Icahn School of Medicine at Mount Sinai
Children's Environmental Health Center

Children's Environmental Health Center
Department of Environmental Medicine and Climate Science
Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1217
New York, NY 10029-6574

October 24, 2024

To the members of the Westport Representative Town Meeting:

The Children's Environmental Health Center of the Icahn School of Medicine at Mount Sinai strongly discourages the installation of artificial turf playing surfaces and fields due to the uncertainties surrounding the safety of these products and the potential for dangerous heat and chemical exposures.

As pediatricians, epidemiologists, and laboratory scientists, recipients of numerous research grants from the National Institute of Health, and host to one of 10 nationally funded Pediatric Environmental Health Specialty Units, we receive frequent inquiries from communities regarding the wide-scale use of artificial turf surfaces on school grounds and in park properties. This led us to conduct a review of the risks and benefits of artificial playing surfaces, during which we found **significant gaps in the evidence supporting the safety of artificial turf products**. Our findings are summarized below and in our online resources accessible at https://mountsinaiexposomics.org/learning-hub/turf-sports/ and https://www.healthyplayingsurfaces.org/ and via webinar on the Environmental Health Impacts of Synthetic Turf and Safer Alternatives.[1]

Studies to assess the safety of artificial turf are ongoing and inconclusive. Adequate safety assessment requires biomonitoring to determine chemical exposures under realistic play conditions. Importantly, no studies have addressed children's exposure to chemicals from artificial turf surfaces via oral and dermal routes, the two most likely ways that turf chemicals enter the body during play. Extremely few studies have examined the composition and safety of alternative infills to recycled tire rubber including those purported to be "natural". A 2016 USEPA report found research supporting the safety of alternative infills such as EPDM, TPE, and plant-based infills "lacking or limited". [2] Recent studies including one conducted by Mount Sinai and the Toxic Use Reduction Institute (TURI) found the **presence of known carcinogens and neurotoxins including polycyclic aromatic hydrocarbons (PAHs), lead, zinc, and black carbon in almost all alternative infill materials examined**.[3,4]

Undisclosed chemicals of concern are present in plastic grass blades, turf pads, and matting. Recent analyses identified per- and poly-fluoroalkyl substances (PFAS, aka "Teflon chemicals"), a class of more than 5000 chemicals linked to numerous health problems including cancer, nervous system toxicity, immune dysfunction, thyroid, and cardiovascular disease in the plastic grass blades and backing used on artificial turf fields and in adjacent bodies of water.[5,6,7,8,9] PFAS are considered "forever chemicals" because they persist in the body and the environment and are widespread drinking water contaminants. These findings raise concerns about PFAS groundwater and environmental contamination from turf field run off and emphasize the need for further examination of exposures that may occur from turf components other than infill.

Actions by the USEPA highlight increasing recognition that there is no safe level of PFAS exposure. On April 10, 2024 USEPA finalized legally enforceable National Primary Drinking Water Regulations for six PFAS, dramatically lowering the recommended levels of PFOA and PFOS and citing **scientific evidence of health impacts at drinking water levels close to zero**.[11] These guidelines also include advisories for newer PFAS chemicals PFNA, GenX, PFBS, and PFHxS.

In addition to drinking water regulations, steps have been taken to designate PFAS hazardous substances and restrict their use in certain products both at the federal and state level including in Connecticut.[10,11,12,13,14] **To allow**

Icahn School of Medicine at Mount Sinai
Children's Environmental Health Center

Children's Environmental Health Center
Department of Environmental Medicine and Climate Science
Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1217
New York, NY 10029-6574

the installation of PFAS-containing surfaces would be extremely short-sighted as further restrictions and regulations on these chemicals are likely to come.

Risk of heat injury is elevated on artificial turf. On hot summer days, temperatures of over 160 degrees Fahrenheit have been recorded on synthetic play surfaces.[15] All types of artificial turf surfaces have been shown to have higher surface temperature and air temperature at head height compared with natural grass, regardless of infill type.[16] Vigorous play in these conditions conveys a very real risk of burns, dehydration, heat stress, or heat stroke. Children are less able to regulate their body temperature than adults, making them particularly susceptible to conditions of extreme heat.[17,18]

High temperatures and risk of heat illness lead to a loss of field usage even on moderately hot days, which have become increasingly common due to climate change. Like asphalt, artificial turf fields contribute to the "heat island effect", in which communities close to the fields become hotter than surrounding areas.[19] Artificial turf contributes to the climate crisis throughout its lifecycle, requiring fossil fuels during production and emitting greenhouse gases during use and disposal.[20]

Children are uniquely vulnerable to harmful exposures from artificial turf surfaces because of their unique physiology and behaviors, rapidly developing organ systems, and immature detoxification mechanisms.[21] Children may be exposed to artificial turf chemicals through ingestion, inhalation, skin absorption, and open wounds or broken skin. Children and young athletes breathe faster than adults, putting them at greater risk for inhalation of chemicals that off-gas from turf fields. Small children put their hands and other objects in their mouths, increasing the risk of exposure via ingestion. In addition, youth 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 injuries that have been observed on artificial turf fields.[14] Vulnerability to turf chemicals persists through the teen years as the reproductive and nervous systems continue to develop beyond the first two decades of life. Lastly, children have more future years of life over which chronic diseases linked to the chemicals in turf develop.

Chemical hazards escape from artificial turf surfaces to the environment. A number of the chemical components of artificial turf surfaces are soluble in water. When rain and snow fall on synthetic fields, these materials can leach from the surface to contaminate ground water and soil.[22] Recent studies find PFAS in wetlands adjacent to artificial turf suggesting that these chemicals may migrate from field components to contaminate the environment.[7] Artificial turf is also a major contributor to microplastics in the environment, with a recent study finding an estimated 20,000 fibers per day released into waterways.[23] For this reason, the European Union includes crumb rubber artificial turf in their ban on microplastic-producting products.[24] Microplastic contamination is found in drinking water and wildlife throughout the globe and in human blood, lungs, and placenta.[25,26,27,28]

Turf materials are transported home. Over time, play surfaces break down into smaller pieces and fine particles that may be picked up on children's shoes, clothing, and skin. Infill and grass blades accumulate in shoes and stick to bodies of players, bringing these materials into cars and homes. Thus, exposure can continue for many hours beyond the time that a child spends in the play area.

Daily outdoor play and physical activity are essential components of a healthy childhood. Safe play areas are an essential component of any school environment. While it is important to maximize safe play time, we caution

Icahn School of Medicine at Mount Sinai
Children's Environmental Health Center

Children's Environmental Health Center
Department of Environmental Medicine and Climate Science
Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1217
New York, NY 10029-6574

against the use of materials which carry risks of chemical and heat exposure and have not been comprehensively tested for safety.

For the reasons outlined above, the Children's Environmental Health Center recommends natural grass fields and playing surfaces as the safest option for areas where children play. For case studies that include data on cost, labor, and play time on organically managed natural grass athletic fields see https://www.uml.edu/research/lowell-center/athletic-playing-fields/.

I would be happy to answer any questions that you might have.

Kind Regards,

Sarah Evans, PhD MPH
Assistant Professor
Children's Environmental Health Center
Department of Environmental Medicine and Climate Science
Icahn School of Medicine at Mount Sinai

---

[1] https://www.healthandenvironment.org/webinars/96595
[2] https://www.epa.gov/chemical-research/december-2016-status-report-federal-research-action-plan-recycled-tire-crumb
[3] Massey *et al. New Solut*. 2020 May;30(1):10-26. doi: 10.1177/1048291120906206.
[4] Armada et al. Sci *Total Environ*. 2022 Mar 15;812:152542.
[5] Lauria et al. Widespread Occurrence of Non-Extractable Fluorine in Artificial Turfs from Stockholm, Sweden. Environ. Sci. Technol. Lett. 2022, 9, 666−672. doi.org/10.1021/acs.estlett.2c00260
[6] https://www.atsdr.cdc.gov/pfas/PFAS-health-effects.html
[7] https://www.bostonglobe.com/metro/2019/10/09/toxic-chemicals-found-blades-artificial-turf/1mlVxXjzCAqRahwgXtfy6K/story.html
[8] https://sinaiexposomics.org/pfas-chemicals-and-your-health/
[9] https://www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/PFAS_in_Artificial_Turf_Carpet
[10] https://www.epa.gov/newsreleases/epa-proposes-stop-authorized-use-certain-pfas-pesticide-products
[11] https://www.epa.gov/superfund/designation-perfluorooctanoic-acid-pfoa-and-perfluorooctanesulfonic-acid-pfos-cercla
[12] https://portal.ct.gov/governor/news/press-releases/2021/07-2021/governor-lamont-signs-legislation-banning-use-of-pfas?language=en_US
[13] https://portal.ct.gov/deep/remediation--site-clean-up/pfas-task-force/pfas-task-force
[14] https://www.cga.ct.gov/2024/ba/pdf/2024SB-00292-R01-BA.pdf
[15] Devitt, D.A., M.H. Young, M. Baghzouz, and B.M. Bird. 2007. *Journal of Turfgrass and Sports Surface Science.* 83:68-82
[16] https://plantscience.psu.edu/research/centers/ssrc/sportsturf-scoop/temperature
[17] https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Children-and-Disasters/Pages/Extreme-Temperatures-Heat-and-Cold.aspx
[18] Falk B, Dotan R. *Appl Physiol Nutr Metab.* 2008 Apr;33(2):420-7. doi: 10.1139/H07-185.
[19] Luz Claudio. *Environmental Health Perspectives*. Vol 116. No 3. March 2008.
[20] https://www.nrpa.org/parks-recreation-magazine/2019/may/synthetic-sports-fields-and-the-heat-island-effect/
[21] Bearer, CF. Neurotoxicology 21:925-934, 2000.
[22] 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

Icahn School of Medicine at Mount Sinai
Children's Environmental Health Center

Children's Environmental Health Center
Department of Environmental Medicine and Climate Science
Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1217
New York, NY 10029-6574

---

[23] de Haan et al. The dark side of artificial greening: Plastic turfs as widespread pollutants of aquatic environments. Environmental Pollution. Volume 334, 1 October 2023,122094. DOI: 10.1016/j.envpol.2023.122094
[24] Zuccaro et al. The European Union Ban on Microplastics Includes Artificial Turf Crumb Rubber Infill: Other Nations Should Follow Suit Environ. Sci. Technol. 2024, 58, 6, 2591–2594. DOI: 10.1021/acs.est.4c00047

[25] Amato-Lourenço et al. *Journal of Hazardous Materials*. Vol. 416, 15 August 2021, 126124. doi: 10.1016/j.jhazmat.2021.126124
[26] Ragusa et al. *Environ Int*. 2021 Jan;146:106274. doi: 10.1016/j.envint.2020.106274.
[27] Leslie et al. Environment International. Vol. 163, May 2022, 107199. 10.1016/j.envint.2022.107199
[28] de Haan et al. *Environmental Pollution.* Vol 334, Oct 1 2-23, 122094. https://doi.org/10.1016/j.envpol.2023.122094