# Concentrations Of Certain Toxins In Breast Milk Are Low, Study Finds

February 13 2007

Nursing mothers worried about passing harmful chemicals to their infants through breast milk should be aware that the air inside their home may pose a greater health risk.

Researchers from Ohio State and Johns Hopkins universities measured the levels of harmful gases called “volatile organic compounds” (VOCs) in human milk and in the air inside the homes of three lactating mothers in inner-city Baltimore .

A nursing infant's exposure to VOCs from indoor air was 25- to 135-fold higher than what that infant ingested through breast milk. In fact, levels found in milk were far below the U.S. EPA's maximum contaminant levels for drinking water.

“I was worried that we were going to see a much larger contribution from milk, so I am tremendously relieved by these findings,” said Timothy Buckley, the study's senior author and an associate professor of public health at Ohio State.

Although the study is small and provides just a preliminary assessment of VOC levels in human milk, it is one of the first studies of its kind in the United States in which researchers are able to quantify levels of these compounds in human milk.

“We ought to focus our efforts on reducing indoor air sources of these compounds,” said Sungroul Kim, the study's lead author and a

postdoctoral fellow with the Johns Hopkins Bloomberg School of Public Health.

Both Buckley and Kim stress that despite human milk's vulnerability to chemical contamination, the health benefits of nursing far outweigh the risks, and that breast milk is the best source of nutrition for a growing infant.

The findings currently appear online at the website for the journal *Environmental Science & Technology*. Buckley and Kim conducted the study with Rolf Halden, an assistant professor of public health at Johns Hopkins.

The researchers analyzed eight milk samples from three lactating mothers living in inner-city Baltimore. From May through July 2005, the mothers provided a milk sample each morning for three consecutive mornings. The women were asked to manually express milk into a glass jar and then seal the jar with a provided cap. The researchers also placed air samplers in the living rooms of the women's homes – each woman lived in a two-story row home on a busy street. Air samples were collected over the three days that coincided with milk collection.

The researchers analyzed the milk and indoor air samples for four VOCs – benzene, MTBE (methyl tertiary butyl ether), toluene and chloroform. Automobile exhaust is the primary source for benzene and MTBE, while toluene comes from car exhaust as well as consumer products such as glue, shoe polish, and paint thinner. Treated drinking water is the biggest source of chloroform inside most homes.

In the laboratory, the researchers transferred the milk samples to vials. They then inserted a syringe through the cap on the vial and into the air space between the cap and the milk. The VOCs in breast milk samples disperse into this air space, and the gases were collected with a needle

coated with absorbent material. The researchers collected indoor air samples by passing air through a material that specifically absorbed the VOCs of interest.

Once they collected the VOCs, the researchers used gas chromatography-mass spectrometry to analyze the levels of each compound in the milk and indoor air samples. This analysis technique differentiates between various substances in a given sample.

The milk samples had higher concentrations of chloroform than any other of the three VOCs. Next came toluene, followed by benzene and MTBE. The researchers had also acquired five additional human milk samples from a milk bank in Raleigh, N.C., provided by anonymous donors. They ran these samples through the same tests, and found that the VOC levels in this milk were comparable to those of the Baltimore samples.

As there are no health-based guidelines or standards for chemicals in human milk, the researchers compared the concentrations in the milk samples to the U.S. EPA's safe drinking water standards. The levels of chloroform, benzene and toluene in milk were well below the EPA's maximum contaminant level for drinking water, by factors of 180, 40 and 2170, respectively. MTBE isn't specifically regulated in drinking water by the EPA.

“We were pleasantly surprised to see these relatively low concentrations of VOCs in human milk,” said Buckley, who also chairs the Division of Environmental Health Sciences in Ohio State's College of Public Health. “Especially for inner-city settings, which is where VOC levels tend to be the highest.”

The rank of VOC concentrations in indoor air differed from that in milk, with toluene levels ranking the highest followed by MTBE,

chloroform and benzene. After comparing the level of VOCs in milk to the concentrations in the air, the researchers found that higher levels of toluene, benzene and MTBE in indoor air meant greater concentrations of the contaminants in breast milk. This suggests that the indoor air was the likely source for the VOCs that eventually get into the mother's breast milk.

However, the researchers did not see this relationship with chloroform.

“Chloroform exposure occurs not only through inhalation, but also through water ingestion and absorption through the skin while showering or bathing,” Buckley said. “So in this case, exposure was probably poorly captured by the air samplers set up in the living rooms.”

The indoor VOC levels measured in the current study are comparable to what has been reported in inner cities across the United States, the researchers say.

“Therefore, it's also likely that the levels of VOCs in human milk that we found are typical for lactating women living in urban areas,” Buckley said.

VOCs are a fact of modern life – nearly every human on the planet has at least a trace of these compounds in their body. The focus should be on minimizing our exposure to their sources, Buckley said.

“With respect to automobile sources of air toxics, the level of traffic and your distance from that traffic both affect what you breathe,” Buckley said. “The homes in our study were within five or six feet of busy roadways. Many inner-city residents may not have the choice to reside very far from these heavily used roads.”

Source: Ohio State University