Greenlist Bulletin

From the Toxics Use Reduction Institute at the University of Massachusetts Lowell

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This is the weekly bulletin of the TURI Library at the University of Massachusetts Lowell. Greenlist Bulletin provides previews of recent publications and websites relevant to reducing the use of toxic chemicals by industries, businesses, communities, individuals and government. You arewelcome to send a message to jan@turi.org if you would like more information on any of the articles listed here, or if this email is not displaying properly.

Today's environmental manager's toolbox: evaluating the EHS attributes of products

Source: Journal of Environmental Sustainability, 2011
Author: Kathryn H. Winnebeck

In response to the public's interest, companies have expanded their focus on reducing their environmental footprint through designing environmentally preferable products. Corporate environmental managers typically work with product design teams on this effort.

This paper explains three tools available to assist in the assessment of EHS attributes of products, namely risk assessment, alternatives assessment, and life cycle assessment. An overview, process appropriate uses, and limitations of each tool are discussed.

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Health and environmental effects of nanomaterials remain uncertain: cohesive research plan needed to help avoid potential risks from rapidly evolving technology

Source: The National Academies, January 25, 2012

Despite extensive investment in nanotechnology and increasing commercialization over the last decade, insufficient understanding remains about the environmental, health, and safety aspects of nanomaterials. Without a coordinated research plan to help guide efforts to manage and avoid potential risks, the future of safe and sustainable nanotechnology is uncertain, says a new report from the National Research Council. The report presents a strategic approach for developing research and a scientific infrastructure needed to address potential health and environmental risks of nanomaterials. Its effective implementation would require sufficient management and budgetary authority to direct research across federal agencies.

Nanoscale engineering manipulates materials at the molecular level to create structures with unique and useful properties -- materials that are both very strong and very light, for example. Many of the products containing nanomaterials on the market now are for skin care and

cosmetics, but nanomaterials are also increasingly being used in products ranging from medical therapies to food additives to electronics. In 2009, developers generated $1 billion from the sale of nanomaterials, and the market for products that rely on these materials is expected to grow to $3 trillion by 2015.

The committee that wrote the report found that over the last seven years there has been considerable effort internationally to identify research needs for the development and safe use of nanotechnology, including those of the National Nanotechnology Initiative (NNI), which coordinates U.S. federal investments in nanoscale research and development. However, there has not been sufficient linkage between research and research findings and the creation of strategies to prevent and manage any risks. For instance, little progress has been made on the effects of ingested nanomaterials on human health and other potential health and environmental effects of complex nanomaterials that are expected to enter the market over the next decade. Therefore, there is the need for a research strategy that is independent of any one stakeholder group, has human and environmental health as its primary focus, builds on past efforts, and is flexible in anticipating and adjusting to emerging challenges, the committee said.

Download the report

PFCs, chemicals widespread in environment, linked to lowered immune response to childhood vaccinations

Source: Harvard School of Public Health, January 24, 2012

A new study finds that perfluorinated compounds (PFCs), widely used in manufactured products such as non-stick cookware, waterproof clothing, and fast-food packaging, were associated with lowered immune response to vaccinations in children. It is the first study to document how PFCs, which can be transferred to children prenatally (via the mother) and postnatally from exposure in the environment, can adversely affect vaccine response. The study appears in the January 25, 2012 issue of the *Journal of the American Medical Association (JAMA)*.

"Routine childhood immunizations are a mainstay of modern disease prevention. The negative impact on childhood vaccinations from PFCs should be viewed as a potential threat to public health," said study lead author Philippe Grandjean, adjunct professor of environmental health at Harvard School of Public Health.

PFCs have thousands of industrial and manufacturing uses. Most Americans have the chemical compounds in their bodies. Prior studies have shown that PFC concentrations in mice similar to those found in people suppressed immune response, but the adverse effects on people had been poorly documented.

The researchers analyzed data on children recruited at birth at National Hospital in Torshavn, Faroe Islands during 1999-2001. A total of 587 participated in follow-up examinations. Children were tested for immune response to tetanus and diphtheria vaccinations at ages 5 and 7 years. PFCs were measured in maternal pregnancy serum and in the serum of children at age 5 to determine prenatal and postnatal exposure.

The results showed that PFC exposure was associated with lower antibody responses to immunizations and an increased risk of antibody levels in children lower than those needed to provide long-term protection. (Antibody concentrations in serum are a good indicator of overall immune functions in children.) A two-fold greater concentration of three major PFCs was associated with a 49% lower level of serum antibodies in children at age 7 years.

"We were surprised by the steep negative associations, which suggest that PFCs may be more toxic to the immune system than current dioxin exposures," said Grandjean.

The PFC concentrations are similar to or slightly below those reported in U.S. women, and most serum PFC levels in Faroese children at age 5 were lower than those measured in U.S. children aged 3 to 5 years in 2001-2002.

The world's first magnetic soap

Source: Royal Society of Chemistry, January 26, 2012

Researchers have created a liquid surfactant that can be moved by a magnet. The discovery opens the way to soaps and detergents which could be directed to a specific point or removed from a mixture by applying an external magnetic field.

Surfactants, which are ubiquitous in society in the form of everything from detergents and emulsifiers to wetting agents, consist of molecules containing a water-soluble anionic 'head' joined to a water-insoluble cationic 'tail'. The molecules then spontaneously aggregate into particles known as vesicles or micelles.

The research team, led by Julian Eastoe at the University of Bristol in the UK, took conventional surfactants and mixed them with an iron salt, resulting in the exchange of the original anion with the iron-containing ion. The resulting ionic liquid surfactant was shown to be able to respond to a magnetic field. Vertically suspended droplets could be deviated by a small magnet and, more spectacularly, surfactant covered by a less dense organic solvent could be pulled through the upper layer of the solvent by a magnet, overcoming both gravity and the surface tension effects at the interface of the two liquids.

To understand the cause of the magnetic effects, the team probed the surfactant using small angle neutron scattering, carried out at the Institut Laue-Langevin neutron source in Grenoble, France.
'This told us that there was internal organisation in the liquid, that there were clusters present,' says Eastoe. These clusters consist of micelles around 10nm across, in which the iron is aggregated in the central core. 'Isolated ions are not of themselves magnetic,' he explains. 'There needs to be a connection between the units. The proximity of the iron in the aggregates provides this communication between the iron-containing parts of the molecule.'

Eastoe says the team is now looking to develop more responsive and sensitive magnetic surfactants. 'What we have done is a proof of principle,' he says. 'We want to know if we can modify and improve chemicals so that they can perform different tricks and different tasks. We have shown that magnetic soaps and surfactants are a reality. It opens the way to being able to tell such solutions where to go, to target them or direct them to specific areas.'

Peter Griffiths, who researches surfactant chemistry at Cardiff University in the UK, is impressed by the study. 'Surfactants are some of the most versatile molecules known to us - indeed they are encountered in huge quantities by us all everyday - because of their ability to alter the properties of surfaces and interfaces,' he says. 'Eastoe has shown another remarkable feature of these fascinating molecules, where magnetic fields may be used to tune the behaviour of the surfactant at the air-water interface, indeed overcoming the effects of gravity it would seem. This study opens the door for a range of new application for surfactants that could lead to more efficient and greener chemical process.'

Honeybee deaths linked to seed insecticide exposure

Source: Purdue University, January 11, 2012

Honeybee populations have been in serious decline for years, and Purdue University scientists may have identified one of the factors that cause bee deaths around agricultural fields.
Analyses of bees found dead in and around hives from several apiaries over two years in Indiana showed the presence of neonicotinoid insecticides, which are commonly used to coat corn and soybean seeds before planting. The research showed that those insecticides were present at high concentrations in waste talc that is exhausted from farm machinery during planting.
The insecticides clothianidin and thiamethoxam were also consistently found at low levels in soil - up to two years after treated seed was planted - on nearby dandelion flowers and in corn pollen gathered by the bees, according to the findings released in the journal *PLoS One* this month.

"We know that these insecticides are highly toxic to bees; we found them in each sample of dead and dying bees," said Christian Krupke, associate professor of entomology and a co-author of the findings.

The United States is losing about one-third of its honeybee hives each year, according to Greg Hunt, a Purdue professor of behavioral genetics, honeybee specialist and co-author of the findings. Hunt said no one factor is to blame, though scientists believe that others such as mites

and insecticides are all working against the bees, which are important for pollinating food crops and wild plants.

Krupke and Hunt received reports that bee deaths in 2010 and 2011 were occurring at planting time in hives near agricultural fields. Toxicological screenings performed by Brian Eitzer, a co-author of the study from the Connecticut Agricultural Experiment Station, for an array of pesticides showed that the neonicotinoids used to treat corn and soybean seed were present in each sample of affected bees. Krupke said other bees at those hives exhibited tremors, uncoordinated movement and convulsions, all signs of insecticide poisoning.

Seeds of most annual crops are coated in neonicotinoid insecticides for protection after planting. All corn seed and about half of all soybean seed is treated. The coatings are sticky, and in order to keep seeds flowing freely in the vacuum systems used in planters, they are mixed with talc. Excess talc used in the process is released during planting and routine planter cleaning procedures.

"Given the rates of corn planting and talc usage, we are blowing large amounts of contaminated talc into the environment. The dust is quite light and appears to be quite mobile," Krupke said. Krupke said the corn pollen that bees were bringing back to hives later in the year tested positive for neonicotinoids at levels roughly below 100 parts per billion.

"That's enough to kill bees if sufficient amounts are consumed, but it is not acutely toxic," he said.
On the other hand, the exhausted talc showed extremely high levels of the insecticides - up to about 700,000 times the lethal contact dose for a bee.

"Whatever was on the seed was being exhausted into the environment," Krupke said. "This material is so concentrated that even small amounts landing on flowering plants around a field can kill foragers or be transported to the hive in contaminated pollen. This might be why we found these insecticides in pollen that the bees had collected and brought back to their hives."

Krupke suggested that efforts could be made to limit or eliminate talc emissions during planting.

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