

Health Effects of Crumb Rubber Surfaces

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Overview

- **Crumb Rubber and Crumb Rubber Surfaces**
- **History**
 - Concerns Raised About Health Effects
- **Alleged Health Impacts / Injuries**
- **Agency Responses / Research / Findings**
- **Conclusion**



What is Crumb Rubber?



- Crumb rubber is recycled rubber from scrap tires that is mechanically derived or reduced to smaller particles using cryogenics.
- The tires crumb rubber is made made from natural and synthetic rubber, carbon black, oil and chemical additives that give the tires their unique characteristics (e.g. adhesion rolling resistance, ozone resistance etc.)



What Are Crumb Rubber Surfaces

- **Surfaces made from or with crumb rubber include:**
 - Artificial Turf / Astroturf
 - crumb rubber, sometimes called “astro-dirt”, is used for cushioning
 - Rubberized Asphalt
 - ground cover for playground equipment
 - surface material for running tracks



History of Concerns and Responses

- There are concerns about potential chemical releases from artificial surfaces made using or containing crumb rubber and the safety / health, and environmental implications.
- The EPA and U.S. Consumer Product Safety Commission (CPSC): examined crumb rubber and determined there are not any elevated health risks.
 - The EPA acknowledges existing "studies do not comprehensively evaluate" all concerns. It has not indicated that it is safe or unsafe.

2008

- EPA: Scoping-Level Field Monitoring Study of Synthetic Turf Field and Playgrounds, designed to measure possible emissions, not to assess potential health risks
- CPSC: stated "artificial turf fields were safe to play on", based on limited tests for lead on artificial grass on turf fields.
- NYC Park Department: stopped using crumb rubber in new fields.

2009

- Los Angeles Unified School District: stopped using recycled infill.



History of Concerns and Response – Continued

Lawsuits

2008

- Chicago Protect Our Parks (POP) lawsuit alleging that safety warnings regarding actions to limit exposure to contaminants in the dust emitted from artificial turf fields, were disregarded by the Parks District and Latin School.
 - Another lawsuit alleges a violation of Chicago Lead Bearing Substances Ordinance.

2009

- California Attorney General's Office: sued manufacturers for violating state law by failing to provide "clear and reasonable warnings" about lead content in turf fibers and crumb rubber.



History of Concerns and Response (Cont.)

Current Federal actions include the following:

2015

- **October 23, 2015:** The House Energy and Commerce Committee sent a letter to U.S. EPA Administrator, Gina McCarthy asking about the safety of recycled rubber tire “crumbs” used in synthetic turf fields in the US.
- The EPA has compiled an extensive list of literature pertaining to Tire Crumb and Synthetic Turf Fields from the past 12 years (EPA 2015).



Concerns about Health Implications / Injuries

- **Illness from Chemical Exposure (including Carcinogens / Lead)**
 - Exposure Pathways
 - Ingestion
 - Inhalation of particulates or vapors/gases
 - Direct skin contact/trans-dermal absorption (e.g. latex)
 - Ocular exposure (via one’s eyes)
- **Exposure to Disease Vectors / Pathogens**
 - Infection
 - Potential Exposures: mold, solid waste, bodily fluids, etc.
- **Heat Exposure / Stress / Injury**



Artificial Turf Maintenance / Hygiene



[Video Example of Turf Cleaning](#)

Ways to address foreign materials / substances from the surrounding environment and from individuals on or near artificial turf fields:

- Rake
- Sweep
- Brush
- Aerate
- Disinfect

Elements of a Conceptual Site Model

SOURCES

- Contaminants
- Concentrations
- Time
- Location

PATHWAYS

- Media
- Rates of Mitigation
- Time
- Loss and Gain Functions

RECEPTORS

- Types
- Sensitivities
- Concentrations
- Numbers

Chemicals of Potential Concern

Compounds potentially found in crumb rubber:

- Organic Compounds
 - Semi-volatile organic compounds (SVOCs)
 - Benzene
 - Polycyclic aromatic hydrocarbons (PAHs)
- Heavy Metals
 - Lead
 - Zinc
 - Chromium
 - Arsenic
 - Cadmium
 - Mercury



Factors Influencing Exposure

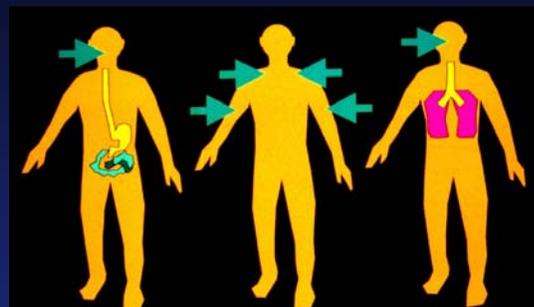
Exposure Pathway / Frequency / Duration

Crumb Rubber:

- Particle size
- Material composition
- Age / deterioration

Environmental:

- Indoor (Ventilation) / Outdoor
- Temperature
- Moisture
- pH



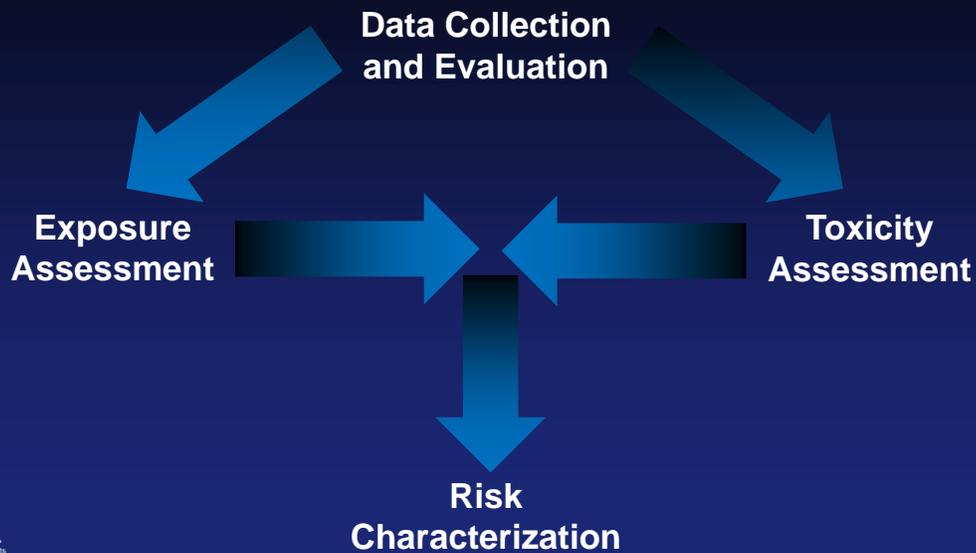
Ingestion

Dermal

Inhalation



The Risk Assessment Process



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

- Draft Status Report expected by end of 2016
- Objectives:
 - Identify / Characterize chemical compounds crumb rubber in artificial turf fields and playgrounds.
 - Characterize exposure / how people are exposed to chemical compounds based on their activities.
 - Identify follow-up activities that could be conducted to provide additional insights about potential risks.
- Research Protocol Methods:
 - Conduct Data / Knowledge Gap Analysis
 - Stakeholder Engagement
 - Athletes, parents, and coaches
 - Government agencies
 - Industry representatives
 - Test Crumb Rubber / Characterize Chemicals, Potential Emissions, and Toxicity
 - Study / Characterize Exposure Under Use Conditions

Agency Response, Action, and Findings

- **NYC Department of Health and Mental Hygiene (NYDOHMH)**
 - Commissioned a review of literature pertaining to chemical release, exposure, and health effects related to artificial turf fields.
 - The 11 studies reviewed had similar conclusions that exposure to chemicals in crumb rubber is likely to be small and unlikely to increase risk of health effects.
- **NY Department of Environmental Conservation**
 - Assessment of Potential Environmental Impacts from the use of Crumb Rubber as Infill Material in Synthetic Turf Fields (2008).
- **California Office of Environmental Health**
 - Hazard Assessment to determine if chemicals in crumb rubber can be released under various conditions and what, if any, exposures or health risks releases may pose those frequently using crumb rubber fields (underway).
 - Evaluation of Health Effects of Recycled Waste Tires in Playgrounds and Track Products (2007)
 - Study of chemicals and particulates in the air above the new generation of artificial turf playing fields and artificial turf as a risk factor for infection by MRSA (2009).
 - Results did not show increased risk of MRSA



Agency Response, Action, and Findings

Connecticut

- **Human Health Risk Assessment (2010):**
 - Findings suggest, outdoor and indoor synthetic turf fields are not associated with elevated adverse health risks, but that it would be prudent to provide adequate ventilation for indoor fields to prevent a buildup of rubber-related volatile organic chemicals (VOC) and SVOC.
 - Results are consistent with findings from NYC, New York, the EPA, and Norwegian studies, which tested different kinds of fields and under a variety of weather conditions.

Washington

- Reviewing information about soccer players with cancer to see what expected levels of cancer would be based on Washington state cancer rates.



Findings: Health Risks

- “Health risk assessment studies suggested that users of artificial turf fields, even professional athletes, were not exposed to elevated risks.”
- “For the products and fields we tested, exposure to infill and artificial turf was generally considered de minimus, with the possible exception of lead for some fields and materials.”
- Turin, Italy Study: examined routes of exposure and determined outdoor inhalation of dusts and gases was the main route of exposure for both carcinogenic and non-carcinogenic substances.
- Inhalation of atmospheric dusts and gases from vehicular traffic is associated with higher risk than playing soccer on an artificial field.
- “Artificial turf football fields present no more exposure risks than the rest of the city.”



Findings: Air and Water

- “Limited number of studies have shown that the concentrations of volatile and semi-volatile organic compounds in the air above artificial turf fields were typically not higher than the local background”.
- Fewer volatile compounds were observed in the air over samples of older crumb rubber.
- Under natural weathering conditions there was a significant reduction of out-gassing organic compounds from the crumb rubber in the first 14 days; values remained consistent thereafter.
- A study of water quality found “the concentrations of heavy metals and organic contaminants in the field drainages were generally below respective regulatory limits.”



Findings: Lead

- A study of the impact of crumb rubber size on lead exposure risk confirms that “the exposure of lead ingestion and risk level increases as the particle size of crumb rubber gets smaller.”
- A study was able to:
 - Determine that inhalable lead, if present, is “re-suspended from even minor physical activity on an artificial surface”;
 - Conclude that “human exposure from lead-containing artificial turf fields is not just limited to dermal, but also to inhalation route of exposure”; and
 - Does not indicate “the magnitude of the potential contribution the inhalation route of exposure may contribute”.
- Another study found that:
 - One crumb rubber sample had moderate lead content (53 p.p.m.) the others had relatively low concentrations of lead (3.12-5.76 p.p.m.), according to soil standards; and
 - 24.7-44.2% of lead in the samples was bio-accessible in synthetic gastric fluid.



Findings: PAH

- A study indicates that uptake of PAH by football players active on artificial grounds with rubber crumb infill is minimal.
 - If there is exposure / uptake it is very limited and within the range of uptake of PAH from environmental sources and / or diet.
- Another study found that:
 - Crumb rubber often, especially on newer turf fields, contained PAHs at levels above health-based soil standards;
 - The levels of PAHs appear to decline as the field ages; and
 - PAHs contained in crumb rubber had zero or near-zero bio-accessibility in the synthetic digestive fluids.



Synthetic Turf Council: Summary of Research

More than 50 independent and credible studies from groups such as the U.S. Consumer Product Safety Commission, and statewide governmental agencies such as the New York State Department of Environmental Conservation, New York State Department of Health and the California Environmental Protection Agency, have validated the safety of synthetic turf (see Position Statements to learn more).

Recent highlights include:

- In October 2010, the California Office of Environmental Assessment completed its multi-year study of air quality above crumb rubber infilled synthetic turf, and bacteria in the turf, and reported that there were no public health concerns.
- In July 2010, the Connecticut Department of Public Health announced that a new study of the risks to children and adults playing on synthetic turf fields containing crumb rubber infill shows “no elevated risks.”
- The California EPA released a report dated July 2009 which indicated there is a negligible human risk from inhaling the air above synthetic turf.
- Independent tests conducted by the New York State Department of Environmental Conservation and New York State Department of Health, released in May 2009, proved there were no significant health concerns at synthetic turf fields.
- In July 2008, a U.S. Consumer Product Safety Commission staff report approved the use of synthetic turf by children and people of all ages.



Conclusions

- **Indoor artificial turf fields may present a greater potential risk of health impacts than outdoor artificial turf fields related to:**
 - Bacteria survival / risk of infection (bacteria can exist but do not thrive; risk diminishes over time and if temperature of field is elevated)
 - Air quality, emissions, ventilation
- **Crumb rubber made using color fast agents and older tires (often found on older fields) may be more likely to have increased levels of lead.**
- **Decreases in out-gassing organic / compounds and PAH may be affected as new crumb rubber is added to compensate for the loss of material.**
- **Only a comprehensive testing of a field can provide assurance that no health hazards exist.**



Questions

THANK YOU

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