

Overview of the Research on Crumb Rubber in Synthetic Turf

Prepared by
The InnovaNet Group
For
Synthetic Turf Council

“The use of outdoor and indoor artificial turf fields is not associated with elevated health risks.”

Connecticut Department of Public Health

Human Health Risk Assessment of Artificial Turf Fields Based upon
Results from Five Fields in Connecticut

2010

“Based on the available literature on exposure to rubber crumb by swallowing, inhalation and skin contact ... we conclude, that there is not a significant health risk due to the presence of rubber infill for football players [for] an artificial turf pitch with rubber infill from used car tyres.”

Hofstra, U.

Environmental and Health Risks of Rubber Infill: Rubber crumb from car tyres as infill on artificial turf.

2007

“Many governmental bodies including Norway, Sweden and California have recently reviewed the health issues associated with the use of crumb rubber as infill at playgrounds and synthetic turf fields. Their assessments did not find a public health threat.”

Ly Lim, Ph.D., P.E.

A STUDY TO ASSESS POTENTIAL ENVIRONMENTAL IMPACTS FROM THE USE OF
CRUMB RUBBER AS INFILL MATERIAL IN SYNTHETIC TURF FIELDS

New York State Department of Environmental Conservation

June 2008

“...exposure to COPCs (chemicals of potential concern) from the crumb rubber may occur, however the degree of exposure is likely to be too small through ingestion, dermal or inhalation to increase the risk for any health effect.”

Lim, L. and R. Walker

An Assessment of Chemical Leaching, Releases to Air and Temperature at Crumb-Rubber Infilled Synthetic Turf Fields

New York State Department of Environmental Conservation

2009

“Several scientific research studies carried out in the United States and Europe have assessed potential exposures and health risks for people using turf fields containing crumb rubber. According to the Health Department's review of these research findings, health effects are unlikely from exposure to the levels of chemicals found in synthetic turf.”

Artificial Turf: Are any health effects associated with these chemicals found in synthetic turf crumb rubber?

The New York City Department of Health and Mental Hygiene website

2014

“Extensive research has pointed to the conclusion that (synthetic turf) fields result in little, if any, exposure to toxic substances. A review of existing literature points to the relative safety of crumb rubber fill playground and athletic field surfaces. Generally, these surfaces, though containing numerous elements potentially toxic to humans, do not provide the opportunity in ordinary circumstances for exposure at levels that are actually dangerous. Numerous studies have been carried out on this material and have addressed numerous different aspects of the issue. For the most part, the studies have vindicated defenders of crumb rubber, identifying it as a safe, cost- effective, and responsible use for tire rubber.”

Rachel Simon
University of California, Berkeley

February 2010

UNIVERSITY OF CALIFORNIA, BERKELEY
LABORATORY FOR MANUFACTURING AND SUSTAINABILITY

Technical Literature

There have been more than 60 technical studies and reports issued between 1988 and 2010 that review the health effects of crumb rubber

- 34 concerning inhalation toxicity
- 31 concerning ingestion toxicity
- 16 concerning dermal toxicity
- 5 concerning cancer

Three Exposure Pathways

- Ingestion
- Inhalation
- Dermal Contact

Concerning Ingestion

Crumb rubber does not represent an increased ingestion hazard

- ***“Oral ingestion was deemed to be low in overall hazard because ingestion of tire crumb on the ground is not likely, and the gastrointestinal tract is unlikely to be efficient in extracting toxic chemicals from tire crumb.”***
 - Detlef A. Birkholz, Kathy L. Belton, Tee L. Guidotti, Toxicological Evaluation for the Hazard Assessment of Tire Crumb for Use in Public Playgrounds, J. Air & Waste Manage. Assoc. 53:903–907, July 2003
- ***“OEHHA then compared the levels of released chemicals to their health-based screening values, assuming a young child ingested ten grams of tire shreds; all exposures were at or below the screening values **suggesting a low risk of noncancer acute health effects.**”***
- ***“Assuming ingestion of the above five chemicals (zinc and four PAHs) via chronic hand-to-mouth contact, exposures were below the corresponding chronic screening values, **suggesting a low risk of adverse noncancer health effects.**”***
 - California Integrated Waste Management Board, Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products. 2007, Integrated Waste Management Board: Sacramento, CA.
- ***“Based upon the current evidence, **a public health risk appears unlikely.** DPH does not believe there is a unique or significant exposure from chemicals that can be inhaled or ingested at these fields.”***
 - CT Department of Public Health, Health Questions about Artificial Turf Fields, Oct 2007

Concerning Inhalation

Crumb rubber does not represent an increased inhalation hazard

- ***“A screening-level assessment of health risks was performed by comparing the estimated exposures to health-based screening levels. All exposures were lower than the screening levels, indicating that adverse health effects were unlikely in athletes using these fields.”***
 - Office of Environmental Health and Hazard Assessment, 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, Department of Resources Recycling and Recovery, Editor. 2010, State of California.
- ***“Further, the concentrations of VOCs and particulate matter detected above the surface of the fields did not exceed background levels, and thus do not suggest an increased risk from the installation of these fields.”***
 - Lim, L. and R. Walker, An Assessment of Chemical Leaching, Releases to Air and Temperature at Crumb-Rubber Infilled Synthetic Turf Fields, New York State Department of Environmental Conservation and Department of Health, Editor. 2009
- ***“Concentrations of VOCs and PM above field did not exceed background, even with high field temperatures; Not likely to pose risk from inhalation.”***
 - Lim, L. and R. Walker, An Assessment of Chemical Leaching, Releases to Air and Temperature at Crumb-Rubber Infilled Synthetic Turf Fields, New York State Department of Environmental Conservation and Department of Health, Editor. 2009.
- ***“Based upon the current evidence, a public health risk appears unlikely. DPH does not believe there is a unique or significant exposure from chemicals that can be inhaled or ingested at these fields.”***
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- ***“OEHHA then compared the levels of released chemicals to their health-based screening values, assuming a young child ingested ten grams of tire shreds; all exposures were at or below the screening values suggesting a low risk of noncancer acute health effects.”***
 - California Integrated Waste Management Board, Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products. 2007, Integrated Waste Management Board: Sacramento, CA.

Concerning Dermal Contact

Crumb rubber does not represent an increased skin exposure hazard

- ***The chances that substances in the rubber cause skin irritation to non-sensitized persons is estimated to be low.***
 - Hofstra, U., Environmental and Health Risks of Rubber Infill: Rubber crumb from car tyres as infill on artificial turf, 2007.
- ***This study provides evidence that uptake of PAH of football players active on artificial grass fields with rubber crumb infill is minimal. If there is any exposure, then the uptake is very limited and within the range of uptake of PAH from environmental sources and/or diet.***
 - Joost G. M. van Rooij Æ Frans J. Jongeneelen, Hydroxypyrene in urine of football players after playing on artificial sports field with tire crumb infill, Int Arch Occup Environ Health (2010) 83:105–110
- ***As is apparent from Table 10, exposure to PCBs , PAHs, phthalates and alkyl phenols via the skin is extremely low and is measured in ng/kg body weight/day. It is therefore concluded that skin exposure to recycled rubber granulate will not cause any increased health risk.***
 - Norwegian Institute of Public Health and the Radium Hospital, Artificial turf pitches – an assessment of the health risks for football players. 2006, Norwegian Institute of Public Health and the Radium Hospital: Oslo. p. 1-34.

Concerning an Increased Risk of Cancer

Crumb rubber does not represent a significantly increased cancer risk

- *“Supplemental chronic risk estimates ... indicate that regular exposure (e.g., regular play on ground rubber filled athletic fields) to ground rubber for the length of one’s childhood does not increase risk of cancer above levels considered by the state of California to be de minimus*.”*
 - U.S. EPA, Child-Specific Exposure Factors Handbook, Interim Report. 2002
 - * “i.e. a lifetime excess cancer risk of 1 in 1 million”
- *“Ingestion of a significant quantity of tire shred did not elevate a child’s risk of developing cancer, relative to the overall cancer rate of the population.”*
 - Rachel Simon, University of California, Berkeley, Review of the Impacts of Crumb Rubber in Artificial Turf Applications, February 2010
- *“Genotoxicity testing of tire crumb samples ... suggests that ingestion of small amounts of tire crumb by small children will not result in an unacceptable hazard of contracting cancer.”*
 - Detlef A. Birkholz, Kathy L. Belton, Tee L. Guidotti, Toxicological Evaluation for the Hazard Assessment of Tire Crumb for Use in Public Playgrounds, J. Air & Waste Manage. Assoc. 53:903–907, July 2003

The preponderance of evidence shows no negative health effects associated with crumb rubber in synthetic turf