

County of Santa Clara

Public Health Department



Public Health Administration
150 W. Tasman Drive, 2nd Floor
San José, CA 95134
408.792.5040

DATE: November 9, 2023

TO: Honorable Board of Supervisors
James R. Williams, County Executive

FROM: Sara H. Cody, MD, Health Officer and Public Health Director *SHC*

SUBJECT: Public Health Risks of Artificial Turf

At the October 11, 2023, meeting of the Health and Hospital Committee, Chairperson Simitian requested a report back from the Health Officer regarding the possible public health risks, if any, of artificial turf or “astroturf.” The Public Health Department has collated the following findings from primary research and reviews by expert entities to describe the major areas of potential risk and benefit to public health, including environmental health. However, this summary is not intended to be comprehensive and may not address concerns related to specific materials. Decisions regarding whether to utilize artificial surfaces are complex and should include operational considerations not addressed in this document, including but not limited to availability, cost, maintenance, runoff from fertilizer, drought conditions, and related building, construction, and water use regulations.

Artificial turf fibers are typically made from nylon, polypropylene or polyethylene and are connected to a backing material. The base material, also called infill, consists of one or more granular materials that are worked in between the fibers during the installation process. Commonly used base materials are granulated crumb rubber produced from used tires, flexible plastic pellets, sand, and rubber-coated sand. Artificial turf has gained favor in the context of widespread public health consensus that improved access to outdoor spaces for exercise and play are beneficial to multiple areas of health. At the same time, concerns for drought and insufficient water supply have imposed limits on the use of grass and other natural materials. In addition, some materials were proposed to reduce risk of mechanical injury, such as when a child may fall onto the material from a play structure. However, various agencies and advocacy groups have raised concerns that such surfaces could create increased risk related to the following major categories: heat stress, mechanical injury, infection, allergic reaction, or chemical exposure. In addition, environmental risks may include the need for solid waste disposal and chemical contamination of watersheds due to runoff from the surfaces.

Below is a summary of the potential health, safety, and environmental concerns related to direct exposure to synthetic turf fields (1):

Heat Stress

Synthetic turf fields absorb heat, resulting in surface temperatures that are much higher than the temperatures of the surrounding air. Surface temperatures on crumb-rubber infilled synthetic turf fields often exceed that of natural surfaces in the same conditions. These

temperatures can reach levels of discomfort and may contribute to heat stress for individuals using the surface. While watering synthetic turf may briefly reduce surface temperatures, this intervention may be of limited utility or practicality. People using artificial fields and surfaces should be advised to remain hydrated and to seek relief from the heat in shaded areas during conditions that increase surface temperatures (2).

Injury

Many factors influence the rate of sports injuries, including the type of playing surface. Other risk factors have been implicated in injury rates among athletes, in addition to the type of playing surface. These risk factors include level of competition, skill level, age, shoe type, previous injury and rehabilitation, and a number of individual physical characteristics. Overall, studies have found no consistent differences in injury rates between natural surfaces and crumb-rubber infilled synthetic turf (3).

Infection Risk

There has been some concern that infections, including methicillin-resistant *Staphylococcus aureus* (MRSA), may be more common among users of synthetic turf fields than users of natural turf fields. Research has been conducted examining the ability of *Staphylococcus aureus* (*S. aureus*) to survive on synthetic turf infill and fibers. The available data do not suggest the widespread presence of infectious agents, such as MRSA, on synthetic turf fields. Also, the available information indicates that outdoor or indoor synthetic turf surfaces are no more likely to harbor infectious agents than other surfaces in those same environments (4).

Latex Allergy

Natural rubber contains substances called latex allergens, which can cause an allergic response in some people. About 6 percent of the general population is allergic to latex. Tire rubber contains latex allergens, although at much lower levels than in latex gloves and other consumer products. People playing on synthetic turf may be exposed to latex allergens through direct contact with the skin (dermal exposure) and inhalation of small rubber particles suspended in the air. While some artificial surfaces include latex, a review by the New York State Department of Health failed to find evidence of any cases of latex allergy resulting from contact with crumb rubber or synthetic turf fields (5).

Chemical Exposures

Exposure to a chemical requires contact with it. Contact with a chemical occurs in three ways: swallowing it (ingestion exposure), breathing it (inhalation exposure), or having it come in direct contact with the skin or eyes (dermal/ocular exposure). The potential for harmful effects from exposure to a chemical depends on the amount of the chemical a person contacts, how the chemical enters the body, how often contact occurs, the toxic properties of the chemical, and many other individual factors such as age, gender, general health, genetic differences, exposure to other chemicals, and lifestyle choices. Results from numerous studies suggest that the potential for chemical exposures from crumb rubber in synthetic turf is low (6,7,8). Further studies by the federal government (Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds) and California (California Office of Environmental Health Hazard Assessment) are underway to fill data gaps and decrease uncertainties in this area.

Cancer

In 2014, a women's soccer coach at the University of Washington compiled a list of players she knew of who were diagnosed with cancer, raising concerns about the possibility that playing soccer on artificial turf fields might increase the risk of developing cancer. In response, public health officials at the Washington State Department of Health and researchers from the University of Washington School of Public Health investigated the cases on the coaches list but did not find this to be an unusual rate of occurrence for residents of similar age in Washington State. Based on their investigation, Washington State Department of Health determined in 2017 that no further public health response was warranted at that time (9). A 2018 California study also found no association at the county level between artificial turf field density and lymphoma incidence in adolescents and young adults (10).

In addition to direct effects to human health, there are environmental and behavioral considerations for artificial turf use:

Environmental Effects

Artificial turf adds chemicals and microplastics to the environment. Water does not penetrate artificial turf, so rainfall either pools or becomes runoff, carrying with it polycyclic aromatic hydrocarbons, per- and polyfluoroalkyl substances (PFAS), lead, and zinc. These substances are toxic to fish and other aquatic life. Artificial turf can also undermine biodiversity as it does not provide habitat for insects and other wildlife and blocks soil from sequestering carbon dioxide (11). Artificial turf involves the use of non-renewable resources, such as petroleum-based plastics, and energy intensive processes for manufacturing and additional carbon footprint for transportation and installation. Artificial turf has a limited lifespan, and then it is typically disposed of in landfills, where overall capacity is estimated to be depleted in 15 years.

Safe and Inclusive Play Spaces for Children and Young Adults

Childhood and adolescence are critical periods for developing movement skills, learning healthy habits, and establishing a firm foundation for lifelong health and well-being. Outdoor play is a great way to encourage children to move and stay physically active, which protects their health in childhood and throughout life (12). Studies indicate that play improves cognitive, physical, social, and emotional well-being of children and young adults (13). Since falls are a very common playground hazard, the installation and maintenance of protective surfacing under and around outdoor play equipment is crucial to protect children from severe injuries. Public health experts have further recommended that parks should be readily accessible and usable by individuals with disabilities as required by the Americans with Disabilities Act (14).

References

1. New York State Center for Environmental Health. Information About Crumb-Rubber Infilled Synthetic Turf Athletic Fields.
https://www.health.ny.gov/environmental/outdoors/synthetic_turf/crumb-rubber_infilled/fact_sheet.htm
2. McNitt S., Petrunak D., Evaluation of Playing Surface Characteristics of Various In-filled Systems; Penn State Department of Crop and Soil Sciences
3. Williams JH, Akogyrem E, Williams JR; A Meta-Analysis of Soccer Injuries on Artificial Turf and Natural Grass. *Journal of Sports Medicine* Volume; Article ID 380523; 2013.
4. Archibald L, Shapiro J, Pass A; Methicillin-Resistant Staphylococcus aureus Infection in a College Football Team: Risk Factors Outside the Locker Room and Playing Field. *Infect Contr Hosp Epid.* 29:450-453; 2008.
5. California Environmental Protection Agency Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products. Sacramento, CA: Office of Environmental Health Hazard Assessment; 2007.
6. Birkholz DA, Belton KL, Guidotti TL; Toxicological Evaluation for the Hazard Assessment of Tire Crumb for Use in Public Playgrounds. *Journal of the Air & Waste Management Association*; 53:7, 903-907; 2003.
7. Ginsberg G, Toal B, Simcox N, Bracker A, Golembiewski B, Kurland T, Hedman C; Human Health Risk Assessment of Synthetic Turf Fields Based Upon Investigation of Five Fields in Connecticut. *Journal of Toxicology and Environmental Health, Part A*, 74:17, 1150-1174, 2011.
8. Cheng H, Hu Y and Reinhard M. Environmental and Health Impacts of Artificial Turf: A Review. *Environ Sci & Technol* 48 (4), 2114–2129, 2014.
9. Washington State Department of Health. Investigation of Reported Cancer among Soccer Players in Washington State. 2017.
10. Bleyera A, Keegan T; Incidence of malignant lymphoma in adolescents and young adults in the 58 counties of California with varying synthetic turf field density. *Cancer Epidemiology* 53: 129–136, 2018.
11. Toxic Use Reduction Institute. Athletic Playing Fields: Choosing Safer Options for Health and the Environment. 2019.
<https://www.turi.org/content/download/11980/188623/file/TURI+Report+2018-002+June+2019.+Athletic+Playing+Fields.pdf>
12. Centers for Disease Control and Prevention. Physical Activity Guidelines for Americans 2nd Edition. 2018. https://health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf
13. Yogman M, Garner A, Hutchinson J, et al. AAP Committee on Psychosocial Aspects of Childs and Family Health, AAP Council on Communications and Media. The Power of Play: A Pediatric Role in Enhancing Development in Young Children. *Pediatrics*. 2018;142(3):e20182058
14. US Consumer Product Safety Commission. Public Playground Safety Handbook (No. 325). 2010. <https://www.cpsc.gov/s3fs-public/325.pdf>