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Plastic Grass isn't Greener

An exploration of the environmental and human health hazards of artificial turf in our schools and communities

By **Rochelle Rubinstein**

ALL ENVIRONMENTAL and outdoor educators are aware of the physical, psychological, and social benefits that children enjoy from activity in natural environments. In schoolyards and playgrounds, it is a pleasure to watch students revel when playing on fresh grass. Yet, increasingly, the natural grass fields and wood chip playgrounds in our schools and other public spaces are being replaced with synthetic surfaces. Examples of these surfaces include poured-in-place rubber, foam padding, or carpets of plastic with various types of infill, of which crumb rubber from shredded used tires is the most common.

There are three main reasons that administrators have converted their playing fields and other outdoor playing surfaces to synthetic turf. The first is that grass fields and playgrounds deteriorate when overused. Secondly, inclement weather usually leads to outdoor activities being cancelled. Lastly, the synthetic turf industry has been successful in creating the perception that their products offer an easy, low-maintenance solution to overused grass surfaces.

At first glance, these perceptions appear to be true. However, there is plenty of evidence that using shredded old tires and plastic play surfaces is both destructive to the environment and potentially hazardous to human health. This is

especially true of children, who are more vulnerable to toxins. While the toxicity of these materials is well-documented — whether off-gassing into the air or leaching into the soil — there have not yet been any comprehensive, long-term studies that assess these factors or the associated health effects.

Educators and community leaders should be wary about proposals to convert fields and other outdoor play areas to synthetics. In this article, I will present the main health and environmental concerns.

Heat island effect

Whereas natural grass has a cooling effect on a local environment, synthetic turf can reach dangerously high temperatures. For example, according to a study by the Toronto District School Board, when natural grass reached 34°C (93°F) on a summer day, synthetic turf reached a frighteningly high temperature of 67°C (152°F).¹ This worsens what is known as the "urban heat island effect," whereby urban areas — full of heat-absorbing surfaces like concrete — become significantly warmer than surrounding rural areas.

Dehydration

The New York City Health Department has reported that playing on plastic surfaces with tire waste infill can result in dehydration, heatstroke, and thermal burns. "Children are less able to regulate their body temperature than adults, mak-

ing them particularly susceptible to conditions of extreme heat. In addition, children have a higher surface-area-to-body-mass ratio, produce more body heat per unit mass, and sweat less than adults, all factors that increase susceptibility to heat injury."²

Off-gassing

Natural grass absorbs carbon dioxide and releases healthy oxygen. However, synthetic turf is composed of materials that break down due to exposure to sunlight and the grinding force of human activity, and off-gas a variety of toxic chemicals into the air. The major chemical components of the recycled tires in the infill are styrene, a neurotoxic, and butadiene, a proven human carcinogen that has been shown to cause leukemia and lymphoma. Shredded crumb rubber and tire waste also contains lead, cadmium, and other heavy metals known to damage the developing nervous system.^{3,4}

Children are particularly vulnerable to chemical exposure from playground surfaces due to their hand-to-mouth behaviors, close proximity to the ground, and higher respiratory rates compared to adults. Thus, there is increased potential for toxins to be inhaled, absorbed through the skin, and even swallowed.

Supporting a ban on these products are pediatricians, epidemiologists, and laboratory scientists at the Children's Environmental Health Center at the Icahn School of Medicine, New York. They explain that children are uniquely vulnerable "due to a number of factors including, but not limited to, their unique physiology and behaviors, rapidly developing organ systems, and immature detoxification mechanisms."^{5,6}

Toxins migrate

As recycled rubber in play surfaces breaks down into tiny pieces over time, they are picked up on children's and teachers' shoes, clothing, and skin, and are then carried into schools, homes, cars, etc. As such, exposures for children and their families and pets continue for many hours beyond the time spent in the play area.

Both the plastic "grass" blades and the infill — which includes tire crumb as well as silica sand with acrylic polymer and ground cork — break down and migrate widely, including into our waterways. These materials, which can include additives such as flame retardants and Polycyclic Aromatic Hydrocarbons (PAH), are toxic to aquatic life. The microplastics from the plastic "grass" are known to migrate into our oceans, food chain, and drinking water.⁷

Crumb rubber toxicity

The toxic components of rubber and plastic play surfaces must be removed and replaced after their after usable lifespan of eight to 10 years. There is a high likelihood that federal requirements will necessitate the disposal of these materials as hazardous waste — an environmental danger as well as a significant expense.⁸

Infections and abrasions

Unlike natural grass, which is permeable and capable of absorbing infectious material, synthetic turf is impermeable and requires chemicals for cleaning sweat, mucous, spit,

Tips for safer play on artificial turf

- If you select a turf field that does contain chemicals of concern, post a safety warning on your field to keep players and spectators safe.
- Avoid use on hot days.
- Avoid use for passive activities (i.e., sitting, lounging, picnicking.)
- Ensure good ventilation of indoor fields.
- Monitor young children to prevent accidental ingestion.
- Always wear shoes on artificial turf.
- Wash your hands before eating, drinking, or adjusting a mouth guard.
- Clean cuts and abrasions immediately.
- Brush hair thoroughly after play.
- Remove and clean shoes and gear outside before getting in a car.
- At home, take off shoes and shake out children's equipment and clothes outside or over the garbage.
- Shower immediately after playing on artificial turf.
- Vacuum any infill that comes into your home.

Source: Mount Sinai Children's Environmental Health Center, New York¹¹



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blood, bird droppings, etc.

The Pediatric Environmental Health Clinic of Mount Sinai Hospital, New York, warns about skin infections related to turf abrasions and burns. As plastic and rubber granule surfaces are more abrasive than natural grass, there is increased risk of abrasions that are ripe for Methicillin-resistant *Staphylococcus aureus* (MRSA) infection.⁹

Injury and concussions

Synthetic fields and playgrounds become hard as they age and because the infill is carried away on shoes, clothing, skin, and hair. The infill is supposed to be topped up annually but it rarely is. Some of Toronto's synthetic turf playgrounds and fields seem as hard as concrete. This increased hardness results in greater risk of concussion.

Professional athletes lament this problem as well as the threat of abrasions known as "turf burn" that can harbor infections. As far back as 2007, superstar soccer player David Beckham said, "You can't ask any athlete to perform at a high level on the FieldTurf (plastic "grass" with tire crumb infill). What it does to your body as a soccer player, you're in bits for three days after that... Every game, every team should have grass, without a doubt." Today, only two Major League Baseball stadiums are still using synthetic turf: Tropicana Field in Tampa and the Rogers Centre in Toronto.

"Natural" infills

Synthetic surfaces of plastic "grass" require infill to keep the surfaces soft enough to prevent injury. As we learn more about the hazards of the most popular infill — made of shredded used tires — we must also be aware of new infills that are being marketed as "organic," "natural," or "safe." One example is silica sand coated in acrylic polymers. These pellets break down into hazardous silica dust — a lung hazard rec-



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ognized by the EPA as a carcinogen¹⁰ — that combines with the breaking down of acrylic polymers into plastic dust and micro-debris. Another example is "natural" cork and coconut infill, which turns to dust before blowing and floating away during storms, thus leaving a play surface that is dangerously hard. The new "natural" infills are expensive, require use of chemicals, are respiratory risks, and have not been properly researched or regulated. No matter how "natural" the infill may be, the plastic green carpet on top of the infill remains an environmental and health concern.

What we can do

Given this information, what are our options? To start, teachers and parents can share information among themselves and with students. This can provide opportunities for broader conversations about topics such as the environment, nature deficit disorder among young people, and the benefits of natural grass, both psychological and physical. Exposure to real grass and "dirt" boosts young people's immune systems, increases their cognitive skills, reduces stress, and decreases the risks of ground impact and injuries.

There is a morass of online advertisements and promotions for artificial turf. It is better to rely on dedicated, reliable websites (as listed below in Additional Resources).

While none of the synthetic turf surfaces have been adequately researched, most decision-makers and school staff are not aware of the health hazards of synthetic turf. Teachers and parents can and should be involved when schools consider replacing natural surfaces with synthetic materials.

In schools that already have synthetic fields and playgrounds, teachers and parents can share as widely as possible relevant precautionary information and safety tips. (See the sidebar on p. 4.) They should also speak up when the time comes to replace the synthetic



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turf. Whenever a discussion of applying the precautionary principle comes up, this quote from Dr. David Brown, a public health toxicologist, serves as a useful starting point: "the evidence of hazardous substances is sufficient to create a burden of proof of safety before more fields are installed."

Last but not least, environmentally-conscious teachers and parents can enthusiastically remind young people that natural grass is the safest surface for school fields and that wood chips are safest for playgrounds and school fields. Natural grass does require professional installation and maintenance, but there are now many types of hardy, low-maintenance, pest-and drought-resistant grass blends from which to choose. When wood chips are used instead, they require just a bit of raking and an occasional topping up.

When we are so scrupulous about condemning single-use plastic straws and drinks in single-use plastic bottles, isn't it also time to address the fields of plastic and used tires in our elementary schools?

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References:

1. TORONTO District School Board Terms of Reference Governing Future Installations of Artificial Turf Sports Fields, report No. 09-13-2156, 2013, page 19, Playground Surface Temperatures
2. <https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Children-and-Disasters/Pages/Extreme-Temperatures-Heat-and-Cold.aspx>
3. ATSDR Toxicological Profile for Styrene, November 2010, <http://www.atsdr.cdc.gov/toxprofiles/tp53.pdf>

4. International Agency for Research on Cancer, 2008, <http://monographs.iarc.fr/ENG/Monographs/vol100F/mono100F-26.pdf>
5. Timothy Ciesielski et al. Cadmium Exposure and Neurodevelopmental Outcomes in U.S. Children. *Environ Health Perspect.* 2012 May; 120(5): 758-763. 27. doi: 10.1289/ehp.1104152
6. CDC (2012) Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention. http://www.cdc.gov/nceh/lead/acclpp/final_document_010412.pdf
7. Connecticut Department of Environmental Protection (2010) Artificial Turf Study: Leachate and Stormwater Characteristics http://www.ct.gov/deep/lib/deep/artificialturf/dep_artificial_turf_report.pdf
8. Environment and Human Health, Inc.; Synthetic Turf - Industry's Claims vs. the Science.
9. *New England Journal of Medicine*, February 2005.
10. <http://www.epa.gov/chemical-research>
11. Mount Sinai Children's Environmental Health Center; Artificial Turf: A Health-Based Consumer Guide.

Additional Resources:

- 12 Reasons Why Synthetic Fields Pose a Health Risk; Environment & Human Health, Inc.; www.ehhi.org
- Artificial Turf & Children's Health; Mount Sinai Children's Environmental Health Center
- Independent Science on Public Health Concerns Regarding Synthetic Turf; Grassroots Environmental Education
- National Center for Health Research; <http://www.center4research.org/nchr-letter-do-city-council-artificial-turf/>
- Natural Grass Athletic Fields (Benefits, Cost, & Maintenance) PowerPoint (2017); Sports Turf Managers Association
- Safe Healthy Playing Fields Coalition Information Sheet; SafeHealthyPlayingFields.org
- synturf.org
- TURI Turf Fact Sheet; Toxic Use Reduction Institute

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