Can men pass exposure to PBBs to kids? Emory U. study seeks volunteers

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It was the worst agricultural contamination incident in U.S. history—the accidental inclusion of PBB fire retardant in cattle feed at the Velsicol Chemical factory in St. Louis, Mich., in 1973.

Researchers have identified ongoing human health problems from exposure to the chemical in the four and a half decades since—from thyroid disorders to an increased risk of breast cancer. Health problems were also found to potentially pass to additional generations through the mother's placenta and breast milk.

But researchers from Atlanta's Emory University, in meetings with PBB-contaminated Michigan communities, kept hearing similar anecdotes involving men, too.

"When I would describe to people the kind of health effects in children of women exposed to PBB, some would say, 'In my family, it was my father who was exposed, not my mother. But our children are having the same kinds of conditions,' " said Michele Marcus, Emory professor of epidemiology and lead researcher on the PBB health studies.

Emory's newest round of research, kicking off in earnest in April, will focus on whether males can genetically pass on PBB-related health disorders. Researchers are seeking volunteers to provide blood samples and answer questionnaires as part of the study.

"We want to find families where the grandfather was exposed, but not

the grandmother, so the exposure of the next generation would only be through the father's DNA," Marcus said.

It's estimated that, through milk and meat, the chemical made it into the bodies of nine out of 10 Michigan residents.

Research shows PBB affects the epigenome, the compounds that tell a genome, the genetic material present in a cell, what to do.

"PBB does impact how certain genes are regulated," Marcus said. "Could that gene regulation impact, that epigenome, be passed on to the children and grandchilden? It has been shown in animal studies, but it hasn't yet been demonstrated in people."

The perfect scenario for the multigenerational study would be a family where the grandfather was exposed, the grandmother was not, and they now have an adult child, male or female, and a grandchild, she said.

"Because this happened over 40 years ago, some of the families we've already identified are where a man grew up on a contaminated farm; he ate the contaminated food, perhaps as a teenager or young adult; and then he married a woman from out-of-state, and they have children and grandchildren," Marcus said.

HOW IT HAPPENED

In 1973, the Velsicol plant, then known as Michigan Chemical, was producing a PBB-based flame retardant known as FireMaster, as well as magnesium oxide, a cattle feed supplement sold under the trade name NutriMaster.

Ten to twenty 50-pound bags of PBB made it to the now-defunct Michigan Farm Bureau Services operation in place of NutriMaster. It

was mixed into cattle feed and purchased by farmers throughout Michigan.

Soon, livestock began exhibiting bizarre behavior and symptoms, including hooves that grew long and twisted, and dying off. The offspring of cattle that had eaten the tainted feed were being born with horrific birth defects. After the feed mix-up was discovered by investigating veterinarians about nine months later, about 30,000 contaminated cattle, 1.5 million chickens, and thousands of hogs and rabbits were killed and disposed of in mass graves in Kalkaska and Mio—along with tons of meat headed to market. About 500 Michigan farms were quarantined, prevented from selling milk or meat, nearly destroying the state's dairy industry.

"It really was all over the state," said Melanie Pearson, who leads Emory's community engagement efforts on its PBB research.

"We recently mapped all of the quarantined farms, and there were farms in almost every county of the state."

The cleanup of the now-shuttered Velsicol site is still ongoing, the largest EPA Superfund project in the Great Lakes region, with an estimated cleanup cost of more than $300 million.

That contamination has proven very persistent. About 867 Michigan residents, believed exposed to PBB through working in or living by the chemical plant, or from living on a tainted farm, gave blood samples to Emory researchers. More than 60 percent of participants—four decades later—still had PBB blood levels higher than 95 percent of the U.S. population.

St. Louis resident James Hall, 54, grew up about three blocks away from the chemical plant.

"I was kind of there 24-7," he said. "My paper route was in that neighborhood. My grandma and grandpa, from when I was age 5 on, lived right across the street."

Hall got his blood tested by Emory researchers in 2013. His result was shocking: PBB at more than 5 parts per billion.

"My levels are seven times higher than the average for chemical plant workers," he said. "They are 16 times higher than the farm families."

Then things made sense.

"In 2007, I started having problems with weight and fatigue," he said. "I figured I was getting old, fat and tired. Lazy. I worked 12 hours a day and slept 12 hours a day. That's all I did."

Hall's weight ballooned up to nearly 300 pounds. Then he felt a nodule in his throat. Doctors ultimately removed his thyroid glands, which produce hormones that regulate the body's metabolic rate as well as heart and digestive function, muscle control and more.

"The doctors said, 'You're going to be on medication for the rest of your life,' " he said.

Like others in St. Louis, Hall wonders about every family member who suffered a disease or died, whether toxic exposures were to blame. His brother died of cancer at age 24. A daughter died from a heart condition in 2005, at just 2 years old.

"It's insidious," he said. "You can't tie it down. (But) I believe there's something to it."

LEARNING ABOUT THE EFFECTS

In addition to the multigenerational study, Emory researchers also hope to obtain funding and approval to study how long PBB stays in the body following exposure, and to test whether ingesting certain substances will aid the body in eliminating it.

"We're trying to understand why some people still have high levels in their body, while some people have eliminated the PBB," Marcus said.

A complicating factor has been gaining access to the records of the thousands of Michigan residents tested in the original Michigan Health Department PBB registry in 1978. Participants must actively waive privacy rules to allow Emory researchers access—and it's a matter of ongoing legal debate between the university and state officials whether descendants can provide that waiver for registry participants who've since died, Pearson said.

Hall, the chairman of the Pine River Superfund Citizen Task Force in St. Louis, says the research is important.

"Everybody goes through denial, anger," he said. "I'm at the point now where I'm in the action phase. I want to learn as much as we can learn from it, and transfer that to policy, to medical response."

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TO PARTICIPATE IN THE PBB-EXPOSED STUDY

Emory University is seeking participants in a multigenerational study of PBB health effects.

Specifically, researchers are looking for families where:

1. The grandfather lived or worked on a Michigan farm in 1973 to 1978;

2. The grandfather worked or lived very near the Michigan Chemical/Velsicol plant in St. Louis;

3. The grandfather had a child with a woman who was probably not exposed to PBB (for example, his wife/partner was not living in Michigan);

4. This couple had a son or daughter who was born after 1978, and this adult child had a child.

To enroll in the study, contact Emory's PBB Research Team at 888-892-0074 or by e-mail at pbbregistry@emory.edu.

Those who took part in the original Michigan Health Department PBB Registry in 1978, also known as the Michigan Long-Term PBB Study, need to transfer their records to Emory University to be part of its ongoing database. To receive information on transferring records, call the above toll-free number or e-mail pubregistry@emory.edu.