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A CONSTRUCTIVE CONTRIBUTION TO THE RESPONSIBLE DEVELOPMENT AND USE OF ENGINEERED NANOMATERIALS

nanoRISK

OPTIMIZING THE BENEFITS OF NANOTECHNOLOGY WHILE MINIMIZING AND CONTROLLING THE RISKS

Insider Report

It appears that the nanotechnology research community is not exactly at the forefront when it comes to following, not to mention setting, standards for safe practices for handling nanomaterials.

QUESTIONABLE SAFETY PRACTICES IN NANOTECHNOLOGY LABS AROUND THE WORLD

The discussion about nanotechnology related safety issues so far has focused mainly on three areas – consumers getting exposed to products containing nanomaterials; nanomaterials getting released into the environment and potentially entering the food chain; and industrial workers being exposed to nanomaterials during the production process. There are an increasing number of reports and research papers dealing with these issues.

Interestingly, while surveys of nanotechnology safety practices have concentrated on industrial settings, the safety issues of a significant number of people working with nanomaterials have not been addressed in a concerted matter – the researchers at university and private research laboratories who are doing all the early stage R&D.

According to a survey conducted by a Spanish research group, it appears that the nanotechnology research community is not exactly at the forefront when it comes to following, not to mention setting, standards for safe practices for handling nanomaterials.

Published in a recent issue of *Nature Nanotechnology* ("Reported nanosafety practices in research laboratories worldwide"), Jesus Santamaria, who heads the Nanostructured Films and Particles (NFP) Group at the University of Zaragoza, and his team have conducted an online survey to identify what safety practices researchers are following in their own labs.

"The results of our survey indicate that environmental health and safety practice in many research laboratories worldwide is lacking in several important aspects, and several reasons may contribute to this" says Santamaria.

"Toxicity of nanomaterials is a complex subject because it depends on multiple factors including size, surface area, chemical composition, shape, aggregation, surface coating and solubility. Furthermore, most published research emphasizes acute toxicity and mortality, rather than chronic exposure and morbidity."

He emphasizes that these factors are aggravated by the fact that, although there have been some attempts at creating international standards for managing the risks of nanomaterials, there are no widely accepted exposure limits for nanomaterials.

Consequently, there is no clear benchmark that can be used as a target for implementing suitable laboratory safety measures for nanomaterials. This, and the fact that there even aren't agreed standards and terminology, makes it difficult for a simple survey to tease out the true state of safety practices in nanotechnology labs.

Nevertheless, the responses of the 240 participants in the survey shed some light on what's going on. The questions covered: details of the materials and processing methods used; safety measures; waste disposal procedures; and knowledge of legislation for handling nanomaterials.

One of the most surprising results is that nearly three quarters of respondents reported not having internal rules to follow regarding the handling of nanomaterials (approximately half did not have rules and over a quarter were not aware of any internal regulations).

Based on the findings of their initial survey, Santamaria and his team conclude that there is the need for further research aimed at studying the possible adverse health effects of nanomaterials, both under conditions representative of the exposure that may be encountered as background conditions in research laboratories, and under short-term exposures as a

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The ENRHES project has released Its final report – a scientific review of the health and environmental safety of four classes of nanomaterials.

What We Know About Engineered Nanoparticles' Health And Environmental Safety

In 2008, the Joint Research Centre, Institute for Health and Consumer Protection of the European Commission funded the project *Engineered Nanoparticles: Review of Health and Environmental Safety* (ENRHES). Last month, the ENRHES project released its final report (available as a free download).

It is quite remarkable that the authors feel compelled to start their introduction section with this sentence: "Nanotechnology is a sector of the material manufacturing industry that has already created a multibillion $US market, and is widely expected to grow to 1 trillion $US by 2015." Firstly, a lot of people would argue with the narrow definition of nanotechnology as being a sector of the material manufacturing industry. Secondly, it appears that still no publicly funded report can afford to omit the meaningless and nonsensical reference to a 'trillion dollar industry by 2015'. It really is astonishing how this claim gets regurgitated over and over again – even by serious scientists – without getting scrutinized.

The overall aim of the ENRHES project was to perform a comprehensive and critical scientific review of the health and environmental safety of four classes of nanomaterials: fullerenes, carbon nanotubes, metals and metal oxides. The review considers sources, pathways of exposure, the health and environmental outcomes of concern, illustrating the state-of-the-art and identifying knowledge gaps in the field, in order to coalesce the evidence which has emerged to date and inform regulators of the potential risks of engineered nanoparticles in these specific classes. The specific objectives of the ENRHES project were to review information on:

- production, use and exposure to the target engineered nanomaterials;
- persistence, bioaccumulation, toxicity and interactions of the engineered nanoparticles in living and environmental systems;
- differences in toxicity posed by variations in physico-chemical characteristics.

The final objective of the project was to perform a coherent evaluation of the feasibility of conducting a regulatory risk assessment for each material type and perform basic risk assessments to the extent possible based on the information presented within the review.

Overall, the report paints a picture of the current state of knowledge concerning exposure to nanoparticles and ongoing work in the area. The author team has developed prioritized recommendations and set them in the context of informing policy makers in the development of methods to address exposure as it relates to the potential hazards.

They conclude that their findings "strongly supports the further development of thorough characterization (including proper considerations of agglomeration/ aggregation) of the nanoparticles in exposure media when conducting exposure assessment, as well as in the generation of data for determining exposure to both humans and the environment as well as assessing hazardous properties. This is a crucial prerequisite for carrying out a meaningful assessment of the risks. Further testing strategies are required to be established to cover all relevant endpoints needed for a risk assessment. At present, carrying out risk assessment of nanoparticles can only sensibly be done on a case-by-case basis. Only when more data becomes available may it be possible to group nanomaterials according to their physical, chemical and/or biological properties or mode of action, so that testing could be done for representatives of each group."

The massive review (426 pages) first provides context for the four groups of materials chosen – fullerenes, carbon nanotubes, metals and metal oxides – in terms of production techniques, applications and market value. It then highlights the essential role which nanoparticle characterization plays in a variety of overlapping contexts ranging from fundamental and applied research, through process and product quality control and commercialization, to health and environmental protection.

In the context of exposure assessment, the review shows that there is, in general, a paucity of published data. The authors make recommendations for further occupational, consumer and environmental exposure assessment to support effective risk assessment and characterization.

Similarly, the review highlights the general paucity of data in the area of environmental fate and behavior, which represents a major obstacle in developing a holistic view of the fate and transport of nanomaterials within the environment and therefore environmental exposure.

The review then goes on to present a substantial appraisal of the toxicity of nanoparticles for each of the four nanomaterial classes covered, considering the latest studies which have sought to assess the toxicity of nanomaterials including the utilization of both *in vivo* (within mice and rats) and *in vitro* models (using cell lines and primary cells). It evaluates their toxic potential and identifies the underlying mechanisms driving each of their toxicities, and determines whether any generalizations can be made regarding nanomaterials as a whole.

Finally, based on the information provided so far, the authors presents a basic risk assessment, inspired by the REACH Guidance, for the four types of nanomaterials under review. This includes an assessment for both the human health and the environment, limited to the extent that the available data allows. For each nanomaterial uncertainties and additional work needed to complete the assessment are also described.

One conclusion that the authors point out: "The risk assessments show a significant lack of measured and modeled exposure data of nanoparticles, for humans (occupational and consumer exposure) and for the environment."

New biophysical research contributes to the general picture of the fundamental behaviors of nanoparticles in both biological and ecological systems.

Mammalian And Plant Cells Respond Differently To Fullerenes

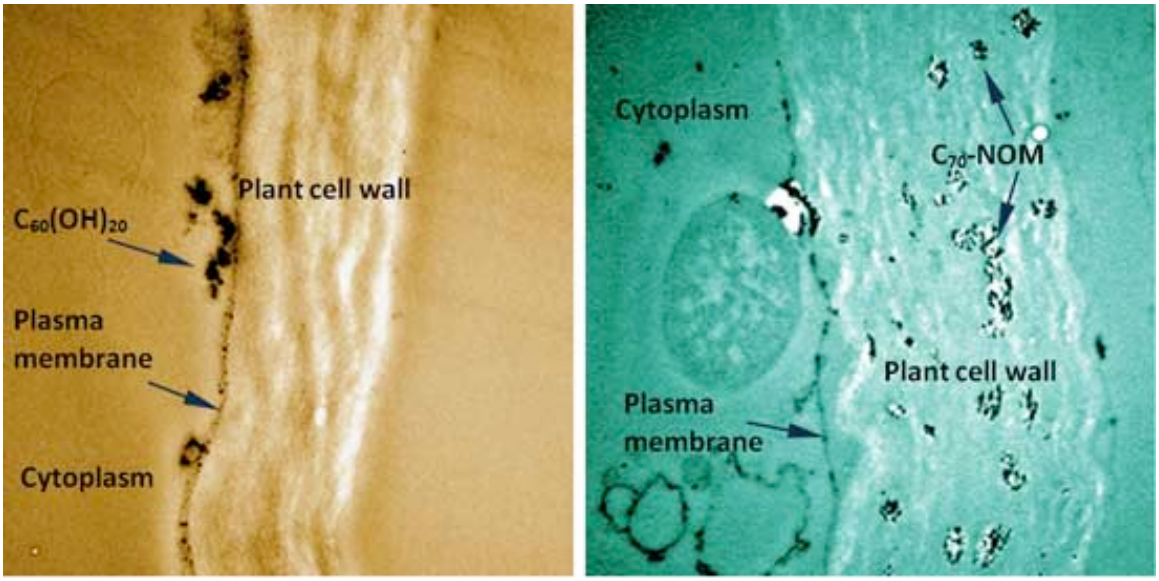
Some scientists believe that, with the increased mass production of engineered nanoparticles like carbon nanotubes, there is a realistic chance for these particles to interact with water, soil and air, and subsequently enter the food chain. However, understanding the behavior and impacts of nanomaterials in the environment and in human health is a daunting task. The cynics argue that it is impossible to fully explore the toxicological impact of every existing and future nanomaterial with its many millions of variants, so why bother with a few half-hearted and underfunded research projects. Rather, let's wait until nanotechnology has its asbestos moment and some people drop dead – then we have something concrete to look into.

People who are taking a more thoughtful approach to the complexities of nanotoxicological research agree that most likely we never will have full scientific certainty about the environmental and health impact of nanomaterials. Today we don't even know what the impact of most chemicals is, and that includes products we have been using for many years. Nevertheless, a general understanding about nanotoxicity is slowly emerging as the body of research on cytotoxicity, genotoxicity, and ecotoxicity of nanomaterials grows.

New biophysical research – a parallel study of carbon-nanoparticle uptake by plant and mammalian cells – contributes to the general picture of the fundamental behaviors of nanoparticles in both biological and ecological systems.

"While biological and ecological systems constantly interact and are integrated in the network of nature, it remains a new challenge to evaluate and correlate the biological and environmental impacts of nanoparticles within the same context," says Pu-Chun Ke. "Our study provides a first parallel comparison on the uptake of carbon nanoparticles by plant *Allium cepa* and mammalian HT-29 cells. We have identified these two key factors in determining the fate of nanoparticles in biological and ecological systems: the structure of the host cell, and the physiochemistry of the nanoparticles. These two factors are integrated in any systems involving both synthetic nanoparticles and living organisms."

In previous work ("The Differential Cytotoxicity of Water-Soluble Fullerenes"), it was discovered that pristine nanoparticles could induce damage in mammalian cells while well-functionalized fullerene nanoparticles are far more biocompatible. Ke, an associate professor at Clemson University, who leads the Single-Molecule Biophysics and Polymer Physics Laboratory, explains that this differential toxicity stems from the hydrophobic interior of the lipid bilayer, which promotes the partitioning of the hydrophobic nanoparticles.



TEM imaging of carbon nanoparticle uptake by Allium cepa plant cell. (Images: Dr. Ke, Clemson University)

"In other words the energy penalty would be quite high for well-solubilized nanoparticles to be taken up by a mammalian cell, unless the biological process of endocytosis overwrites the physical process of passive diffusion and thermodynamics. Our study suggests that the supramolecular assembly of C70 suspended in natural organic matter (C70-NOM), due to its non ideal solubility, behaved similarly to pristine C70 nanoparticles in mammalian cells."

Ke and his team found that in the presence of a (hydrophobic, rigid) plant cell wall, well-solubilized fullerene derivative C60(OH)20 nanoparticles readily translocated across the cell wall and accumulated at the interface between the cell wall and the (fluidic and amphiphilic) plasma cell

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SAFETY PRACTICES…

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consequence of certain laboratory operations.

"In the absence of regulations, scientists should self-regulate, because they are the ones who decide in practice how nanomaterials are handled in the laboratory and are ultimately responsible for implementing nanosafety practices," says Santamaria. "One effective way to speed-up the adoption of safety precautions would be for journals to require a specific description of nanosafety measures within the methods or experimental section of all papers dealing with nanomaterials."

MAMMALIAN AND PLANT CELLS…

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membrane. At high nanoparticle concentrations such accumulation would mechanically protrude through the cell membrane to induce cell damage. By comparison, less-solubilized fullerene C70-natural organic matter complexes were mostly trapped in the porous plant cell wall, and therefore imposed little effect on plant cell viability.

"For mammalian cells we have found that C60(OH)20 nanoparticles were largely bio-benign, while C70-NOM caused increased cell damage with its increased concentration" says Ke. "This research tells us that even for the same nanoparticles they may exert contrasting effects on biological and plant hosts due to the presence of an extra plant cell wall in the latter. For the same host systems, mammalian or plant cells included, nanoparticles may as well induce contrasting cell damage due to their different hydrophilicity."

The results from this work could be exploited in two ways: mitigating the toxicity of nanoparticles for their biosensing and imaging applications; and designing drug and gene delivery strategies to mammalian and plant systems with a nanoparticle transporter of appropriately designed surface properties.

Research like this is inherently multidisciplinary in its nature, requiring scientists with different backgrounds, both in experimental and simulation fields, to collaborate. In this particular case, the research is characterized by its distinct biophysical nature.

"The basic components of our research are supramolecular assembly, molecular cell biology, and thermodynamics" explains Ke. "We believe such fundamental research is needed for describing the complex behaviors of nanoparticles in biological and ecological systems, which serve as the basis for understanding the biological and environmental implications and applications of nanomaterials."

The researchers have published their findings in a recent issue of *Small* ("Differential Uptake of Carbon Nanoparticles by Plant and Mammalian Cells").

ENVIRONMENTAL CLEAN-UP

Dr. Barbara Karn of EPA's National Center for Environmental Research (NCER) is lead author on a recently published article in Environmental Health Perspectives entitled "Nanotechnology and In Situ Remediation: A Review of the Benefits and Potential Risks".

The article was written "to focus on environmental cleanup and provide a background and overview of current practices, research findings, societal issues; potential environment, health and safety implications and future directions for nanoremediation." What's unique here is that the article reviews the rapidly emerging discipline of nanotechnology as applied to waste site remediation.

While the article clearly is useful for the community desiring an overview and update on applications and implications associated with nanoremediation, it also provides information to managers desiring to apply the technology to their sites. The 76 references cited by the authors provide a plethora of original articles for those seeking in-depth information. Carol Rowan-West, Director of the Office of Research and Standards at the Massachusetts Department of Environmental Protection, is distributing the article to the New England Biological Technical Assistance Group and Massachusetts' Interagency Nanotechnology Workgroup. She said it is a "good teaching tool" that highlights a new remediation technology, the strengths and limitations of nanoremediation, research needs, and the issues associated with effects of nanoparticles on the environment."

One very useful resource developed for the article is the nanoremediation map located on the Web site of the Project on Emerging Technologies, a partnership between the Woodrow Wilson International Center for Scholars and the Pew Charitable Trust in Washington, DC. The map is a particularly good resource for remediation site managers who are interested in investing in nanotechnology as a tool for cleanup. By clicking on a site icon, information on the location, site type, contaminants treated, and type of nanoparticle appears. All of the sites, which include military installations, manufacturing sites, oil fields, and private properties, are being treated for some form of chlorinated hydrocarbons at a minimum. By providing this site information, the map points the community interested in nanotechnology in the right direction to gather additional information. The nanoremediation map is a living document and will expand as more site information is added. The map is also an important resource for those charged with protecting human health and the environment, since these sites provide in situ laboratories to study the potential risks, persistence, fate and transport, and toxicity of the nanoparticles to local flora and fauna.

The science and application of nanoremediation still is in its infancy. There is great potential to use this technology to clean up contaminated sites, but we need to proceed with caution until the human and environmental effects of nanoparticles are better understood. Continued research in this area will be research dollars well spent.

Australia Launches National Framework For Safe Development Of Bio- And Nanotechnologies

The Australian Government is introducing a national framework to guide the safe development of new technologies such as nanotechnology and biotechnology as part of a $38.2 million National Enabling Technologies Strategy.

"Technologies like nanotechnology and biotechnology have enormous potential, but we can only realize that potential with the community's support," said Innovation Minister, Senator Kim Carr. "Health, safety and environmental protection are paramount for the Government. This strategy is about ensuring we meet the highest standards while at the same time maximizing opportunities to develop these cutting-edge technologies.

"The responsible development of enabling technologies will support new industries, new export opportunities and, most importantly, new jobs.

"These technologies promise to give us breakthrough medicines, faster computers, new biofuels, stronger and lighter materials, better solar cells, more abundant and nutritious food, purer water, and much more besides.

The strategy provides a comprehensive national framework with three funding components:

- $10.6 million to support policy and regulatory development, industry uptake, international engagement and strategic research;
- $9.4 million for public awareness and community engagement to increase understanding of enabling technologies; and
- $18.2 million for the National Measurement Institute to improve measurement infrastructure, standards and expertise and ensure that Australia leads the way internationally.

A Stakeholder Advisory Council will advise on implementation of the strategy, and an Expert Forum for Enabling Technologies will monitor emerging trends.

"The strategy will help ensure that balanced, factual information is easily accessible to the community and industry. It will also deliver nationally consistent measures to promote the uptake of these technologies, which offer Australian industry a sustainable future."

The strategy is part of the Rudd Government's $1.1 billion Super Science Initiative. The strategy is available at www.innovation.gov.au/enablingtechnologies.

Researchers Investigate Nanoparticle Barrier Capacity Of Human Placenta

The question of whether or not nanoparticles have an effect on the human body – and if so, how – is still largely unanswered. There is little information, for instance, on whether pregnant women exposed to these minute particles pass them on to their unborn babies. Scientists from Empa and the University Hospital Zurich now show first results ("Barrier Capacity of Human Placenta for Nanosized Materials").

During the investigation polystyrene nanoparticles were injected into the mother's blood supply. Scientists then observed whether these were able to pass into the baby's blood supply.

Over several years, Empa researchers have been studying the effects of numerous nanoparticles on human cells and tissue. These investigations will help scientists to understand what problems – if any – these tiny things might cause when released into the human body (and in the environment). In a study recently published in the journal "Environmental Health Perspectives" scientists from Empa and the University Hospital Zurich have investigated a very special organ, the human placenta. It acts as a filter of sorts between a mother and her unborn child. Responsible for supplying the fetus with sufficient nutrients and oxygen, the placenta also ensures that the circulatory systems of mother and child do not mix. The researchers wanted to know if nanoparticles were able to cross the placental barrier.

Established animal models cannot be used for this purpose as the placenta in these creatures is fundamentally different from that of humans. Normally it is not easy to carry out scientific investigations on placental tissue, but several mothers who gave birth to their babies in the hospital agreed to allow the researchers to use their placentas for this study. In the laboratory it is possible to maintain both the mother's and the baby's circulatory systems (which are closely linked) for several hours in these donated organs.

The investigation required the researchers to add fluorescent polystyrene nanoparticles to the mother's blood circulation and then observe if they were able to pass into the fetal circulation. Polystyrene particles are particularly suitable for this kind of test as they do not cause stress in the surrounding tissue and are easily detected. The particles injected into the placenta were of different sizes, ranging from 50 nanometers up to half a micron (500 nanometers) in diameter. The first result of the study was that the cutoff size of the beads was between 200 and 300 nanometers. Particles smaller than this, crossed the placental barrier and entered the fetal circulation while larger particles were held back.

The fact that particles below a certain size are able to pass through to the placental tissue to the fetus is not really unexpected, but the phenomenon must certainly be subject to further study, the investigators say. They are therefore keen to understand the mechanism, by which the particles are transported across the barrier – in both directions. They are not doing this purely for the love of research, though. They would like to determine how, in future, nanoparticles might be used for therapeutic purposes. The tiny particles could feasibly be employed as a vehicle to transport drugs in a targeted fashion to the circulatory system of an unborn child, without this affecting the mother's health.

CARBON NANOSTRUCTURES – ELIXIR OR POISON?

A Los Alamos National Laboratory toxicologist and a multidisciplinary team of researchers have documented potential cellular damage from fullerenes. The team noted that this particular type of damage might hold hope for treatment of Parkinson's disease, Alzheimer's disease, or even cancer.

The research recently appeared in *Toxicology and Applied Pharmacology* and represents the first-ever observation of this kind for spherical fullerenes.

Engineered carbon nanoparticles, which include fullerenes, are increasing in use worldwide. Each buckyball is a skeletal cage of carbon about the size of a virus. They show potential for creating stronger, lighter structures or acting as tiny delivery mechanisms for designer drugs or antibiotics, among other uses. About four to five tons of carbon nanoparticles are manufactured annually.

"Nanomaterials are the 21st century revolution," said Los Alamos toxicologist Rashi Iyer, the principal research lead and coauthor of the paper. "We are going to have to live with them and deal with them, and the question becomes, 'How are we going to maximize our use of these materials and minimize their impact on us and the environment?'"

Iyer and lead author Jun Gao, also a Los Alamos toxicologist, exposed cultured human skin cells to several distinct types of buckyballs. The differences in the buckyballs lay in the spatial arrangement of short branches of molecules coming off of the main buckyball structure. One buckyball variation, called the "tris" configuration, had three molecular branches off the main structure on one hemisphere; another variation, called the "hexa" configuration, had six branches off the main structure in a roughly symmetrical arrangement; the last type was a plain buckyball.

The researchers found that cells exposed to the tris configuration underwent premature senescence—what might be described as a state of suspended animation. In other words, the cells did not die as cells normally should, nor did they divide or grow. This arrest of the natural cellular life cycle after exposure to the tris-configured buckyballs may compromise normal organ development, leading to disease within a living organism. In short, the tris buckyballs were toxic to human skin cells. Moreover, the cells exposed to the tris arrangement caused unique molecular level responses suggesting that tris-fullerenes may potentially interfere with normal immune responses induced by viruses.

The team is now pursuing research to determine if cells exposed to this form of fullerenes may be more susceptible to viral infections. Ironically, the discovery could also lead to a novel treatment strategy for combating several debilitating diseases. In diseases like Parkinson's or Alzheimer's, nerve cells die or degenerate to a nonfunctional state. A mechanism to induce senescence in specific nerve cells could delay or eliminate onset of the diseases. Similarly, a disease like cancer, which spreads and thrives through unregulated replication of cancer cells, might be fought through induced senescence. This strategy could stop the cells from dividing and provide doctors with more time to kill the abnormal cells.

Because of the minute size of nanomaterials, the primary hazard associated with them has been potential inhalation—similar to the concern over asbestos exposure. "Already, from a toxicological point of view, this research is useful because it shows that if you have the choice to use a tris- or a hexa-arrangement for an application involving buckyballs, the hexa-arrangement is probably the better choice," said Iyer. "These studies may provide guidance for new nanomaterial design and development."

Los Alamos National Laboratory researchers will continue to attempt to understand the potential effects of exposure to nanomaterials in much the same way that Los Alamos was a worldwide leader in understanding the effects of radiation during the Lab's early history. Los Alamos workers using nanomaterials will continue to follow protocols that provide the highest degree of protection from potential exposure. Meantime, Los Alamos research into nanomaterials provides a cautionary tale for nanomaterial use, as well as early foundations for worker protection. Right now, there are no federal regulations for the use of nanomaterials. Disclosure of use by companies or individuals is voluntary. As nanomaterial use increases, understanding of their potential hazards should also increase.

UPCOMING EVENTS
LOOKING AT THE RISKY SIDE OF NANO

Environmental Implications of Nanotechnology
May 11-13, 2010, Los Angeles, CA (USA)
This conference brings together leading researchers working on nanotech risk assessment, nanotoxicology, ecosystem impacts, transport and transformation of nanomaterials, and nanomaterial detection.

Science and Technology for Environmental Protection
May 23-27, 2010, Seville (Spain)
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.

2nd iNTeg-Risk Conference 2010
June 14-18, 2010, Stuttgart (Germany)
Dealing with multiple and interconnected emerging risks.

Greener Nano 2010
June 16-18, 2010, Portland, OR (USA)
GN10 will feature advances in the design and production of greener nanomaterials.

IN SHORT – PAPERS, INITIATIVES & UPDATES

PAPER: One-to-One Comparison of Sunscreen Efficacy, Aesthetics And Potential Nanotoxicity

Numerous reports have described the superior properties of nanoparticles and their diverse range of applications. Issues of toxicity, workplace safety and environmental impact have also been a concern. Here we show a theoretical comparison of how the size of titanium dioxide nanoparticles and their concentration in sunscreens can affect efficacy, aesthetics and potential toxicity from free radical production. The simulation results reveal that, unless very small nanoparticles can be shown to be safe, there is no combination of particle size and concentration that will deliver optimal performance in terms of sun protection and aesthetics. Such a theoretical method complements well the experimental approach for identifying these characteristics. doi: 10.1038/NNANO.2010.25

REPORT: Particulate Matter Can Cause Respiratory, Vascular and Cardiac Damage

The Rochester Particulate Matter Research Center recently released a report that integrates the results of many of their PM health effects studies. The report, entitled *Assessment of Ambient UFP Health Effects: Linking Sources to Exposure and Responses in Extrapulmonary Organs*, shows that ultrafine air particles (particulate matter or PM) can cause significant health effects in the respiratory, vascular, and cardiac systems, especially in the elderly and those with atherosclerotic vascular disease. The center found that ultrafine particulate matter is easily transported from the respiratory tract to other organs, such as the heart and central nervous system, potentially causing oxidative stress in those organs. Age and disease were found to be critical modifying or susceptibility factors. Researchers also found that impacts on the circulatory system could be worse for those with atherosclerotic vascular disease, such as seen in type 2 diabetes. The Rochester PM Research Center was established through a Science to Achieve Results (STAR) grant. Read the full report: Assessment of Ambient UFP Health Effects: Linking Sources to Exposure and Responses in Extrapulmonary Organs (pdf).

PROJECT: European Project for Engineered Nanoparticle Risk Assessment Publishes First Newsletter

The first ENPRA Newsletter (pdf) is now available to download. The newsletter offers an introduction to the ENPRA project, and summarizes research progress and developments from its first 6 months, together with a summary of upcoming events and noteworthy announcements. Launched in May 2009, ENPRA (Engineered NanoParticle Risk Assessment) is a major new European Framework 7 project to develop and implement a novel integrated approach for engineered nanoparticle (ENP) risk assessment.

INITIATIVE: Russia and Finland Cooperate on Model for Regulating Nanotechnology

RUSNANO and Tekes, the Finnish Funding Agency for Technology and Innovation, signed a memorandum on standardization and regulation in nanotechnology at a recent Russian-Finnish roundtable. Participants examined problems regulating nanotechnology and approaches to developing coordinated positions for presentation to European standardization and safety agencies. The standards would be applicable to joint Russian-Finnish projects, if undertaken. The group agreed that a working group would be formed to take over joint efforts to standardize and regulate Russian-Finnish nanotechnology.

PAPER: Study Shows That Silver Nanoparticles Can Cause Toxicity in Fish

A nanoparticle growing in popularity as a bactericidal agent has been shown to be toxic to fish, according to a Purdue University study. Tested on fathead minnows – an organism often used to test the effects of toxicity on aquatic life -- nanosilver suspended in solution proved toxic and even lethal to the minnows. When the nanosilver was allowed to settle, the solution became several times less toxic but still caused malformations in the minnows. Using electron microscopy, the researchers were able to detect nanosilver particles measuring 30 nanometers or less inside the minnow embryos. doi: 10.1007/s10646-009-0404-4

MARKET: Insurance Company Introduces Nanotechnology-Specific Liability Coverage and Risk Management Services

Lexington Insurance Company has introduced LexNanoShield, an integrated insurance product and array of risk management services designed for firms whose principal business is manufacturing nanoparticles or nanomaterials, or using them in their processes. For the exposures faced by these companies, LexNanoShield includes liability coverage that provides protection for general liability, product liability, product pollution legal liability and product recall liability exposures. In addition, first party product recall coverage is available to reimburse expenses incurred if a product containing nanoparticles or nanomaterials is recalled from the market for safety reasons. LexNanoShield also provides insureds with legal, technical and loss control consulting services to help develop, implement and assess nanotechnology-specific risk management programs.

GOVERNMENT: UK Food Standards Agency Supports Creation of a Confidential Database of Food Industry Research into Nanotechnology

A previous House of Lords report had argued that such a database was necessary to inform the development of appropriate risk assessment procedures, and to aid setting priorities for research into the safety of nanotechnology.

IN THIS ISSUE

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OPTIMIZING THE BENEFITS OF NANOTECHNOLOGY WHILE MINIMIZING AND CONTROLLING THE RISKS

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