

# Dioxins in food chain linked to breastfeeding ills

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Exposure to dioxins during pregnancy harms the cells in rapidly-changing breast tissue, which may explain why some women have trouble breastfeeding or don't produce enough milk, according to a University of Rochester Medical Center study.

Researchers believe their findings, although only demonstrated in mice at this point, begin to address an area of health that impacts millions of women but has received little attention in the laboratory, said corresponding author B. Paige Lawrence, Ph.D., associate professor of Environment Medicine and of Microbiology and Immunology at URM.

"Estimates are that three to six million mothers worldwide are either unable to initiate breastfeeding or are unable to produce enough milk to nourish their infants," Lawrence said. "But the cause of this problem is unclear, though it has been suggested that environmental contaminants might play a role. We showed definitively that a known and abundant pollutant has an adverse effect on the way mammary glands develop during pregnancy."

Dioxins are generated mostly by the incineration of municipal and medical waste, especially certain plastics. Most people are exposed through diet. Dioxins get into the food supply when air emissions settle on farm fields and where livestock graze. Fish also ingest dioxins and related pollutants from contaminated waters. When humans take in dioxin - most often through meat, dairy products, fish and shellfish - the toxin settles in fatty tissues; natural elimination takes place very slowly.

The typical human exposure is a daily low dose, which has been linked to possible impairment of the immune system and developing organs.

In 2004 Lawrence's laboratory made the novel discovery that dioxin impairs the normal development of mammary glands during pregnancy. However, the underlying mechanisms were unclear, as was the extent of injury and whether exposure during certain stages of pregnancy had more or less of an impact on milk production.

This week, in an online report in *Toxicological Sciences*, researchers showed that dioxin has a profound effect on breast tissue by causing mammary cells to stop their natural cycle of proliferation as early as six days into pregnancy, and lasting through mid-pregnancy. In tissue samples from mice, exposure to dioxin caused a 50-percent decrease in new epithelial cells. This is important, Lawrence said, because mammary glands have a high rate of cell proliferation, especially during early to mid-pregnancy when the most rapid development of the mammary gland occurs.

Researchers also found that dioxin altered the induction of milk-producing genes, which occurs around the ninth day of pregnancy, and decreased the number of ductal branches and mature lobules in the mammary tissue.

The timing of dioxin exposure also seemed to be significant, the study noted. For example, when exposure occurs very early in pregnancy but not later, lab experiments showed that sometimes the mammary glands can partially recover from the cellular injury. However, although it is important to understand timing of exposure for research purposes, it is irrelevant for humans, who cannot really control their exposure to dioxins, Lawrence said.

"Our goal is not to find a safe window of exposure for humans, but to

better understand how dioxins affect our health," she said. "The best thing people who are concerned about this can do is think about what you eat and where your food comes from. We're not suggesting that we all become vegans -- but we hope this study raises awareness about how our food sources can increase the burden of pollutants in the body. Unfortunately, we have very little control over this, except perhaps through the legislative process."

Much of Lawrence's research focuses on a transcription factor known as aryl hydrocarbon receptor, or AhR. When pollutants enter the body they bind to AhR, which then turns on certain genes responsible for detoxification. By using dioxin to activate AhR, researchers have learned that dioxin impairs the ability to fight off infection. The link between dioxin and the immune system is still being studied, but meanwhile researchers looked further at the mammary tissue after observing coincidentally that cells involved in milk production were sustaining so much damage that rodents could not nourish their offspring.

The next step is to understand what controls the differentiation process. An important question to answer, Lawrence said, is whether the toxic harm is occurring directly in the breast, or if it occurs throughout the entire body but has a unique manifestation in the fatty mammary tissue.

The URMC research group is also studying a possible connection between dioxin and breast cancer. Their hypothesis is that dioxin exposure in some people might cancel the general protection that pregnancy has on [breast tissue](#) against breast cancer.

Source: University of Rochester Medical Center ([news](#) : [web](#))

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