# Researchers find elevated flame retardant exposure among U.S. gymnasts

*By Sara Mishamandani*

Gymnasts may be ingesting or inhaling dust created by foam blocks that contain hormone-disrupting flame retardant chemicals, according to a new study from the Boston University (BU) School of Public Health., supported in part by NIEHS.

"Our results suggest that the study gymnasts are highly exposed, but it's unclear what health risks, if any, they would face as a result of this exposure," said Courtney Carignan, Ph.D., lead author of the study *(http://www.ncbi.nlm.nih.gov/pubmed/?term=Flame+Retardant+Exposure+among+Collegiate+United+States+Gymnasts)* published online Dec. 3 in the journal Environmental Science and Technology.

The study detected 4-6.5 times more flame retardants in the blood of collegiate gymnasts than in the general U.S. population.

*Carignan graduated from BU this spring with her Ph.D. She is now training as a postdoctoral researcher at the Children's Environmental Health and Disease Prevention Center at Dartmouth College. (Photo courtesy of Courtney Carignan)*

## Measuring exposure to flame retardants

NIEHS-funded researchers affiliated with the BU and Duke University Superfund Research Program (SRP) Centers collected blood and samples wiped from hands of 11 female gymnasts, aged 18-22, who were training at a collegiate gym in the eastern United States. Each participant filled out a questionnaire about her personal characteristics, gymnastics history, gym use, and habits, including hand washing, transportation, and diet. All participants reported practicing gymnastics for at least 12 years and averaging 19 hours a week in the gym at the time of the study.

The gymnasts' blood contained the compound bromodiphenyl ether (BDE)-153, a component of the flame retardant PentaBDE, at levels comparable to groups with high occupational exposure, such as U.S. foam recyclers and carpet installers.

PentaBDE, which was widely used in polyurethane foam for furniture, was voluntarily phased out by U.S. manufacturers in 2005, and is now banned in 172 countries. However, PentaBDE, which can accumulate in living organisms, is a long-lasting chemical in the environment and is still present in U.S. products manufactured before 2005.

Previous studies showed that PentaBDE can disrupt endocrine activity and affect thyroid regulation and brain development. Early exposure to PentaBDE has been linked to low birth weight, lowered IQ, and impaired motor and behavioral development in children.

## Getting to the source of exposure

Most gyms contain a large pit filled with hundreds of foam polyurethane blocks, which provide a soft landing for gymnasts learning new acrobatic moves. Samples of dust and foam taken from the study participants' gym, as well as two other U.S. gyms, suggest that the foam blocks, some of which were up to 20 years old, were the likely source of exposure. Handwipe samples from the gymnasts after practice contained 2-3 times more flame retardants than before practice.

To reduce exposure, Carignan recommends washing hands after touching equipment at the gym and showering after leaving the gym. Carignan also started the Gymnast Flame Retardant Collaborative, *(http://www.gymnastcollaborative.org/)* which provides information about flame retardants and gymnastics through a website.

The study was funded by NIEHS individual research grants and an NIEHS training grant. SRP grantees Wendy Heiger-Bernays, Ph.D., Heather Stapleton, Ph.D., Thomas Webster, Sc.D., and Michael McClean, Sc.D., are principal researchers on the grants and study authors.

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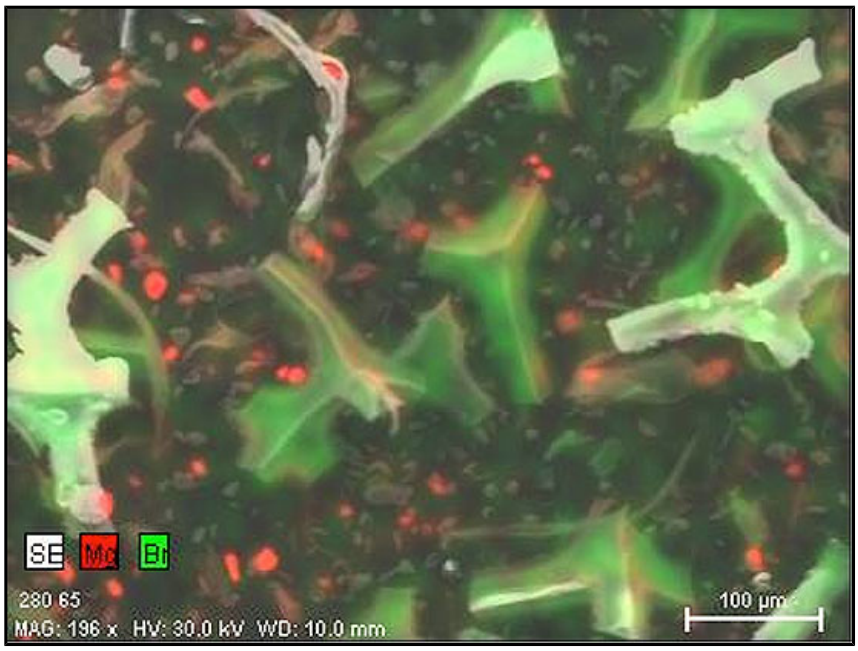
(Sara Mishamandandani is a research and communication specialist for MDB Inc., a contractor for the NIEHS Superfund Research Program and Division of Extramural Research and Training.)




*Researchers used a scanning electron microscope with energy-dispersive X-ray spectroscopy to create an image of the dust from a gymnastics foam pit. The presence of brominated flame retardants in fragments of foam are indicated in green. Red indicates magnesium, presumably from gym chalk. (Photo courtesy of Simon C. Roberts, Duke University)*

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