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Preventing Human Exposure to Polybrominated diphenyl ether (PBDE) Flame Retardants to Protect Public Health

Policy Date: 11/9/2004
Policy Number: 2004-05

This policy, acknowledging that polybrominated diphenyl ether (PBDE) flame retardant compounds are widely used and chemically similar to PCBs, and noting more recent recognition that PBDEs are environmentally persistent, rapidly bioaccumulate in human tissue including breast milk and function as developmental neurotoxicants in animals, urges proactive steps to reduce human exposure citing especially APHA policy (#200011) encouraging "precautionary action to prevent potential harm to reproductive health, infants, and children, even if some cause and effect relationships have not been established with scientific certainty."1

More specifically, PBDEs are commonly used flame retardants found in foam products, textiles, electrical equipment, building materials and transportation. Penta-BDE, octa-BDE and deca-BDE are three of the most common commercial classes, with varying numbers of bromine atoms per molecule. Chemically, they look very much like PCBs, which were banned in 1976 due to their high toxicity and persistence and now conclusive evidence that they cause neurodevelopmental problems in children.2 Aside from their fire-retardant properties, PBDES are potent toxins that persist in the environment and bioaccumulate in the food chain and in human tissues.3 Like PCBs, PBDEs are lipophilic and have been found in fish, bird eggs and marine mammals as well as in human milk, fat and blood. While PCB levels in fish and breast milk have slowly declined since being banned, PBDE levels are increasing at an exponential rate. A 100-fold increase in total PBDEs was noted in Lake Ontario trout between 1978 and 1998.4 Body burdens of PBDEs in San Francisco Bay Harbor seals increased by a factor of 100 between 1989 and 1998.5 Total PBDE levels in human milk, blood and tissues have increased by a factor of 100 during the past 30 years, doubling about every five years.6 PBDE levels in U.S. women's breast milk are typically 10-100 times higher than levels in European women7,8 and are now approaching concentrations at which health effects have been observed in laboratory animals.9-17 Although human data on health effects are still lacking for PBDEs, ample data on toxicity are available from animal studies. These studies document that PBDEs are toxic to the brain, reproductive system and liver and disrupt thyroid function.18 Effects on thyroid function provide a plausible mechanism for PBDEs' possible adverse effects on child development. Human studies already document adverse effects on intelligence and psychomotor skills in children with disruptions in thyroid levels in the womb through the second year of life.19-22 One study found that workers exposed to PBDEs experienced higher prevalence of hypothyroidism.23 Concurrent exposure to both PBDEs and PCBs, as from consuming some fatty fish, may present an increased risk since some researchers have found additive or synergistic effects between the two chemicals.24

PBDEs have been detected in household dust,25 food, and in air drawn from a warm TV,26 but the major human exposure pathways have yet to be identified. PBDEs with fewer bromines, such as penta, have the highest potential for bioaccumulation and are typically the most common classes found in humans, fish and other wildlife. Scientists, however, have increasingly been finding deca-BDEs and other higher brominated congeners in biota.27-29 Moreover, it is clear that deca can debrominate and convert to the more bioavailable forms in the environment and potentially during metabolism as well, making them a greater health risk than originally thought.

Global PBDE production totaled 150 million pounds in 1999, over 50 percent of which was used in the Americas.30 Deca-BDE is the most widely used class of BDE at 80 percent of worldwide production.31 Like PCBs, PBDEs flame retardants are now ubiquitous in the environment. The European Chemicals Bureau estimates that 75 percent of penta-BDE emissions will end up in soil and 24.9 percent in surface water and sediment.32 Measured levels of PBDEs in U.S. sewage sludge are 40 times that of European sludge.33

Eliminating most uses of PBDE flame retardants is possible, and a prudent step to protect public health. Concerns about rising levels of PBDEs in the breast milk of Swedish women led to efforts by industrial users in both Sweden and Germany to phase out the use of these chemicals. These actions have led to a decline in PBDE levels in breast milk of Swedish women.34 The European Union has enacted a ban on penta and octa-BDEs and is considering a ban on deca-BDEs as well. The states of California, Hawaii, New York, and Maine have enacted phase-outs of penta and octa-BDEs. Minnesota, Massachusetts, Michigan, Washington and Maryland have proposed similar state-level phase-outs.

Alternatives to the use of PBDE flame retardants are available and cost effective. Alternatives include: product redesign to

eliminate the need for added chemicals; use of naturally flame retardant materials like wool and leather or plastics containing sulfur; and use of less toxic alternatives.35 The German Environmental Agency selected red phosphorus, ammonium polyphosphate and aluminum trihydroxide as alternatives with the least adverse environmental impact.36

Some computer and electronics manufacturers like Apple, Ericsson, IBM, Intel, Motorola, Panasonic, Phillips, and Sony are using alternatives. For example, Motorola now uses a halogen-free laminate that is cost effective, while meeting fire safety standards.37 Toshiba has replaced BFR-containing plastic casings in electronic parts with inherently flame-resistant polyphenylene sulfide. IKEA furniture, Crate and Barrel and Eddie Bauer are requesting PBDE-free polyurethane foam from their manufacturer Hickory Springs.

Although global manufacturers of these compounds continue to produce, as well as export, their products to the United States, one of the two U.S. manufacturers of PBDEs, Great Lakes Chemical, has already announced that they will phase out production of penta and octa-BDEs by 2005. The remaining U.S. manufacturer, Albemarle, continues to manufacture deca-BDE. By calling for a reasonable time frame for phase-out of deca-BDEs, impacts on businesses and workers could be minimized. Phasing out these compounds and substituting safer alternatives protects U.S. manufacturers of PBDEs and companies that use them in their products from potential liability and helps maintain a European market for products requiring flame retardant properties. Since exposure to PBDEs may include an inhalation route of exposure, phasing out the manufacture of these chemicals should better protect the health of workers in industries dealing with PBDEs.

A PBDE phase-out may result in job loss for existing production workers. APHA policy statement 9304 acknowledges potential worker impacts and calls for assistance to workers who are displaced by technological changes.38 New research further supports the need for Work Environment Impact Assessments prior to chemical phase-outs/bans in order to prevent the shifting of risks to workers within the affected industry.39 A PBDE phase-out also provides economic opportunities for workers in industries which make safer alternatives to PBDE flame retardants.40

In light of the aforementioned emerging science on the inherent toxicity and persistence of PBDEs, evidence of adverse health effects on animals and the prevalence and rising levels in fish, biota and human breast milk, immediate action is needed to prevent further environmental contamination and to protect public health.

Therefore, The American Public Health Association hereby:

1. Resolves: That APHA urge state and federal governments to require the use of PBDE flame retardants be phased out in all products manufactured and sold in the United States by a date certain; and

2. Resolves: That APHA urge state and federal governments, in enacting such phase-outs, to consider policies that alleviate short-term economic impacts on the PBDE production workforce, and to also consider economic benefits to workers in industries making safer alternatives; and

3. Resolves: That APHA urge state and federal governments to provide financial incentives for development and use of alternative flame retardants or preferably changes in product design to increase fire resistance without use of chemicals, to assure fire safety, while protecting the public from toxic exposures; that alternative flame retardants be adequately tested for toxicity; and that environmental and health safety must be assured prior to use; and

4. Resolves: That APHA urge state and federal governments to require labeling of chemical flame retardants used in products; and

5. Resolves: That APHA urge state, federal and local governments to regulate the safe disposal of products containing brominated flame retardants and to prohibit land application of sewage sludge until testing can assure that such material does not contain measurable levels of PBDEs; and

6. Resolves: That APHA urge the U.S. Centers for Disease Control and Prevention to expand the national biomonitoring program to include PBDEs and to increase the number of people studied; and

7. Resolves: That APHA urge Congress to increase funding for research on PBDE flame retardants, including monitoring levels of PBDEs in fish, sediments, human milk, blood and tissue, and additional research into exposure routes and human health effects from these exposures.

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