
North Andover Board of Health
Meeting Minutes
Thursday – March 14, 2019
7:00 p.m.
120 Main Street, 2nd Floor Selectmen’s Meeting Room
North Andover, MA 01845

Present: Frank MacMillan Jr., Joseph McCarthy, Michelle Davis, Daphnee Alva-LaFleur, Patrick Scanlon, Brian LaGrasse, Toni K. Wolfenden, Suzanne Egan

I. CALL TO ORDER

The meeting was called to order at 7:03 pm.

II. PLEDGE OF ALLEGIANCE

III. PUBLIC HEARINGS

IV. APPROVAL OF MINUTES

V. OLD BUSINESS

VI. NEW BUSINESS

VII. COMMUNICATIONS, ANNOUNCEMENTS, AND DISCUSSION

Dr. Francis P. MacMillan, Jr. Chairman of the Board of Health, explains to the town residents that the Board of Health is a regulatory body that is required to hold its meetings in public. The Board of Health has a regular meeting schedule. This is an additional meeting called at the request of the Planning Board to provide the Board of Health’s advice on public health matters that they wish to consider regarding the artificial turf fields project. Dr. MacMillan explains that the Planning Board has primary responsibility for the field’s project and the Board of Health does not have jurisdiction over the review of the project. At this point, the Board of Health will honor the Planning Boards request to advise them on the artificial turf fields. All public comments regarding the artificial turf fields should be directed to the Planning Board at their next scheduled meeting on Tuesday March 19, 2019.

Brian LaGrasse, Director of Public Health provided the Board of Health with packets of information gathered from EPA (Environmental Protection Agency), Massachusetts Department of Public Health/Bureau of Environmental Health, New York State Department of Health, California Environmental Protection Agency, and The Commonwealth of Massachusetts Executive Office of Health and Human Services Department of Public Health. This information gathered provided the Board with a synopsis of all the research and papers that have been done and published so far. (see attached)

To date, Brian LaGrasse has not found any information that concludes there is any significant risk with the turf fibers or crumb rubber if the turf is properly constructed and maintained. The EPA started a study a

while ago on artificial turf. Their original synopsis and interpretation of the data was that there was no significant risk. The EPA began a new multi-year study that is still ongoing however, the public comment period was closed out on February 25, 2019. This report is in the process of being written, and the data has not yet been published.

The Massachusetts Department of Public Health has provided a fact sheet about artificial turf fields (ATF) dated February 2019. The sheet provides information on: what the fields are made of; what chemicals are in the fields and concerns. ATF's are made from recycled car or truck tires. There are natural and man-made substances used during the tire manufacturing and some of these chemicals have been found in the crumb rubber infill. These include volatile organic compounds (VOCs), semi-VOCs (SVOCs) such as polycyclic aromatic hydrocarbons (PAHs) and metals such as lead, which are considered carcinogens. The conclusion was that adverse health effects from using ATFs are unlikely, however studies are still going on but everything right now points to the same conclusion. The fact sheet also talks about injuries and bacteria. Some common mitigation strategies with AFT are: to use something other than crumb rubber, like TPE, which is a type of plastic versus a rubber, and using a lighter color Thermoplastic Elastomer (TPE) or turf to reduce high temperatures.

Joseph McCarthy explains that although he prefers natural grass fields, that doesn't mean there is a problem with ATF. There are pros and cons. Crumb rubber which is finely ground rubber tires. Cons – it is black and retains heat. The temperatures on the fields can be very high. TPE – comes in different colors lighter colors are generally cooler.

Frank MacMillan discusses the findings in the New York State Department of Health - Information about Crumb-Rubber Infilled Synthetic Turf Athletic Fields. Dr. MacMillan refers to page 7 which summarizes the turf fields into areas of concerns: heat stress, injury, infection, latex allergy, chemical exposures and cancer. To help with heat problems, the summary explains to people to remain hydrated and seek relief from the heat in shaded areas. Injuries, there are no consistent differences between natural grass fields and synthetic fields. Skin cuts and abrasions can result from both natural and synthetic fields and both are susceptible to infections. Clean wounds; avoid sharing equipment, razors, towels, soap and other objects with others to reduce the spread of germs. There are no known cases of latex allergy resulting from contact with crumb rubber or synthetic turf fields. Studies show that the potential for chemical exposures from crumb rubber is low, however further studies by the federal government and California are underway to fill gaps in data and to help decrease uncertainties. Currently, California and Washington State have not found support for cancer associations with AFT use, assessments do not support a cancer risk but at the same time, Dr. MacMillan wants to take mitigation matters whenever possible.

Michelle Davis has spent significant time reviewing materials provided and researching the topic of Artificial Turf Fields. She discovered that it was difficult finding significant research to make a sound decision. Studies are limited. Ms. Davis did find that health boards do not endorse any specific consumer products.

Joseph McCarthy discusses the Testimony of Dr. Diana Zuckerman before the Maryland House of Delegates Appropriations Committee on the Health Risks of Artificial Turf. This is an opposing view of artificial fields. Mr. McCarthy expresses concerns about the report's validity.

The Board of Health recommendations about ATF:

- Mitigate wherever possible and feasible
- No lead or low lead products
- Research TPE (thermoplastic elastomer) and alternatives
- Follow up with action items
- The Board of Health will not endorse a consumer product

MOTION made by Michelle Davis to submit the opinion of the Board of Health to Planning Board for the next public hearing. Seconded by Patrick Scanlon and all were in favor. **(5-0-0)**

VIII. CORRESPONDENCE / NEWSLETTERS

IX. ADJOURNMENT

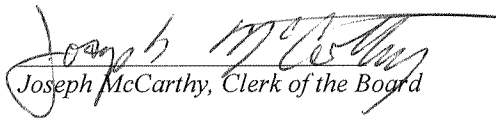
MOTION made by Michelle Davis to adjourn the meeting. Joseph McCarthy seconded the motion and all were in favor. The meeting adjourned at 7:30 pm.

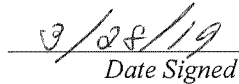
North Andover Board of Health
Meeting Minutes
Thursday – March 14, 2019
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North Andover, MA 01845

Prepared by:
Toni K. Wolfenden, Health Dept. Assistant

Reviewed by:
All Board of Health Members & Brian LaGrasse, Health Director

Signed by:


Joseph McCarthy, Clerk of the Board


Date Signed

Documents Used at Meeting:

Meeting Agenda – March 14, 2019

Email from Brian LaGrasse to Monica Gregoire – Monday January 28, 2019

EPA – Federal Research on Recycled Tire Crumb Used on Playing Fields

EPA – Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds Status Report

EPA – Science in Action Innovative Research for a Sustainable Future – Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds

Massachusetts Department of Public Health Bureau of Environmental Health – Artificial Turf Fields

New York State Department of Health – Information about Crumb-Rubber Infilled Synthetic Turf Athletic Fields

The Commonwealth of Massachusetts Department of Public Health letter to Needham Board of Health – April 29, 2008

California Environmental Protection Agency – Environmental Health Study of Synthetic Turf – August 2016 Update

The Commonwealth of Massachusetts Department of Public Health letter to Medway Board of Health – March 23, 2015

Testimony of Dr. Diana Zuckerman before the Maryland House of Delegates Appropriations Committee on the Health Risks of Artificial Turf – Diana Zuckerman, PhD, National Center for Health Research, - February 8, 2018

**North Andover Board of Health
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- I. **CALL TO ORDER**
- II. **PLEDGE OF ALLEGIANCE**
- III. **APPROVAL OF MINUTES**
- IV. **PUBLIC HEARINGS**
- V. **OLD BUSINESS**
- VI. **NEW BUSINESS**
- VII. **COMMUNICATIONS, ANNOUNCEMENTS, AND DISCUSSION**
 - A. **Artificial Turf Fields**
- VIII. **CORRESPONDENCE / NEWSLETTERS**
- IX. **ADJOURNMENT**



Brian LaGrasse <blagrasse@northandoverma.gov>

Re: Department Review - 495 Main Street Recreational Complex

1 message

Brian LaGrasse <blagrasse@northandoverma.gov>
To: Monica Gregoire <mgregoire@northandoverma.gov>

Mon, Jan 28, 2019 at 2:42 PM

Thanks Monica. I took a look at the plans and proposal and just have one comment regarding the components and materials that will be used for the construction the artificial turf fields (ATF) and "poured in place rubber safety surface" in the playground. The Board of Health would just like to ensure that any rubberized pellets and other components used for these areas meet the standards set forth in the Consumer Product Safety and Improvement Act. The lead limit is set at 100 ppm and components used in construction should be certified as no or low lead concentrations. I think this may be standard practice in ATF construction now but just want to be sure. A study done a few years ago found a ATF with extremely high lead levels in the turf fiber used in construction.

Also the concession stand being proposed should go through a plan review with the Health Department sooner rather than later. Design layout, scope of operation and material finishes should be approved and determined as soon as possible.

Thanks and let me know if you have any questions.







Sincerely,
Brian

On Wed, Jan 9, 2019 at 9:22 AM Monica Gregoire <mgregoire@northandoverma.gov> wrote:
Good Morning,

An application has been submitted to Planning for a recreational complex at 495 Main Street. The project includes the construction of athletic fields, tennis courts, picnic areas, associated parking areas, walkways and emergency/maintenance access paths. The Property is located in the Residential 4(R4) Zoning District. Please review the attached application and provide feedback no later than the close of Business on **Tuesday, January 15th**. Please do not hesitate to contact me if you have any questions or concerns.

Thank you,

Monica

-  [Recreation Complex - General and Specific Requi...](#)
-  [Recreation Complex Permitting Plans 12-20-18.pdf](#)
-  [Recreation Complex Stormwater Report 12-20-18.pdf](#)
-  [Recreation Complex SWPPP & EC Plan 12-20-18.pdf](#)
-  [Site Plan Review Special Permit Application Sta...](#)
-  [Site Plan Review Special Permit Application.pdf](#)

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Monica Gregoire

Staff Planner

Planning Department

Town of North Andover

3/12/2019

Town of North Andover Mail - Re: Department Review - 495 Main Street Recreational Complex

120 Main Street

North Andover, MA 01845

Phone (978) 688-9535

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Email mgregoire@northandoverma.gov

Web www.northandoverma.gov

Hours of Operation: Monday, Wednesday, Thursday 8 AM - 4:30 PM
Tuesday 8 AM - 6 PM, Friday 8 AM -12 PM

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An official website of the United States government.

We've made some changes to EPA.gov. If the information you are looking for is not here, you may be able to find it on the EPA Web Archive or the January 19, 2017 Web Snapshot.

Close



Federal Research on Recycled Tire Crumb Used on Playing Fields



Background

Concerns have been raised by the public about the safety of recycled rubber tire crumb used in synthetic turf fields and playgrounds in the United States. We know people are concerned and players and their families want answers. Limited studies have not shown an elevated health risk from playing on fields with tire crumb, but the existing studies do not comprehensively evaluate the concerns about health risks from exposure to tire crumb. We are committed to supporting more comprehensive efforts to assess risks from tire crumb.

NO Evidence yet

That's why on February 12, 2016, the U.S. Environmental Protection Agency (EPA), the Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (ATSDR), and the Consumer Product Safety Commission (CPSC) launched a multi-agency **Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds** to study key environmental and human health questions.

Federal Research

This coordinated *Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds* includes outreach to key stakeholders, such as athletes and parents, and seeks to:

- Fill important data and knowledge gaps.
- Characterize constituents of recycled tire crumb.
- Identify ways in which people may be exposed to tire crumb based on their activities on the fields.

The study has four parts:

- Literature Review/Gap Analysis (EPA and CDC/ATSDR)
- Tire Crumb Characterization (EPA and CDC/ATSDR)
- Exposure Characterization Study (EPA and CDC/ATSDR)
- Playground Study (Consumer Product Safety Commission)

Status

The collection and analysis of samples for the exposure and tire crumb characterization parts of the study are now complete. EPA and CDC/ATSDR drafted the report which is now undergoing technical peer review.

For the tire crumb characterization part of the study, tire crumb samples were gathered from tire crumb manufacturing/recycling plants and from indoor and outdoor fields across the country. Samples were gathered from nine tire crumb manufacturing/recycling plants and 40 fields.

For the exposure characterization part of the study, on August 2, 2017, the Office of Management and Budget (OMB) approved the Information Collection Request for the continuation of the exposure characterization study. With the OMB approval, the EPA and CDC/ATSDR team were able to complete the field work associated with the exposure characterization in the Fall of 2017. During the exposure characterization field work, EPA and CDC/ATSDR visited several fields to collect exposure information to better characterize people's exposure to tire crumbs. Activity information from field users who elected to participate in the study was also gathered.

Prior to the August 2017 OMB approval, the exposure characterization portion of the study as outlined in the Federal Research Action Plan was posted for public comment in February 2017. An additional requirement of a 30-day Federal Register Notice, along with the Information Collection Request package was published on June 12, 2017 .

On December 30, 2016, the agencies released a status report describing the progress of the research to date. The status report includes the final peer-reviewed Literature Review/Gaps Analysis report and describes the progress to date on other research activities that are part of the effort including: Characterization of the chemicals found in tire crumb; Characterization of the exposure scenarios for those who use turf fields containing tire crumb; Study to better understand how children use playgrounds containing tire crumb and; Outreach to key stakeholders. The status report does not include research findings. (See sidebar for links to the Federal Register Notices and 2016 Status Report).

While this effort won't provide all the answers about whether synthetic turf fields are safe, it represents the first time that such a large study is being conducted across the U.S. The study will provide a better understanding of potential exposures that athletes and others may experience and will help answer some of the key questions that have been raised.

Timeline

The draft report on the Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds (FRAP) was sent for external peer-review in May 2018. The US EPA and CDC/ATSDR are currently working to

address peer review comments. The Agencies plan to release the report in two parts. The first part summarizing the Tire Crumb Rubber Characterization Study will be released for public comment in early 2019. Currently, CDC/ATSDR is initiating a full biomonitoring study to investigate potential exposure to constituents in tire crumb rubber infill. The information from the biomonitoring study will be released for public comment, along with information collected as part of the FRAP Exposure Characterization Study, at a later date. The timeline and information about the study is and will continue to be posted to this website.

With respect to the biomonitoring study, CDC/ATSDR has posted a 60-day Federal Register Notice inviting comment on the proposed supplemental data collection, "Exposure Characterization and Measurements during Activities Conducted on Synthetic Turf Fields with Tire Crumb Rubber Infill."

Public comments were due on 2/25/16



Study will evaluate & characterize human exposure potential to select chemicals from tire crumb rubber infill

Existing Research and Information

- Other federal, state, and local government agencies have conducted limited studies on artificial turf fields. For example, from 2009-2011, New York City and the states of New York, Connecticut and New Jersey conducted studies on tire crumb infill and synthetic turf.
- Also, in 2008 and 2009 the Consumer Product Safety Commission and the Agency for Toxic Substances and Disease Registry evaluated synthetic turf "grass blades" in response to concerns about lead exposure. Their evaluations estimated that any potential releases of toxic chemicals from the grass blades, such as lead, would be below levels of concern. In 2008, EPA conducted a limited Scoping-Level Field Monitoring Study of Synthetic Turf Fields and Playgrounds. The purpose of the limited study was to test a method for measuring possible emissions from using synthetic turf on playgrounds and ball fields, not to determine the potential health risks of recycled tire crumb in playgrounds or in synthetic turf athletic fields.

Public and Stakeholder Engagement

- 60-day Federal Register Notice: Comment on proposed supplemental sample collections - Closes 2/25/2019
- International Society of Exposure Science Meeting Presentations
- 2017 Federal Register Notice: Public Comment and Federal Responses
- 30-day Federal Register Notice: Comment on Information Collection Request for Characterization of Exposure Potential during Activities Conducted on Synthetic Turf with Crumb Rubber Infill - Closed on July 12, 2017
- 60-day Federal Register Notice: Comment on proposed and/or continuing sample collections - Closed April 11, 2017
- 2016 Federal Register Notice: Public Comment and Federal Responses
- April 2016 Webinar Recording: Overview of the Federal Research Action Plan

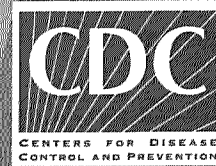
Study Documents

- [December 2016 Status Report: Federal Research Action Plan on Recycled Tire Crumb](#)
- [Research Protocol and Study Design](#)
- [Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds](#)
- [2008 EPA Limited Scoping-Level Field Monitoring Study of Synthetic Turf Fields and Playgrounds](#)

Related Links

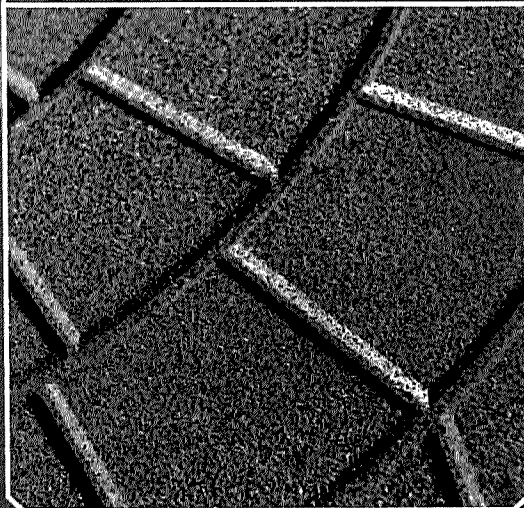
- [Tire Crumb Questions and Answers](#)
- [Government Organization Websites Related to the Use of Tire Crumb on Fields and Playgrounds](#)

LAST UPDATED ON DECEMBER 26, 2018



Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds

STATUS REPORT



Prepared By:

U.S. Environmental Protection Agency (EPA)¹

Centers for Disease Control and Prevention / Agency for Toxic Substances and Disease Registry (CDC/ATSDR)²

U.S. Consumer Product Safety Commission (CPSC)/ Directorate for Health Sciences³

Disclaimer:

This document has been reviewed by the U.S. Environmental Protection Agency, the Agency for Toxic Substances and Disease Registry, and the Consumer Product Safety Commission and approved for release.

Any mention of trade names, products, or services does not imply an endorsement by the US Government.

¹ US EPA Contact: Monica Linnenbrink – firecrumbs@epa.gov

² CDC/ATSDR Contact: 1-800-CDC-INFO (1-800-232-4636) or visit CDC-INFO website at <https://wwwn.cdc.gov/dcs/ContactUs/Form>. Reference Tire Crumb Research Status Report or visit the ATSDR webpage titled: Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds at <https://www.atsdr.cdc.gov/frap/index.html>.

³ CPSC Contact: Eric Hooker - EHooker@cpsc.gov

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I. Executive Summary

Over the past several years, parents, athletes, schools, and communities have raised concerns about the safety of recycled tire crumb rubber used as infill for playing fields and playgrounds in the United States. The public has expressed concerns that the use of these fields could potentially be related to certain health effects. Studies to date have not shown an elevated health risk from playing on fields with tire crumb rubber, but these studies have limitations and do not comprehensively evaluate the concerns about health risks from exposure to tire crumb rubber.

Synthetic turf field systems were initially introduced in the 1960s. Currently, there are between 12,000 and 13,000 synthetic turf recreational fields in the United States, with 1,200 – 1,500 new installations each year (STC et al., 2016). Synthetic turf fields are installed at municipal and county parks; schools, colleges and universities; professional team stadiums and practice fields; and military installations. Potentially millions of people are estimated to use these fields, including professional and college athletes, youth athletes in school or other athletic organizations, coaches, team and facility staff, referees, fans, bystanders and local communities.

On February 12, 2016, the Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (CDC/ATSDR) and the U.S. Environmental Protection Agency (EPA)⁴, in collaboration with the Consumer Product Safety Commission (CPSC)⁵, released a *Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds* (FRAP)⁶. The purpose of the FRAP is to study key questions concerning the potential for human exposure resulting from the use of tire crumb rubber in playing fields and playgrounds. This kind of information is important for any follow up evaluation of risk that might be performed.

The FRAP includes outreach to key stakeholders to obtain information to fill important data gaps, research to characterize constituents of tire crumb made from recycled tire rubber, studies to identify ways in which people may be exposed to tire crumb rubber based on their activities on the fields, and an analysis of existing scientific literature on the topic.

Prior to initiating the study, federal researchers developed a research protocol, *Collections Related to Synthetic Turf Fields with Crumb Rubber Infill*⁷, which describes the study's objectives, research design, methods, data analysis techniques, and quality assurance/quality control measures in place to ensure the integrity of the following components of the research:

- literature review and data gaps analysis;
- tire crumb rubber characterization research;
- human exposure characterization research.

⁴ The specific roles of EPA and CDC/ATSDR are provided in the FRAP

⁵ This report includes contributions written by the CPSC staff and has not been reviewed and/or approved by, and may not necessarily reflect the views of, the Commission.

⁶ The FRAP is available through the Tire Crumb website: www.epa.gov/tirecrumb

⁷ The research protocol is available through the Tire Crumb website: www.epa.gov/tirecrumb

EPA

science in ACTION

INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds

Background

Concerns have been raised by the public about the safety of recycled tire crumb used in playing fields and playgrounds in the United States. Limited studies have not shown an elevated health risk from playing on fields with tire crumb, but the existing studies do not comprehensively evaluate the concerns about health risks from exposure to tire crumb.

Federal Research

Because of the need for additional information, the U.S. Environmental Protection Agency (EPA), the Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (ATSDR), and the U.S. Consumer Product Safety Commission (CPSC) are launching a multi-agency action plan to study key environmental human health questions. This coordinated federal action includes outreach to key stakeholders, such as athletes and parents, and seeks to fill important data and knowledge gaps, characterize constituents of recycled tire crumb, and identify ways in which people may be exposed to tire crumb based on their activities on the fields. The Federal Research Action Plan includes numerous activities, including research studies. While additional research questions may require evaluation beyond this year, the information will help answer some of the key questions that have been raised.

Objectives

The specific objectives of this research effort are to:

- Determine key knowledge gaps.
- Identify and characterize chemical compounds found in tire crumb used in artificial turf fields and playgrounds.
- Characterize exposures, or how people are exposed to these chemical compounds based on their activities on the fields.
- Identify follow-up activities that could be conducted to provide additional insights about potential risks.

Research Summary

Conduct Data and Knowledge Gap Analysis: The Agencies will evaluate the existing scientific information related to recycled tire crumb used in artificial turf fields and other types of playing fields to build on current understanding of the state-of-the-science and inform the research activities.

Outreach to Key Stakeholders, Including Parents and State Agencies: EPA, ATSDR, and CPSC will convene discussions with members of the public and organizations with an interest in studying tire crumb. These parties have ongoing tire crumb studies or can provide expertise to inform the federal study. The agencies will meet with:

- **Athletes, parents, and coaches** to get first-hand perspectives on potential exposures.

- **Government agencies** to discuss the federal research, share relevant information from state-level studies, request support, and identify current best practices for minimizing exposures. One important state partner is California. California's Office of Environmental Health Hazard Assessment has an in-depth tire crumb study underway. This study includes a series of scientific studies to determine if chemicals in tire crumb can potentially be released under various environmental conditions and what, if any, exposures or health risks these potential releases may pose to players who frequently play on artificial fields constructed with tire crumb. The evaluation includes expert solicitation and stakeholder participation to help guide the design and EPA and other federal agencies are actively engaged in that process.
- **Industry representatives** to better understand the manufacturing process and use parameters for recycled tire crumb used in artificial turf and for recycled tire-derived playground surface materials.

Testing of Tire Crumb to Characterize Chemicals, Potential Emissions, and Toxicity: The agencies will test different types of tire crumb. These tests – along with existing scientific information from the literature – will help us better understand the tire crumb materials. For example, this will help the scientists working on this effort to understand chemicals that are found in tire crumb and might be emitted from the material. It will also help us understand if chemicals can be released from tire crumb when a person comes into contact with them – for example, when tire crumb comes in contact with sweat on the skin or are accidentally ingested by athletes playing on turf fields. Once we better understand what chemicals are in tire crumb, we will also be able to search existing databases of information to understand the potential health effects of those chemicals. Some examples of research activities are listed below.

- Based on information obtained through the efforts described above, evaluate various manufacturing process (for example, the tire crumb manufacturing process and the tire-derived playground surface materials manufacturing process), including an analysis of the diversity of these processes, material blends, components of the material (metals, volatile and semi-volatiles, particulate matter).
- Conduct laboratory analyses to characterize components of the chemicals in newer and older (aged) tire crumb materials at different temperatures.
- Determine the rate at which tire crumb components are absorbed by the body using simulations of biological processes in the lab, for example simulations of activities in the stomach as well as salivating and sweating.
- Evaluate potential cancer and non-cancer toxicity of key tire crumb constituents based on existing databases of information.

Launch Pilot-Scale Study to Characterize Exposure Under Use Conditions: The agencies will conduct several activities to better understand potential exposures that may occur when individuals frequently use artificial turf fields. Scientists will identify various exposure scenarios (ways in which people may be exposed based on their activities on the fields) and then design and conduct a pilot-scale exposure study to characterize people's exposures on these fields. This work will consider possible ways that one may be exposed – including by breathing, accidentally ingesting, or physical contact with tire crumb. Some examples of research activities are listed below.

- Develop exposure scenarios, paying particular attention to high-end exposure scenarios.
- Identify activity patterns for athletes and other relevant populations.
 - Estimate nature, duration, and frequency of exposures.
 - Evaluate other relevant factors, such as the standard operation and maintenance of the fields (e.g., replacement of materials, use of biocides) and how the materials change over time.
- Design and conduct pilot-scale exposure study to characterize exposures on select playing fields, considering all relevant routes of exposure (inhalation, dermal, oral).

- Develop methods, as necessary, for measuring exposure to both targeted and non-targeted analytes.

Public Comment Opportunities: Some studies that are part of this research plan are posted for public comment through a Federal Register Notice (available at Regulation.Gov, search by docket number Docket No. ATSDR–2016–0002). For example, one study that is part of the Federal Register Notice will gather data from facilities with fields that contain tire crumb materials, and another study will gather activity data from persons who routinely perform activities on artificial turf fields with tire crumb. The number of fields that will be sampled as well as the number of field users who will be surveyed are described in the Federal Register Notice. We encourage you to review the Federal Register Notice and provide your comments.

Additional Research Activities: EPA, CDC/ATSDR, and CPSC have set an ambitious schedule for this effort in 2016. A number of additional activities may also be initiated during this time, depending upon further consideration of their value to the overall effort, their feasibility, the availability of resources, and other factors. Additional research could include identifying potential biomarkers of exposure, collecting preliminary biomonitoring data, analyzing samples of recycled tire crumb used on playground surfaces, and evaluating the feasibility of conducting an epidemiologic study. CPSC is exploring conducting a survey of parents to get first-hand perspectives on potential exposures from playground surface materials. As part of this coordinated effort, CPSC plans to conduct additional work on the safety of playgrounds.

Timeline and Deliverables

By the end of 2016, the agencies anticipate releasing a draft status report that describes the preliminary findings and conclusions of the research through that point in time. The draft status report will summarize the agencies' progress in: (1) Identifying key constituents of concern in recycled tire crumb used in artificial turf fields; (2) Assessing potential exposures to potentially harmful constituents; (3) Conducting an initial evaluation of potential cancer and non-cancer toxicity of key chemical constituents; and (4) Identifying follow-up activities that could be conducted to provide additional insights about potential risks. The results of the preliminary work on recycled tire-derived playground surface materials will also be described. The report will also outline any additional research needs and next steps.

More Information

Information and updates about this research will be posted to EPA's website – <http://www.epa.gov/TireCrumb>

Artificial Turf Fields

An artificial turf field (ATF) is a popular alternative to a natural grass field because it requires relatively low maintenance. While most commonly used outdoors, ATFs have also been installed indoors. In recent years, health concerns have been raised about the safety of ATFs, especially with regard to potential exposure to chemicals found in ATF components. This fact sheet provides information about what ATFs are made of and ways to safely use them.

WHAT ARE ATFs MADE OF?

ATFs are typically composed of three layers – gravel or stones at the bottom, infill in the center, and artificial grass blades on top. The grass blades are made of plastic. The infill layer typically contains crumb rubber made from recycled car and truck tires. (Less frequently, infill materials can be entirely plant-based). Non-plant based infill can be composed of crumb rubber exclusively or as a mixture of crumb rubber and sand. The sand helps stabilize the field, while the crumb rubber cushions the surface and keeps grass blades upright.

WHAT CHEMICALS ARE IN ATFs?

Most often, the crumb rubber used in ATFs comes from recycled car or truck tires. Many natural and man-made substances are used during tire manufacturing, and some of those chemicals have been found in crumb rubber infill. These include volatile organic compounds (VOCs), semi-VOCs (SVOCs) such as polycyclic aromatic hydrocarbons (PAHs), and metals such as lead.

CAN I BE EXPOSED TO CHEMICALS WHILE USING ATFs?

There are several possible ways to be exposed to the chemicals found in the crumb rubber:

- Breathing in volatile chemicals or dust particles generated from the crumb rubber.

- Swallowing small amounts of crumb rubber either while playing on the fields, or afterward, if hands are not washed.
- Skin contact with crumb rubber.

CAN I BE EXPOSED TO LEAD WHEN PLAYING ON ATFs?

Lead has been detected in the crumb rubber of some ATFs. However, since the number of fields sampled for lead is very small, the results cannot be generalized to all ATFs. Some ATFs are also constructed with components that are certified as having low or no lead content. Using ATFs with this certification can help minimize exposure to lead.

CAN EXPOSURE TO CHEMICALS IN ATFs AFFECT MY HEALTH?

At sufficiently high exposures, the chemicals found in crumb rubber can cause irritation of the eyes, nose, throat, and skin, as well as headaches, nausea, and even organ damage. Some PAHs may also increase the risk of developing cancer if individuals are exposed to very high concentrations over long periods of time. However, many factors determine whether exposure to chemicals through ATF usage can affect health. These include the amount, frequency, and duration of exposure; the amount of chemical absorbed into the body; and the sensitivity of an individual (e.g., children are generally more sensitive than adults).

To date, scientific research largely has concluded that adverse health effects from using ATFs are unlikely. While crumb rubber infill contains potentially harmful chemicals, the concentrations are generally below levels of concern. However, it is important to note that the research had various limitations, such as the small number of fields tested. Furthermore, no studies have evaluated whether there is a relationship between disease outcomes and exposure to crumb rubber in ATFs.

IS RESEARCH ADDRESSING ATF_s AND HEALTH?

Yes. A joint effort between the U.S. Environmental Protection Agency, Centers for Disease Control and Prevention, and Consumer Product Safety Commission is underway. This *Federal Research Action Plan* will answer questions about the chemical composition of crumb rubber and chemical concentrations by testing indoor and outdoor ATF_s across the country. The collaboration will also survey and observe people using ATF_s to collect data to evaluate exposure to chemicals (e.g., frequency and duration of use). This federal effort will offer a better understanding of potential exposure to chemicals in the crumb rubber.

To learn more about the *Federal Research Action Plan*, visit: <https://www.epa.gov/chemical-research/tire-crumb-questions-and-answers>

CAN USING ATF_s INCREASE MY RISK FOR BACTERIAL INFECTIONS?

Very limited research has found that ATF_s contain fewer bacteria (e.g., MRSA) than soil possibly because ATF_s have less moisture and other yet unknown factors that reduce bacterial growth. California's Environmental Protection Agency also found that while athletes experience more frequent turf burns on ATF_s compared to natural fields, the severity was similar between the two types of fields. The joint federal study will better characterize bacterial populations associated with the tire crumb rubber infill collected from ATF_s.

DOES MDPH SUPPORT THE USE OF ATF_s?

MDPH does not endorse any consumer products, including ATF_s. The purpose of this fact sheet is to summarize currently available information and offer suggestions for ways to minimize possible

exposure to potentially harmful chemicals during use of ATF_s.

ARE THERE TIPS FOR SAFER USE OF ATF_s?

Yes. MDPH recommends these common sense steps to minimize potential exposure to potentially harmful chemicals in ATF_s.

When playing on ATF_s

- Always wear shoes.
- Do not swallow any crumb rubber that accidentally enters the mouth. Monitor young children to prevent swallowing.
- If playing indoors, ensure adequate ventilation.
- Be aware of any heat-related illnesses.

After playing on ATF_s

- Wash hands after use and before eating (especially young children).
- Clean all clothing and equipment.
- Take off shoes before entering the house to prevent tracking in any crumb rubber.
- Clean all turf burns with soap and water.

Do not use ATF_s

- On extremely hot days because the crumb rubber absorbs heat and may be too hot to play on when temperatures are high.
- For passive recreation (e.g., sitting, laying).

WHO CAN I CONTACT TO LEARN MORE?

Specialists at the Massachusetts Department of Public Health, Bureau of Environmental Health, are available to answer your questions. Contact us at 617-624-5757 (TTY: 617-624-5286) or visit us at www.mass.gov/dph/environmental_health.

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Information About Crumb-Rubber Infilled Synthetic Turf Athletic Fields

PURPOSE

The installation of synthetic turf athletic fields by school districts, municipal governments, colleges & universities, and professional sports organizations has become widespread throughout the U.S. Several types of artificial turf fields use crumb rubber as an infill material deposited between blades of artificial grass attached to a backing material. This document will provide information about health and safety issues related to this type of synthetic turf field.

BACKGROUND

The first well-publicized use of AstroTurf, a synthetic turf for athletic fields, was at the Houston Astrodome in 1966. This first generation of synthetic turf was essentially a short pile carpet with a foam backing. Since then, design changes have resulted in a greater variety of synthetic turf athletic fields. One type of synthetic turf is fabricated using synthetic fibers, manufactured to resemble natural grass, and a base material that stabilizes and cushions the playing surface. The 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. A combination of sand and crumb rubber is sometimes used.

Crumb rubber is produced by grinding used tires. Steel and fiber tire components are removed during the process and the rubber pellets are sorted by size. Pellet sizes ranging from about one-sixteenth to one quarter inch in diameter are used on synthetic turf. Crumb rubber is typically applied at a rate of two to three pounds per square foot of field surface.

HEALTH AND SAFETY CONSIDERATIONS

Some potential health and safety considerations related to synthetic turf have generated public concern. These include:

- Heat stress
- Injury
- Infection
- Latex allergy
- Chemical exposure

Heat Stress

Synthetic turf fields absorb heat, resulting in surface temperatures that are much higher than the temperatures of the surrounding air. In June 2002 at Brigham Young University (BYU) in Utah, the average surface temperature on a synthetic turf field was reported to be 117°F while the average surface temperatures on natural turf and asphalt were 78°F and 110°F, respectively. A maximum surface temperature of 200°F on the BYU synthetic turf field was reported. A turf specialist at the University of Missouri reported measuring an air temperature of 138°F at “head-level” height on the university’s synthetic turf field on a sunny 98°F day. The surface temperature of the field was reported to be 178°F. A study conducted at Penn State University measured surface temperatures on experimental plots of nine different types of infilled synthetic turf. Temperature measurements were made on three occasions. The average air temperatures reported were 79°, 78°, and 85°F. The corresponding average surface temperatures reported for the synthetic turf plots are 120°, 130° and 146°F. The highest surface temperatures typically occur when synthetic turf is in direct sunlight and the dark fibers, used to simulate grass, absorb solar radiation. Surface temperatures have been observed to drop rapidly when cloud cover is present.

Water can be applied to synthetic turf to reduce the surface temperatures on warm days. A study at BYU found that watering synthetic turf lowered the surface temperature from 174°F to 85°F, but the temperature rose to 120°F in five minutes and to 164°F in twenty minutes. A study conducted by Penn State University on experimental synthetic turf plots examined the effect of watering synthetic turf on surface temperature. Measurements were made on three occasions. For one monitoring period, surface temperatures ranging from about 130° to 160°F were lowered initially to about 75°F, but increased within 30 minutes to temperatures ranging from about 90° to 120°F, where they remained fairly stable for the three-hour monitoring period.

The surface temperatures reported on synthetic turf fields can get high enough to reach levels of discomfort and may contribute to heat stress among users of the fields. While watering synthetic turf may temporarily reduce surface temperatures, other factors are likely to influence its effectiveness. Studies were not found that examined the role of synthetic turf in contributing to heat stress or that compared the occurrence of heat stress among athletes playing on natural turf and synthetic turf.

Because of the potential for high temperatures on infilled synthetic turf fields, it is important that people who play or work on the fields be provided with adequate warnings regarding the potential for heat stress. People should also be advised to remain hydrated and to seek relief from the heat in shaded areas. The potential for high surface temperatures warrants consideration when making decisions about installing and using a synthetic turf field.

Injury

Many factors influence the rate of sports injuries, including the type of playing surface. The many kinds of synthetic turf surfaces and changes in the turf products over the years complicate the assessment of how the playing surface affects injury rates. 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. Published studies were reviewed that compared injury rates (*e.g.*, rate of sprains, lacerations, fractures) among athletes when playing on infilled synthetic turf and

natural turf fields. Although the ability of the studies to detect differences in injury rates was limited by the small number of injuries reported, studies that account for the amount of time spent on different types of playing surfaces concluded that there were no major differences in overall injury rates between natural and infilled synthetic turf. Although some studies found some differences in specific injury types, there was no consistent pattern across the studies.

The potential for head injuries from contact with the surfaces has been assessed by determining the ability of the surfaces to absorb impacts. Tests have shown that the force of impact on asphalt surfaces is much higher than the level generally accepted to be associated with serious head injury. The force of impact on many types of natural turf and all types of synthetic turf tested are below this level.

The abrasiveness of synthetic turf fibers may contribute to the injury risk among athletes, particularly for abrasions or "turf burns." The degree of abrasiveness appears to be dependent on the composition and shape of the turf fibers. A study conducted at Penn State University suggests that synthetic turf with nylon fibers, used in older synthetic turf fields, is more abrasive than synthetic turf with other fibers such as those made from polypropylene or polyethylene.

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. Considerable variability has been found in the survival time of *S. aureus* on different infill and fiber types when tested under laboratory conditions in the absence of direct sunlight and high temperatures. For indoor fields, which are not subjected to direct sunlight and high temperatures, *S. aureus* has been found to survive on both synthetic and natural turf for multiple days after being applied. The numbers of surviving bacteria decreased over time on both surface types. The application of commercially available antimicrobial treatments, detergents or cationic surfactants greatly reduced the survival rate of *S. aureus* on indoor synthetic turf fields. For outdoor fields, conditions of higher temperatures and sunlight were shown to be effective disinfectants and the bacterial survival rate was much lower than the rate for indoor fields. The survival rate of *S. aureus* on Kentucky bluegrass, which is often used for natural turf athletic fields in the northern United States, was found to be comparable to the survival rate on synthetic turf. A microbial survey of 20 outdoor synthetic turf fields and 2 natural turf fields did not find *S. aureus* on any of the playing surfaces. *S. aureus* was found in locker room samples collected from towels, blocking pads, weight equipment, a stretching table, as well as samples collected from the hands and faces of every player tested.

While injury studies have not consistently identified differences in abrasion and laceration risks between natural and infilled synthetic turf, some types of synthetic turf may result in more skin abrasions. Abraded skin is susceptible to infection through contact with infectious agents on surfaces. Although only a few research studies have been conducted, 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. Disease outbreak investigations conducted in response to illnesses caused by a variety of infectious agents (e.g., MRSA,

Campylobacter, meningococcus, echovirus, herpes simplex virus, hepatitis virus, coxsackie virus) have not identified playing fields, either natural or synthetic, as likely to increase the risk of transmitting infections.

Skin cuts and abrasions that may result from contact with athletic fields, including both natural and synthetic fields, are susceptible to infection. Athletes and others developing skin abrasions should clean the wounds, and seek prompt medical attention for proper wound care prior to returning to competition. To reduce the chances of transmitting infectious agents such as MRSA, athletes should avoid sharing towels (on and off the field), razors, soap and other personal-care materials with others, and should properly sanitize shared surfaces such as training equipment between uses.

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.

A study conducted for the California Environmental Protection Agency tested samples of tire rubber on the skin of guinea pigs. None of the animals developed any rashes or allergic reactions from contact with the rubber.

Whether crumb rubber can cause an allergic response in people is not known. Reports of latex allergy associated with contact with crumb rubber or synthetic turf fields were not found.

Chemical Exposure

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). For each of these types of contact (“exposure routes”) exposure only occurs if the contact with the chemical results in the chemical being absorbed into the body. Not all chemicals are readily absorbed by all routes. For complex substances containing many chemicals such as crumb rubber, the ability of a chemical to be released from the substance is an important factor in determining how much is absorbed, and therefore how much exposure actually occurs to the specific chemical.

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 (i.e., the route (ingestion, inhalation, or dermal/ocular) and how well it’s absorbed by that route), 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.

Tires are manufactured from natural and synthetic rubbers along with numerous chemical additives, including zinc, sulfur, carbon black, and oils that contain polyaromatic hydrocarbons (PAHs), volatile organic chemicals (VOCs) and semi-volatile organic chemicals (SVOCs). Because crumb rubber is manufactured from used tires, it is expected to contain the same chemicals as tire rubber.

A number of studies exploring the chemical-exposure potential of crumb rubber have involved extracting chemicals using strong acids or organic solvents under high temperature conditions. While the results of such studies provide information about the total amount of individual chemicals contained in crumb rubber, the extraction conditions are not representative of conditions in the environment or the human body. These types of studies do not accurately quantify exposure potential and, therefore, cannot be used to accurately estimate potential health risk.

The potential for ingestion exposure to the chemicals in crumb rubber by children playing on synthetic turf has been evaluated in several studies where crumb rubber was extracted under conditions designed to mimic the human digestive tract. This type of study provides a more realistic estimate of exposure potential for chemicals contained within the crumb rubber material by simulating what chemicals in the crumb rubber are likely to be released (and therefore would be available to be absorbed). None of these simulated absorption studies indicated that ingestion of crumb-rubber by children would pose a significant health risk. A controlled study that fed crumb rubber to laboratory rats for 14 days and incorporated crumb rubber into their bedding material found no signs of adverse health effects resulting from the exposures.

Crumb rubber contains zinc, and studies consistently find that zinc readily leaches from crumb rubber in greater quantities than any other substance. The concentrations of zinc leached from crumb rubber have been found to not represent a human health risk.

Several studies have assessed potential health risks resulting from inhalation exposures to chemicals contained in synthetic turf fields. Health agencies in New York State, New York City, and the State of Connecticut collected air samples on synthetic and natural turf fields during use. The air samples were analyzed for VOCs, SVOCs, and airborne particulate matter. The studies concluded that inhalation exposures resulting from playing on synthetic turf fields were insignificant, and not different from inhalation exposures on natural turf fields. The Connecticut study found that air samples collected from an indoor synthetic turf field had higher concentrations than the outdoor fields. The authors noted that other potential sources of VOCs and SVOCs were present, and that the facility did not have its exhaust system operating on the day samples were collected. The authors concluded that, based on their findings, exposure levels for indoor synthetic turf fields represented only a marginal health risk, but ventilation of indoor fields was recommended. Several earlier European studies had similar findings. An Italian study found that inhalation exposures resulting from playing on synthetic turf are negligible, and that exposures associated with motor vehicle emissions in the areas near the fields during the same time period were about ten times higher. Two studies that measured a metabolite of PAHs in the urine of soccer players after playing on synthetic turf found no measurable uptake of PAHs resulted from playing on the field.

Some types of synthetic turf fibers contain elevated levels of lead (*e.g.*, in the range of about 2,000 to 9,000 parts per million). Degradation of these fibers can form a dust that presents a potential source of lead exposure to users of the fields. The Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry addressed the potential for lead exposures from synthetic turf fibers in a June 2008 Health Advisory (<http://www.cdc.gov/nceh/lead/artificialturf.htm>). Newer synthetic turf products are available that do not contain elevated lead levels.

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. A 2018 California study found no association at the county level between artificial turf field density and lymphoma incidence in adolescents and young adults. In addition, while it is well established that crumb rubber contains PAH carcinogens, multiple lines of evidence as described above indicate that they are not readily released or absorbed during athletics on these fields. Thus, a number of assessments reviewed here (see Chemical Exposures section in Sources below) have concluded that cancer and non-cancer risks are low.

Uncertainties

A number of studies have been conducted in the US and other countries that are quite consistent in their conclusions regarding the low potential for chemical exposure from crumb-rubber artificial turf fields. However, some uncertainty remains due to study limitations such as the small number of fields tested under a limited range of environmental conditions, limited information about effects of direct ingestion and direct contact with crumb rubber, and limited sources and ages of crumb rubber tested. New studies underway in California (<https://oehha.ca.gov/risk-assessment/synthetic-turf-studies>), and at the federal level (National Toxicology Program <https://ntp.niehs.nih.gov/results/areas/syntheticurf/index.html>, and USEPA/CDC/CPSC <https://www.epa.gov/chemical-research/federal-research-recycled-tire-crumb-used-playing-fields>) should help address these limitations and lessen uncertainty further.

OTHER CONSIDERATIONS

Several other factors may need to be considered when installing and using synthetic turf.

Costs: Costs for any given installation will depend on many site-specific factors, both for synthetic and natural turf fields. However, in general for a given set of site conditions, installation of synthetic turf tends to be more expensive than installation of natural turf, while synthetic turf fields have a longer average lifetime, have lower maintenance costs, and can be used without the rest periods required for natural turf.

Alternative Types of Infill: Manufacturers have developed several alternative materials to crumb rubber infill, including: manufactured materials such as ethylene propylene diene terpolymer and thermoplastic elastomer; Nike Grind made from recycled athletic shoes; and mineral-based and plant-derived materials such as sand, cork, and coconut hulls. Any alternative infill materials would need to be subjected to the same rigorous physical and chemical testing that crumb rubber has undergone to determine if they are preferable substitutes for crumb rubber for use as infill material. Thermoplastic elastomer, for example, has been found to release greater amounts of PAHs in water and air than does crumb rubber.

SUMMARY OF INFORMATION FOR CRUMB-RUBBER INFILLED SYNTHETIC TURF ATHLETIC FIELDS

Heat stress	Surface temperatures on crumb-rubber infilled synthetic turf fields can reach levels of discomfort and may contribute to heat stress. This warrants consideration when making decisions about installing and using a synthetic turf field. While watering synthetic turf may briefly reduce surface temperatures, a number of factors may influence its effectiveness. People using these fields should be advised to remain hydrated and to seek relief from the heat in shaded areas.
Injury	Overall, studies have found no consistent differences in injury rates between natural and crumb-rubber infilled synthetic turf.
Infection	Skin cuts and abrasions that may result from contact with athletic fields (natural and synthetic turf) are susceptible to infection. Athletes and others developing skin abrasions should clean the wounds and seek prompt medical attention. Athletes should avoid sharing equipment, razors, towels, soap and other objects with others, because these items can spread germs.
Latex allergy	NYSDOH is not aware of cases of latex allergy resulting from contact with crumb rubber or synthetic turf fields.
Chemical exposures	Results from numerous studies suggest that the potential for chemical exposures from crumb rubber in synthetic turf is low; further studies by the federal government and California are underway to fill data gaps and decrease uncertainties.
Cancer	Analyses in California and Washington State have not found support for cancer associations with artificial turf field use; various exposure and risk assessments do not support a cancer risk.

WHERE CAN I GET MORE INFORMATION?

For additional information, please email us with your request at btssa@health.ny.gov

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April 29, 2008

Janice Berns, Director
Needham Board of Health
1471 Highland Avenue, Room 24
Needham, MA 02192

Dear Ms. Berns:

The Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health (BEH) has reviewed the findings of various public health agencies that have been involved with addressing public health concerns associated with artificial turf. We have also reviewed scientific publications and information from advocacy groups relative to potential health effects from exposure opportunities to chemicals in synthetic turf.

Components of turf include artificial grass fibers and crumb rubber and sand infill overlaid on a carpet backing. Grass fibers are composed of nylon or polyethylene. The state of New Jersey tested dust from both synthetic turf composed of nylon grass fibers, as well as polyethylene grass fibers. They reported that elevated levels of lead were found in two of twelve samples, both of which were nylon. No lead was found in synthetic turf with polyethylene grass fibers. Thus, based on available information, it appears that polyethylene grass fibers are preferable to nylon grass fibers.

Crumb rubber infill is typically made of recycled tires. This material has been found to contain chemicals, including polycyclic aromatic hydrocarbons (PAH), metals, and volatile organic compounds (VOC). While these chemicals are in the material of the crumb rubber, current information does not suggest significant exposure opportunities to the chemicals in the materials such that we would expect health effects.

The most relevant study we identified to evaluate potential health effects related to the fill was a California study. California's Office of Environmental Health Hazard Assessment completed a study investigating the potential health risks of playground surfaces and track surfaces that are composed of recycled tires. MDPH feels that this is the most complete and relevant study at this time, as these materials are similar to those used in the infill of synthetic turf. Findings from this assessment concluded that exposure opportunities to the rubber materials would not be expected to result in health effects.

With respect to the temperature issues you raised during our recent conversation, I asked our staff for an opinion of protocols for use during hot weather periods. Available information

→ (see attached) - view online

suggests heat levels rise on some artificial turf material as outdoor temperatures rise. Thermoplastic rubber (TPE) infill can be used as an alternative to infill from recycled tires. TPE is manufactured in lighter colors which are thought to generate less heat than black infill. TPE also does not contain recycled products and is made of polyethylene or polypropylene and rubber. Based on a brief review of the literature, there is information suggesting that the composition of polyethylene or polypropylene and rubber presumably contains fewer chemicals than infill made of recycled tires.

In summary, MDPH/BEH believes that based on the available information, the use of polyethylene artificial turf is not expected to result in health impacts. However, if there are ongoing concerns regarding artificial turf and health impacts, the town may want to consider using a turf that is light colored, composed of polyethylene grass fibers, and has TPE infill (as opposed to infill consisting of recycled tires). If you have any questions, please feel free to contact us at 617-624-5757.

Sincerely,

Suzanne K. Condon, Associate Commissioner
Director, Bureau of Environmental Health

Cc: Peter Connolly, Needham Board of Health



Environmental Health Study of Synthetic Turf – August 2016 Update

The California Office of Environmental Health Hazard Assessment (OEHHA) is conducting a study of the potential health effects associated with the chemicals released from synthetic turf and playground mats containing recycled waste tires. The California Department of Resources Recycling and Recovery (CalRecycle), which regulates the use of waste tires in California, has contracted with OEHHA to perform the study.

What's New?

OEHHA has amended the contract with CalRecycle based upon input from the Synthetic Turf Scientific Advisory Panel and input from the public. The scope of the synthetic turf field investigation has been expanded to include: methods to extract as many chemicals as possible from crumb rubber samples for identification, the use of more suitable artificial bio-fluids (such as fluids that mimic human sweat) to evaluate the chemicals that enter the body, and measurements of crumb rubber particle size to understand if inhalation of small particles occurs. To accommodate the additional analyses, OEHHA has extended the project completion date to mid-2019.

What is OEHHA studying?

The study is assessing the potential health impacts associated with playing on synthetic turf fields and playground mats. It is examining athletic fields and playground mats made from crumb rubber derived from recycled waste tires. Major parts of the study include:

- Identifying and measuring chemicals released from crumb rubber and artificial grass blades in indoor and outdoor fields and playground mats throughout California.
 - Synthetic turf fields of various ages and subjected to various weather conditions will be studied.
 - Air above synthetic turf fields and playgrounds will be monitored for particulate matter and specific chemicals that can be inhaled.
 - The size distribution of the collected particulate matter will be characterized.
- Evaluating exposures to chemicals released from crumb rubber and synthetic grass blades through inhalation, swallowing, and skin contact. This includes consideration of:
 - The extent to which individuals (for example athletes and bystanders) are exposed, based on their activity patterns and how often and long they stay on the field.



- How exposure to the chemicals varies by age groups of athletes and bystanders.
- Movement of chemicals from turf into body fluids.
- Evaluating the hazards and toxicological activities of chemicals released from turf. This includes examining the ways that sensitive populations, such as children, may be more vulnerable to chemicals released from synthetic turf fields.
- Developing a study protocol for measuring chemicals from synthetic turf in urine or other bodily fluids of athletes, or using personal monitors worn by athletes. (The current study plan calls for developing a study plan but not undertaking these measurements. These studies could take place after completion of the current study.)
- Conducting an assessment of potential health impacts associated with exposures to chemicals released from synthetic turf and playground mats, taking into account the findings of the above activities.

What information will the study provide?

The study is scheduled for completion in mid-2019 with the release of a report on the field monitoring results, exposure characterization, and health risk assessment. Prior to completion, OEHHA will release a draft report describing the preliminary data and results of the study in mid-2018.

The information generated in the study will enable OEHHA to determine the types and concentrations of chemicals individuals are exposed to when playing on synthetic turf and playground mats, estimate the level of exposures associated with various activities, and assess whether these exposures pose potential health risks. CalRecycle will use this information in making future decisions regarding the use of crumb rubber in synthetic turf and playground mats.

How is OEHHA obtaining input on the study?

OEHHA began the study by conducting an interactive webinar and public meetings in Los Angeles, San Diego, and Berkeley to seek input from athletes, coaches, parents and other interested individuals. OEHHA also convened a panel of scientific experts in exposure and biomedical sciences to provide input and advice on the study. The first meeting of the panel was held in February 2016, and there will be additional panel meetings throughout the study. All meetings of the panel will be held in public, with opportunities for the public to comment.

Has OEHHA studied synthetic turf in the past?

OEHHA conducted two studies on the potential human health effects associated with use of recycled waste tires in playground and synthetic turf products in 2007 and 2010. These studies evaluated key aspects of synthetic turf fields, including inhalation of chemicals,



bacterial infections, and skin abrasions. OEHHA's current effort will fill in data gaps and address the potential risks from chemical exposures resulting from skin contact with, breathing or ingesting crumb rubber from synthetic turf fields. The California Integrated Waste Management Board, which has since been reorganized as CalRecycle, also contracted with OEHHA to perform the previous two studies:

- Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products, January 2007
- Safety Study of Artificial Turf Containing Crumb Rubber Infill Made From Recycled Tires: Measurements of Chemicals and Particulates in the Air, Bacteria in the Turf, and Skin Abrasions Caused by Contact with the Surface, October 2010

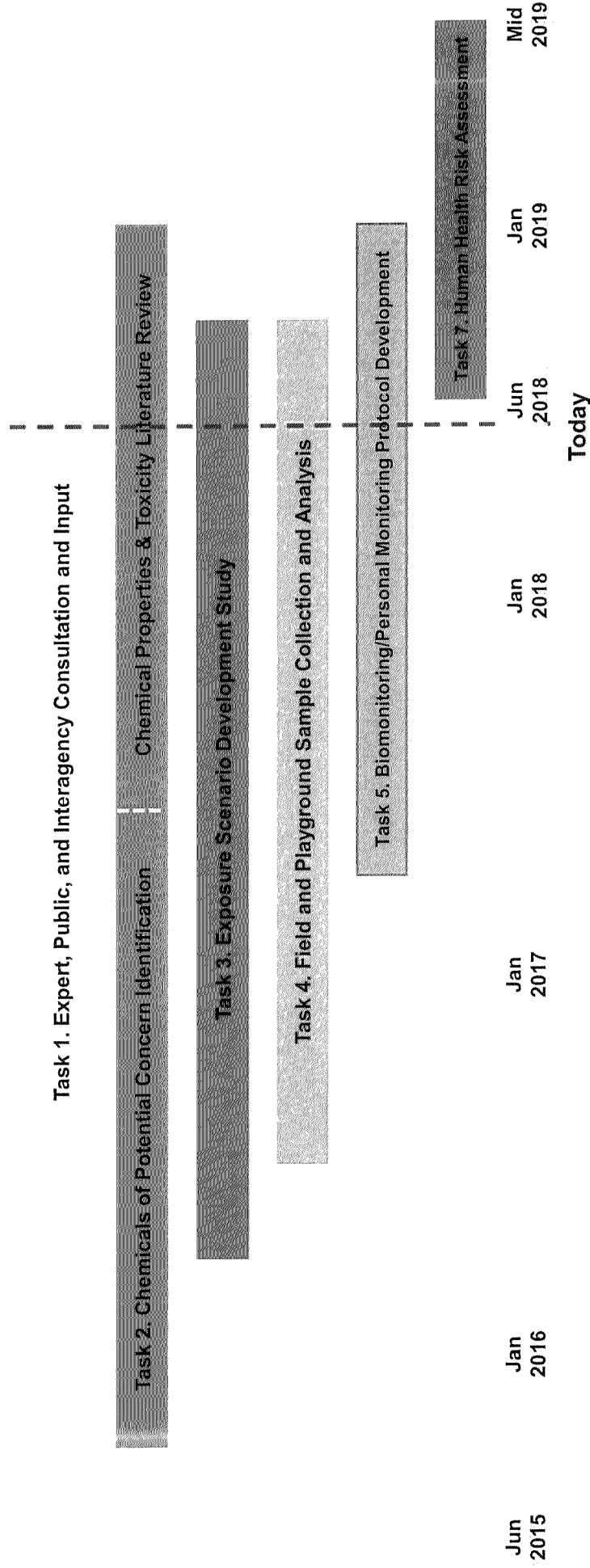
These studies can be found at: <http://oehha.ca.gov/risk-assessment/synthetic-turf-studies>.

First Published on: October 20, 2015

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Synthetic Turf Study Overview





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March 23, 2015

Stephanie Bacon, Health Agent
Office of Board of Health
155 Village Street
Medway, MA 02053

Dear Ms. Bacon:

Thank you for your letter of February 24, 2015, in which you requested that the Massachusetts Department of Public Health, Bureau of Environmental Health (MDPH/BEH), evaluate health concerns related to the use of crumb rubber infill material for artificial turf fields in Medway, Massachusetts. As you are likely aware, our office had previously evaluated this issue in a series of letters to the Town of Needham Board of Health in 2008, 2011, and 2013.

In response, MDPH/BEH staff have evaluated more recent information on potential exposure opportunities to artificial turf components, including crumb rubber infill, and evaluated health concerns, including cancer, in relation to exposure to such turf. Recent media reports on soccer players, particularly goalies that have played on artificial turf, and the incidence of some cancers have been expressed. These reports raised concerns about the possible association between playing on crumb rubber fields and the development of cancers, notably, non-Hodgkin's lymphoma, Hodgkin Lymphoma, and osteosarcoma. We also evaluated information you provided on the content of the specific products used in Medway. Our review is summarized below.

Updated Literature Review

Our previous evaluations noted that crumb rubber infill has been found to contain chemicals, including polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and metals. We further stated that although these chemicals are in the material itself, information available at that time did not suggest significant exposure opportunities to the chemicals in the materials such that we would expect health effects. We noted that the most relevant study on this topic at the time was a study conducted by the California Office of Environmental Health Hazard Assessment (CA OEHHA).

Since that time, the CA OEHHA conducted additional evaluations of chemical concentrations in air above crumb rubber turf fields under active use (CA OEHHA 2010). Air samples were taken above fields and analyzed for VOCs and metals. Results suggested that adverse health effects were unlikely to occur from inhalation of VOCs or metals in particulates above these fields. To assess the potential for skin infections due to bacteria or to skin abrasions on these fields, tests for bacterial contamination were performed and the frequency of skin abrasions was assessed. Researchers found fewer bacteria detected on the artificial turf compared to natural turf, suggesting that the risk of infection to athletes using these fields was actually lower. However, more skin abrasions were observed in athletes using artificial turf fields than natural turf fields, and the study authors made various recommendations to help prevent skin abrasions (e.g., protective equipment or clothing) and prompt treatment of skin abrasions.

In another study, the state of Connecticut conducted air sampling at four outdoor artificial turf fields with crumb rubber infills (most relevant to Medway) under summer conditions (Simcox et al. 2011). Air measurements were taken using stationary air sampling monitoring devices as well as personal samplers (placed on people using the fields). They concluded that exposure opportunities to turf contaminants were not associated with elevated health risks and suggested that their findings were consistent with other studies available at the time. A letter prepared by the Connecticut Department of Public Health reiterates these conclusions (CTDPH 2015).

A 2014 study by researchers at the Rutgers Robert Wood Johnson Medical School in New Jersey evaluated opportunities for exposures to PAHs, semivolatile organic compounds (SVOCs), and heavy metals from exposures to artificial turf fibers and crumb rubber infills by measuring these constituents in simulated body fluids (digestive fluids, lung fluids, sweat) that represented different routes of exposure (ingestion, inhalation, dermal). This bioaccessibility study aimed to provide a better measure of the actual amount of these contaminants that might be absorbed into the body after exposure. The researchers found that PAHs were routinely below the limit of detection and SVOCs that have environmental regulatory limits to use for comparison were identified at levels too low to quantify. Some metals were detected but at concentrations at which health risks were low, with the exception of lead from the field sample collected. That sample indicated lead at levels in the simulated digestive fluids that the authors reported could result in blood lead levels above the current U.S. Centers for Disease Control and Prevention (CDC) reference value for blood lead in children (5 ug/dL). It should be noted that the lead concentration of the materials used in this study included a sample of turf fiber with a lead concentration of 4,400 mg/kg. This level contrasts with information on the Medway artificial turf components, which reportedly either contained lead at 39 mg/kg (crumb rubber infill) or had no lead (turf fibers) (see discussion later in this letter). Based on the lead result from this one field sample, the authors suggested that components of artificial turf fields should be certified for low or no lead content prior to use. Overall, however, the authors concluded that opportunities

for exposure to constituents in these fluids presented very low risk among all populations that would use artificial turf fields (Pavilonis et al. 2014).

A study conducted in 2010 in the Netherlands assessed the exposure of soccer players to PAHs after playing sports on a rubber crumb field. Urine testing in participants indicated that uptake of PAHs by the participants following exposure to artificial turf with rubber crumb infill was minimal. If there is any exposure, the authors reported, uptake is minimal and within the normal range of uptake of PAHs from environmental sources and/or diet observed in healthy individuals (van Rooij and Jongeneelen 2010).

It is probably worthwhile to also note that MDPH/BEH reviewed testing data for artificial turf for the Town of Needham, as reported in our letters of 2011 and 2013 to the Needham Board of Health. The Town of Needham contracted with an environmental testing firm to conduct environmental tests including, air measurements of volatile organic compounds taken in the laboratory and heavy metals (arsenic, cadmium, chromium, lead, mercury, selenium, zinc) content of crumb rubber materials. Our review and conclusions for that testing, did not indicate exposures of health concern.

Material in Medway

MDPH/BEH reviewed available information provided by the Medway Board of Health regarding the specific materials used in the Medway fields. These included the APT Gridiron turf system and Liberty Tire Recycling 10+20 BM Rubber Crumb Brantford, ON. Among the materials provided for these products were statements or test results for various constituents in these products.

APT submitted a written statement dated October 29, 2014, that reported that the APT Gridiron turf systems (essentially the grass fibers of the artificial turf) are manufactured and installed without the use of any lead or heavy metals. They reported that this included all materials used for the turf fibers and backings. No other documentation about this product, including any testing results, was provided to support this statement.

With respect to the 10+20 BM Crumb Rubber infill product, laboratory testing results were provided for this product, although it is not clear whether the testing was for the materials specifically used in turf applied in Medway. Testing was conducted for metals content as well as emissions of volatile organic compounds (VOCs). It appears that testing included the following: (1) testing for VOCs emitted into a confined air space in the laboratory after heating the product to 73 degrees F; and (2) content testing for eight heavy metals, including lead. The laboratory compared results to criteria established by the Greenguard certification program, part of Underwriters Laboratory, that uses among its criteria for certification health-based levels derived by the CA OEHHA.

Testing results for metals content of the product indicated a lead concentration of 39 mg/kg, which is less than the current Consumer Product Safety Improvement Act (CPSIA) limit of 100 mg/kg for lead in children's products (Ulirsch et al. 2010). No other metals were detected.

Test results measuring emissions off-gassing from heated material were provided in measurements that cannot be compared to any health-based standards or guidelines and thus, MDPH/BEH did not further evaluate this information. Typically, when certain products raise health concerns, health agencies review Material Safety Data Sheets (MSDS). An MSDS provides information on health risks associated with use of the product. An industry group, Synthetic Turf Council, provides a sample template MSDS for crumb rubber infill material (Synthetic Turf Council 2014). Although this sample MSDS is not specific to any particular product, it appears to be applicable to crumb rubber infill in general. In the section under "Hazardous Ingredients," the MSDS notes that the product can contain fine fibers that may cause irritation symptoms (e.g., itching, irritation of mucous membranes, eye irritation). The MSDS notes that the crumb rubber material is generally thought to be a nuisance dust.

Concerns About Cancer Among Soccer Players

As noted earlier in this letter, some recent news reports suggested that the incidence of cancers among soccer players, particularly goaltenders exposed to artificial turf, might be atypical. These reports included many cancer types, but some focused specifically on NHL, Hodgkin Lymphoma, and osteosarcoma in three individuals. We thought it would be helpful to provide additional information on cancers in general and known risk factors for NHL, Hodgkin Lymphoma, and osteosarcoma.

Cancer in General

Understanding that cancer is not one disease, but a group of diseases, is very important. Research has shown that there are more than 100 different types of cancer, each with separate causes, risk factors, characteristics and patterns of survival. A risk factor is anything that increases a person's chance of developing cancer and can include hereditary conditions, medical conditions or treatments, infections, lifestyle factors, or environmental exposures. Although risk factors can influence the development of cancer, most do not directly cause cancer. An individual's risk for developing cancer may change over time due to many factors and it is likely that multiple risk factors influence the development of most cancers. In addition, an individual's risk may depend on a complex interaction between their genetic make-up and exposure to environmental agents, including infectious agents and/or chemicals. This may explain why some individuals have a fairly low risk of developing a particular type of cancer as a result of an environmental exposure, while others are more vulnerable.

Cancers in general have long latency or development periods that can range from 10 to 30 years in adults, particularly for solid tumors. In some cases, the latency period may be more than 40 to 50 years. It is important to note, however, that latency periods for children and adolescents are significantly shorter than for adults.

Hodgkin Lymphoma

Hodgkin Lymphoma is most common in young adults between the ages of 15 and 40, especially in individuals in their 20s. Among adolescents, it is the most common type of cancer.

Hodgkin Lymphoma occurs specifically in a type of B lymphocyte (or white blood cell) called the Reed-Sternberg cell while other lymphomas (non-Hodgkin's types) occur in different cells.

Established risk factors for Hodgkin Lymphoma include: exposure to the Epstein-Barr virus (EBV); a previous diagnosis of mononucleosis (mono is caused by the EBV); family history; and certain hereditary conditions (such as ataxia telangiectasia) associated with a weakened immune system. The Epstein-Barr virus is very prevalent in the general population. Even though most of us have been exposed to the virus (which remains latent in our bodies), most people do not develop mononucleosis or Hodgkin Lymphoma. EBV is thought to account for about 20% or 25% of the diagnoses of classical Hodgkin's in the US.

Higher socioeconomic status is also a possible risk factor. This is thought to be due to delayed infectious exposures in childhood.

Occupational exposures as risk factors have been studied extensively and none have emerged as established risk factors. Likewise, there is very little evidence linking the risk of Hodgkin Lymphoma to an environmental exposure, other than the EBV.

Non-Hodgkin Lymphoma (NHL)

NHL refers to a diverse group of cancers that are characterized by an increase in malignant cells of the immune system. Each subtype of NHL may have different risk factors associated with its development. The specific cause of NHL in most individuals is unknown.

Although some types of NHL are among the more common childhood cancers, more than 95% of diagnoses occur in adults. Incidence generally increases with age, and most diagnoses occur in people in their 60s or older.

Established risk factors for NHL include a weakened immune system, associated with various medical conditions, and exposure to various viruses. An increased risk is faced by individuals taking immunosuppressant drugs following organ transplants; individuals with autoimmune disorders, such as rheumatoid arthritis and lupus; and individuals who have taken certain chemotherapy drugs for other cancers. Several viruses have been shown to play a role in the development of NHL, including the human immunodeficiency virus (HIV), the human T-cell leukemia/lymphoma virus (HTLV-1), and the Epstein-Barr virus.

Exposure to high-dose radiation (for example, by survivors of atomic bombs and nuclear reactor accidents and possibly by patients who have received radiation therapy for a previous cancer) may pose an increased risk. Some studies have also suggested that exposure to chemicals such as benzene and certain herbicides and insecticides may be linked with an increased risk of NHL. Smoking has been associated in some studies with certain types of NHL.

Osteosarcoma

Osteosarcoma is a type of malignant bone cancer which accounts for about 2% of childhood cancers in the United States. It is the most common type of cancer that develops in bone and comprises about 66% of malignant bone tumors in children in Massachusetts. Most osteosarcomas occur in children and young adults between the ages of 10 and 30. Teenagers comprise the most commonly affected age group and are at the highest risk during their growth spurt. However, osteosarcoma can occur in people of any age, with about 10% of all osteosarcomas occurring in people over the age of 60.

Established risk factors for osteosarcoma include certain inherited syndromes (such as retinoblastoma, the Li-Fraumeni syndrome, and others) and certain bone diseases (such as Paget disease of the bone and hereditary multiple osteochondromas). Individuals with these syndromes and bone diseases have an increased risk of developing osteosarcoma. People who have received radiation treatment for a previous cancer may have a higher risk of later developing osteosarcoma in the area that was treated. Being treated at a younger age and with higher doses of radiation both increase the risk. Because the risk of osteosarcoma is highest between the ages of 10 and 30, especially during the teenage growth spurt, experts believe that there may be a link between rapid bone growth and the risk of a bone tumor. Children with osteosarcoma are often tall for their age, which supports the link with rapid bone growth. Other than radiation, there are no known lifestyle or environmental risk factors associated with osteosarcoma. Besides from these risk factors, the causes of most osteosarcomas are unknown.

Summary

In summary, the scientific literature continues to suggest that exposure opportunities to artificial turf fields are not generally expected to result in health effects. Testing results on the crumb rubber infill indicated lead content less than CPSIA statutory limits established for children's products. For the turf fibers, APT provided a statement that this material did not have lead used in its manufacture, but no additional documentation was provided.

With respect to cancer concerns reported in media stories, it is important to note that the reports of cancers were of a wide variety of different types, each with its own set of risk factors. In addition, our staff reviewed cancer incidence data for the Town of Medway. The Massachusetts Cancer Registry (MCR) is a population-based surveillance

system that began collecting information in 1982 on Massachusetts residents diagnosed with cancer in the state. All newly diagnosed cancer cases among Massachusetts residents are required by law to be reported to the MCR within six months of the date of diagnosis (MGL, c.111, s.111B). This information is kept in a confidential database and reviewed for accuracy and completeness.

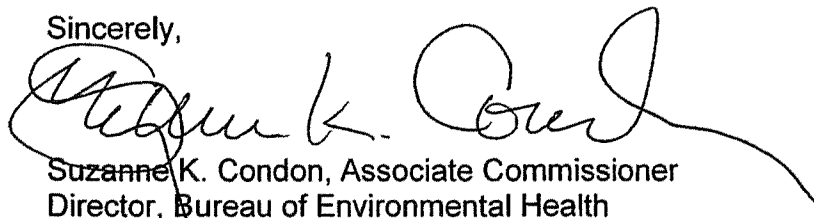
Available information on the occurrence of cancers in children living in Medway indicates no diagnoses of Hodgkin Lymphoma, NHL, or osteosarcoma have been reported to the MCR in a search of their files from 2006 to the present. Although it is possible that a very recent diagnosis may not yet have been reported to the MCR, the fact that there are no reports of such cancers is reassuring.

Although available resources cannot support MDPH conducting environmental testing of this material, we would be happy to assist the Town of Medway in developing a sampling and analysis plan as well as provide technical support in interpreting results, similar to the assistance that we provided to the Town of Needham.

As we stated in our letters to Needham officials, while available information does not indicate exposure opportunities of health concern, MDPH/BEH continues to recommend common sense ways to minimize any potential exposure to chemicals that may be contained in synthetic turf fields made of crumb rubber. MDPH/BEH suggests washing hands after playing on the field and before eating, particularly for younger children with frequent hand-to-mouth activity, and taking off shoes before entering the house to prevent tracking in any crumb rubber particles. Also, there are studies that indicate heat levels on artificial turf fields may rise as outdoor temperatures increase (New York State 2009). Thus, for protection of the players, MDPH/BEH recommends increasing hydration, taking frequent breaks, and watering down the field to cool it on hot days to prevent the potential for burns or heat stress. Finally, based on recent work in California, MDPH/BEH recommends that steps be taken to minimize the potential for skin abrasions (e.g., protective equipment) and that skin abrasions be treated promptly to prevent potential infections.

We hope this information is helpful to you and Medway residents. If you have any questions, please feel free to contact us at 617-624-5757.

Sincerely,

A handwritten signature in black ink, appearing to read "Suzanne K. Condon". The signature is fluid and cursive, with a long, sweeping tail that extends to the right.

Suzanne K. Condon, Associate Commissioner
Director, Bureau of Environmental Health

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— Article submitted to the Planning Board by a resident

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Testimony of Dr. Diana Zuckerman before the Maryland House of Delegates Appropriations Committee on the Health Risks of Artificial Turf

Diana Zuckerman, PhD, National Center for Health Research, February 8, 2018

I am Dr. Diana Zuckerman and I am here today as the president of the National Center for Health Research and as a resident of Montgomery County for more than 25 years. My children grew up in the county and so this is an issue of great importance to me personally as well as professionally.

I congratulate you on introducing HB 505, to prohibit the use of state funds for artificial turf fields and playgrounds, and I strongly support it. Public funds should not be used for artificial turf and similarly dangerous playground materials.

There is considerable misunderstanding about the safety and cost-effectiveness of recycled tire material, other synthetic rubber, plastics, triclosan, and other synthetic materials on playing fields and playgrounds. Your focus today is on whether state funding should be used to install and refurbish these artificial fields. You will hear from others about the fact that these artificial fields are not cost-effective. Since my training is in epidemiology and public health, I will focus on why investing in artificial turf fields is bad for our children's health.

Artificial turf is made from synthetic rubber, plastic, and other materials with known health risks. For example, the widely used material known as crumb rubber or tire crumb includes carcinogens as well as chemicals that disrupt our body's hormones. These are called endocrine disrupting chemicals, and studies show that they contribute to early puberty, obesity, and attention deficit disorder. Since breast cancer and several other cancers are fed by estrogen and other hormones, these materials can also cause cancer in the long-term.

Some endocrine disrupting chemicals have been banned by Federal law from toys and other products for young children. It does not make sense that chemicals banned from rubber duckies, teething toys, and other products used for a relatively short period of time by children are allowed in playing fields and playgrounds where children are exposed day after day, week after week, and year after year.

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The artificial turf industry will tell you that there is no clear evidence that their fields caused any child to develop cancer. That is true. But as an epidemiologist, I can also tell you that for decades there was no evidence that smoking caused cancer or that Agent Orange caused cancer. It takes many years to develop that evidence. And even then, it is usually impossible to prove that the cancer that any individual has developed was specifically caused by smoking or any other one source of exposure. However, the weight of the evidence can be clear, even when the specific cause and effect can't be proven. There is clear evidence that the materials used in synthetic turf can cause cancer, skin irritation, contribute to obesity, and other health issues.

Artificial grass fields are just part of the problem. Rubber playground materials used to cover the ground near slides, swings, and other playground equipment are attractive and seem safe, but they are made with the same kind of tire crumb and "virgin rubber" as athletic fields and have the same risks. At a local park I recently saw particles of synthetic rubber and other potentially harmful material break off – it looks like candy and can end up in children's mouths, as well as up their noses, in their ears, and on their clothes. A much safer alternative, which is also ADA-compliant, is engineered wood fiber, which is just as effective as softening any falls and has no dangerous chemicals.

What the Scientific Studies Say

The California Office of Environmental Health Hazard Assessment (OEHHA) conducted three laboratory studies to investigate the potential health risks to children from playground surfaces made from recycled tires. One study evaluated the level of chemicals released that could cause harm to children after they have had contact with loose tire shreds, either by eating them or by touching them and then touching their mouth. The other two studies looked at the risk of injury from falls on playground surfaces made from recycled tires compared to wood chips, and whether recycled tire shreds could contaminate air or water.^[1]

It would not be ethical to ask children to eat tire shreds, so the researchers created chemical solution that mimicked the conditions of a child's stomach and placed 10 grams of tire shreds in it for 21 hours at a temperature of 37°C. Researchers then measured the level of released chemicals in the solution and compared them to levels EPA considered risky. The study also mimicked a child touching the tire shreds and then touching her mouth by wiping recycled tire playground surfaces and measuring chemical levels on the wipes. To evaluate skin contact alone, the researchers tested guinea pigs to see if rubber tire playground samples caused any health problems. This study assumed that children would be using the playground from the ages of 1 through 12. Results of the OEHHA studies showed that a single incident of eating or touching tire shreds would probably not harm a child's health, but repeated or long-term exposure might. Five chemicals, including four PAHs, were found on wipe samples. One of the PAHs, "chrysene," was higher than the risk level established by the OEHHA, and therefore, could possibly increase the chances of a child developing cancer.^[1]

Out of the 32 playgrounds surfaced in recycled tires that the researchers in California looked at, only 10 met that state's standard for "head impact safety" to reduce brain injury and other serious harm in children who fall while playing. In contrast, all five surfaces made of wood chips met the safety standard.^[1]

A 2012 study analyzing rubber mulch taken from children's playgrounds found harmful chemicals in all of them, often at high levels.^[2] Twenty-one samples were collected from 9 playgrounds, and the results showed that all samples contained at least one hazardous chemical, and most contained high

concentrations of several PAHs. Several of the identified PAHs can be released into the air by heat, and when that happens children are likely to inhale them. While the heat needed to do this was very high in some cases (140 degrees Fahrenheit), many of the chemicals also became airborne at a much lower temperature of 77 °F. And since rubber playgrounds retain much more heat than grass or dirt, a temperature of 140 degrees can happen even on a sunny spring, summer, or fall day when the temperature near grass is only 70 degrees. The authors concluded that the use of rubber recycled tires on playgrounds "should be restricted or even prohibited in some cases."^[2]

A 2015 report by Yale scientists analyzed the chemicals found in 5 samples of tire crumbs from 5 different companies that install school athletic fields, and 9 different samples taken from 9 different unopened bags of playground rubber mulch. The researchers detected 96 chemicals in the samples. A little under a half have never been studied for their health effects, so their risks are unknown, and the other chemicals have been tested for health effects, but those tests were not thorough. Based on the studies that were done, 20% of the chemicals that had been tested are considered to probably can cause cancer, and 40% are irritants that can cause breathing problems such as asthma, and/or can irritate skin or eyes.^[3]

What the EPA Has Done

The EPA created a working group that collected and analyzed data from playgrounds and artificial turf fields that used recycled tire material. Samples were collected at six turf fields and two playgrounds in four study sites (Maryland, North Carolina, Georgia and Ohio). In a report released in 2009, the agency concluded that the level of chemicals monitored in the study and detected in the samples were "below levels of concern." However, there were limitations to this study because they did not measure the concentration of organic chemicals that are known to vaporize during summer heat, such as PAHs.

Due to the small number of samples and sampling sites used, the EPA stated that it is not possible to know if these findings are typical of other playgrounds or fields until additional studies are conducted.^[4] When announcing the results of the study, EPA joined other organizations in recommending that as a precaution, young children wash their hands frequently after playing outside.^[4]

A meeting was then convened by the EPA in 2010, bringing together various state and federal agencies to discuss safe levels of chemical exposure on playgrounds made from recycled tire rubber, and opportunities for additional research.^[4] In the case of PAHs, the EPA has concluded that while there are currently no human studies available to determine their effects at various levels, based on laboratory findings, "breathing PAHs and skin contact seem to be associated with cancer in humans."^[5]

In February 2016, the U.S. government announced a new action plan to better understand the likely health risks of recycled tire crumb and similar artificial surfaces. This initiative involves 4 U.S. government agencies: the EPA, Centers for Disease Control and Prevention (CDC), Agency for Toxic Substances and Disease Registry (ATSDR) and Consumer Product and Safety Commission (CPSC). However, I'm sure many of you are aware that the current EPA is unlikely to complete the analysis in an objective, scientific way.

In summary, it is essential that the State of Maryland stop paying for artificial turf fields and playgrounds that can clearly exacerbate our children's existing health problems and cause new health problems. Let's

instead invest in safe, natural playing fields, unless any artificial alternatives are proven to be safer, more effective, and as cost-effective as grass.

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<http://www.winn.com/2015/09/03/new-yale-study-reveals-carcinogens-and-skin-irritants-in-synthetic-turf/> Accessed February 2018.
5. US Environmental Protection Agency (EPA). Polycyclic Aromatic Hydrocarbons (PAHs)-Fact Sheet. November 2009. <https://www.epa.gov/north-brunswick-project/polycyclic-aromatic-hydrocarbons-pahs-fact-sheet> Accessed February 2018.



North Andover Health Department
Community and Economic Development Division

MEMORANDUM

To: The North Andover Planning Board
From: The North Andover Board of Health
RE: Artificial Turf Fields
Date: March 18, 2019

The North Andover Board of Health appreciates the opportunity to submit this evaluation and recommendation to the North Andover Planning Board. Please note that the North Andover Board of Health does not endorse any specific consumer products and this is in response to the Planning Board's request to the Board of Health for review and recommendation regarding any public health hazards associated with artificial turf fields (ATF's).

The North Andover Board of Health has considered whether the ATF proposed at the recreational complex to be constructed at 495 Main Street, North Andover poses any health risks to users or bystanders. The Board has reviewed numerous articles, literature, government studies and scientific data relevant to this topic. This research identifies the following areas as potential issues or concerns relative to ATF's and crumb rubber infill and provides mitigating measures to reduce or eliminate such concerns. The Board understands that there are still ongoing studies and data gaps and will examine any new evidence, studies or data as it is published. Should you require any further information, please do not hesitate to contact Brian LaGrasse, North Andover Director of Public Health.

The North Andover Board of Health held a public meeting on March 14, 2019 to discuss the research and the public health hazards associated with ATF's and made the following recommendations:

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1. Treatment of Minor Scrapes and Cuts

The Board considered data and fact sheets about disease transmission from sports, sporting equipment and surfaces that may be impacted or contain methicillin-resistant staphylococcus aureus (MRSA) or staphylococcus aureus (*S. aureus*) particularly where cuts and scrapes occur.

Research has determined that survival rate of *S. aureus* and MRSA on natural grass or artificial turf is the same. Both have a very low rate of survival, particularly when exposed to UV light and higher temperatures.

The Centers for Disease Control provides information on prevention of *S. aureus* and MRSA infections. It states that even if surfaces contain *S. aureus* and MRSA, a person who comes into contact with surfaces will not necessarily develop an infection. *S. aureus* and MRSA are most likely to cause problems when someone has a cut or scrape that is not covered. So it is important to cover cuts and open wounds with bandages.

BOH Recommendation: Immediately clean and cover any cuts, abrasions or wounds and practice good personal hygiene.

2. Crumb Rubber and Artificial Turf

The crumb rubber infill that is part of most artificial turf fields is made from recycled ground tires which contain metals, volatile organic compounds (VOCs) and polycyclic aromatic compounds (PAHs).

The Board reviewed the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health, position letters based on scientific literature. MDPH concluded that lead was not found in polyethylene grass fibers used in artificial turf fields, so these are preferable to nylon grass fibers, some of which had been found to contain lead. Several government agencies also reported that current information does not suggest that exposure to ATF's pose any significant risk or adverse health effects.

BOH Recommendation: The chemicals comprising the artificial turf components do not appear to pose any significant risk to children and adults using the field, based on research to date. Low or no lead turf fibers and materials should be acceptable and normal construction standards for municipal field projects. All materials should be certified low or no lead products and they should all meet the standards set forth in the Consumer Product Safety and Improvement Act. Alternatives such as thermoplastic elastomers (TPE) should also be researched and considered as the turf infill.

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3. Heat Stress

Available information suggests that heat levels are elevated on artificial fields with crumb rubber infill. The elevated temperatures were more pronounced in direct sunlight but was reduced when cloud cover was present and in shaded areas.

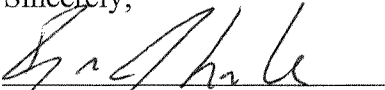
The use of thermoplastic elastomers (TPE) can mitigate the elevated temperatures as TPE can be manufactured in lighter colors which generate less heat than the black tire crumb infill.

BOH Recommendation: It is important that people who play on the fields be provided with adequate warnings regarding the potential for heat stress. Posting of signage and educating artificial turf field users that the field can heat up quicker than the surrounding ambient environment in the hot weather is important. Having sufficient hydration and shade tents may be beneficial in combating the increased temperatures that can be realized on artificial turf fields with dark colored infill.

The Board wants to note that ATF infrastructure is already in place in town and has been in use for several years without concern. In conclusion, the aforementioned recommendations are based on available information and research that the Board of Health found to be from credible sources. To date the evidence and scientific research published largely has concluded that any adverse health effects associated with use of ATF's is unlikely at this time. The Board acknowledges that there are gaps in the conclusive data and that there are several ongoing studies yet to be published. The Board will examine any new credible evidence and scientific studies when they are published and reserves the right to issue additional recommendations.

Please feel free to call or email me if you have any questions, comments or concerns.

Sincerely,



Brian J. LaGrasse,
Director of Public Health

CC: BOH

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