

Study links reduced fertility to flame retardant exposure

January 26 2010

Women with higher blood levels of PBDEs, a type of flame retardant commonly found in household consumer products, took longer to become pregnant compared with women who have lower PBDE levels, according to a new study by researchers at the University of California, Berkeley.

The study, to be published Jan. 26 in the journal *Environmental Health Perspectives*, found that each 10-fold increase in the blood concentration of four PBDE chemicals was linked to a 30 percent decrease in the odds of becoming pregnant each month.

"There have been numerous animal studies that have found a range of health effects from exposure to PBDEs, but very little research has been done in humans. This latest paper is the first to address the impact on human fertility, and the results are surprisingly strong," said the study's lead author, Kim Harley, adjunct assistant professor of maternal and child health and associate director of the Center for Children's Environmental Health Research at UC Berkeley's School of Public Health. "These findings need to be replicated, but they have important implications for regulators."

PBDEs, or polybrominated diphenyl ethers, are a class of organobromine compounds that became commonplace after the 1970s when new fire safety standards were implemented in the United States. The [flame retardants](#) are used in foam furniture, electronics, fabrics, carpets, plastics and other common items in the home.

Studies have found widespread contamination of house dust by PBDEs, which are known to leach out into the environment and accumulate in human [fat cells](#). Studies also suggest that 97 percent of U.S. residents have detectable levels of PBDEs in their blood, and that the levels in Americans are 20 times higher than in their European counterparts. According to the researchers, residents in California are among those experiencing the highest exposures, most likely due to the state's relatively stringent flammability laws.

The researchers measured PBDE levels in blood samples from 223 pregnant women enrolled in a longitudinal study at the Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS) that examines environmental exposures and reproductive health.

The median concentrations of the four PBDE chemicals in the analysis were slightly lower in this study population than in the general U.S. population, possibly because many of the participants had grown up in Mexico where PBDE exposures are limited, said the authors of the study. The median number of months it took to get pregnant was three, with 15 percent of the participants taking longer than 12 months to conceive.

When the analysis was limited to women who were actively trying to become pregnant, the researchers found that they were half as likely to conceive in any given month if they had high levels of PBDE in their blood. "We aren't looking at infertility, just subfertility, because all the women in our study eventually became pregnant," said Harley. "Had we included infertile couples in our study, it is possible that we would have seen an even stronger effect from PBDE exposure."

It is not entirely clear how PBDEs might impact fertility. A number of animal studies have found that PBDEs can impair neurodevelopment, reduce thyroid hormones, and alter levels of sex hormones. Both high

and low thyroid hormone levels can disrupt normal menstrual patterns in humans, but this study did not find a link between PBDE exposure and irregular menstrual cycles.

Because the participants were mostly young, Mexican immigrant women who lived in an agricultural community, the researchers controlled for exposure to pesticides in their analysis. The researchers also controlled for other variables known to impact fertility, such as irregularity of menstrual cycles, frequency of intercourse, pre-pregnancy body mass index, use of birth control pills in the year before conception, smoking, and alcohol and caffeine consumption.

There are some 209 different possible formulations of PBDEs, but only three mixtures - pentaBDE, octaBDE and decaBDE - have been developed for commercial use as flame retardants. The mixtures are distinguished by the average number of bromine atoms attached to each molecule. Like many other studies, the most prevalent PBDEs in the blood of women participating in the UC Berkeley study were four components of the pentaBDE mixture.

Penta- and octaBDE have both been banned for use in several U.S. states, including California, but they are still present in products made before 2004. Last month, the U.S. Environmental Protection Agency (EPA) announced an agreement with three major manufacturers of decaBDE to phase out its production by 2013.

"Although several types of PBDEs are being phased out in the United States, our exposure to the flame retardants is likely to continue for many years," said the study's principal investigator, Brenda Eskenazi, UC Berkeley professor of epidemiology and of maternal and child health at the School of Public Health. "PBDEs are present in many consumer products, and we know they leach out into our homes. In our research, we have found that low-income children in California are exposed to

very high levels of PBDEs, and this has us concerned about the next generation of Californians."

Keeping up with the ever-expanding range of chemicals in our environment is challenging, the researchers noted. As PBDEs are being phased out, they are being replaced with other brominated compounds. "We know even less about the newer flame retardant chemicals that are coming out," said Harley. "We just don't have the human studies yet to show that they are safe."

A 2007 state assembly bill that would have banned all brominated and chlorinated chemical flame retardants from household furniture and bedding sold in California failed to pass.

Provided by University of California - Berkeley

Citation: Study links reduced fertility to flame retardant exposure (2010, January 26) retrieved 19 April 2024 from

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