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## Chemicals from Personal Care Products Pervasive in Chicago Air

On the brink of a federal review, chemicals found in deodorants, lotions and hair conditioners are showing up in Chicago's air at potentially alarming levels

By Brian Bienkowski and Environmental Health News | Tuesday, April 30, 2013 | 1 comments

On the brink of federal regulatory review, chemicals in deodorants, lotions and conditioners are showing up in Chicago's air at levels that scientists call alarming.

The airborne compounds – cyclic siloxanes – are traveling to places as far as the Arctic, and can be toxic to aquatic life.

"These chemicals are just everywhere," said Keri Hornbuckle, an engineering professor at the University of Iowa and senior author of a new study.

Concentrations were 10 times higher in Chicago's air than in the air of West Branch, Iowa, and four times higher than in Cedar Rapids, Iowa.

Hornbuckle said the findings are worrisome because the compounds are ubiquitous and have been detected at much higher levels than other common environmental contaminants. "These are big concentrations and, truthfully, are concerning to me," she said.

But whether there are any risks from breathing the chemicals is unknown. There have been no studies to measure people's exposures or investigate potential health risks.

In Chicago's air, the most prevalent compound, known as D5, was at levels three times greater than what polychlorinated biphenyl (PCBs) typically are there. PCBs are persistent chemicals banned in the 1970s. D5 is most commonly used in soaps, lotions, shampoos and conditioners.

The compounds also are probably in high concentrations in the air of many cities, but no one has looked elsewhere yet. The United States produces or imports between 200 million and one billion pounds of cyclic siloxanes annually, according to U.S. Environmental Protection Agency estimates.

Many people rub the compounds all over their bodies every day. They are in about half of all personal care items, comprising up to two-thirds of the product's mass in some cases, according to a 2008 study by the New York Department of Public Health and a 2009 Health Canada study. They're used in such products because they are odorless, colorless and feel smooth.



**CHI-TOWN AIRBORNE COMPOUNDS:** With elevated levels of cyclic siloxanes in Chicago's air, it's possible that wildlife in the world's largest freshwater source—the Great Lakes—are contaminated with these chemicals.

*Image: Flickr/Steve G*

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The new study did not track where the airborne chemicals came from, but it suggests that personal care products are a major source since D5 was the dominant compound in both indoor and outdoor air samples.

Indoor air concentrations in University of Iowa labs and offices were 30 and 75 times higher than those in the outdoor air of Cedar Rapids and West Branch, and D5 made up 97 percent of mass of the indoor samples.

“It’s population based,” said Rachel Yucuis, a masters student at the University of Iowa and lead author of the new study. “And indoors you have both personal products sitting out, and what’s on people, in a concentrated space.”

At night, levels of cyclic siloxanes were about 2.7 times higher than in the daytime, which is probably due to changes in the atmosphere at night, Yucuis said.

D4 – used in polishes, detergents, sealants, adhesives and plastics -- is toxic to wildlife, according to the EPA. Previous lab studies found the compound toxic to certain species – small rainbow trout and water fleas – at concentrations that are expected in the environment.

In addition, D4 causes tumors, reproductive problems, altered organ size and acts like a weak estrogen in studies of lab animals. D5 has caused changes in the nervous systems, livers and immune systems of lab animals.

D4 and D5 are not currently regulated anywhere in the world. But the EPA announced last year that it would evaluate whether D4 should be regulated under the Toxic Substances and Control Act. However, the agency is less concerned about outdoor air concentrations than it is about the risks to water-dwelling creatures, an EPA spokesperson said in an email.

The accumulation potential and toxicity of cyclic siloxanes are debated by scientists and industry representatives.

Both D4 and D5 are “safe for human health and the environment when used as intended,” Karluss Thomas, senior director of the American Chemistry Council’s Silicones Environmental, Health and Safety Center, said in an emailed response.

He said higher levels of the compounds in places such as Chicago are not cause for concern because there is no evidence they harm humans.

But a science panel of the European Commission that reviewed existing data about D4 concluded in 2006 that it was “unable to assess the risk to consumers when D4 is used in cosmetic products.”

“Despite the size of the dossier submitted by industry for evaluation, it is unfortunate that the dossier lacked meaningful information/data on actual consumer exposure to D4,” the panel said.

Over the past decade, D5 has largely replaced D4 in cosmetics, according to cyclic siloxane studies.

California health officials have expressed concern about this growth in use of D5, saying in 2007 that “it has potential public health impacts” and “has been measured in several aquatic species at parts per million concentrations, and appears to have a long half-life in humans. Thus, D5 persistence in the environment and in animal and human tissues is a concern.”

How the chemicals build up in aquatic creatures is not well understood.

Thomas cited wildlife studies in Minnesota and Europe showing that animals at the top of food webs had lower concentrations than animals at the bottom.

However, other research shows the compounds were accumulating in the food chains of Norway’s Lake Mjosa and England’s Humber

Estuary, according to work by Michael McLachlan and Stockholm University colleagues.

McLachlan said the compounds have an odd structure that makes it difficult to understand them, but he said that most scientists say they are accumulating. "Standard chemicals usually mostly end up in sediment," McLachlan said. "However, with cyclic siloxanes, a much smaller portion ends up in sediment and a much larger portion ends up in fish."

With elevated levels in Chicago's air, it's possible that wildlife in the world's largest freshwater source – the Great Lakes – are contaminated with them, but no one has looked yet, Hornbuckle said. Labs across the Great Lakes region are investigating ways to measure the chemicals, according to a 2010 study on emerging contaminants in the Great Lakes from Environment Canada.

Cyclic siloxanes are world travelers. It takes about two weeks for D4 and D5 to degrade in the atmosphere. "Air can circle the entire globe in a week," McLachlan said.

In 2011, Canadian researchers sampled air at 20 sites worldwide – including five in the Arctic – and found the compounds in all places. In winter, when there is less sunlight to break down the chemicals, the Arctic sees a spike, McLachlan said.


Researchers also have found that wastewater treatment plants and sewage sludge are highly contaminated with the chemicals.

"They [cyclic siloxanes] are much different compared to other environmental chemicals," McLachlan said. "We're really just starting to understand how they behave."

*This article originally ran at Environmental Health News, a news source published by Environmental Health Sciences, a nonprofit media company.*

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