

The Michigan PBB Research Registry

Information for Clinicians



60% of recently tested Michiganders still have elevated levels of PBB in their blood*

Michigan PBB Contamination – Quick Facts

In early 1973, the Michigan Chemical Company (Velsicol) accidentally shipped polybrominated biphenyls (PBB), a fire-retardant chemical, to the Farm Bureau instead of magnesium oxide, a nutritional supplement.

- The PBB was mixed into livestock feed and consumed by cattle, pigs, and chickens. Contaminated farm products were distributed throughout the state until the accident was discovered about a year later.
- The major acute health effects reported were skin rashes, hair loss, and memory problems, though these effects were mainly transient, and prevalent regardless of the level of PBB exposure.
- PBB is stored in adipose tissue and remains in the body for many years. PBB impacts the endocrine system and has been shown to interfere with steroid hormones estrogen and testosterone, as well as thyroid function in animal models.

Michigan PBB Research Registry

To study the long-term health effects of the PBB exposure, the Michigan Health Department created a registry of more than 6,000 people who consumed the contaminated farm products or worked at the chemical plant.

- The children of exposed women may have been exposed to PBB *in utero* and through breast milk. The children of exposed men may have been exposed to PBB brought home on clothing.
- The health effects of PBB are still being investigated but research has identified several notable findings among the exposed population. (Research Findings listed on second page.)
- Most of the findings are based on studies that compared PBB registry members with high blood levels of PBB to those with low (or non-detectable) levels of PBB.
- Other risk factors for the health outcomes were considered and adjusted for, when possible.

*Chang et al, 2020. Serum concentrations of polybrominated biphenyls (PBBs), polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) in the Michigan PBB Registry 40 years after the PBB contamination incident. *Environment International* 137:105526.

For more information please visit
www.PBBregistry.emory.edu



Research Findings related to the Michigan PBB Contamination

- More thyroid problems were found among those exposed to higher levels of PBB and differences in thyroid hormones were associated with PBB exposure in childhood.¹
- Children of women with high exposure to PBB were more than twice as likely to have lower Apgar scores at birth.²
- Among women exposed as children, PBB levels were associated with differences in menstrual hormone levels.³
- Higher risks of breast cancer,⁴ lymphoma and gastrointestinal cancers⁵ were associated with PBB exposure. The International Agency for Research on Cancer and the US National Toxicology Program have classified PBB as a likely human carcinogen.⁶
- PBB can cross the placenta and has been detected in breast milk of exposed mothers. Children born to highly exposed mothers were more likely to have PBB detected in their blood, and children of highly exposed mothers who were also breastfed were more likely to have PBB detected in their blood than children who were not breastfed.⁷
- Breastfed daughters exposed to high levels of PBB *in utero* had an average age of menarche approximately one year earlier than breastfed daughters exposed to low levels of PBB *in utero* or daughters who were not breastfed.⁸
- Daughters exposed to higher levels of PBB *in utero*, now of reproductive age, were two to four times more likely to experience miscarriages compared to daughters with low *in utero* exposure.⁹
- Sons of women highly exposed to PBB were twice as likely to report a genitourinary condition (hernia, hydrocele, cryptorchidism, hypospadias, or varicocele), than sons of lower exposed women.¹⁰

References

1. Bahn et al, 1980. Hypothyroidism in workers exposed to polybrominated biphenyls. *New England Journal of Medicine* 302(1). Jacobson et al, 2017. Serum PBBs and PCBs and thyroid function among Michigan adults several decades after the 1973-1974 PBB contamination. *Environmental Health Perspectives* 125(9). Curtis et al 2019. Thyroid hormone levels associate with exposure to PBB in adults exposed as children. *Environmental Health* 18:75.
2. Terrell ML, Hartnett KP, Lim H, Small CM, Wirth J, Marcus M. 2015. Maternal exposure to brominated flame retardants and infant Apgar Scores. *Chemosphere* 118: 178-186.
3. Howards et al, 2019. PBB exposure and menstrual cycle function. *Epidemiology* 30(5):687.
4. Terrell ML, Rosenblatt KA, Wirth J, Cameron LL, Marcus M. 2016. Breast Cancer among women in Michigan following exposure to brominated flame retardants. *Occupational and Environmental Medicine* 73:564-7
5. Hoque A, Sigurdson AJ, Burau KD, et al. 1998. Cancer among a Michigan cohort exposed to polybrominated biphenyls in 1973. *Epidemiology* 9:373-8.
6. Lauby-Secretan et al. Carcinogenicity of polychlorinated biphenyls and polybrominated biphenyls. 2013. *Lancet Oncology* 14 (4):287-288. National Toxicology Program, 2016. Report on Carcinogens, 14th Ed.; US Department of Health and Human Services
7. Joseph, A D., Terrell, M.T., Small, C.M., Cameron, L.L., Marcus, M. 2009. Assessing inter-generational transfer of a brominated flame retardant. *Journal of Environmental Monitoring* 11, 802-807.
8. Blanck, H.M., Marcus, M., Tolbert, P.E., Rubin, C., Henderson, A.K., Hertzberg, V.S., Zhang, R.H., Cameron, L. 2000. Age at menarche and tanner stage in girls exposed in utero and postnatally to polybrominated biphenyl. *Epidemiology* 11, 641-647.
9. Small, C.M., Murray, D., Terrell, M.L., Marcus, M. 2011. Reproductive outcomes among women exposed to a brominated flame retardant in utero. *Archives of Environmental & Occupational Health* 66(4), 201-208.
10. Small, C.M. et al. 2009. Maternal exposure to a brominated flame retardant and genitourinary conditions in male offspring. *Environmental Health Perspectives* 117(7), 1175-1179.

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