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

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Department of Environmental Medicine and Public Health
Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1217
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To Mayor McGeeHee and Members of the Maplewood Township Committee,

We, the Children's Environmental Health Center of the Icahn School of Medicine at Mount Sinai, strongly discourage the installation of artificial turf fields in Maplewood Township due to the uncertainties surrounding the safety of these products.

As pediatricians, epidemiologists, and laboratory scientists at the Children's Environmental Health Center of the Icahn School of Medicine at Mount Sinai, 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 concerned parents and physicians 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 discussed in detail in the attached documents: "Artificial Turf: A Health-Based Consumer Guide" and "Position Statement on the use of Recycled Tires in Artificial Turf Surfaces".

Children and young adults are uniquely vulnerable to harmful exposures from artificial turf surfaces. This is due to a number of factors including their unique physiology and behaviors, rapidly developing organ systems, and immature detoxification mechanisms.[1] Vulnerability persists through the teen years as the reproductive and nervous systems continue to develop beyond the first two decades of life. Children and young athletes breathe faster than adults at rest, putting them at greater risk for inhalation of chemicals that off-gas from turf fields. 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.[2,3] Lastly, children and young adults have more future years of life over which chronic diseases develop.

Studies to assess the safety of artificial turf are ongoing and inconclusive. The preponderance of existing data on artificial turf pertains to recycled tire infill, or "crumb rubber", which contains known carcinogens and neurotoxins. Concerns about the safety of recycled rubber playing surfaces have been raised by the federal government, based on a lack of comprehensive studies. In 2016, the United States Environmental Protection Agency (USEPA) announced the launch of an investigation into the safety of crumb rubber in partnership with the Centers for Disease Control and Prevention and the Consumer Product Safety

[1] Bearer, CF. Neurotoxicology 21:925-934, 2000.
[2] Falk B, Dotan R. *Appl Physiol Nutr Metab.* 2008 Apr;33(2):420-7. doi: 10.1139/H07-185.

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Commission, stating **"existing studies do not comprehensively evaluate the concerns about health risks from exposure to tire crumb"[3].**

Extremely few studies have examined the composition and safety of alternative infills 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" [4].** Indeed the little information available regarding the composition and safety of these newer generations of infill makes it impossible to assess safety. In addition, the grass blades, mats, and other components utilized in all synthetic turf fields have not been thoroughly studied for composition and safety.

Adequate safety assessment requires biomonitoring to determine children's chemical and heat exposure under realistic play conditions. Importantly, no studies have addressed children's exposure to chemicals from artificial turf surfaces via oral and dermal routes. **Until the findings of these studies are available and conclusively demonstrate the safety of artificial surfaces, we recommend a moratorium on the use of these materials where children play.**

We have identified several potential dangers that playing on recycled rubber playing surfaces pose to children. These include:

1. **Extreme heat.** On hot summer days, temperatures of over 160 degrees Fahrenheit have been recorded on recycled rubber play surfaces[5]. 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[6]. 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[7].

2. **Inhalation, ingestion, and absorption of toxic and carcinogenic chemicals.** Children are particularly vulnerable to chemical exposures from play surfaces due to their developmentally appropriate hand to mouth behaviors. In addition, their close proximity to the ground and higher respiratory rates compared with adults increase the likelihood of inhalational exposures. Thus, there is a potential for

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[3] http://www.epa.gov/sites/production/files/2016-02/documents/us_federal_research_action_plan_tirecrumb_final_0.pdf

[4] https://www.epa.gov/chemical-research/december-2016-status-report-federal-research-action-plan-recycled-tire-crumb

[5] Devitt, D.A., M.H. Young, M. Baghzouz, and B.M. Bird. 2007. Surface temperature, heat loading and spectral reflectance of artificial turfgrass. Journal of Turfgrass and Sports Surface Science 83:68-82

[6] https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Children-and-Disasters/Pages/Extreme-Temperatures-Heat-and-Cold.aspx

[7] Falk B, Dotan R. *Appl Physiol Nutr Metab.* 2008 Apr;33(2):420-7. doi: 10.1139/H07-185.

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toxins to be inhaled, absorbed through the skin and even swallowed by children who play on recycled rubber surfaces. The major chemical components of recycled rubber are styrene and butadiene, the principal ingredients of the synthetic rubber used for tires in the United States[8]. Styrene is neurotoxic and reasonably anticipated to be a human carcinogen[9]. Butadiene is a proven human carcinogen that has been shown to cause leukemia and lymphoma[10]. Shredded and crumb rubber also contain lead, cadmium, and other metals known to damage the developing nervous system[11,12]. Children may also inhale potentially harmful chemicals that have been detected in the air above rubber turf such as benzathiazole and polycyclic aromatic hydrocarbons (PAHs), both of which are linked to cancer[13].

Although less data on the composition of alternatives to crumb rubber is available, analyses 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[14,15].

Few studies have assessed potential chemical exposures from the artificial grass blades and backing materials used on synthetic playing fields. **A recent study identified perfluoroalkyl chemicals (PFAS), a class of 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**[16,17]. PFAS are persistent pollutants that have been shown to contaminate wetlands and drinking water. These findings raise concerns about PFAS groundwater contamination

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[8] Denly *et al* A Review of the Potential Health and Safety Risks from Synthetic Turf Fields Containing Crumb Rubber Infill. May 2008. http://www.nyc.gov/html/doh/downloads/pdf/eode/turf_report_05-08.pdf

[9] ATSDR Toxicological Profile for Styrene, November 2010. http://www.atsdr.cdc.gov/toxprofiles/tp53.pdf.

[10] International Agency for Research on Cancer, 2008. http://monographs.iarc.fr/ENG/Monographs/vol100F/mono100F-26.pdf

[11] 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

[12] 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

[13] Connecticut Department of Public Health (2010) Human Health Risk Assessment of Artificial Turf Fields Based Upon Results from Five Fields in Connecticut. http://www.ct.gov/deep/lib/deep/artificialturf/dph_artificial_turf_report.pdf

[14] Athletic Playing Fields: Choosing Safer Options for Health and the Environment. https://www.turi.org/TURI_Publications/TURI_Reports/Athletic_Playing_Fields_Choosing_Safer_Options_for_Health_and_the_Environment

[15] Massey *et al. New Solut*. 2020 May;30(1):10-26. doi: 10.1177/1048291120906206.

[16] https://www.atsdr.cdc.gov/pfas/PFAS-health-effects.html

[17] https://www.bostonglobe.com/metro/2019/10/09/toxic-chemicals-found-blades-artificial-turf/1mlVxXjzCAqRahwgXtfy6K/story.html

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from turf field run off and emphasize the need for further examination of exposures that may occur from turf components other than infill.

4. **Transportation home of infill materials.** Over time, the infill used in play surfaces breaks down into smaller pieces and fine particles that may be picked up on children's shoes, clothing and skin. These particles are tracked into homes and cars, and carried into the places where children live, play, eat and sleep. Thus exposure can continue for many hours beyond the time that a child spends in the play area.

5. **Escape of chemical hazards from rubber surfaces to the environment.** A number of the chemical components of turf fields 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[18]. Recent studies find PFAS in wetlands adjacent to artificial turf suggesting that these chemicals may migrate from field components to contaminate the environment[15]. In addition, chemicals in turf are released into the air and may be inhaled, particularly on hot days. Infill and grass blades are accumulate in shoes and stick to bodies of players, bringing these materials into cars and homes.

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

We urge you to maintain natural grass fields in Maplewood Township in order protect the health of the children of your community. Thank you for the opportunity to provide you with our professional opinion. We would be happy to answer any questions that you might have.

Kind Regards,

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[18] 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