

# Researchers discover that human hair and nails can tell toxic secrets

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Ronald Hites and Amina Salamova. Credit: Indiana University

Chemicals used as flame retardants that are potentially harmful to humans are found in hair, toenails and fingernails, according to new research from Indiana University.

The discovery of an easily available biomarker should ease the way for further research to determine the human impact of chemicals commonly found in the environment, including in indoor dust, water and air.

Exposure to flame retardants in various forms has been linked to obesity, learning disabilities, neuro and reproductive toxicity, and endocrine disruption. Flame retardants are frequently added to plastic, foam, wood

and textiles. They are used in both commercial and consumer products worldwide to delay ignition and to slow the spread of fire. Flame retardants persist in the environment and bioaccumulate in ecosystems and in human tissues.

"Little is known about the human exposure to flame retardants, especially new classes of the retardants," said researcher Amina Salamova at the School of Public and Environmental Affairs at IU Bloomington. "The first step is to establish a relatively easy and reliable way of measuring chemical levels in people, especially children, and we've determined that [hair](#) and nails can provide exactly that."

Until now, researchers depended on samples of human milk, blood and urine, and those samples are more difficult to obtain than hair and nails.

Salamova is the co-author of the study, "Hair and Nails as Noninvasive Biomarkers of Human Exposure to Brominated and Organophosphate Flame Retardants," with Liang-Ying Liu of SPEA, Ka He of the IU School of Public Health-Bloomington and Ronald A. Hites, Distinguished Professor in SPEA. Their study was published in the journal *Environmental Science and Technology*. It was funded by an Indiana University Collaborative Research Grant.

The researchers collected hair, fingernails and toenails from 50 students in Bloomington and compared the levels of chemicals found in those samples with what was found in blood from the same people.

Salamova and colleagues found that there was a strong relationship between the levels of a large group of flame retardants, the polybrominated diphenyl ethers or PBDEs, in hair and nails, on the one hand, and those in serum, on the other. In some cases, women had higher concentrations of common flame retardants, and the researchers speculate that was a result of nail polishes that contain these chemicals.

Previous research by an IU team, which included Salamova and Hites, found that chemicals used as [flame retardants](#) were present as environmental pollutants in tree bark harvested from locations around the globe, including remote sites in Indonesia, Nepal and Tasmania.

**More information:** Liang-Ying Liu et al. Hair and Nails as Noninvasive Biomarkers of Human Exposure to Brominated and Organophosphate Flame Retardants, *Environmental Science & Technology* (2016). [DOI: 10.1021/acs.est.5b05073](https://doi.org/10.1021/acs.est.5b05073)

Provided by Indiana University

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