

Emerging and Unknown Pollutants

White Paper for the Maine Air Toxics Initiative (MATI)

By the Maine DEP

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In 1990, the US Congress developed the Clean Air Act Amendments (CAAA). Within these Amendments a list of 188 Hazardous Air Pollutants (HAPs) were identified. No chemicals have been added to this HAP list since then.

The issue of emerging pollutants has risen to the forefront within the past 5 to 8 years. Regulators are attempting to identify the some 80,000 new chemicals that are produced through industry and manufacturing yearly and that may create health risks. There are two major categories of emerging air pollutants; known chemicals to industry and commerce, that are previously unrecognized as pollutants, and new chemicals introduced, such as drugs, pharmaceuticals, cosmetics, pesticides, etc. The known universe contains over 22 million organic and inorganic substances. Approximately 6 million are commercially available. EPA regulates 188 of these hazardous air pollutants (HAPs).¹

The European Union (EU) made great strides in identify these unknown chemicals with its program REACH (**R**egistration, **E**valuation and **A**uthorization of **C**hemicals). Canada is developing a similar strategy for 4,000 chemicals to be studied for health effects.² When Canada releases its data, the Maine DEP will evaluate the list of chemicals for possible ambient air toxics that should be investigated .

Many of the chemicals identified by the EU do not pose a direct air issue but potentially could after the intended use and disposal in the waste stream. Some of the industries and process are worthy of consideration due to either regulations or health impacts. These include nanotechnology, personal care products, Perfluorooctanoic acid (PFOAs), Teflon, and Bromated Flame Retardants (BFRs) which are discussed below. Further information about the EU Reach program is available from the following links:

<http://ec.europa.eu/environment/chemicals/reach.htm>

http://ec.europa.eu/enterprise/reach/index_en.htm

<http://www.organicconsumers.org/politics/EUchemical112105.cfm>

EPA conducted workshops in 2003 and 2005 on Emerging Pollutants. However, most of the focus of these workshops was on chemicals in wastewater rather than air. Some of the pollutants focused on in these conferences were pharmaceuticals, personal care products, pesticides/herbicides and brominated flame-retardants. Conference proceedings are available at the following links:

¹ EPA/ORD Non-Regulated Contaminants: Emerging Issues slide presentation <http://www.epa.gov/esd/chemistry/pharma/images/iom-ppt-2003.pdf>

² Canadian Chemicals to be Tested, <http://www.theglobeandmail.com/servlet/story/RTGAM.20060914.wxchemicals14/BNSStory/specialScienceandHealth/home>

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http://www.epa.gov/osp/regions/emerpoll_rep.pdf

<http://www.newmoa.org/prevention/chemicalspolicy/workshops/science2005/compendium/>

The Great Lakes Region US States & Canadian Provinces also have developed a Memorandum of Understanding (MOU) concerning "Emerging Pollutants." Details on this MOU are available at:

<http://www.epa.gov/history/topics/canada/04.htm>

http://www.c2p2online.com/documents/Ted_Smith.pdf

Nanotechnologies

Nanotechnology is the process in which nano materials, hundreds of times smaller than the diameter of a human hair, are produced and utilized in a wide array of products. It involves the manufacture and manipulation of materials at the molecular or atomic level. Researchers are exploring ways to build at this scale, reengineering familiar substances like carbon and gold to create new materials with novel properties and functions. Nano particles in use today are found in numerous products from suntan lotions to tennis balls to medicinal applications. There are presently over 500 products being sold that claim they are made with nano-scale or engineered nano-materials. The issue of concern to the Maine Air Toxics Initiative is what will happen with these products after use or when the material is otherwise introduced into the environment.

For example, suntan lotions and sunscreens now use nanoparticles. About 10 - 20 years ago, the sunscreens with a high skin protection factor (SPF) were chalky white because of the relatively large size of compounds like titanium dioxide that are white in color. What researchers found is that Titanium dioxide particles in the nano-size are small enough that they do not reflect visible wavelengths of light but still absorb UV light. Therefore, they serve as very good UV absorbers but do not reflect the chalky white color. Today almost all sunscreen with a SPF above 39 incorporate nano-particles of titanium dioxide or zinc oxide. These products have been ruled safe by the US Food and Drug Administration (US FDA) and the Scientific Committee for Cosmetic Products (SSNCF) in the European Union. However, the US FDA has been challenged by several environmental organizations and they are now reviewing the US FDA policy. See further links below.

At this time, little is known about the environmental impacts of nano-particles. The EU, Canada, and several US environmental advocacy groups have issued cautions and concerns. At this time, no risk assessments have been compiled in the US.

The following are links to EPA's white paper and the FDA nanotechnology issue.

<http://www.epa.gov/osa/nanotech.htm>

<http://www.fda.gov/nanotechnology/agenda1010.html>

<http://www.fda.gov/nanotechnology/>

Other Internet sources of information about Nanotechnology can be found at the following links:

http://es.epa.gov/ncer/publications/workshop/pdf/10_20_05_nanosummary.pdf

http://es.epa.gov/ncer/publications/workshop/pdf/10_26_05proceeding1.pdf

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http://www.pewtrusts.com/pdf/Nanotech_0905.pdf

A broadcast of "To the Point" at KCRW titled "The Brave New World of Nanotechnology" on January 17, 2006, is in the archives of <http://www.kcrw.com/archive> and contains more information about specific products and uses of nanotechnology.

Pharmaceuticals and Personal care products (PPCPs)

Pharmaceuticals and Personal care products (PPCPs) comprise a very broad, diverse collection of thousands of chemical substances, including prescription and over-the-counter therapeutic drugs, fragrances, cosmetics, sun-screen agents, diagnostic agents, nutraceuticals, biopharmaceuticals, and many others. Large quantities of a wide spectrum of PPCPs (and their metabolites) can enter the environment following use by multitudes of individuals or domestic animals and subsequent discharge to (and incomplete removal by) sewage treatment systems. No municipal sewage treatment plants are engineered for PPCP removal. Most of these by-products are believed to remain in the effluent, some may be transferred to the sludge, but little is expected to enter the air.

Europe has investigated a wide array of perfumes and fragrances, and some have been identified as pervasive in the environment, similar to dioxin. For this reason these perfumes are banned throughout most of the industrialized world. Specifically synthetic musk is found in places like the arctic and is so prevalent that the laboratories where initial testing was performed found elevated levels in ambient air as well as inside the laboratory.

The following links have more information about PPCPs:

<http://www.epa.gov/esd/chemistry/pharma/faq.htm>

<http://www.epa.gov/nerlesd1/chemistry/pharma>

<http://www.fpinva.org/FragranceReview.htm>

<http://www.naturalingredient.org/syntheticfragrances.htm>

http://www.ameliaww.com/fpin/fragrance_rti4948.htm

Perfluorooctanoic acid (PFOAs)

Perfluorooctanoic acid (PFOA) is used in the process that makes water, stain, grease resistant products; Teflon®; and food packaging. PFOAs are bioaccumulative and cause birth defects in laboratory animals, including cancer, liver damage and birth defects. Worker cohort studies showed a 3.3% increase in cancer. PFOAs are found in the blood of more than 95% of Americans. The World Wildlife Federation (WWF) in its "Causes for Concern" report states that "scientists have found per fluorinated compounds, in dolphins, whales and cormorants in the Mediterranean; seals and sea eagles in the Baltic; and polar bears."

In March of 2006, EPA reached voluntary agreements with the eight manufacturers in the world to phase out production of PFOAs. Under this stewardship program, from the 2000 base year, EPA is projecting a reduction of 95% by 2010 and virtual elimination by 2015.

Although Teflon is not a PFOA, PFOAs are presently used in the production of Teflon®. However, according to the DuPont web page (see below), it is in the process of changing the

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method of Teflon® production. When Teflon® is heated too much, toxic PFOA fumes are released, which are believed to have killed up to a million pet birds. PFOA are also found in Scotchgard™ and Scotchban™ produced by 3M.

The following links have more information about PFOAs and Teflon®:

<http://www.epa.gov/opptintr/pfoa/index.htm>

<http://www.epa.gov/opptintr/pfoa/pubs/pfoastewardship.htm>

<http://yosemite.epa.gov/opa/admpress.nsf/68b5f2d54f3eefd28525701500517fbf/fd1cb3a075697aa485257101006afbb9!opendocument>

http://www2.dupont.com/Media_Center/en_US/news_releases/2006/article20060127c.html

http://www.usatoday.com/news/health/2006-01-25-epa-pfoa_x.htm

http://www.defending-science.org/case_studies/perfluorooctanoic-acid.cfm

<http://www.ewg.org/issues/pfcs/20050112/scienceanalysis.php>

http://ec.europa.eu/health/ph_risk/committees/04_scher/docs/scher_o_014.pdf

http://www.usatoday.com/news/health/2006-02-15-epa-teflon-carcinogen_x.htm

<http://www.cbsnews.com/stories/2005/01/12/health/main666449.shtml>

http://www.newmediaexplorer.org/sepp/2004/01/31/toxic_teflon_frying_pans.htm

<http://assets.panda.org/downloads/causesforconcern.pdf>

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Bromated flame retardants (BFRs = penta-BDE, octa-BDE, and deca-BDE)

Brominated flame retardants (BFRs) have routinely been added to plastics and polyurethane foam for several decades in a successful effort to reduce fire-related injury and property damage. However, concern for BFRs has risen because of their widespread production and use; strong evidence of increasing contamination of the environment, wildlife, and people; and emerging information of potential health effects. Polybrominated Diphenyl Ethers (PBDEs) constitute a class of Brominated Flame Retardants (BFRs). The penta and octa PBDE mixtures appear to be major contributors to current human body levels. The highest levels of PBDEs in human tissues are found in Canada and the U.S., which is the largest producer and consumer of PBDE products, with levels in Americans is 10 -70 times higher that levels reported for Europe and Japan. Review of available data by CDC now suggests that decaBDE is present throughout the environment and that levels are increasing. The chemical has been found in house dust, sewage sludge, fish, birds, mammals and human breast milk.

It is suspected that these chemicals behave similar to dioxin since their structures are similar and laboratory studies have shown that these chemicals are endocrine disruptors. Deca-, Octa-, and Penta-BDE are carcinogenic in laboratory animals. Like dioxin, BFRs accumulate in fatty tissue and they may be passed to infants through breast milk.

In 2003, Maine banned the sale of products containing commercial PBDE formulations-- pentaBDE and octaBDE, effective January 1, 2006. Additionally, the bromine industry has voluntarily ceased production of the octa and penta PBDE mixtures. DecaBDE is the remaining PBDE mixture in production and is used mainly as a flame retardant in TV casings. DEP is preparing a report on decaBDE for submittal to the Legislature in January 2007 that will contain an assessment of risks of products containing decaBDE, and assess the availability of safer alternatives. The legislature will consider this report as it determines whether to ban the sale of products containing decaBDE effective January 1, 2008. No other state in the US has banned the sale of products containing decaBDE.

Further information on BFRs is available at the following links:

<http://www.maine.gov/dep/rwm/publications/legislative-reports/pdf/bromfeb2005.pdf>

<http://www.oecd.org/dataoecd/44/46/36423809.pdf>

<http://www.ehponline.org/members/2003/6559/6559.pdf>

<http://www.sciencenews.org/articles/20011013/bob18.asp>

http://pubs.acs.org/subscribe/journals/esthag-w/2003/dec/policy/rr_flame.html

<http://www.moea.state.mn.us/publications/dfe-selection.pdf>

<http://www.epa.gov/oppt/pbde/pubs/proj-plan32906a.pdf>

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