Discontinued pajama flame retardant detected in baby products and house dust

Tom Webster, the associate chair of the Boston University School of Public Health's environmental health department, has been investigating the public-health implications of flame retardant use for more than five years. Because of a paper recently published in *ES&T* (**2009**, DOI 10.1021/es9014019), Webster can for the first time answer "yes" when people ask him whether the flame retardants he studies are the same ones previously used in children's pajamas. But he isn't happy about it.

The new paper documents the presence of tris(1,3-dichloro-2-propyl) phosphate (TDCPP or TDCP) in the foam padding of products intended for use by children, as well as in dust from U.S. homes. Heather Stapleton, an assistant environmental chemistry professor at Duke University's Nicholas School of the Environment, is the paper's corresponding author, and Webster is a coauthor. They say that they are concerned about both findings because a 1978 *Science* paper reported TDCPP to be weakly mutagenic; by the early 1980s, the flame retardant had ceased to be used in children's pajamas. The U.S. Consumer Product Safety Commission classifies TDCPP as a probable human carcinogen, and the U.S. Environmental Protection Agency considers it a moderate cancer hazard, according to their paper.

A written statement provided by Joel Tenney of the advocacy department of ICL Industrial Products America, a fire retardant manufacturer, counters that there is an extensive human-health toxicology data set showing that TDCP "does not pose any health risks for consumers." This assessment, however, seems to ignore the U.S. data on TDCPP and does not consider the importance of dust as an exposure route, say Stapleton, Webster, and Susan Klosterhaus, an environmental scientist at the San Francisco Estuary Institute and paper coauthor. Tenney says that his organization looks to the EU's risk assessment "as the most comprehensive collective review of the science" and "remains interested in new research addressing our products."

JUPITERIMAGES

Researchers have documented the presence of TDCPP in the foam padding of children's strollers, as well as other baby equipment and products.

"I was amazed when I learned that TDCPP was still in use," says Arlene Blum, founder of the Green Science Policy Institute and a coauthor on both the 1978 *Science* paper and the new *ES&T* paper. The research team detected TDCPP at levels of up to 5%, by weight, in a baby stroller and a nursery rocking chair, as well as other foam-padded furniture, such as couches, chairs, and sofa beds. Some of the tested items were intended for use in a baby's nursery. In fact, Stapleton more recently determined that TDCPP was also present in a nursing pillow and a changing-table pad.

"I am genuinely concerned about [TDCPP's presence] in children's products," Webster says. Babies tend to put anything and everything in their mouths, he points out, adding that his child "used to chew on his stroller." As the researchers explain in their paper, children are also known to ingest much more dust than adults, so they are at disproportionately greater risk from any compound found in house dust.

TDCPP has been the main fire retardant used in automotive foam cushioning for many years, and it became the second most widely used flame retardant in furniture foam after the penta-BDE retardants were discontinued in 2004, according to Tenney's statement. The penta-BDE flame retardants were also known to accumulate in house dust, and penta-BDE was banned by the UN's Stockholm Convention on Persistent Organic Pollutants earlier this year.

Bob Luedeka, executive director of the Polyurethane Foam Association, says that foam formulators add flame retardants to their products to meet California's Technical Bulletin 117 flame retardancy standard. California's Bureau of Home Furnishings and Thermal Insulation interprets the standard as applying to upholstered furniture and baby products padded with polyurethane foam, but Luedeka and Tenney say they disagree with that interpretation. "There's no reason for fire retardants to be used [in baby products]," Luedeka says.

Meanwhile, Klosterhaus says that she has now detected TDCPP in biosolids from wastewater treatment plants that discharge into San Francisco Bay and in bay sediments. "It is clear that these chemicals are capable of entering aquatic environments," she says. Over the past decade, researchers at Stockholm University and Umeå University (Sweden) have also reported finding the compounds in residential air and dust samples, as well as sewage sludge.

—KELLYN BETTS

10.1021/es902480t
Published on Web 08/18/2009