

Athletes kick up hidden toxic chemicals from artificial turf.

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Zhang J, I-K Han, L Zhang and W Crain. 2008. **Hazardous chemicals in synthetic turf materials and their bioaccessibility in digestive fluids.** *Journal of Exposure Science and Environmental Epidemiology* 18:600–607.

Synopsis by Niladri Basu and Wendy Hessler

In a study of artificial turf, scientists found harmful chemicals in virtually every sample tested, including PAHs, chromium and lead.

Arsenic and cadmium were detected in most samples.

Tests with synthetic saliva, gastric juice and intestinal fluids showed that some of the contaminants were biologically available.

Potential risks to children and adults using these areas should be evaluated since nearly 1,000 fields of artificial turf are installed every year in the U.S.



Context

Natural grass fields in sports complexes are increasingly being replaced with artificial (or synthetic) turf. The new generation of fields are designed to mimic the look and feel of natural grass and are hailed as more cost-effective and durable.

Artificial turf came onto the market in the 1960s through a joint venture between the Ford Foundation and Monsanto. According to the Synthetics Turf Council, more than 3,500 artificial turf fields are currently in use across North America. Nearly 1,000

What did they do?

Spurred by recent media and regulatory concerns, Zhang et al., carried out a small scale study to examine the potential health risks of artificial turf. They had two goals: 1) measure toxic chemicals in artificial turf samples (rubber granules, grass fiber) and 2) determine if the chemicals are bioavailable to humans. They studied samples from 8 turf facilities in New York.

First, the authors used basic analytical techniques to measure levels of 15 polycyclic aromatic hydrocarbons (PAHs) and five metals. The chosen PAHs are toxic and are listed on the US EPA's list of priority hazardous chemicals. The five metals studied - lead, arsenic,

fields are being newly installed every year. This amounts to more than 124 million square feet of new added turf to the landscape annually. Construction costs for each field range between \$400,000 and several millions of dollars.

To mimic the look and feel of natural grass, artificial turf is comprised of multiple product layers. Artificial 'grass blades' are made of recycled plastics and polymers that include polyethylene, polypropylene and nylon. Surfaces are filled with bits of recycled tires to provide a cushioned platform. These tire bits are usually less than 3 millimeters in diameter.

There is growing concern that some artificial fields are contaminated with toxic chemicals - including polycyclic aromatic hydrocarbons (PAHs) and metals - in the artificial grass blades or in the surface fill. The substances, which may end up in the air, on skin or in mouths, can pose a health risk through breathing or eating for children, athletes and others who use the fields.

Recent media articles have raised public awareness about the toxic chemicals found in artificial fields. Regulators in several states, including New York, New Jersey, California, Connecticut and Minnesota have started to take note and are taking steps to impose legislation that calls for additional testing and even outright removal of these fields.

health standards.

Furthermore, many of these chemicals could migrate out of the field's materials and into people during digestion. It is likely that athletes playing and rolling on the fields could get the small bits in their mouths and swallow them. The authors did not characterize exposure through breathing contaminated air, dust and particles.

The toxic chemicals found in this study are known to harm human health. Exposure to PAHs can cause cancer. The metals studied are known to damage the brain, kidney, liver, skin and bladder.

Adults are not the only ones being exposed to the toxic chemicals. Children who play sports on the fields or those who accompany adults to practices or games and sit on the turf are likely at increased risk because they play on the ground and explore with their hands. Artificial turf is being installed at schools and parks where children will be in contact with the surfaces. Some people are even installing

cadmium, chromium and zinc - are also harmful to people.

Second, the authors tested the turf and underlying materials for bioavailability. They placed pieces of both into synthetic saliva, gastric fluid and intestinal fluid to assess if the PAHs and metals would leave the materials if they were in mouths or swallowed by adults and children.

What did they find?

PAHs were present in every sample tested. Levels of total-PAH approached 40 parts per million (ppm) in some samples. Levels of many PAHs exceeded health-based standards for soil.

When assessed for bioavailability, none of the PAHs showed great mobility out of the materials and into the artificial body fluids. But, some levels of naphthalene, benzo(a)pyrene and benzo(ghi)perylene were detected.

In two samples analyzed for zinc, levels approached 10,000 ppm. Chromium and lead were detected in every sample. Arsenic and cadmium were detected in most samples. Chromium and lead exhibited bioavailability to humans.

What does it mean?

The findings here support recent media and regulatory concerns that toxic chemicals exist in artificial turf and may pose a health risk to those using the fields. While it was a small-scale study, the scientists found high levels of toxic chemicals. In many cases, levels exceeded safe

artificial turf on their own home lawns.

Additionally, toxic chemicals in artificial turf may pollute the larger environment. Athletes and others who walk, sit or play on the turf can transfer the rubber granules, which can latch onto shoes and clothes, away from the fields and into vehicles and homes. Surface runoff can carry particles and leached chemicals off the fields to contaminate local rivers and streams. Older fields, which are now being replaced with newer surfaces, need to be disposed of properly.

Besides the toxic chemicals, there are further concerns that artificial turf enhances physical injury to athletes and promotes antibiotic resistance.

More research is needed to understand the extent of personal exposures, health consequences and environmental pollution associated with the burgeoning growth of artificial turf in cities and towns across North America.

Resources

Artificial turf: exposures to ground-up rubber tires. 2007. Environment and Human Health, Inc. Report

Claudio, L. 2008. **Synthetic turf: health debate takes root.** Environmental Health Perspectives 116:A116-122.

McCarthy, M and S Berkowitz. 2008. **Artificial turf: health hazard?** USA Today May 7.

Shapira, I. 2008. **US investigates artificial turf's lead levels.** Washington Post April 20:C04.

Coverage of artificial turf health concerns



Search

19 October **Rochester-area turf war: year-round playability vs. safety for athletes.** About 3,500 synthetic fields are in use nationwide at the high school, college and professional sports levels. But some maintain that artificial turf might be a danger due to lead and other toxic metals. Rochester Democrat and Chronicle, New York.

5 October **Turf's up: Despite drawbacks, artificial playing fields remain popular at local schools.** Excessive heat is an unfortunate side effect of these "field turf" artificial surfaces, which have become extremely popular among North County high schools in California. San Diego North County Times, California.

23 September **Portland keeps kids off field with high lead level.** Portland Public Schools is limiting access to an elementary school field with artificial turf as a precaution against lead. Associated Press.

22 September **Portland limits use of turf field at Rieke over lead concerns.** Portland Public Schools is limiting access to an artificial turf field often used by elementary school students after district tests showed levels of lead above some national recommendations. Portland Oregonian, Oregon.

21 September **School's turf field is safe to use.** State public health officials have told Salem-Keizer School District that the level of lead detected in West Salem High School's artificial-turf sports field is safe and no further action is needed. Salem Statesman Journal, Oregon.

More news about
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