

Study finds gymnasts' face high exposure to flame retardants

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Competitive gymnasts have a higher exposure to potentially harmful flame-retardants than the general population, likely because such contaminants are present in foam used in gym equipment, a study led by Boston University School of Public Health researchers has found.

The study, published online in the journal *Environmental Science and Technology*, found that the average concentration of a flame-retardant known as PentaBDE in gymnasts' blood sera was 4 to 6.5 times higher than in general U.S. population groups. Median concentrations of PentaBDE and related contaminants in hand-wipe samples from the gymnasts were 2 to 3 times higher after their practice, compared to before, indicating that the gymnasts contacted the flame-retardants during practice. Concentrations of the flame-retardants were much higher in gym air and dust than in comparison residences where they are used in foam-containing furniture. Flame-retardants escape from polyurethane foam over time and accumulate in the air and dust of indoor environments.

"Despite the U.S. phase-out of PentaBDE production nearly a decade ago, large amounts are still in use," the research team said. Further, replacement flame-retardants are being used in newly manufactured foam pit cubes and landing mats, "suggesting the potential for increasing exposure to these compounds, as older gym equipment is replaced. Additional research is needed to confirm these findings and improve our understanding of gymnast exposures."

The researchers suggested that the risks of ingesting flame-retardants, through dust and contact, could be reduced by hand-washing after practice and before eating.

While the study did not examine health effects, previous research has suggested that PentaBDE may affect brain development in children and

fertility in women, although results are preliminary and warrant further study. Almost all Americans have detectable levels of PentaBDE in their bodies, due to both exposure in the indoor environment and diet.

PentaBDE congeners are endocrine disruptors that have been associated with changes in thyroid hormones in several epidemiologic studies. Due to concerns about its persistence and toxicity, PentaBDE was banned in the European Union in 2004 and phased-out of production in the U.S in 2005, although foam products containing it are still in use.

Restrictions on the use of PentaBDEs have resulted in the increased use of other flame-retardants, such as tris (1,3-dichloro-2-propyl) phosphate (TDCPP) and Firemaster 550.

The research team recruited 11 collegiate female gymnasts, ages 18-22, from one gym and collected hand-wipe and blood samples from them after a gymnastics practice, which lasted about 2 ½ hours. They also measured concentrations of bromine in the foam of landing mats, pit cubes and other materials. They collected samples of dust and foam from a second gym.

PentaBDE was the dominant flame-retardant in dust collected from all locations in both gyms. Most of the pit cubes, in use for years, contained PentaBDE. Local fire codes may require gyms to use flame-retardant foam.

The researchers said personal exposure to PentaBDE and other [flame-retardants](#) may vary between gymnasts, depending on the contaminants present and personal factors, such as training duration and activities, hand-washing and bathing frequency, diet and exposure to sources in other environments. They noted that the study findings were not generalizable to all gymnasts, many who may train less frequently.

The team said future research on gymnasts should include a larger sample size and seek to identify the primary exposure pathways, to inform recommendations for reducing exposure.

More information:

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