

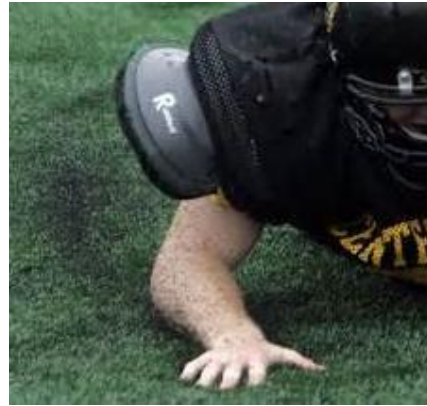
ATHLETES AND PARENTS

California Synthetic Turf Scientific Advisory Panel Meeting - 2/8/2016

REFERENCE MATERIALS '

Submitted by Safe Healthy Playing Fields Coalition www.safehealthyplayingfields.org





In addition to stirring up the tire crumb particulates and tire crumb dust ...



... the on the field activity acts as a mortar and pestle to further break down the tire crumb into dust. %

CHEMICALS & TIRE CRUMB '

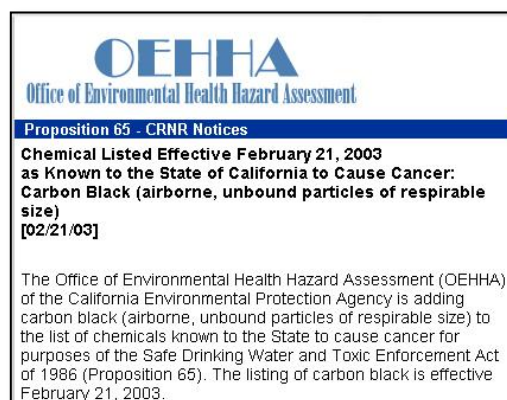
Hundreds of chemicals and additives make up tire crumb. Some of the toxic chemicals found in tire crumb synthetic turf include, but are not limited to; 1,3-butadiene, benzene, polycyclic aromatic hydrocarbons (PAHs), manganese, zinc, lead, benzothiazole, butylated hydroxyanisole, n-hexadecane, 4-(t-octyl) phenol, and phthalates.

Carbon black is the most prevalent chemical component of tire crumb. Carbon black is a nano-particulate powder produced by the incomplete combustion of heavy petroleum products and hydrocarbons. (Carbon black was not included in the “List of Chemicals of Potential Concern” in the Synthetic Turf Study Scientific Advisory Panel Meeting materials).

Even though tire manufacturers are not required to divulge how much carbon black they use in each tire -- it is generally recognized that carbon black makes up well over 25% (by weight) of a tire. The current California Synthetic Turf Study lists the percentage as 38% (West Coast Rubber - Materials Data Sheet).



carbon black



OEHHA listing for carbon black

The State of California's Office of Environmental Health Hazard Assessment (OEHHA) lists carbon black as a chemical known to cause cancer, (“airborne, unbound particles of respirable size”). In 2006, the International Agency for Research on Cancer (IARC) determined carbon black's classification as a Group 2B carcinogen.

The Occupational Safety and Health Administration (OSHA) has set the legal limit for carbon black exposure in the workplace as 3.5 mg/m³ over an 8-hour workday. The National Institute for Occupational Safety and Health (NIOSH) has set a recommended exposure limit (REL) of 3.5 mg/m³ over an 8-hour workday. At levels of 1750 mg/m³, carbon black is considered immediately dangerous to life and health.

An average tire crumb synthetic turf football field contains over 150 tons of carbon black material. (This does not include the field's apron -- sidelines and end zones. The larger soccer fields and sports multiplexes would also contain more material)

Over **40,000** tires are used per playing field, (football field / soccer field).
An average passenger tire includes **7.5** pounds of carbon black.
40,000 x 7.5 = 300,000 pounds of carbon black per regulation football field.

FieldTurf.com

RubberNews.com / Crain Communications, Inc.

TIRE CRUMB SAMPLE '



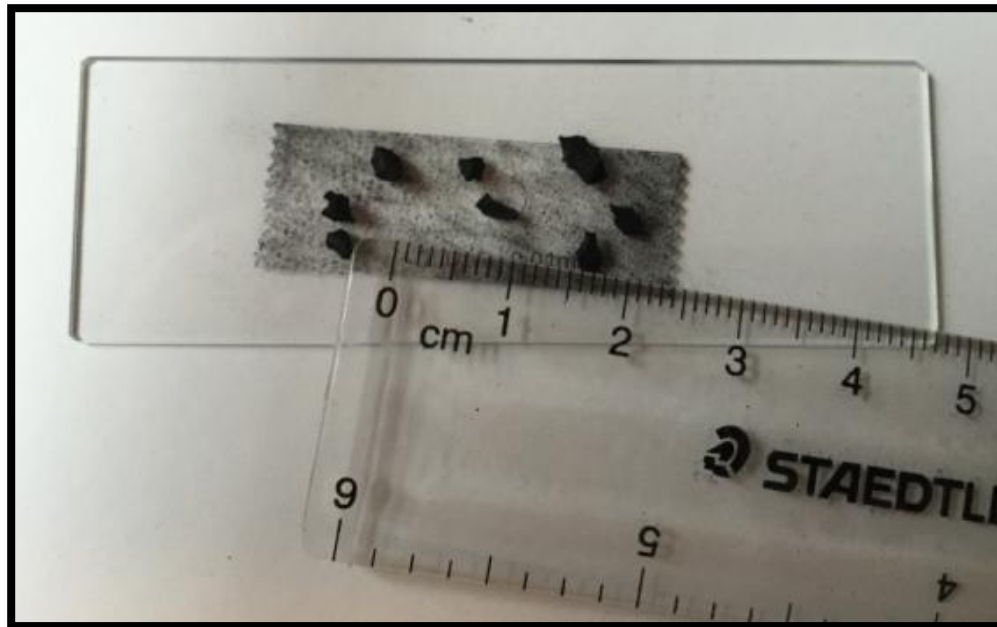
The sampled tire crumb is from infill material intended for an athletic field.



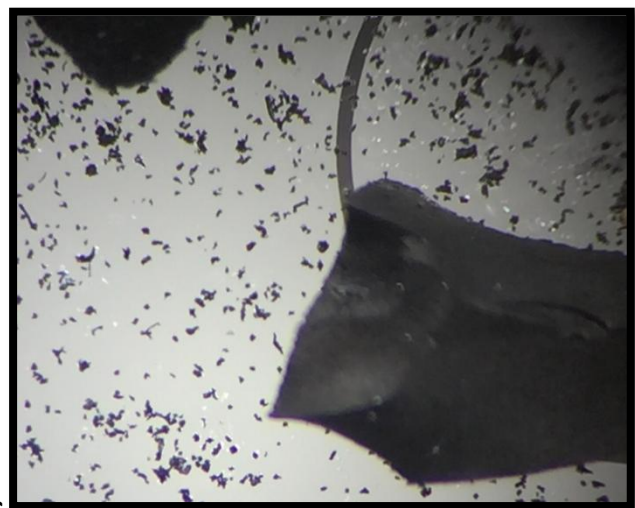
Tire crumb sample in container with lid, calibration slide, and ruler (6 inch / 15 cm). %

TIRE CRUMB PARTICULATES -- SIZE RANGE & CONTOURS

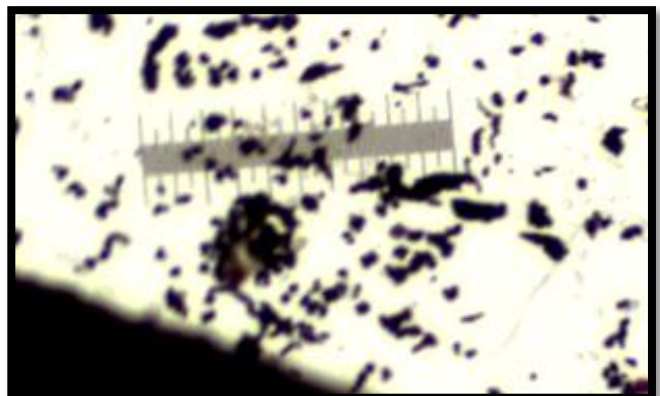
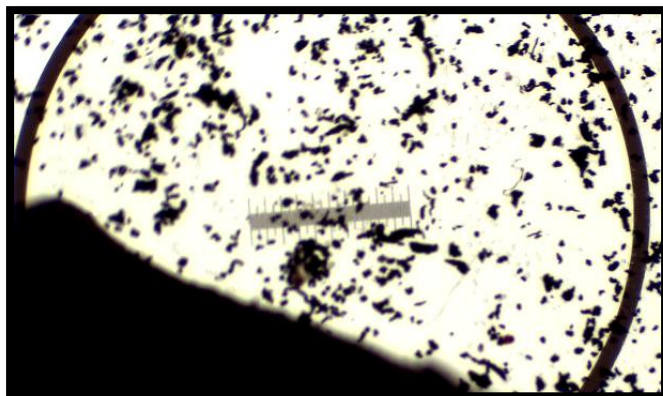
(This series of images zooms in on a single microscope calibration slide – images A-E)



A
Tire crumb and tire dust samples - placed on a calibration slide alongside metric ruler. %



B
Calibration slides' circle diameter is less than 4mm. %

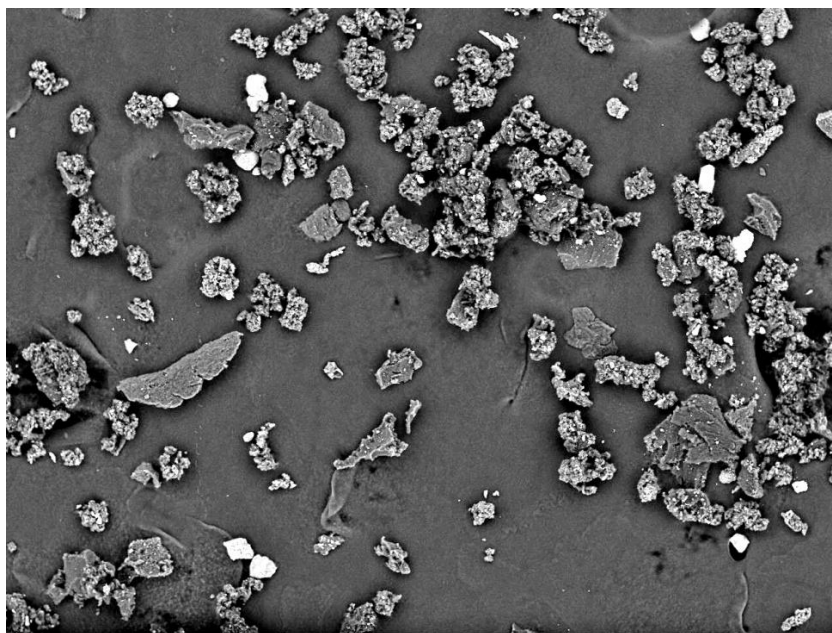


D
Each of the smallest divisions on the calibration slide equals 0.01 mm. %

ELECTRON MICROSCOPE / TIRE CRUMB DUST '

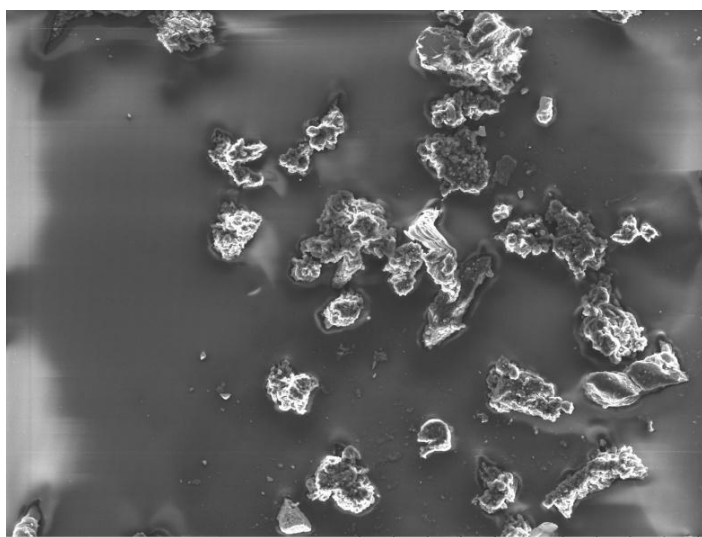


HITACHI TM3000 electron microscope.



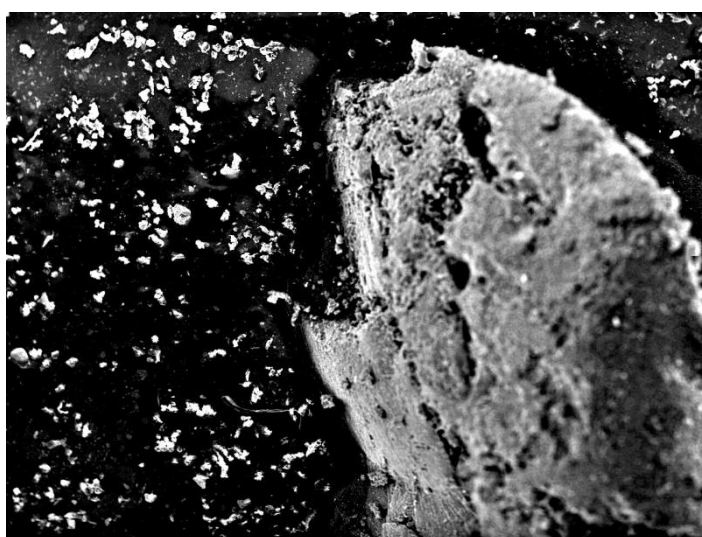
TM3000_1375 2016/01/28 15:40 N D3.9 x180 500 um

Electron microscope image of tire crumb dust at 500 microns. %



TM3000_1373 2016/01/28 15:13 N D4.7 x400 200 um

Image of tire crumb dust at 200 microns.



TM3000_1374 2016/01/28 15:21 N D6.2 x50 2 mm

Image of tire crumb dust at 2mm. %

BIO-EXPOSURE -- LODGING AND ENTRAPMENT POTENTIAL ' OF TIRE CRUMB PARTICULATES AND DUST '

Respiratory Tract

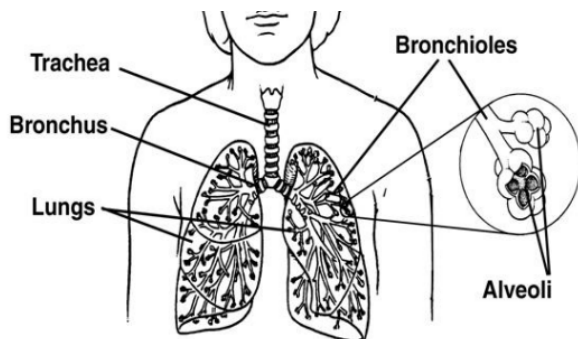
trachea ~ 1 inch diameter (= 2.54cm = 25.4 mm)

bronchioles ~ 1- .5 mm or less

alveoli ~ .1 - .05 mm

(particles in the narrower sections of the respiratory system
can remain for extended periods and damage organ walls)

nose, (particles can be deposited & trapped in nose)



Gastrointestinal Tract

esophageal ulcers ~ 2.5 cm

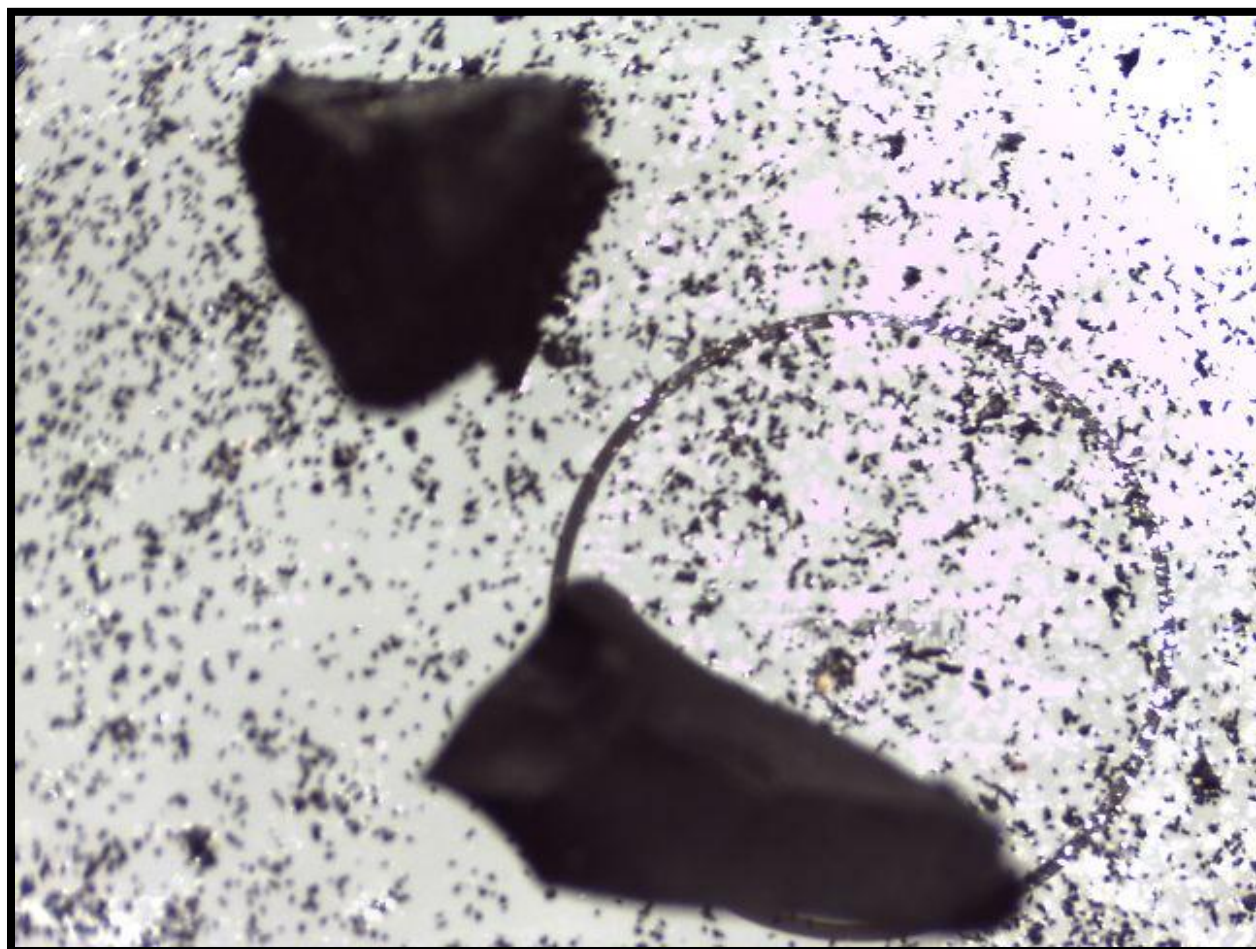
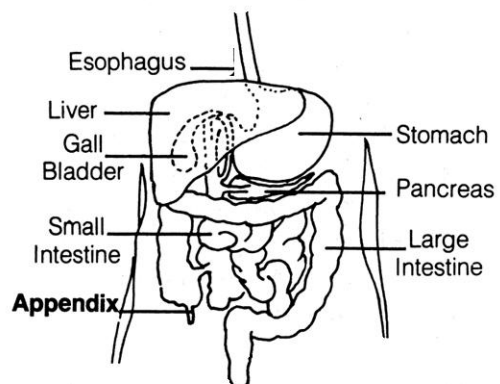
colon ~ 2.5-3.0 cm diameter

(gases from material trapped in the colon can be absorbed)

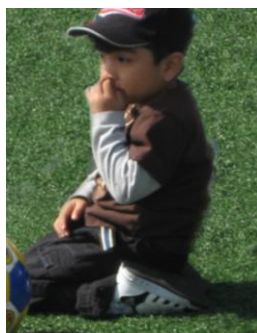
colon diverticula ~ 3.0 mm to 3.0 cm

folds of intestinal lining - up to 8mm in depth

intestinal appendix ~ 9 cm long / 7-8 mm diameter



Tire crumb and tire crumb dust on calibration slide -- calibration slide circle's diameter is less than 4mm. %



Users of the fields also include infants -- and passive activities. %

The chemicals found in the tire particulates, and gases of tire crumb synthetic turf can enter the human body through open cuts, inhalation, ingestion, etc. Athletes and parents ask for the panels' consideration of the following variables regarding the chemicals and their physiological impact on the athletes. They might include -- but not be limited to;

Indefinite source of tire crumb;

- the inconsistency (or lack of standardization) of the chemical makeup of the heterogeneous particles, i.e.;
 - variability of 100s of tire manufacturers, including multiple countries of origin, (see pages 1 through 8 of Tire Manufacturer Plant Codes <http://www.harriger.com/tire1.htm>)
 - variability of years of manufacture,
 - variability of tire types and models,
 - variability of tire components; (tread, side wall, lining, etc.)
 - variability of environmentally absorbed chemicals (lead, diesel exhaust, etc.)
- the sample size (depth & dimension) relative to available amount of tire crumb particulates per field.

Condition of tire crumb samples;

- new tire crumb application vs. previous (environmentally affected) tire crumb application
- accounting for granular convection (brazil nut effect)
- the range of particulate sizes (initial tire crumb applied to field, relative to a "treated/washed" sample as suggested at the OEHHA workshops) (the smaller the individual particulates, the greater the total surface area).
- variability of ossification of tire crumb sample particulates
- field conditions (in relation to rain/watering activity, intensity of play activity, heat, etc.)
- sample location on field (i.e. corners, penalty kick areas, in front of goal, mid-field, etc.)

Impacts of tire crumb chemicals on human body;

- the individual as well as cumulative types of chemical impacts of the tire chemicals on the human body (i.e. carcinogens, mutagens, sensitizers-agents, etc.)
- the person's length of exposure time to chemical gases (polyaromatic hydrocarbons PAHs, etc.),
- the variety of intake mechanisms; respiration, ingestion, and dermal uptake (including open wounds)
- the number & duration of exposures (1 time exposure vs. cumulative) creating a chemical buildup within body.
- the cumulative types of exposures – large particle exposures, small particulate exposures, other chemical exposures (including phthalate exposure from the plastic turf), & gas exposures (including heat variability), etc.
- the abrasive impacts of large (sharp) tire particles during intense respiration (inhalations and exhalations) on lining of respiratory organs,
- the irritability (ulcerative and inflammatory) impact of tire particles (sharp) on various organ linings
- the amount of time chemicals are exposed to various organs of the body (i.e. trachea, lungs, bronchioles, alveoli, intestines, appendix, etc.),
- the indirect transport routes of particle within body (i.e. traveling from respiratory system then swallowed into alimentary system),
- the transport time of particle within body,
- the absorption of tire particulates and chemicals into transport systems, (i.e. the bloodstream, lymphatic system),
- the distribution of tire chemicals in secondary exposures, (i.e. chemicals and metabolites may be distributed and stored in various parts of the body, such as fat or bone, and remain in the individual for many years).
- the variety of potential metabolizing processes for conversion of tire chemicals into metabolites (metabolites may be more toxic than the original chemical which was absorbed)

Condition and precondition of user or athlete;

- the respiration rate of athlete -- resting rate vs. exertion rate (resting an average athlete will breathe in and out about 12 times a minute bringing in about 6 liters of air per minute. In conditions of physical exertion, up to 10,000 liters may be exchanged),
- the effect of hyperventilation or respiratory alkalosis on tire chemical interactions
- the age, sex, genetic background, previous exposures, diet and other factors of person exposed to tire crumb and synthetic turf chemicals (i.e. infant, elderly, athlete,)
- the precondition of person (i.e. prior exposures to a toxin, asthmatic condition, autoimmune deficiency, bezoars)

ADDRESSING SOME COMMON MISUNDERSTANDINGS REGARDING TIRE CRUMB:



waste tire stock pile



spreading tire crumb on top of plastic turf

- **Tire crumb is not covered by the plastic turf.**

The tire crumb is poured on top of the plastic turf and is directly exposed to the athletes or children.

- **The toxic chemicals used in tires have not been encapsulated through vulcanization.**

Vulcanization is a temporary binding process that involves adding more chemicals. The tire, as it ages; dries, hardens, and breaks down into a dust. The increased surface area of tire crumb and trampling hastens this process.

- **The tire crumb used in the United States is not a less toxic mixture -- and the repurposed tires used on synthetic turf are not limited to tires manufactured in the United States.**

1) Hundreds of recipes are used to make tires. The ingredients used in the United States, (as well as throughout the world), are secret, (or proprietary), information.

2) 30,000 to 40,000 tires are used per single athletic field. Determining the origin of each tire pulled from various stockpiles is a difficult and unrealistically time consuming process of finding and identifying a tiny (usually well worn) numerical code embedded on the tire, then matching it with an international index of hundreds of international manufacturers. (see pages 1 through 8 of Tire Manufacturer Plant Codes <http://www.harriger.com/tire1.htm>)

- **Cryogenic “cleaning” of the tire crumb does not remove the toxic chemicals.**

Cryogenic cleaning is a process whereby the tire is frozen and then pulverized, to remove the steel belts and other large components. The shattering of the frozen tire creates sharp angular edges,

- **Potential high lead readings found in synthetic turf samples are not limited to the plastic turf.**

Lead has been found in infrequent, but significant spikes, in the tire crumb. This is potentially due to environmental uptake, (i.e. picked up from the lead weights historically used to balance tires), as well as highway environmental exposures (i.e. lead paint, vehicle exhausts, etc.).



Soccer goalies ingest and inhale a greater amount of tire crumb. %

TIRE CRUMB AND TIRE DUST '

