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Research suggests breast-fed infants metabolize perchlorate

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A group of infants and mothers tested at The University of Texas at Arlington have given researchers another reason to extol the unique properties of breast milk.

A team led by Purnendu "Sandy" Dasgupta, Jenkins Garrett Professor of Chemistry and Biochemistry at UT Arlington, has found evidence that breast-fed babies can metabolize the environmental contaminant perchlorate, decreasing their risks of detrimental developmental effects from exposure.

The research suggests a link between this characteristic and bifidobacteria, bacteria that is plentiful in the digestive systems of breast-fed babies.

The team's work with 18 pairs of infants and mothers is detailed in the article "Breast-fed Infants Metabolize Perchlorate," which was recently accepted for publication by the American Chemical Society journal Environmental Science & Technology and is available online.

"Both Centers for Disease Control researchers and our lab have previously observed that there is a higher concentration of perchlorate in breast milk versus formula. Although the merits of breastfeeding far outweigh any risk posed by this, it has caused some mothers concern." Dasgupta said. "Our results suggest that nature has already devised a way to at least partly take care of it."

Dasgupta's team did not find similar evidence of perchlorate metabolism in a small number of samples from formula-fed infants. "Formula-fed babies get much less perchlorate anyway, so the risk is not as great as the breast-fed babies," Dasgupta said.

Carolyn Cason, UT Arlington interim vice president for research, said Dasgupta's findings have added valuable information to what is known about the benefits of breastfeeding and the impact of environmental contaminants.

"The worldwide chemistry community has honored Dr. Dasgupta time and again for his willingness to address a diverse group of problems with novel solutions," Cason said.

Perchlorate occurs naturally in the environment and in rocket fuel, fireworks, some fertilizers and road flares. Evidence suggests it can block the uptake of iodine to the thyroid and disrupt the production of hormones necessary for normal neurological development. These effects would be particularly harmful to infants and young children.

Reports of high levels of exposure have not been widespread, but concerns remain and government studies show between 5 million to 17 million people may be drinking water containing perchlorate. The U.S. Environmental Protection Agency announced in February 2011 that it would review emerging science on perchlorate and develop a regulation "to protect Americans from any potential health impacts."

In 2005, Dasgupta gained national attention for his discovery of levels of perchlorate concentration as high as 92 and an average of 10.5 micrograms per liter in breast milk samples from across the U.S. By comparison, California has a limit of 6 micrograms per liter for perchlorate in drinking water.

In the current study, Dasgupta and his team studied 43 breast milk samples and 39 urine samples from 13 pairs of breast-fed infants and mothers, as well as 21 urine samples and 21 formula samples from five pairs of formula-fed infants and mothers. They measured perchlorate and iodine concentrations in the breast milk and corresponding infant urine samples.

Neither iodine nor perchlorate has been known to significantly accumulate or metabolize in the body. So, concentrations of iodine and perchlorate in the breast milk compared to the amount of each in the baby's urine should result in similar ratios.

The researchers found the ratios were similar for formula-fed babies. But, for breast-fed babies, they found that the perchlorate concentration in the urine was 52 percent less than what is expected if there was no loss.

The team's discoveries indicate some metabolism of the perchlorate is taking place in the breast-fed infants, said C. Phillip Shelor, a graduate assistant in Dasgupta's lab and the lead author of the paper. To confirm that bifidobacteria is likely responsible, the team added perchlorate to store-bought milk with cultured bifidobacteria in it – the perchlorate was significantly destroyed with time.

The work was funded by a grant from The Gerber Foundation, a charity benefiting children that was established by the founder of the baby foods brand and is now an independent entity. Other co-authors include: Andrea B. Kirk, Martina Kroll and Catrina A. Campbell, all associated with Dasgupta's lab at UT Arlingto,n and Pankaj Choudhary, an associate professor of biostatistics at UT Dallas.

Dasgupta said it is not his intent to downplay the risks of perchlorate exposure or the need for education about getting proper iodine levels

into breastfeeding mothers' diets. He hopes the current work will add to the public discussion and inspire additional analysis.

"This is definitely something worth looking at further," he said.

Provided by University of Texas at Arlington

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