Charity wristbands alert to chemical exposure
Phthalates dominate

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Silicon wristbands, often worn in support of a chosen charity, can be a beacon for chemical exposure, according to a team from Oregon State University, US.

Silicon is known to absorb a wide range of compounds. In the study, wristbands tested positive for chemicals such as phthalates, pesticides and flame retardants.

Lead researcher Kim Anderson came up with the idea of using the wristbands to monitor chemical exposure, after watching a sporting event. "I saw the wristbands on lots of folk (including men), and knew that we could make the material work," she says.

The researchers gave the wristbands a thorough clean with diverse solvents, before handing them to a range of people to wear day and night for 30 days. They then used gas chromatography–mass spectrometry (GC–MS) to screen the wristbands for 1,182 chemicals, including pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pharmaceuticals and phthalates.

"Like a cell in an organism, the wristband is lipophilic [fat–loving], so organic chemicals want to ‘leave’ the air and ‘enter’ the wristband in the same manner as a cell," explains professor Anderson. "We have designed them to be a good surrogate of the cell. We are interested in the bioavailable fraction of the chemicals in the environment because this is the fraction that, once in the organism, can be bioactive, including toxic."

In total, they identified 49 different compounds in the wristbands. Most of the individual compounds were PAHs, or consisted of industrial compounds used as flame retardants, plasticisers, or in synthetic material manufacturing. The two most detected substances are both used in personal care products: diethyl phthalate (found in all 23 samples) and a perfume called tonalide. Meanwhile, butyl benzyl phthalate, a plasticiser, used in floor tiles, foams and carpet backing, was found in 19 samples; and di–n–octyl phthalate, used in vinyl resins, was found in 11. The team also found home-use pesticides in several of them.

The researchers tested the wristbands on roofers working with hot asphalt to determine whether they could be used to assess occupational chemical exposure. All of the roofers’ wristbands contained PAHs, 12 of which are on a US Environmental Protection Agency priority list. The wristbands were "extremely sensitive" to chemical exposure, even after only eight hours, say the researchers.

"We hope this easy-to-wear and dynamic application of silicone may become a valuable tool to address challenges of the exposome and mixture toxicity," write the researchers in Environmental Science and Technology.

The team is constantly adding to the list of chemicals they are screening for. It recently included about 50 flame retardants and intends to add another 117 chemicals, in the coming weeks, says professor Anderson, director of Oregon’s Food Safety and Environmental Stewardship programme.

It is also expanding the number of colours. "During our children’s flame retardant study, we learned that if we didn’t have pink wristbands available we would not achieve 100% compliance," says professor Anderson. "We expect to have six new colours, this year, including pink."
Emma Davies

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