

Children's Exposure to PBDEs Binational Comparison Highlights Dramatic Differences

Elevated exposures to polybrominated diphenyl ether (PBDE) flame retardants have been linked to developmental neurotoxicity in children and endocrine disruption in adults. A growing body of evidence shows that children's bodies have higher levels of PBDEs than adults', possibly because of greater hand-to-mouth activity. One of the largest studies to date of PBDE uptake in children provides important evidence that U.S. children may take in significant amounts of these compounds from their environment [*EHP* 119(10):1442–1448; Eskenazi et al.].

The children were participants in the Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS) cohort study. Their Mexican-American mothers were recruited to the study through prenatal clinics serving low-income farm workers in California's Salinas Valley. A team led by researchers at the University of California, Berkeley, School of Public Health assessed measurements of PBDEs in blood serum collected from mothers during pregnancy and from children at age 7 years. On average, the PBDE concentrations in the 264 children were 3 times higher than those measured in their mothers during pregnancy. This suggests that most of the children's PBDE exposure did not occur prenatally or through breastfeeding.

The researchers then compared the California children's PBDE levels with those of 283 5-year-olds living in the Mexican states from

which the CHAMACOS mothers had come. The Mexican data were collected via a second study, Proyecto Mariposa, which is affiliated with CHAMACOS. The California children's PBDE levels were, on average, 7 times higher than those of the Mexican children.

The California children's geometric mean for the seven most commonly found PBDE compounds was 87.8 ng/g serum (lipid weight), levels the researchers say are high enough to "present a major public health challenge" according to evidence of potential health effects of these compounds. In the small body of literature published to date, only children living and working on hazardous waste sites in Nicaragua have been documented to have higher PBDE levels than children in California.

PBDEs have been used extensively in long-lived consumer goods, particularly in California, where the law requires that flame retardants be added to the polyurethane foam used in upholstered furniture and children's products such as car seats. Many products containing now-banned PBDEs are believed to still be in use throughout the United States and the world.

Because the retardants are not chemically bound to the foam and plastic to which they were added, they can escape into household dust. Although this study did not assess exposure pathways, the results support earlier evidence that inadequate ventilation and deteriorating PBDE-treated foam from aging or poorly maintained furniture may contribute to disproportionately high PBDE exposures in lower-income homes.

Kellyn S. Betts has written about environmental contaminants, hazards, and technology for solving environmental problems for publications including *EHP* and *Environmental Science & Technology* for more than a dozen years.

Indoor PM Pollution and Elevated Blood Pressure Cardiovascular Impact of Indoor Biomass Burning

Elevated blood pressure leads to increased risk of cardiovascular disease, stroke, and kidney disease. Indoor air pollution, including exposure to fine particulate matter (PM_{2.5}), has been hypothesized to contribute to elevated blood pressure, although little epidemiologic research has been conducted on this potential link. To investigate the issue further, a team of U.S., British, and Chinese researchers assessed the link between blood pressure and PM_{2.5} emitted during indoor burning of wood, coal, or crop residues used for heating and cooking [*EHP* 119(10):1390–1395; Baumgartner et al.]. These fuels and the poorly vented, inefficient stoves in which they are typically burned are a significant source of indoor air pollution exposure for almost half the world's population.

The researchers evaluated the blood pressure of 280 Chinese women, aged 25–90, in conjunction with their personal exposure to PM_{2.5}, as measured by a device the women wore or set nearby during two to six 24-hour periods over the course of a year. Blood pressure was measured immediately before and after each 24-hour PM_{2.5} measurement. The researchers were able to account for other factors that affect blood pressure, including age, education,

height, weight, physical activity, salt intake, medication use, smoking, secondhand smoke exposure, caffeine consumption, pregnancy, medical history, air temperature, season, and socioeconomic status.

The 24-hour PM_{2.5} exposures ranged from 22 to 634 µg/m³ in winter (mean 117 µg/m³) and 9 to 492 µg/m³ in summer (mean 55 µg/m³); by comparison, the EPA 24-hour standard is 35 µg/m³. There was a significant association between increasing PM_{2.5} exposure and elevated blood pressure in women over age 50, with an increase in systolic blood pressure of 4.1 mmHg and an increase in diastolic blood pressure of 1.8 mmHg for each log-µg/m³ increase in PM_{2.5}.

Few studies have investigated the link between chronic PM exposures and the development of overt hypertension. However, the authors estimate, based on previous reports, that reducing systolic blood pressure by 4 mmHg among Chinese women aged 50–59 could lead to an 18% decrease in coronary heart disease, a 22% decrease in stroke, and about 231,000 fewer premature deaths among Chinese women over age 50. They say such reductions could be accomplished if households switched from open fires and other inefficient cooking and heating devices to more efficient stoves (such as improved wood-burning cookstoves) and less polluting fuels (such as liquefied petroleum gas).

Bob Weinholt, MA, has covered environmental health issues for numerous outlets since 1996. He is a member of the Society of Environmental Journalists.

Indoor burning of traditional biomass fuels, as in this home in Yunnan Province, China, results in significant indoor PM_{2.5} exposure.

