What silicone wristbands say about chemical exposure in Uruguayan children

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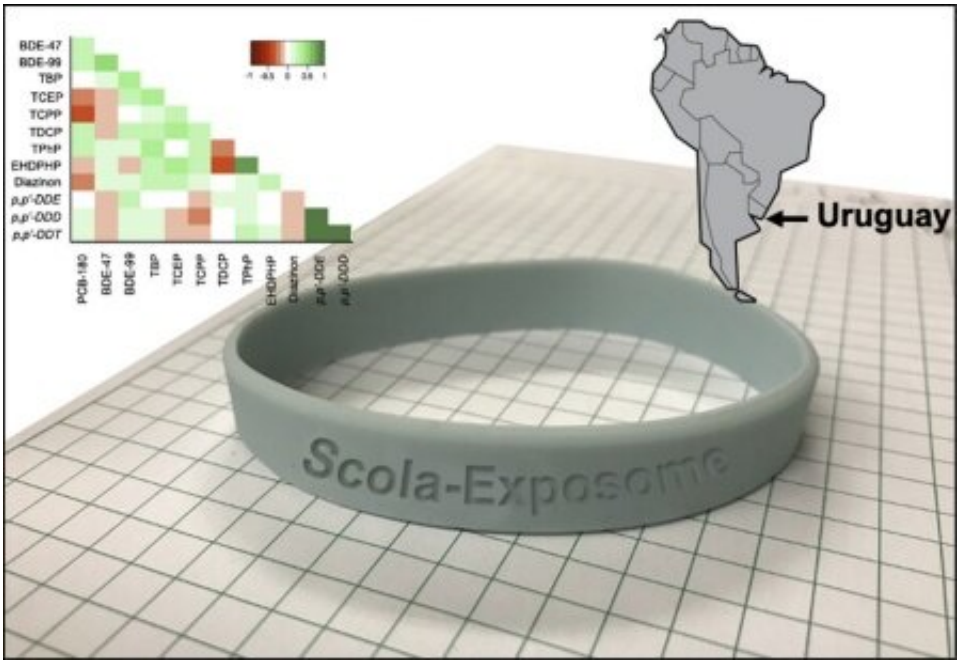

Researchers from the University at Buffalo and the Catholic University of Uruguay used silicone wristbands to examine the extent of chemical exposure among a small group of children in Montevideo, Uruguay. Credit: University at Buffalo

Millions of children fail to reach their developmental potential worldwide, in part due to higher rates of exposure to current and legacy pollutants.

Researchers studying chemical exposures among children in Uruguay

turned to an unlikely data collection device as part of a recent study: silicone wristbands.

These wristbands—the kind many people around the world wear to show their support for a cause or organization—are extremely effective in capturing certain types of harmful chemicals, and they're easy for children to wear.

Researchers from the University at Buffalo and the Catholic University of Uruguay used the wristbands to examine the extent of chemical exposure among a small group of children in Montevideo, Uruguay. The 6- to 8-year-olds wore the bands for seven days. After analyzing the wristbands, researchers found an average of 13 pollutants in each one collected. Some of the wristbands showed exposure to DDT, a harmful pesticide that has been banned for use in many countries, including the U.S., since the 1970s.

The study, published recently in the journal *Science of the Total Environment*, is the first to apply silicone wristbands to measure children's exposure to chemicals in a country outside of the U.S. The study was conducted as part of an ongoing research project in Montevideo led by Katarzyna "Kasia" Kordas, Ph.D., the paper's senior author. Kordas is an associate professor of epidemiology and environmental health in UB's School of Public Health and Health Professions and co-director of UB's Community for Global Health Equity.

The UB RENEW (Research and Education in eNergy, Environment and Water) Institute provided funding for the study.

"One of the key findings from this research is that we still observe industrial and agricultural chemicals that have been banned from production for years and even decades," said Steven C. Travis, the

study's first author, who is a Ph.D. student in the Department of Chemistry in UB's College of Arts and Sciences.

"We were also able to find specific differences between chemical exposures of the children in our study compared to children in the U.S., and identify potential reasons for differences in exposure," added Travis, whose major Ph.D. adviser, Diana Aga, Henry Woodburn Professor of Chemistry in UB's College of Arts and Sciences, is a paper co-author.

Silicone wristbands have become a popular method in recent years to measure personal exposures to organic chemicals because they are easy to wear and are a non-invasive sampling method. They also have a greater capacity to hold semi-volatile chemicals, and can capture chemicals for a longer period of time. More than 1,500 chemicals have been sampled using silicone wristbands, Travis said.

Researchers analyzed wristbands in this study for 45 chemicals from among five groups: polychlorinated biphenyls (PCBs), pesticides, polybrominated diphenyl ethers (PBDEs), organophosphorus flame retardants (OPFRs) and novel halogenated flame-retardant chemicals (NHFRs). NHFRs were the only chemical group not detected. Anywhere from eight to 19 chemicals were detected in each of 23 wristbands collected.

"The use of wristbands as a personal sampling device is an excellent alternative for assessing what harmful chemicals are accumulating in children's bodies, rather than the old-fashioned way of collecting blood and measuring the chemical concentrations in the blood," said Aga.

PCBs were found in 19 of the 23 wristbands. The researchers noted that the entry and trade of PCBs wasn't regulated in Uruguay until 2007, and that there were an estimated 40,000 transformers—a major source of PCBs—operating in the country in 2006.

The presence of PBDEs was confirmed in 22 out of 23 wristbands. Concentrations of this chemical group, however, were much lower than those found in U.S. studies. That was surprising, according to the researchers.

"With this study, we've been able to link different exposures to certain lifestyle characteristics," Travis said. "For example, we are able to suggest that not having carpets in the home may lead to lower exposure to brominated flame retardants, which were used widely in the production of carpet padding. Also, with the use of other studies, we can uncover differences in exposure based on various modes of transportation."

Eleven wristbands contained all six OPFRs analyzed. Pesticides were also present, including DDT, which was found in 20 wristbands.

"It is very concerning that young children are exposed to multiple chemicals, including those that have been banned in the U.S. because of demonstrated harms to health," said Kordas. "We know that when chemicals occur together in so-called mixtures, they could be more detrimental to children's development than each chemical alone."

Travis added, "This emphasizes that we need to be more careful with the chemicals that we use for industrial and agricultural purposes, since they have the potential to remain in the environment and can affect people over decades."

More information: Steven C. Travis et al, Catching flame retardants and pesticides in silicone wristbands: Evidence of exposure to current and legacy pollutants in Uruguayan children, *Science of The Total Environment* (2020). DOI: 10.1016/j.scitotenv.2020.140136

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