

Office workers carry biomarker of potentially harmful flame retardant, study finds

March 25 2013

A flame retardant removed from children's pajamas 30 years ago but now used in polyurethane foam is prevalent in office environments, especially in older buildings, where urine testing of workers turned up widespread evidence of its biomarker, a new study led by Boston University School of Public Health researchers has found.

The study, published in the journal *Environment International*, found that the chemical known as TDCPP—chlorinated tris(1,3-dichloro-2-propyl) phosphate, or 'chlorinated tris'—was present in 99 percent of [dust samples](#) taken from participants' homes, vehicles and offices, "demonstrating the widespread presence of this flame retardant in the [indoor environment](#)." The research team recruited 31 adults who worked and lived in the Boston area for the testing.

The study found that the office environment was the strongest predictor of metabolized TDCPP in urine, with significantly lower concentrations of the chemical among workers in a new office building than in older buildings. Similarly, the average concentration of TDCPP in dust was significantly lower in the new office building than in the older office buildings.

Urine samples were collected during the workday, which may explain why an association was found between the quickly metabolized chemical and characteristics of the office, rather than the vehicle or home.

"Overall, our findings suggest that exposure to TDCPP in the work environment is one of the contributors to the personal exposure for office workers. Further research is needed to confirm specific exposure sources (e.g., polyurethane foam), determine the importance of exposure in other microenvironments such as homes and vehicles, and address the inhalation and dermal exposure pathways," the research team concluded.

TDCPP, an additive to polyurethane foam used in upholstered furniture, is found in dust, where it can likely lead to [human exposure](#). Potential health effects remain a concern. In 2011, TDCPP was added to the Proposition 65 list of chemicals known by the State of California to cause cancer.

In vitro studies suggest TDCPP may be neurotoxic, and one study found that increased concentrations in dust were associated with decreased semen quality and reduced free thyroxine in men, suggesting possible effects on fertility and thyroid function. Animal studies show TDCPP is readily absorbed through both the skin and gastrointestinal tract.

The researchers said the high concentrations observed in dust from offices could reflect requirements by the City of Boston that office furniture meet California fire retardant standards, a rule that is not required of residential furniture in Boston. The state of California has proposed a draft furniture flammability standard that could reduce the need for flame retardant chemicals in [polyurethane foam](#). However, the standard used for office furniture has yet to be revised.

"It is currently very difficult to avoid [flame retardants](#). Hopefully, better options will become available in the near future," said Courtney Carignan, a doctoral candidate in environmental health who co-authored the study. "Currently, the best advice we have for people is to wash your hands, especially before eating. Dust control, good ventilation and air purifiers may also be useful for reducing personal exposure."

The low concentrations of TDCPP in the newer office building suggest that its newer furniture did not contain TDCPP, or that it had not yet had sufficient time to migrate out of the products, the researchers said. If the new furniture did not contain TDCPP, it likely contained a different flame retardant such as the controversial FireMaster 550. Other differences between exposures include the possibility of more efficient ventilation or HVAC systems or cleaning methods in the newer building.

The authors urged that "more research is needed to determine factors that influence TDCPP concentrations in dust, in relation to building contents and characteristics."

More information: www.sciencedirect.com/science/.../S0160412013000433

Provided by Boston University Medical Center

Citation: Office workers carry biomarker of potentially harmful flame retardant, study finds (2013, March 25) retrieved 1 May 2024 from <https://medicalxpress.com/news/2013-03-office-workers-biomarker-potentially-flame.html>

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