also recommend the use of environment and health surveillance as an early warning system to act as a safety net around such a decision support program, to which it may also serve to inform."

A "Normal" Field of Toxicology?

The three authors believe it is likely that the field of assessing the health and environmental risks of nanomaterials will transform from an emerging topic with many known-unknowns to a more 'normal' field of toxicology, ecotoxicology, exposure, etc. for a wide range of nanomaterials. At the same time, they note, it seems in some ways that scientists, regulators,

and other decision makers are trying to learn from past mistakes and be more proactive about addressing these potential risks, and to ensure that the 'right' questions are asked.

"Some fundamental issues may not be easy to solve and may require significant time and resources, including questions embedded in emerging risks like "how do we better anticipate surprises?" and "how much information is needed to make a decision?" says Grieger. "These issues are also compounded by, for instance, the variety of emerging nanomaterials and international contexts, in which different societies may choose to handle emerging risks differently."

The central recommendation by Grieger, Baun and Owens is the establishment of an international research program that specifically addresses critical issues of risk governance and timely decision making as these relate to nanomaterials specifically, and emerging technologies more generally. They also recommend the development of environmental and health surveillance is needed to act as a safety net and an early warning system while these issues are being addressed.

SUPERMARKETS SHOULD LEAD DEBATE ON NANOTECHNOLOGY IN FOODS

Big-name retailers like Tesco and Carrefour should help prepare consumers for innovations in the food sector, according to the top civil servant in the EU executive's directorate for health and consumer protection.

Robert Madelin, director-general of the European Commission's DG Sanco, told a meeting of retailers that supermarkets needed to be upfront in explaining the risks and benefits of advances such as nanotechnology.

Pointing to the genetically-modified (GM) food fiasco of the 1990s, he said supermarkets had "followed" the crowd rather than taking the lead.

"On GM, they [retailers] followed their customers and took products off the shelves. On other technologies, they could lead and prepare the debate. They have a role in spurring innovation," he told a meeting of the European Retail Round Table in Brussels on Monday (18 January).

Madelin said powerful retailers should try to take a long-term view and ask themselves what their role is in the context of the EU 2020 strategy. He said it would be futile to encourage innovation in Europe unless retailers were playing their part in engaging with the public. There would be no point in developing new products if the market is closed to selling them.

"The average citizen is not science-averse," he said, but they want to know what the benefits are and how new technologies fit with their values. However, Madelin said big companies are "failing to tell a story consumers can hear".

Nanotechnology on the agenda at new Food Forum

"If you look at the nano debate, after three years of encouraging retail to be more upfront, the industry is still keeping their secrets," he said. The forthcoming Food Supply Chain Forum – which will begin work by Easter – could look at the role of retail in innovation, Madelin revealed. "It would be extremely helpful if business leaders engaged beyond their comfort zone. Retailers should ask themselves what they do to help innovation," he said. However, senior retail industry figures were hesitant to commit themselves to any political agenda, preferring to adopt a neutral stance unless it affects their balance sheets.

Positions

Lars Olofsson, CEO of the Carrefour Group, said retailers would not promote any particular technology. He noted that with GM foods, customers were clearly unconvinced that the innovation in question was safe and necessary. Carrefour banned GM ingredients in its own-brand products and other products followed.

According to Terry Leahy, CEO of Tesco, the retail industry can play a role in helping to fulfil social policy objectives, but it would be "unrealistic to expect them to do it alone".

"We are very willing to engage and accept our responsibilities. All we ask is that the Commission, the

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SUPERMARKETS...

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Parliament and the Council give us the right conditions to do so," he said.

The retail sector has been a hive of innovative activity over recent decades, said Dick Boer, executive vice-president of Royal Ahold. "Innovation in the food chain should not be underestimated – let's not forget what has been achieved. Retail is continually trying to do it faster and cheaper and to give consumers lower prices," he said. Food sold in supermarkets is now safer and fresher than ever before, Boer added.

Monique Goyens, director-general of BEUC, the EU consumer group, said it was important not to promote "innovation for the sake of innovation," adding that technological advances must be geared towards societal needs.

She said the public was not science-averse, as evidenced by the fact that consumers snap up new high-tech products every day. The question customers ask themselves with all innovations is what the risks and benefits of a new technology are. This, she said, is the problem with nanotechnology, as more work needs to be done in the area of risk assessment.

Ian Cheshire, CEO of Kingfisher, a major DIY retailer, said the industry was willing to step up, take responsibility and play its role in the debate on the future of European retail. He said innovation is something retailers do not get sufficient credit for.

"You don't have to be in a white coat to be innovative,"

he said, noting that major strides had been made in the areas of data and supply chain management.

Background

In October 2009, the European Commission launched an inquiry into the food supply chain to examine unfair contractual practices imposed on small farmers by major retail chains and other buyers. This was part of a drive to curb future food price increases and ensure farmers receive a fair share of the price of end products.

As part of a broader effort to improve the state of the food business, the EU executive also announced that it would establish a Food Supply Chain Forum. The forum will bring civil society, regulators, and businesses from across the food chain together to discuss the state of the food retail sector.

The debate on applications of nanotechnology has been climbing up the political agenda in recent years, with incoming Environment Commissioner Janez Potocnik – a former EU science commissioner – saying recently that existing chemicals legislation was not sufficient to regulate nanomaterials.

There have also been reports that companies selling products which contain nanotechnology are deliberately playing down or hiding this fact, fearing a consumer backlash.

(Adopted from material provided by EurActiv)

REPORT OUT FROM THE 5TH NANOREGULATION CONFERENCE

The 5th Int. NanoRegulation Conference took place on November 25-26, 2009 in Switzerland, and tackled the issue of "No Data, no Market?" - Challenges to Nano-Information and Nano-Communication along the Value Chain. During the two-days Conference, a number of leading nanotechnology stakeholders presented their views and expectations regarding information and data exchange along the value chain, and discussed possible approaches to the problem in workshops.

The debate during the NanoRegulation Conference revealed an clear and urgent need for a coordinated information transfer of relevant nanospecific data along the value chain. It became obvious that especially consumer-near goods containing manufactured nanomaterials will have to be labelled in some form sooner or later due to growing pressure from the European Parliament as well as from consumer organizations. However, there are concerns that such nano-labelling could be misunderstood as an indication of hazard, thereby raising new and potentially unnecessary fears among the consumers.

The Conference report which has been released now outlines the positions from the participating stakeholders from

industry, authorities and various NGOs and international organisations. On the second day, a series of parallel workshops covered the issues of "nano labelling in consumer products", "HSE relevant information flow to downstream users and authorities" and "adapting the MSDS to the requirements of the nanoscale". The vivid discussions which took place in the workshops are summarised in the Conference report.

In its introductory part, Dr. Christoph Meili from the Innovation Society Ltd. (St.Gallen) proposes a model of a "Nanotechnology Information Pyramid" as an approach to frame and further deepen the discussion about the "No Data, no Market" problem which is presented by the gaps in the transfer of safety data along the nanotechnology value chain. The "Nano Information Pyramid" proposal is included in the NanoRegulation Conference report and also available as a separate document.

If you are interested in the outcomes of the conference and the detailed positions of the participating stakeholders, you may want to download the [conference report](#).

NEW REPORT PROVIDES IN-DEPTH EXAMINATION OF NANOMATERIALS SAFETY

A comprehensive and authoritative review of the health and environmental safety of engineered nanomaterials has been published by a consortium led by Edinburgh Napier University and the Institute of Occupational Medicine "[Engineered Nanoparticles - Review of Health & Environmental Safety \(ENRHES\)](#)".

The ENRHES project has performed a comprehensive and critical scientific review of the health and environmental safety of fullerenes, carbon nanotubes (CNTs), metal and metal oxide nanomaterials. The review considers sources, pathways of exposure, the health and environmental outcomes of concern, in the context illustrating the state-of-the-art in the field and informing the regulation of the potential risks of engineered nanoparticles.

The review has been conducted by a consortium of leading experts with established track-records in experimental science, engagement with industry and regulators, and conducting review activities. On the basis of this review, prioritised recommendations have been developed and set in the context of informing policy makers in the development of methods to address exposure as it relates to the potential hazards posed by engineered nanoparticles, and in the development of appropriate regulation.

NANOMATERIALS UNDER REACH

Some adjustments are needed in the European chemicals legislation REACH to assess and control the risks of nanomaterials. The information on substances to be provided is not sufficient to determine the specific properties of nanomaterials, nor to assess how these properties affect their behavior and effects in humans and the environment.

RIVM – the National Institute for Public Health and the Environment in The Netherlands – concluded this following research into the suitability of REACH for nanomaterials: "[Nanomaterials under REACH. Nanosilver as a case study](#)". RIVM proposes an adapted set of minimum information requirements, to be applied to all nanomaterials to be registered under REACH, independent of their volume of production and import.

By conducting a hypothetical registration of nanosilver it was investigated whether REACH is suitable for assessing the safe use of nanomaterials. From this it appeared that no definition of a nanomaterial is present, and that a relevant measure for expressing harmfulness and exposure is as yet not known. In addition, the standard information requirements are insufficient to assess hazard and exposure. They are also insufficient for a proper characterization of the nanomaterial. Consequently, it cannot be determined to what extent the nanoform of a substance corresponds to the non-nanoform of the same substance. Furthermore, it is unclear whether current risk reduction measures and extrapolation methods in risk assessment, as established for non-nanomaterials, are applicable to nanomaterials.

UPCOMING EVENTS LOOKING AT THE RISKY SIDE OF NANO

[2010 International Conference on Nanoscience and Nanotechnology](#)

February 22-26, 2010, Sydney (Australia)

Businesses, researchers, civil society representatives and regulators involved or interested in nanotechnologies are invited to take part in the final International Conference of the FramingNano FP7 project whose primary objective has been the development of a sustainable governance framework for nanotechnologies.

[2nd NanoImpactNet Conference](#)

March 9-12, 2010, Lausanne (Switzerland)

The 2nd NanoImpactNet Conference will start with a 1-day training workshop for junior scientists followed by a 3-day conference. This training workshop is aimed at PhD-students, postdocs and early-career scientists and provides training on handling protocols, choices of control materials, dispersion procedures, and hazard evaluation procedures.

[8th International Conference And Workshop On Biological Barriers – In Vitro Tools, Nanotoxicology, And Nanomedicine](#)

March 21 – April 1, 2010, Saarbrücken (Germany)

This conference and workshop is committed to the pressing questions in the triangle of *in vitro* tools, nanotoxicology, and nanomedicine.

[Science and Technology for Environmental Protection \(SETAC\)](#)

May 23-27, 2010, Seville (Spain)

The SETAC Europe Annual Meeting is Europe's biggest meeting on environmental toxicology and chemistry with more than 1500 presentations in parallel platform sessions and poster sessions

[Nanotoxicology 2010](#)

June 2-4, 2010, Edinburgh (UK)

The conference will take place over 3 days, and will be divided into sections that allow focus on specific types of nanomaterials. Each section will include talks spanning disciplines including exposure assessment, human toxicology, characterization, ecotoxicology and risk assessment. Such a format will promote interaction between different disciplines and would allow issues specific to certain materials to be addressed.

[Greener Nano 2010](#)

June 16-18, 2010, Portland, OR (USA)

GN10 will feature advances in the design and production of greener nanomaterials. This conference brings together academics, industrialists and policymakers to discuss approaches to developing economically viable, environmentally benign methods to advance nanotechnology.

IN SHORT – PAPERS, INITIATIVES & UPDATES

REPORT: Of Risks And Regulations: How Leading U.S. Nanoscientists Form Policy Stances About Nanotechnology

In the absence of risk assessment data, decision makers often rely on scientists' input about risks and regulation to make policy decisions. The research presented here goes beyond the earlier descriptive studies about nanotechnology regulation to explore the heuristics that the leading U.S. nanoscientists use when they make policy decisions about regulating nanotechnology. In particular, the scientists explore the relationship between nanoscientists' risk and benefit perceptions and their support for nanotech regulation. The researchers conclude that nanoscientists are more supportive of regulating nanotechnology when they perceive higher levels of risks; yet, their perceived benefits about nanotechnology do not significantly impact their support for nanotech regulation. doi: [10.1007/s11051-009-9671-5](https://doi.org/10.1007/s11051-009-9671-5)

INITIATIVE: 'Nano Information Pyramid' Addresses the 'No Data, No Market' Problem of Nanotechnology

The Innovation Society suggests a "[Nano Information Pyramid](#)" (pdf download) which provides an information exchange framework to illustrate the recipient-specific information transfer along the value chain. The Pyramid combines different information transfer tools in with the different levels of the value chain. This is to ensure that nanospecific (and, if necessary, safety relevant) data are transferred in an appropriate form along the value chain. At the critical positions, proper information exchange can be guaranteed by implementation of accurate measures like for example Risk Management Systems (RMS) or Material Safety Data Sheets (MSDS).

PAPER: Distinguishing Nanomaterial Particles From Background Airborne Particulate Matter For Quantitative Exposure Assessment

A risk management system is needed for workplaces in the nanomaterial industry based on the precautionary principle. One of the problems in the risk management system is difficulty of exposure assessment. In this article, examples of exposure assessment in nanomaterial industries are reviewed with a focus on distinguishing engineered nanomaterial particles from background nanoparticles in workplace atmosphere. An approach by JNIOH (Japan National Institute of Occupational Safety and Health) to quantitatively measure exposure to carbonaceous nanomaterials is also introduced. In addition to realtime measurements and qualitative analysis by electron microscopy, quantitative chemical analysis is necessary for quantitatively assessing exposure to nanomaterials. Chemical analysis is suitable for quantitative exposure measurement especially at facilities with high levels of background nanoparticles. doi: [10.1007/s11051-009-9703-1](https://doi.org/10.1007/s11051-009-9703-1)

REPORT: Risk Assessment Document of Manufactured Nanomaterials

The Research Institute of Science for Safety and Sustainability at AIST has released interim reports on the risk assessment of three nanomaterials, "Titanium Dioxide (TiO₂)", "Fullerene (C₆₀)" and "Carbon Nanotubes (CNTs)", in addition to a brochure representing the concept of the assessment, "The Principles and Basic Approach to Risk Assessment of Manufactured Nanomaterials (interim version)" were published (in Japanese) on October 16, 2009. The [English translations of the executive summaries](#) of these interim reports and the brochure were released on December 22, 2009.

REPORT: Analysis of Information Gathering Initiatives on Manufactured Nanomaterials

In its series on the safety of manufactured nanomaterials, the OECD has published [Analysis of Information Gathering Initiatives on Manufactured Nanomaterials](#) (pdf download). This document analyses the similarities and differences identified in current and proposed information gathering initiatives for manufactured nanomaterials. The analysis includes information elements that should be considered in an information gathering initiative: use pattern; physical and chemical properties; life cycle information; fate; human health toxicity; ecotoxicity; and risk management measures.

PAPER: Potential for Occupational Exposure to Engineered Carbon-Based Nanomaterials in Environmental Laboratory Studies

The potential exists for laboratory personnel to be exposed to engineered carbon-based nanomaterials (CNMs) in studies aimed at producing conditions similar to those found in natural surface. The goal of this preliminary investigation was to assess the release of CNMs into the laboratory atmosphere during handling and sonication into environmentally relevant matrices. The report's finding indicates that laboratory workers may be at increased risk of exposure to engineered nanomaterials. doi: [10.1289/ehp.0901076](https://doi.org/10.1289/ehp.0901076)

ARTICLE: Occupational Safety and Health in Nanotechnology and Organisation for Economic Cooperation and Development

The Organization for Economic Cooperation and Development (OECD), an intergovernmental organization, is playing a critical global role in ensuring that emerging technologies, such as nanotechnology, are developed responsibly. This article describes OECD activities around occupational safety and health of nanotechnology and provides state-of-the-science overview resulting from an OECD workshop on exposure assessment and mitigation for nanotechnology workplace. doi: [10.1007/s11051-009-9637-7](https://doi.org/10.1007/s11051-009-9637-7)

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**OPTIMIZING THE
BENEFITS OF
NANOTECHNOLOGY
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CONTROLLING THE
RISKS**

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