

Research links fire retardant exposure to hormone-related DNA modifications

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Emory University researchers have learned that exposure to Polybrominated Biphenyl (PBB), an endocrine-disrupting fire-retardant, is associated with epigenetic marks, which affects the way genes are expressed. Their findings show that PBB exposure is consistent with hormone-related health effects reported by Michigan residents,

following a 1973 food supply contamination. The results were recently published in the journal *Epigenetics*.

This research is based on the Michigan PBB Registry, which was established by the Michigan state health department in the late 1970's to track the health of thousands of residents after PBB was accidentally mixed into livestock feed and sold to farmers throughout the state of Michigan. The mistake was not discovered until a year later, at which point, some 70 to 90 percent of Michiganders had been exposed to PBB by eating contaminated meat, milk and eggs.

Michele Marcus, Ph.D., MPH, professor in the Departments of Epidemiology, Environmental Health and Pediatrics in Emory University's Rollins School of Public Health and Emory's School of Medicine, has been researching the health effects of PBB for more than 25 years. Five years ago, Alicia K. Smith, Ph.D., associate professor and vice chair of research in the Department of Gynecology and Obstetrics at Emory, joined Marcus and her team of Emory researchers to search for answers related to PBB exposure.

Marcus began her work with this cohort because of previous reports that girls were maturing earlier and breast cancer was increasing in the United States and Europe. "We were concerned that exposure to toxic chemicals might be contributing to these problems," says Marcus. "Since PBB can act like a hormone, or like a weaker version of estrogen, we were concerned that people who were exposed to PBBs might experience similar health problems."

In fact, Marcus and her team found that there was an increased risk of breast cancers among women with high PBB exposure. Female children of highly exposed women were found to mature earlier and have subsequent miscarriages, while male children had urinary and genital problems. In 2015, blood testing revealed that 60 percent of those tested

in Michigan still had elevated levels of PBB. Marcus teamed up with Smith to explore the biological mechanisms that might lead to those health effects.

Now, recent research by the Emory team involved testing blood samples of 658 PBB Registry study participants. The results were analyzed to determine whether epigenetic marks are connected to endocrine system pathways.

"This is the first study to identify epigenetic differences that associate with exposure to PBB," says Smith. "This study goes beyond characterizing health conditions in those exposed to PBB to identify molecular differences in their DNA. We found that those with higher levels of exposure to PBB have common patterns of DNA methylation that are similar to what we see in hormones like estrogen and are likely to change the way some genes are expressed."

"It also means that we may be able to connect the biological dots between PBB exposure and hormone-related [health](#) effects," explains Marcus. "Our findings suggest that areas other than hormone functioning may be impacted by PBB exposure, as well."

While there are currently no approved treatments for PBB exposure, these recent developments are important to the Michigan community, some 40 years after the toxic contamination occurred.

"These results help to reinforce that the community's concerns regarding the long-lasting effects of PBB exposure is warranted and that the consequences of that [exposure](#) are still relevant today," Smith says.

Because of Marcus' history of PBB research and connection to the Michigan community, the Michigan Department of Health and Human Services transferred the Michigan PBB Registry to Rollins School of

Public Health in 2010. Marcus stays in close contact with the registry members and families who have been affected by the PBB contamination by hosting several community meetings each year. The PBB community contributes their knowledge and has become a true partner in the research.

More information: Sarah W. Curtis et al. Exposure to polybrominated biphenyl (PBB) associates with genome-wide DNA methylation differences in peripheral blood, *Epigenetics* (2019). [DOI: 10.1080/15592294.2019.1565590](https://doi.org/10.1080/15592294.2019.1565590)

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