

Comments on ASTDR 2016-0002-0003
Federal Research Action Plan on
Recycled Tire Crumbs Used on Playing Fields and Playgrounds
Submitted to Federal Register May 2, 2016

SAFE AND HEALTHY PLAYING FIELDS COALITION

www.safehealthyplayingfields.org

A grass roots coalition working for healthier alternatives for children and communities

INTRODUCTION

On behalf of the millions of children, parents and athletes who play field sports in the US at schools, parks, athletic facilities and playgrounds, thank you for agreeing to study the potential harm caused by playing on or being near athletic fields with surfaces made waste tires. There are more than 12,000 of these playfields in place (15,000 according to the website of a large company that installs them), and they are being installed at a rate we estimate to be about 3000 a year. By our calculations, 12,000 fields currently present 2,380,000 tons or 4,760,000,000 pounds of loose, unencapsulated tire crumb on their field surface. (See our Table of Runoff and Material Volumes attached.) Tens of thousands of students and young athletes play on those fields, many more thousands have direct or indirect contact with the material. It is a public health issue of substantial importance.

The following lists our comments on the proposed study. We argue that the fields present known carcinogenic, pathogenic, and mutagenic material in a high surface area, pulverized form that is more toxic than whole tires, and should never have been allowed near children, or adults, because of risk of ingestion and inhalation exposure to all the ingredients in tires. On warm, sunny days the

surface temperature routinely reaches over 150F, which presents direct, well-known heat injury risks to children. The heat increases off-gassing of the tire components, increasing the likelihood of pulmonary exposures, and creates a complex dynamic in the children's exposure zone immediately above a field that has not been correctly modeled or studied yet. The material lacks uniformity, or any regulatory or exposure controls. We assert that it is impossible to assure even a single tire crumb field is free of inhalation and ingestion risk of dangerous particulate and gases inherent in tires, tire crumb, and add-in composites; and that dangerous and unwanted exposures from lead, benzothiazoles, 12 carcinogens, phthalates, carbon black and other materials, can happen with every use. The data gaps are enormous, and we hope CDC/CPSC/EPA will recognize there is no way the tire crumb industry can protect any player, on any field, from the potential for dangerous exposures with normal use. We argue that not enough scrutiny was placed on this material.

NOTE: The Safe and Healthy Playing Fields Coalition is a grass roots group of scientists, public health professionals, toxicologists, neurobiologist, educators, plastics engineers, medical doctors, waste management and remediation professionals, coaches, researchers, and parents who donate their own time and skills towards helping communities and individuals assess risks to their communities from tire crumb field use. We do not have a lobbying firm, law firm, hired laboratory, consultant, or revenue-generating source (such as tire crumb), and rely solely on the skill of researchers who donate time to compile our comments. That said, we have found compelling data that refutes almost all claims of safety, and when we asked for additional time to compile the information, we were given two weeks, but denied additional time. Hence, we are working at a disadvantage, and hope that during this study year, we will have time and opportunity to substantiate our concerns, and share our research with the study officials. One of our comments below explains our requests for a conference or virtual meeting that allows more disclosure and discussion.

Our comments are listed in numerically and organized into: 1. General Comments, 2. Characterization and methodology comments; 3. Summary List of requests, and a number of supporting documents are also submitted as part of our comments.

PART I: GENERAL COMMENTS:

1. CPSC/CDC/EPA should use their existing authority to immediately reclassify tire crumb athletic fields as a children's product, since thousands of fields have been installed in schools that serve hundreds of thousands of children.

2. We have grave concerns about their safety to human health and the environment, since **known carcinogenic and pathogenic components in the field material yield into both air and water pathways, and provide ample opportunity for both chronic low dose exposures with every use of the field to lead, chromium, mercury, zinc, PAH, VOC, carbon black, styrenes, benzothiazoles, and plastics; and more intermittent, but dangerous high dose exposures from "HOTSPOTS" of component material.** (See comments on Characterization). Each of the fields has material that is known to cause cancer, illnesses, and injury in humans; and leachate from runoff causes several negative impacts on the aquatic ecosystems. We believe that the potential for human illness (including several cancers) from both low dose and high dose exposures to the ingredients in tires is staggering. Basic logic favors our position. Based on the known potential for exposures to children, and the finding of a group of 200 soccer players with cancer (the group represents the reach of a single charismatic soccer coach), an immediate moratorium on new construction of the fields should be put in place with the existing authority of

CDC/CPSC/EPA, until the tire crumb fields can be shown to be safe to inhale and ingest.

3. The tire crumb recycling industry, which appears “green” in its efforts to sell millions of used tires in “repurposed” shredded form, in fact enables a direct transfer of the contamination burden of waste tires from landfills/collection sites (in the US and abroad) to the play surfaces of 12,000 schools and sports centers, where tens of thousands of children and adults have direct contact with the toxins in tire crumb materials on the field surface, and *these exposures could happen with every single contact.*

4. For the most part, the **schools and sports centers do not have resources to conduct toxicity due diligence**; meaning, they do not have access to a toxicologist who reads the industry studies with their health as the only priority. Purchasers rely on the tire crumb recycling industry statements, industry studies, and industry funded websites that claim toxicology assessment and public health guidance. The sales material can be striking, and the studies appear convincing on the surface, but our study groups have found significantly misleading information about the safety and actual risk of harm from the tire crumb fields to all users, particularly children. They are likely unaware that claims that the fields are “SAFE TO INSTALL; SAFE TO PLAY” have been repealed.

5. **PEER Filings.** Public Employees for Environmental Responsibility have filed a number of complaints and documents that argue for a repeal of endorsements of tire crumb safety from EPA/CPSC, and those statements were in fact repealed; but most schools and potential purchasers are unaware of the removal of endorsements and claims of safety. The PEER filings are an excellent source for telling the toxicity story and regulatory story of this product. We respectfully request that the entire file of complaints and responses to the complaints, and

other supporting material be entered into the record for ASTDR 2016-0002-0003.

The full list of documents for the ASTDR 2016-002-0003 collection and record can be found here: <http://www.peer.org/campaigns/public-health/artificial-turf/news-releases.html>. Please include all in that list, and all supporting materials.

6. Formal legal requests have been made to classify the tire crumb fields as a children's product since children use them, and sales and marketing material are very clear about tire crumb fields are for children. **CDC/CPSC/EPA should use their existing authority to explicitly label the fields as children's products.** (Please refer to PEER filings for details and supporting arguments: <http://www.peer.org/campaigns/public-health/artificial-turf/news-releases.html>)

7. CLASSIC CANCER CLUSTER APPEARANCE: SOCCER PLAYERS

Parents and schools may have trusted the "Safe to Play" statements, **but the parents of the 200 young women and men, who played intense soccer and were stricken with cancer do not trust those claims anymore.**

The case of over 200 young soccer players who used tire crumb fields and contracted cancer, strongly indicates a classic cancer cluster, though the cases have not undergone the formal validation process, not yet. That is because a process for the collection of this information, does not exist yet for either cancer victims, or for other illnesses, head injuries, and heat injuries/illness from the fields.

8. We respectfully request that an official study of the soccer player cancer cluster be initiated by CDC immediately.

Through our activist network, we learned about these cases, which were reported to the NBC news link, or directly to a single, trusted concerned soccer coach. EHHI reported as follows:

“New Cancer Numbers Among Soccer Players on Synthetic Turf,
April 2016

It is important to remember that the only people counted in the numbers below are those who have known to call Amy Griffin. There is still no government agency tracking the cancers among the athletes who have played on synthetic turf. We know the actual numbers of athletes who have played on synthetic turf and contracted cancer have to be much greater than those who have known to report their illness to Amy Griffin.

In January of 2016, there were 159 cancers reported among soccer players; now (April 2016) there are 166. Ninety-seven of those in January were goalkeepers; now there are 102. Sixty-one percent of the soccer players with cancer are goalkeepers. As of this writing, 220 athletes of various sports who have played on synthetic turf have cancer; 166 soccer players who have played on synthetic turf also have cancer.

166 Soccer Players who have played on synthetic turf and have cancer

- 102 are goalkeepers (61% are goalkeepers)
- 64 soccer players with lymphomas, 39 are goalkeepers (61%--over half are goalkeepers)
- 10 soccer players with Non-Hodgkin lymphoma, 7 are goalkeepers (70%--over half)

- 54 soccer players with Hodgkin lymphoma, 32 are goalkeepers (60%--over half)
- 41 total leukemias, 24 are goalkeepers (59%--over half)
- 16 total sarcomas, 7 are goalkeepers (44%)
- 12 thyroid, 9 are goalkeepers (75%--over half)
- 11 brain--5 are goalkeepers (45%)
- 9 testicular--6 are goalkeepers (67%--over half)
- 4 lung--3 are goalkeepers (almost all are goalkeepers)

Remaining are OTHER rare cancers.”

Source: Various; Victim parent volunteers, EHHI primary collection; 4/2016 (ongoing) _____

All the victims were frequent users of turf fields, spending multiple hours a week in close contact with the material in the fields. All were in their mid-twenties or younger.

9. The self-reporting to a trusted coach, is also an indication that the actual illness rates are not yet being properly assessed or managed by any hospital, medical system, or group; there is no “home” for this information, yet. The 200+ cancer victim count is likely the reach of a single coach with the help of a link in broadcast media, and a fraction of the actual count of victims of cancer or other serious illnesses. Better investigation and creating a “safe” place to report serious and intermittent illness will uncover many more victims, and provide needed perspective on the accuracy of risk assessment for this product.

10. The CDC and appropriate agencies should issue a directive asking for adequate screening for injury and disease. That US hospital and medical systems are not yet set up to collect this data is a contributing factor; and concurrently, screening for synthetic field use should be part of a responsible

screening protocol. To our utter dismay, we learned from pediatric oncologists in our group that at least some oncologist are prohibited from screening victims/patients for tire crumb field use; the screening must be part of the approved protocol, and tire crumb product is not yet included..

11. In fact, the number of **all injuries from tire crumb fields should be collected and analyzed to include, but not be limited to: head injury and concussion; joint injuries (multiple); heat injury; blood cancer; lymphomas; testicular cancer; pulmonary illness; neurological impairment; kidney disease; diabetes; brain disease and cancers.** These findings need to be documented, and the children who suffer from them should be screened for tire crumb field use and proximity. No doctor or oncologist should be prevented from asking questions, screening for, or questioning the safety of this product or contact with this product. We believe there are many more heat related illnesses, head injuries, and endocrine system disruptions directly resulting from exposure to the fields than what is being reported.

12. REQUEST MORE INVESTIGATION INTO EXISTING AND POTENTIAL CANCER CLUSTER: We ask that the multiagency group takes steps to expedite the process of collecting epidemiological data and verification of the current soccer player cluster, and other potential clusters, to include field maintenance workers who rake the fields, field installers who pour the millions of pounds of material onto field surfaces, school custodians, high contact users of any kind, and school children in buildings adjacent to the fields. Residences near the fields should be considered in the scope of the study or subsequent studies. **In our own informal assessment, and using SEER database and known levels of cancer victims, we found the potential for 7-11 cancer clusters.** We respectfully ask the CDC experts to look into this possibility and take the necessary steps to prevent additional injury and cancers.

13. NEED FOR EXPLICIT PROTECTION FROM RETRIBUTION: Sadly, the families, coaches, and school leaders who have reported illnesses do so with concern for **retribution from the tire crumb industry, school boards, university administrations, and even sports league administrators, and may need explicit protection and remedy against retribution.** Researchers who study the potential for harm tell us that they do not have protection from retribution from tire crumb field industry proponents. Even in our own group, public health and medical professionals must make statements of concern anonymously to protect themselves from retribution--professionally and personally from industry proponents. Adequate protections need to be established to protect the professionals and parents who speak out.

14. PROTECTION FOR CHILDREN IS NOT A COST-BENEFIT ANALYSIS. Children have a unique vulnerability to toxic exposures--both intermittent high exposures--and to low dose exposures, and if we are aware of a carcinogenic presence, then we are responsible for using a precautionary principle, and removing that exposure risk. With due respect, this is not a cost-benefit analysis that will show a percentage of children will get sick (cost) vs. tournaments played or jobs created (benefit). It is a decision made by a civil society that upholds protection for children's health above all other industry priorities, and a recognition that tens of thousands of children, if not hundreds of thousands, are already being exposed to material with known carcinogenic, and harmful materials on school turf fields.

15. The CDC/CPSC/EPA should recognize that the fields serve children, acknowledge that there are zero safety controls on the material and the potential exposures, and immediately acknowledge tire crumb fields as children's products, and use your existing authority to regulate them as children's products. **Therefore, we emphatically REQUEST THAT THE CPSC/EPA/CDC**

USE EXISTING AUTHORITY TO IMMEDIATELY CLASSIFY ARTIFICIAL TURF AS A CHILDREN'S PRODUCT, SINCE THOUSANDS OF CHILDREN ALREADY USE THE FIELDS, IN THOUSANDS OF SCHOOLS.

Since children and adults are already being exposed on tire crumb fields to the materials in tires, we ask for an **immediate moratorium on further construction of tire crumb based or recycled rubber based artificial turf fields** until adequate assurances that tire crumb particulate, off-gassing, and combinations are safe for children to inhale and safe for children to ingest.

Your three agencies do not need to conduct a study to know with absolute certainty that tires were not designed to be inhaled by children, and we should protect children, at any length, from chronic or lose dose carcinogenic exposures.

Even if we cannot model or know (or will we ever know) the exposures to each child, each day (and we will never know), we do know with certainty that:

1. Carcinogens are in tires.
2. Shredded, pulverized tire crumb contains everything in tires, and more ingredients, including: carbon black, phthalates, VOCs, PAHs, benzothiazoles, lead, chromium, zinc, nanoparticle additives, proprietary additives, 12 known carcinogens, 90 materials known to be harmful to human and environmental health, (EHHI)
3. The material can be inhaled when playing and ingested with contact, or intermittent adjacent contact.
4. Every single direct or indirect use has the potential for exposure to hotspots and low dose chronic exposures to multiple scenarios of these materials.

5. The exposures could impact children, school buildings, and surrounding areas; contamination travels to cars, homes, and even children's bedrooms.
6. It is both within the authority and the responsibility of your three agencies to take immediate action to protect the public, especially children, from known carcinogenic, pathogenic exposures.

Only a complete moratorium on their use will protect the millions of children, athletes and bystanders from inhalation and ingestion of the materials that yield from tire crumb synthetic turf fields.

16. It is also evident that tire crumb will never be safe unless ALL tire ingredients, all "recipes", the manufacturing of tires, and then preparation of materials for fields are controlled from a toxicity perspective. This level of voluntary cooperation from the tire manufacturing industry will, of course, never happen.

17. ONLY UNIFORM MATERIAL SAFE TO INHALE AND INGEST IS APPROPRIATE FOR SCHOOL FIELDS ; UNTIL THEN, A MORATORIUM. When the play surface material is uniform, consistent, and controlled, when it is tested by an adequate study with pediatric toxicology assessments to be safe for ingestion and inhalation, and results are peer reviewed following IRB standards, then we may consider a synthetic turf field might be safe. Until then, tire crumb should be rejected from any casual or unnecessary contact with children or adults.

18. RECONSIDERATION: A reconsideration of the moratorium could occur when the industry can demonstrate a uniform, non-carcinogenic, non-inhalable, non-ingestible alternative that does not present PAH, VOCs, phthalates, lead,

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chromium, mercury, 1,3-benzothiazoles, butadiene, styrenes, carbon black (in particulate, gaseous form, or any form to children); and the product undergoes strict, peer-reviewed study by independent qualified toxicologists who have a mandate to protect children's health and the health of the environment above the interests of industry. The hypothetical product should be subject to regular reviews and quality control determinations to ensure safety over the life of the synthetic field. Safety Data Sheets should be provided and accessible for every user. If waste tires are used, the controls requested above will never be possible, since the tire material, by definition, is a composite of many toxins in unknown quantities and with unknown impacts.

PART TWO: CHARACTERIZATION OF TIRE CRUMB COMMENTS

1. SCALE AND SCOPE: Tire crumb potential to individuals, buildings, surrounding areas and stormwater for contamination is enormous.

2. PUBLIC HEALTH ISSUE: SCALE AND SCOPE CONCEPTS

The potential for contamination from tire crumb is a growing public health issue, in terms of the relative size of the product and its mass; the total number of potential fields; and their basic contact with students, athletes, school personnel, buildings, communities, and streams/storm water.

To give an idea of the existing volumes of material, the field runoff and children affected or who may be affected, we have developed reference tables, and the summary is attached to this filing. These tables indicate the scope and scale, and demonstrate that these are not isolated fields, nor tiny exposure potentials. The quantities of material are enormous. The source and reasoning is explained, but the tables are designed for your model development and quick reference.

3. ENORMOUS QUANTITIES ON EACH FIELD SURFACE .

To give an idea of the scale, a modest soccer field uses 30,000 waste tires. According to a randomly selected company selling packaged tire crumb infill for original or replacement treatments, 30,000 tires makes about 396,667 pounds of lbs of material. According to our calculations, the volume for 2" thick field is about 525 cubic yards, However, a large football field, three times the size of a small soccer field, could use 1,000,000 pounds of tire crumb material.

4. The tires are shredded, pulverized into crumb of various sizes, and the shredded material is poured on top of a plastic "grass" carpet. Importantly, the material is loose, unencapsulated and can loft into the air when struck by a ball or foot, or body. We estimate that, depending on the school, each field has regular, daily contact with at least 1000 athletes and students. At sports events, busy tournaments, or with active use, a field can have contact with many, many more.

5. No fields we found have mandated capture of the leachate or particulate at the field.

6. TOTAL FIELD VOLUMES POTENTIAL: The universe of potential tire crumb playfields is approximately 200,000 - 220,000 schools and athletic facilities in the US, based on number of schools. The potential reach of exposure from use of these fields is in the millions of children, millions of adults, hundreds of thousands of exposed buildings and adjacent soils, and hundreds of thousands of public easements and storm water access points (we estimate 1:1 ratio for field to point source drainage).

7. TABLE RUNOFF AND VOLUMES: SUMMARY OF KEY METRICS

For reference, we analysed fields by sport type, by Metropolitan Service Area, and calculated the volumes for rainfall (by city), and for amount of tire crumb material on a field surface.

Key metrics are the following:

- Estimated tire crumb per 85,000 sq feet field and 2" deep tire crumb infill is 525 cubic yards, 396,667 pounds, or 198 tons per field.
- **The total amount of tire crumb material on surface of 12,000 fields is estimated to be 6,296,296 cubic yards, or 4,760,000,000 pounds or 2,380,000 tons** that are currently in sports centers and schools in April 2016..
- **Runoff is calculated by city and field size, but the total runoff for fields in the top 50 MSAs is 15,006,99,787 gallons.**
- **Total Runoff for 12,000 fields based on number of fields per MSA, accounting for rainfall in that MSA, and added together for 2016 is: 23,370,639,827 gallons...** for a single year.

The calculations were made to illustrate the scale and scope of this product, and to characterize the reach of exposures from the field surface into the airway, and into the water pathway.

8. INGREDIENTS IN TIRE CRUMB: Lack Of Uniformity, High Variation, Multiple Toxins

Tire crumb appears to be a composite material, heterogenous with multiple known carcinogens, pathogens, and mutagens. The material is not uniform,

comes from multiple sources and lots, and can be mixed with plastics and materials of unknown origin. The material can have anticlumping agents, flame retardant additives, paint, and strengthening or characteristic enhancing additives. Shredding of tires can cause small pieces of steel or metals to be included in the material from steel belted tires. Some tire crumb is from newer depositories from recalled tires, some from landfills, and some have been subjected to a variety of weather and conditions. Leachate and off gassing could be variable, with the expectation that newly installed/poured material off-gassing is higher than from an older field, but we expect those rates would vary with the age of the tires from which the tire crumb was made.

9. HETEROGENEOUS, MULTIPLE TOXINS, UNKNOWN ORIGIN: To say that tire crumb infill comes from multiple sources, is an understatement: dispensaries, landfills in the US, landfills abroad, collection centers, factory waste from China, factory waste from the US and abroad. Some of the newer marketed blends included multi colored sport shoe waste, shoe factory waste, and many unidentified synthetic materials. Just as tire companies may add anything to their “recipe” for a tire, an infill provider may offer materials that could have anything added into the blend. Tire plugs, tire polishes, tire coatings, and materials picked up on the roads should be considered. And even if it is known that there are only tires in the blend, there is a broad variation in the ingredients based on the use of the tire, and the manufacturer. Those tires may look the same, but from a toxicity standpoint their variation and the unknowns in the “recipe” create a margin of uncertainty that makes any claim of known safety for inhalation or ingestion impossible. If a vendor says he or she knows what is in a lot of tire crumb, and that is known to be safe, then they ignored the materials in the product. Since we never know what is in any field for sure, and if we know that they have tire crumb, they cannot be demonstrated safe for children to inhale, ingest, nor play upon.

10. What Is In Tires? SOME GROUPS WENT LOOKING

Since it was difficult from MSDS or any other source to identify the components in tires or tire crumb, some groups studied them directly.

11. Environment and Human Health Inc, and Yale University Study

EHHI, Inc. in cooperation with Yale University studied samples of rubber mulch, and new tire crumb with the intent of characterizing their ingredients.

The summary text of their characterization study is found here:

http://www.ehhi.org/turf/metal_analysis2016.shtml

<http://www.ehhi.org/turf/findings0815.shtml>

The EHHI/Yale Study list of components found is explained this way:

The shredded rubber tire playground mulch samples tested were provided by the manufacturer and were purchased in new bags of rubber mulch for use in gardens and playgrounds. The rubber tire infill for synthetic turf fields was obtained as new infill material from installers of synthetic turf fields. There were 5 samples of infill from 5 different installers of fields and 9 different samples of rubber mulch taken from 9 different unopened bags of playground mulch.

RESULTS There were 96 chemicals found in 14 samples analyzed. Half of those chemicals had no government testing on them - so we have no idea whether they are safe or harmful to health. Of those chemicals found that have had some government testing done on them these are the findings with their health effects.

TWELVE (12) KNOWN CARCINOGENS

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2-Mercaptobenzothiazole/ **Carcinogen**, toxic to aquatic life

9,10-Dimethylanthracene/ **Carcinogen**, respiratory irritant and can cause asthma

Bis(2-ethylhexyl) phthalate/ **Carcinogen**, may cause damage to fetuses

Fluoranthene / **Carcinogen**, Fluoranthene is one of the US EPA's 16 priority pollutant, A PAH.

Heptadecane/ **Carcinogen**

2-mercaptobenzothiazole / **Carcinogen**

Phenol, 4-(1,1,3,3-tetramethylbutyl)/**Carcinogen**

Phenanthrene/ **Carcinogen** - A PAH

Phthalimide/ **Carcinogen**, skin, eye and lung irritant. A Fungicide

Pyrene, 1-methyl- /**Carcinogen**

Tetratriacontane /**Carcinogen**, eye and skin irritant. Can cause systemic damage to central nervous system.

Pyrene/ **Carcinogen**, toxic to liver and Kidneys, a PAH

Carbon Black/ **Carcinogen**

Carbon Black makes up to 20% to 30 % of every tire. It is used as a reinforcing filler. Carbon Black is listed as a carcinogen by the International Agency for Research on Cancer (IARC).

Carbon Black, as such, was not analyzed by the Yale Study because Carbon Black is made up of a number of chemicals – some of which were found in the Yale study.

Carbon Black is not one chemical -- it is made up of many chemicals - often of

petroleum products. Furthermore, carbon black has no fixed composition, even of the many compounds it contains. Carbon black from different sources will have differing compositions. In our method, carbon black will register as a series of substances extracted from it. There is no carbon black molecule, it is a mixture.

TWENTY (20) KNOWN IRRITANTS

1,4-Benzenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-

Irritant - causes skin and eye irritation, toxic to aquatic life

1,4-Benzenediamine, N-(1-methylethyl)-N'-phenyl-

Irritant - causes skin and eye irritation, toxic to aquatic life

2(3H)-Benzothiazolone

Irritant - causes skin and lung irritantation

2-Dodecen-1-yl(-)succinic anhydride

Irritant - causes eyes, skin and lungs irritation

3,5-di-tert-Butyl-4-hydroxybenzaldehyde

Irritant - causes irritation to eyes, skin and lungs.

Anthracene

Irritant - causes skin, eye and respiratory irritation. Breathing it can irritate the nose, throat and lungs causing coughing and wheezing.

Benzenamine, 4-octyl-N-(4-octylphenyl)-

Irritant - causes eye and skin irritation

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Benzenesulfonamide

Considered hazardous, very little testing has been done on it.

Benzothiazole, 2-(methylthio)-

Irritant - causes Skin and eye irritation.

Dehydroabietic acid

Toxic to aquatic organisms

Docosane

Irritant - causes Skin irritation

Hexadecanoic acid, butyl ester

Irritant - causes eye, skin and lung irritant. Can cause reproductive effects.

Methyl stearate

Irritant - causes eye, skin and lung irritation.

Octadecane

Irritant - causes skin, eye and respiratory irritation

Octadecanoic acid also known as Stearic acid

Irritant - causes skin, eye and respiratory irritation

Oleic Acid

Irritant - causes skin and eye irritation

Phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-ethyl-

Irritant - causes skin, eye and respiratory irritation

Tetradecanoic acid

Toxic to aquatic organisms. Skin and eye irritant.

Anthracene, 2-methyl-

Acute aquatic toxicity, Not much data available - what there is shows it to be an eye, skin and lung irritant

Anthracene, 9-methyl-

Acute aquatic toxicity, serious eye irritant

13. Carbon Black

Carbon black plays an extraordinary role in tires, and in their toxicity and potential for harm from exposures. Well known from decades of air pollution studies, urban epidemiological studies, carbon black causes lung cancer, brain cancer, kidney cancer, heart disease, neurological disorders, and cognitive degenerative disease.

A known carcinogen (WHO), we have found variations in percentages of the amount of carbon black in a tire, from 30%-68%. (EHHI/Yale Study; NY STUDY, .pdf, pp19-20.) Carbon black breaks down into many sized particles, including PM10/PM2.5. That size particle was shown to cause several types of cancer, including brain cancer, kidney cancer, kidney disease, bladder cancer, and neurological disease and cognitive impairment disorders. (CITE; Harvard Mexico Studies and Urban Cohort Studies)_We know for sure that carbon black is in tires, in part from simple observation of color.

14. THE NY STUDY CHARACTERIZES TIRE CRUMB THIS WAY:

“The components of Firestone’s and Dow Chemical Company’s rubber are summarized in technical specification documents. Although they are only two of many different rubber manufacturers, a similarity between the two vendors is

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readily apparent, even between three different types of rubber, solution-SBR, cold polymerized emulsion SBR, and high cis2-4 polybutadiene rubber. In general, the following similarities were observed between the two manufacturers for the compounds used to produce the rubber:

- The polymer used to produce solution-SBR contained approximately 18-40% bound styrene.
- The oil content in the polymer ranged from 27.3-32.5% in solution-SBR and cold polymerized emulsion SBR. Oils used include aromatic oil, high viscosity naphthenic oil, and treated distillate aromatic extract oil.
- Besides the polymer used, the other components of the rubber were similar between manufacturers and the relative proportions (parts by weight) of these other components ranged as follows:
 - o Carbon black: 50.00 – 68.75
 - o Zinc oxide: 3.00
 - o Stearic acid: 1.00 – 2.00
 - o Sulfur: 1.5 – 1.75
 - o N-tert-butyl benzothiazole sulfonamide (TBBS): 0.9 – 1.50
 - o Naphthenic or aromatic oil: 5.00 – 15.0

The components summarized above are the principal components of the major type of rubber (SBR) used for the manufacturing of crumb rubber and therefore have the potential to have a significant presence in crumb rubber. As discussed in subsequent sections of this report, some of these components have been found to be prevalent in crumb rubber, including **zinc (from the zinc oxide), benzothiazole compounds** (from TBBS), and **PAHs** (possibly from the oils

used). These compounds may be attributed to the SBR used in the manufacturing of crumb rubber.”

15. Phthalates are a regulated toxin, and PEER filings covered some of the toxicity and regulatory discussion. Please refer to <http://www.peer.org/campaigns/public-health/artificial-turf/news-releases.html>

16. ZINC

Coastal Marine Resource Center Study, found fatal levels of zinc in leachate from tire crumb fields. This amount would cause fatal impacts to aquatic ecosystem within 48 hours. This is a notable amount, and though was assessed in terms of environmental health, indicates presence.

Menichini and Abate Study: “Zn concentrations (1 to 19 g/kg) and BaP concentrations (0.02 to 11 mg/kg) in granulates largely exceeded the pertinent standards, up to two orders of magnitude”. “Zinc and BaP concentrations are high in rubber largely exceeding the Italian soil standards”.

17. METALS: MERCURY, CHROMIUM, ARSENIC

The highest median values were found for Zn (10,229 mg/kg), Al (755 mg/kg), Mg (456 mg/kg), Fe (305 mg/kg), followed by Pb, Ba, Co, Cu and Sr. The other elements were present at few units of mg/kg. The highest leaching was observed for Zn (2300 µg/l) and Mg (2500 µg/l), followed by Fe, Sr, Al, Mn and Ba. Little As, Cd, Co, Cr, Cu, Li, Mo, Ni, Pb, Rb, Sb and V leached, and Be, Hg, Se, Sn, Tl and W were below quantification limits. Data obtained were compared with the maximum tolerable amounts reported for similar materials, and only the concentration of Zn (total and leached) exceeded the expected values.

18. LEAD, POLITICS and CHILDREN

The problem is synthetic turf is NOT REGULATED as a children's product by the CPSC thwarting the ability to apply lead regulations that CPSC could enforce.

Lead was identified in synthetic turf fields as early as 2008 but was not addressed in any systemic way due to lack of standards or required testing (although the CPSC could have required the testing mandated for children's products since 2008). The CPSC has chosen not to mandate this children's product testing for synturf and in fact advised the industry about not having it designated as a children's product

< <http://parentscoalitionmc.blogspot.com/2009/03/artificial-turf-tale-of-lead-levels.html>> .

This has led to a "buyer beware" situation especially after the CPSC tested synthetic turf carpets, found lead at varying levels depending on sample age, and astoundingly concluded the whole synthetic turf system was, always and everywhere, safe not just for adults but for children. The assumptions were based on inappropriate modelling for blood lead levels from a meager sampling and the troubling finding presupposes that there is, a safe level of blood lead, which most pediatricians and lead experts agree there is not safe level.

To this day the synthetic turf industry cites the still CPSC-posted "OK to Install, OK to Play on" press release which should never have been posted to begin with, has been disavowed, in front of US Congress, by CPSC commissioner Kaye and is an embarrassment to government science, policy and public health

<<http://www.cpsc.gov/en/Newsroom/News-Releases/2008/CPSC-Staff-Finds->

[Synthetic-Turf-Fields-OK-to-Install-OK-to-Play-On/ >](#)

19. By contrast, The Centers for Disease Control (CDC) in contrast warned and continues to warn the " there is no safe level of lead" to expose children.

<http://www.cdc.gov/nceh/lead/>>

http://www.cdc.gov/nceh/information/healthy_homes_lead.htm.

"No safe blood lead level in children has been identified. Lead exposure can affect nearly every system in the body. Because lead exposure often occurs with no obvious symptoms, it frequently goes unrecognized"

In 2010 Van Ulirsch et al (Environ Health Perspect. 2010 Oct;118(10):1345-9 <<http://www.ncbi.nlm.nih.gov/pubmed/20884393>

20. Evaluating and regulating lead in synthetic turf.

Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry (gulirsch@cdc.gov) concluded that: "Synthetic turf can deteriorate to form dust containing lead at levels that may pose a risk to children. Given elevated lead levels in turf and dust on recreational fields and in child care settings, it is ***imperative that a consistent, nationwide approach for sampling, assessment, and action be developed***. In the absence of a standardized approach, we offer an interim approach to assess potential lead hazards when evaluating synthetic turf."

21. *But no such approach has ever been instituted. Indeed as reported in USA today this year: "The CDC in 2008 said communities should test recreational areas with turf fibers made from nylon, and they should bar children younger than 6 from the areas if the lead level exceeded the federal

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limit for lead in soil in children's play areas. But some communities have refused to test their fields, fearing that a high lead level would generate lawsuits or force them to replace and remove a field, which costs about \$1million, according to a 2011 New Jersey state report . Forty-five of 50 New Jersey schools and towns contacted in 2009 by epidemiologist Stuart Shalat would not let him test their turf-and-rubber fields, Shalat's report states. The EPA also found, in 2009, that "it was difficult to obtain access and permission to sample at playgrounds and synthetic turf fields."<<http://www.usatoday.com/story/news/2015/03/15/artificial-turf-health-safety-studies/24727111/>>

22. And for the past 2 years the company FieldTurf has, with impunity, noted its synturf fields contain lead during testimony on various bills in the Maryland State House.

The latest admission documented on video: <<http://wtop.com/montgomery-county/2016/03/md-lawmakers-seem-information-artificial-turf-schools/>>

"...asked point-blank by one delegate, "Is there lead in your products? The executive answered, "There's lead in a lot of things in this world.".... **"Yes, there's lead in our products."** In spite of this admission and the fact that the legislation in question was meant to post the CDC prescribed warnings about minimizing lead and other toxin exposures from the synturf and tire waste products, and in spite of the fact that the legislation had strong and broad input and support, the legislation was not even allowed to come up for a vote in committee by the committee chair.

23. Public Employees for Environmental Responsibility compiled the literature as of early 2012 on lead

see: <<http://www.peer.org/campaigns/public-health/artificial-turf/news-releases.html>> and specifically: [2012-07-12 lead-limits-needed-on-tire-crumb-playgrounds](#) (NOTE if you go to [PEER.ORG](#) news releases: click on public health and "artificial turf" to find the actual filings with many links}

Unfortunately for the children, fields with high lead remain. But those responsible for protecting children are kept in the dark. NO ONE IS MONITORING OR REGULATING ARTIFICIAL TURF FOR LEAD OR OTHER TOXINS in either old or new fields, including the Consumer Product Safety Commission (CPSC) (see <<http://www.peer.org/news/news-releases/cpsc-drops-artificial-turf-playground-safety-review.html>> Even though the Chairman of the CPSC, recently admitted to congress that its soothing conclusions of safety after finding lead in synthetic turf were NOT correct.

Tested fields keep showing up with lead in them both old AND NEW. Some tested fields have little or no lead , some high levels and some have both within the same field. There is no way of knowing if any of the components of a field contain lead, and how much without stringent and thorough testing of each field.

This problem highlights the need for application of the designation as a children's product for testing and regulation : 1) stringent testing of all the colors and of the backing of the carpet for total lead content (chromium and cadmium should also be tested for) AND 2) Testing many samples of the infill which is an ever-changing "witches brew"™ of chemicals- so undetectable, low and very high levels can all be found in the same field. In addition to having testimony both last year and this year in the MD state chambers from Field Turf that their product DOES indeed contain lead (as you heard in the recent committee testimony on MD house Bill 883 , and in addition to those referenced in the PEER review, other studies on lead also exist.

24. For a comprehensive media article on Lead in artificial turf which cites scientists and studies that the synturf industry avoids please go to:

<http://www.usatoday.com/story/news/2015/03/15/artificial-turf-health-safety-studies/24727111/>

>

For example as reported in that article:

Dr. Shalat's New Jersey State [Study](#) (2012) on artificial turf found lead in the field dust in the respirable air space of a robot and real player- highly variable but sometimes very high (note most facilities would NOT LET THEM TEST).

<http://www.nj.gov/dep/dsr/publications/artificial-turf-report.pdf>

25. PEER writes: The concerns about lead exposure have taken on a new urgency following the release in June of 2012 of a study done for the New Jersey Department of Environmental Protection which found artificial fields made of tire crumb can contain highly elevated levels of lead much greater than the allowed levels for children:

a) It reports "concerns with regard to potential hazards that may exist for individuals and in particular children who engage in sports activities on artificial fields"; and

b) **"Inhalable lead present in artificial turf fields can be resuspended by even minimal activity on the playing surface."**

26. Dr. Lioy of Rutgers who is quoted in the USA Today article recently participated as the senior author in a study which found lead and other toxins in the BOTH the plastic rug (supplied to them by the industry) and tire crumb infill. LEAD was also was found in simulated body fluids meaning there is little or no

protection of any kind against the lead getting out of the material into the body .

27. Pavilonis Study found lead.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4038666/pdf/nihms565643.pdf> > 2014

" **Bio-accessibility and Risk of Exposure to Metals and SVOCs in Artificial Turf Field Fill Materials and Fibers**" , Brian T. Pavilonis¹, Clifford P. Weisel¹, Brian Buckley¹, and Paul J. Liou¹

QUOTE from Pavilonis et al.: "**Since it is possible that children may be exposed to potentially high concentrations of lead while using artificial turf fields we recommend, at a minimum, all infill and fibers should be certified for low or no lead content prior to purchase and installation.**"

*The main out-comes of concern from Pavilonis et al:

a) the finding of **lead, and chromium** in **both** the **tire crumb** and the **plastic rug** and simulated **body fluids** at sometimes extremely high levels ***EVEN IN NEW FIELD CARPETS.***

b) **Benzothiazole** derivatives and **4-(tert-octyl) phenol** were also found in in the simulated body fluids. Both are probable carcinogens (the subject of another fact sheet).

QUOTE: "**Lead was detected in almost all field samples** for digestive, sweat, and total extraction fluids with digestive fluid extract of one field sample as high as 260 mg/kg. Metal concentrations were not markedly different across the three different sample types (new infill, new turf fiber, tire crumb field sample). However, one of the ***new*** turf fiber samples contained relatively large concentrations of **chromium (820 mg/kg) and lead (4400 mg/kg)** compared to the other samples tested...the

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variability of lead contained in the infill material is large and can span more than two orders of magnitude* . One field [tire crumb] sample did contain a high lead level (260 mg/kg) which was on the **same order of magnitude as the NJ DEP cleanup value** (400 mg/kg).”

In summary: Lead-free is the only acceptable level for child products (and indeed for people in general). **There is NO safe level of lead for children.** And yet many of our children are playing often, if not daily, on fields that may contain lead and certainly do contain many other toxic substances. Finding ANY lead in any play area for children of any age is unacceptable. As the CDC notes: Every effort should be made to eliminate ALL unnecessary sources of lead in the environment, especially a child's environment. ***Lead in artificial turf is not only totally unnecessary but dangerous to health AT ANY LEVEL*.**

286. Other sources of information on Lead in tire crumb fields:

www.ehhi.org/turf/<<http://www.ehhi.org/turf/>>

www.safehealthyplayingfields.org<<http://www.safehealthyplayingfields.org>>

www.synturf.org<<http://www.synturf.org>>

[FOOTNOTE SYN TURF]Where on the Synturf page on lead you can find:

No. 36] Mayo Clinics tips to protect children from lead in artificial turf. April 2015.

No. 35] Durham, New Hampshire: Lead scare at UNH, s Memorial Field. November 2012.

No. 34] Beware of lead content in exotic color artificial turf fields! September 2012.

No. 33] Odessa, Texas: Eager fans will not be given pieces of the artificial turf field. September 2012.

No. 32] U.S. Federal panel increases child protection against lead. February 2012.

No. 31] UNLV researcher spreads word about the need to test artificial turf fields.

December 2010.

No. 30] Environmental Health Sciences study (2010): Deteriorating synthetic turf dust containing lead may pose a risk to children. October 2010.

No. 29] Concord, Mass.: Town replaces fake grass fields, officials insist nothing is wrong with the lead levels! July 2012

28. TWELVE (12) CARCINOGENS found and HOW DO THEY INTERACT:

The Yale Study identified the presence of so many carcinogenic materials in a single material that it raises many more questions about interaction of PAHs with metals, and combination impacts. The interaction of the PAHs and benzothiazoles with other materials in the fields needs to be characterized and addressed

29. Strengthening Additives: Nanoparticles

We would also ask for information and clarity about tire strengthening additives of any kind that were built into the material anytime in the past 30 years, these would have been added to tires. [<http://nice.asu.edu/nano/carbon-black-and-amorphous-silica-tires>]

Similarly, we request that the tire manufacturing industry explain their use of nanoparticle products, of any kind, including the type and size, source company and source country, and ask for an explanation about how:

- a. they can be quantified in the product, and
- b. how can they be cleaned up if they are released when the tire crumb and or plastic “grass” carpet degrades?

- c. We would also like to understand what material characterization of their behavior in tires performance,
- d. And or their behavior once they are released into the environment.
- e. We ask for any epidemiological due diligence that was conducted by any tire company on nanoparticle use prior to using them in a commercial product.
- f. Plans for continued use and safety precautions tire companies will impose upon themselves
- g. Epidemiological studies conducted on these particles in tires

30. Plastics, Microplastic Fibers, Microbeads, and Small Particulate Plastics

Assessment of microfiber particulate and small particulate plastics needs to be assessed in characterization studies.

31. Flame Retardants

Flame retardants can be added to a tire in production, or applied post production in a shipping setting or possibly as tire crumb. Since flame retardants are known carcinogens with health issues of concern, and will be on the surface of the waste tire crumb, tire infill providers need to know if they are present, and purchasers need to know that the material contains flame retardants prior to purchase.

32. Tires and Tire Crumb Additives

Myriad products exist to clean, protect, condition, and color tires. We wonder if they are components of tire crumb?

33. Road Waste Picked Up By Tires

Tires spend their lives on roadways, of course, and can pick up many materials in their travels. Debris, hydrocarbons,

34 CARINOGENIC, PATHOGENIC, and MUTAGENIC ingredients in tires cannot be removed by shredding tires into tire crumb and must be assumed to be accessible.

35. Tire crumb and repurposed rubber appear to be the same thing, with interchangeable use... but are they the same? We would like clarification.

We would like clarification about the distinction between the tire crumb, repurposed crumb rubber, and crumb rubber. Specifically if using the term “repurposed rubber crumb” implies uniformity of ingredients? Does that term imply tires are not used? If so, what are the ingredients in repurposed rubber crumb and how do they differ from tire crumb?

36. We would also like access to all MSDS/SDS of tire crumb manufacturers and tire companies, and the ability to ask questions about how and where they were made, variations on lots, source and composite addendums. It is difficult to locate them.

37. EXEMPTION ON LISTING HAZARDOUS MATERIALS: We would like to understand why tire companies have an exemption on their need to list ingredients under Section 2: Hazardous Materials of an MSDS/SDS. We were unable to find the source of that exemption, if it has a deadline, and whether your study group thinks it is an obstacle to understanding and characterizing risk of exposure from tires and tire crumb.

38. Of those MSDS that we located, several, like this Michelin North America Material Safety Data Sheet for Michelin, Uniroyal, BF Goodrich, says in “**Section**

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2 HAZARDOUS INGREDIENTS: Note: Tires meet the definition of article as defined by the OSHA Hazard Communication Standard (29 CFR 1910.1200) and are exempt from MSDS requirements.”

There was clearly no mention of 1,3 butadiene, carbon black, POHs, VOCs, benzothiazoles, or any plasticizers, nor metals, styrene, sulphur, known irritants, or well... anything. Since that section also outlines corrosive, combustible and waste treatment, it is important for more than this issue. We explicitly ask CDC/CPSC/EPA if they can use their existing authority to require tire crumb companies and tire companies to provide ingredient information.

39. SOURCE MATERIAL UNKNOWN: MSDS/SDS CANNOT REPRESENT WHOLE FIELD. Tire crumb comes from many tires, and many sources. Since not a single tire crumb field can accurately list or track which tires were source materials, or what other mixed in components, and there is no accountability from tire crumb recycling industry for the shredded product, then MSDS/SDS cannot be accurate for a whole field due to variability. Therefore, the burden of “proof” of risk lays squarely on the ability of the purchaser (schools, sports directors, booster clubs) to assess risk... of a very very complex product. So, if the exemption stays in place, we will know for sure that we cannot know what is in a tire crumb based field.

40. TREATMENT TO SHOW NO PARTICULATE OR BREAKDOWN: SHOW US. As for studies that claim that their product has been treated (such as cryogenic treatment) to not break down into dangerous particulate, we are deeply skeptical, and would ask for proof. We also ask for assay testing over a period of at least several summer weeks. We ask for the researchers to simulate the pounding over 10 years and assess the particulate characteristics and particle size. That testing in fact is being done right now... in thousands of children

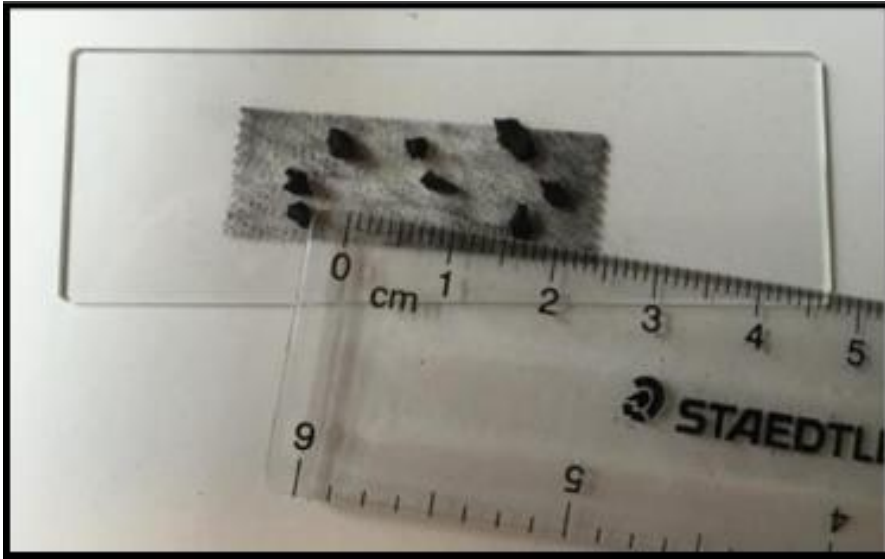
across the country. Simple observation on a player body, on the sideline benches, or under a microscope shows consistent breakdown into particulate.

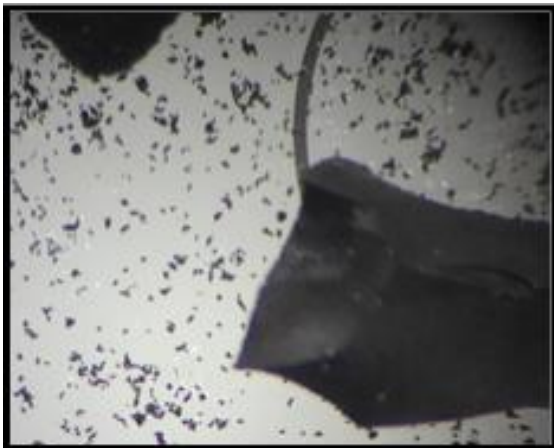
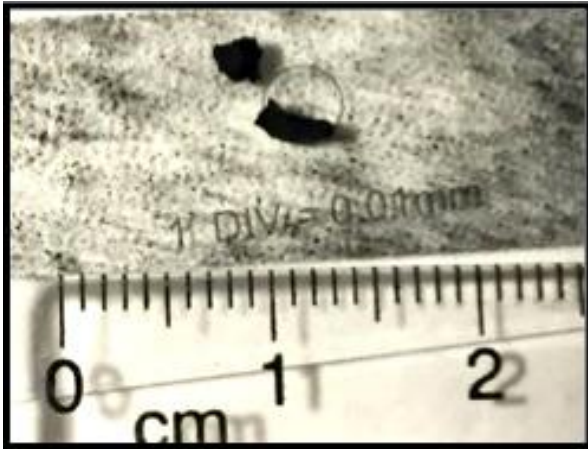
41. SHREDDED, PULVERIZED, HIGH SURFACE AREA FORM OF TIRES and ADD INS is LIKELY MORE TOXIC THAN WHOLE TIRES.

Unfortunately, because it is shredded, pulverized, and in loose and unencapsulated form, tire crumb has exponentially more surface area than whole tires (Thomas, Gupta study;) and we are concerned the material is very likely more toxic--possibly many times more toxic--in the school field form than whole tire form, since the increased surface area provides more opportunity for molecules to escape. We know for sure that the increased amount of surface area in tire crumb makes the material in tire crumb more available to the breathing and exposure zones, and to runoff.

42. CRUMB IS SURROUNDED BY DUST PARTICULATE:

Accurate characterization technique must include a study of the particulate that surrounds tire crumbs, and steps must be taken to make sure that the sampling process does not inadvertently remove that dust and particles. We found several examples of the samples being washed, some in unbuffered water, prior to their analyses being done. Of course, that removes the particulate that concerns us the most. Distribution of the particulate size and type is important. Those particulate can become aerosolized by numerous gases and we ask that attempts are made to properly model this dynamic under high heat conditions, primarily.





43. VERY COMPLEX PICTURE From TOXICOLOGY PERSPECTIVE: Tire crumb material is complex from a toxicology perspective, largely due to the chemical

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complexity presented by multiple known toxic components and variation. It has been described as a “toxic soup” of ingredients for which we have no consistent data on proportions or levels. Characterization of ingredients’ margin of error is unknown..

Testing must be done at the field levels using accepted sampling plans that have been statistically shown to be valid. Not fields have been tested in sufficient detail to determine or rule out any exposures or risks. A look at testing protocols for lead in urban soil sites illustrate the level of attention required and show the degree that current testing has fallen short of that needed for decision making for children’s health.

44. CONTACT PATTERNS, FIELD USE and ADJACENT BUILDING CONTAMINATION

Exposure is likely determined by ingredients in surface, activity, and number of children or users on field. Each school or community field has high use and high contact patterns, such as hosting contact sports, like football, lacrosse, soccer, and baseball, athletic camps, workshops and practices. In those sports, children dive into the field materials. As a child runs or skids or slide tackles, a column of material rises up, as does the dust and particulate that surround the tire crumbs themselves.

Testing for exposure need to list weather conditions including humidity, wind speed, and precipitation, temperature on field surface and ambient air temperature. Number of children on field, and activity level of that play needs to be recorded, video would be most interesting.

Children of all ages use the fields for multiple sports, recreation and school events. Artificial turf tire crumb fields abound in elementary schools and at indoor and outdoor sports centers where children of all ages and all stages of development play soccer, lacrosse, football, track, cheerleading, band, and use

the field for general recreational school activities. In the fields with which we are familiar, families with members of all ages use the fields; and the community holds events, picnics, special fairs, and activities. Some fields are immediately adjacent to a school building.). That there are many uses, and probably many levels of contact and exposure is an important part of characterizing exposures, but both low dose exposures AND high contact exposure scenarios and use need to be examined, with appropriate epidemiological process.

45. SCHOOL BUILDINGS AND SURROUNDING AREAS ARE CONTAMINATED with a great deal of tire crumbs. The fields appear to lose from 1-30 tons of material over their 8-10 year life, and some of it goes directly into buildings, cars, and then homes. This impact needs to be studied as an inadvertent consequence.

46. CANNOT ARGUE NO INHALATION OR INGESTION RISK or SAFETY FOR EVEN A SINGLE FIELD. We argue that given the unique characteristic of nonuniformity, known carcinogenic materials, breakdown into particulate/dust, no known source of origin, and no accurate studies on complex interactivity of those components in the children's exposure zone, in the tire crumb as it is installed today in 12, 000 fields, not a single field installer, nor material provider can demonstrate that the material is safe from inhalation and ingestion during normal use, active use, and on hot days.

47. EVERY USE COULD POSE A TOXIC EXPOSURE and it would be irrational to argue otherwise. We argue that due to the high variability of toxins in the tire crumb substrate (from tires, unknown additives, and factory waste add-ins), and lack of any control of the material, well-known sampling techniques will NOT accurately predict risks to human health.

48. CHILDREN CANNOT AVOID THE EXPOSURES: Since school children cannot self-advocate and take responsibility for staying off a field if directed to be there by coaches or school officials or parents, we must assume that children cannot avoid the exposures when they play on those fields.

49. CANNOT CLAIM THAT EXPOSURES WILL NOT OCCUR. Absolutely no way to responsibly claim that ingestion and inhalation of particulate from the material will NOT occur to those children.

50. HOTSPOTS of intermittent dangerous exposures are possible, and should be expected and searched for in every field.

We must assume that tires have different “recipes” based on their type of use. Therefore, knowing the type of tire used in tire crumb, and each tire “recipe” would be helpful in assessing characterization of ingredients. However, there is no way to ever know what tires, or what material is in any field, and therefore, an MSDS/SDS cannot be representative of any field, or even any meaningful part of a field. Alarming, the high variability in the ingredients presents worrisome “hotspots” potential, where the hotspots might be missed in sampling but even a single exposure could have very serious impacts for a child who has the unfortunate luck to dive into that hotspot. PAH’s may be more prevalent, and present dangerous levels for installation period of the field, and for some unknown period of time afterwards, and considered a “hotspot”, then the consistent release of PAHs in the subsequent years could mean low dose, chronic exposures. Both need to be examined.

51. Lead, chromium, mercury and arsenic could be hotspot sources, based on which tires were used, and how they were treated prior to being placed in the field.

[52.](#) For example, when we asked about the source of lead in tire crumb fields, an infill vendor explained to us that a) lead could be in any field as an ingredient of the tires, of the treatment of tires, and b) once, they were aware of a shipment of tires that was treated with an anticlumping material that contained lead and the whole lot had lead, and c) that some lots had flame retardants added as well. They would never really know, but “most purchasers never ask”, according to the infill material vendor. If an MSDS was required, an additional charge was to be imposed, since MSDS were not available from the materials they acquired from China or other countries. We have collected many more examples of the worrisome unknown ingredients in our fields and can share with the study teams, if requested. While this information is anecdotal, that is the point: we have no idea what is in any field, for sure.

[53.](#) Another example, but this is not anecdotal: in a primary study field exposures in CT, a researcher found that the children’s monitors showed benzene. Since there is no safe level of exposure for benzene, and in fact, tires are not expected to have benzene, the field was sampled more closely, until that “hotspot” was located. The original source of that benzene was not determined, but it was next to a busy parking lot where cars’ exhaust may have been a source as they turned the corner, or possibly the tire crumb material had been previously stored in an area with benzene in surrounding environment, or perhaps it was picked up from contact on roads. We will never know. That finding suggests that the carbon black in the tires can adsorb additional toxins present near tires or tire crumb, and could release that material as the fields are pounded with running feet, or possibly on a hot day. The proper characterization of this material needs to account for adsorption characteristics of carbon black, and other interactions

54. The point is, that it is impossible to locate hotspots for all toxins in every field, and incorrect to extrapolate the risk for a whole field from a single sample or even multiple samples, since every sample is unique. So, while hotspots can easily be missed in a field, the unfortunate child that dives into that particular part of a field has an exposure that can actually be life threatening, but missed in its entirety in the sampling based risk assessment.

55. In fact, since the tire crumb creates multi sized “dust” particles, and off gases, it is impossible to prove that even a single field is safe from inhalation or ingestion exposures from tire dust particulate, off-gassing components, multiple toxins and combinations of toxins, and heat.

56. Importance of the Heat Factor: Source of direct injury and chemical catalyst

HOT HOT HOT HOT EXTREMELY HOT FIELDS

Grass playfields remain close to the temperature of ambient air, and are often much cooler. Asphalt playgrounds used to have a use limit of 141F and many schools remove children from playgrounds when temperatures get hot. With tire crumb based turf fields, surface temperatures can soar on even mild sunny days.

Tire crumb fields “superheat” to levels that are routinely over 150F on a sunny spring day, and in a recent study conducted on a sunny day Utah, found to be close to boiling point, 190F, according to the Penn State Field Turf Heat Study. The study found that tire crumb field surfaces are hotter than ambient air, and increase in heat in a non-linear function with each additional degree Kelvin of heat, hence the designation “superheating”. To draw an example, on a Labor

Day Weekend in DC area, with ambient temps of 82F, the field surface temperature hit 164F by noon on several fields used in a busy, tournament for about 1000 children, both boys and girls, ages 8-15. Those levels are known to melt plastic cleats, require tubs of water on the sidelines to cool down shoes, and create heat-related injury including heat stroke, nausea, heat exhaustion, and dehydration in children and all users. It is not unusual for children players to vomit, faint, and suffer dehydration from hot conditions on the fields.

57. Marketing and sales for these fields tout their usability in all conditions as a benefit (more practice and play hours), but in fact, the heat build up on fields makes them very uncomfortable during many days and conditions. In DC, there are over 100 days of sunshine each year, and most are during the spring, summer and fall, making the fields uncomfortably hot and possibly dangerously hot for a third of a year. [A calculus should be made on the percentage of safe days to play based on field yield risk, and heat.](#)

58. Tire crumb fields do not have any protection from heat, and so they are irrigated to be cooled down, but the effect is temporary.

59. To our knowledge, there has been no well known place for doctors nor parents to report [heat](#) injury, though they are commonplace. (This author specifically remembers a hot, poor air quality day in August in 2014 in Washington DC when during a single practice, 4 soccer players vomited, another child was taken to the hospital after passing out, and another sidelined himself against the coach's wishes, due to extreme dizziness and nausea.)

60. Reluctance to Report? Yet, it is curiously uncommon for school teachers, coaches and parents to remove the children from the fields, due to temperature. We cannot explain that in rational terms.

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We have also noted another curious effect: as football, soccer and lacrosse increase in popularity and competition in the US, competition for spots on high performance teams is fierce. There is a perception from strong sales and marketing of the fields, that the turf fields present a competitive edge for a school, a club or even a teenager trying to get into college, and are worth the high price paid. As psychologist Dr. Wendy Miller, explains, “ it is a culture where high performance parents, players and schools might be willing to overlook these injuries, thinking that to complain would jeopardize their child’s access to a competitive team. This thinking could easily lead to the silencing of reporting of injuries.”

Heat injury reporting needs to be included in the survey questionnaires, and victims of heat injury and illnesses need to have a place to report, with impunity.

6147. HEAT MAKES THE CHEMICAL DYNAMICS ABOVE A FIELD VERY COMPLEX

In addition to the serious issue of direct injury from hot playfields to young children, or anyone, the super hot fields present a very challenging chemical situation.

Dr. David Brown, ShD, toxicologist, professor and former Deputy Director of Public Health Practice Group at ATSDR/ CDC explains that, “the unintended, and largely unstudied chemical consequences of what comes off such an enormous quantity of high surface area material, in amounts and sequence that is scientifically accurate is very difficult to predict and model. Since the chemicals in the area above the field could change instantaneously, the conditions are critically important (number of players, temperature, time from last rainfall, etc.), as is the sampling methodology. But no one has been able to come close to modeling the actual yield, we only know the materials by characterization with

samples, and that variation in samples is so broad as to almost be meaningless, since it could be easy to miss harmful exposures.”

[62.](#) -Analyzing the field yield on a hot day is very complex, and challenging to even trained toxicologists. The superheating of the fields makes gases yield at faster rates as temperatures on the tire crumb surface increases. So, as a day heats up, it is very likely that the yield increases directly with temperature increase; a hot day creates more gases. Based on well understood scientific laws, we presume that the gas yield from the field at surface temperature of 50F (a cloudy day in January in DC) would be considerably less than a field surface temperature of 158F measured last week. If more gases are escaping the surface, then there are more “opportunities” for particulate to adsorb onto the surface of the gases, creating very dynamic series of compounds, none of which would be recommended to inhale.. The changes in the chemical composition over the fields as their temperatures rise is very difficult to test and model. These changes happen in an instant... as a threshold is reached... and the exposures can increase sharply. It is a very sophisticated and difficult challenge to model. But what is the most important is not only that the 24 gases that escape tire crumb ([Norway Study](#)) create dangerous mixtures but those gas/particulate mixtures, (and air) create a vector for deep lung exposures of all the materials in the tire crumb field. So, on poor air quality days, when there are many children on the field and a lot of stirring up of the material, the fields could present enormous risk.

[63.](#) We are concerned about the range of yield levels, but, we are most concerned about the intermittent risk to children during those hot periods (a hot, poor air quality summer day during children’s soccer camp week in Washington DC, for example) when the fields are likely yielding more gas, and therefore particulate has more “carriage” into lungs, respiration rates are higher, skin is exposed, and perspiration is highest. All these are likely factors in

exposure. It is during those days when exposures are probably highest, and high enough overwhelm a developing immune system.

64. Exposure Study Needs To Focus On Worst Case Conditions

We acknowledge that the level of yield from the fields might vary widely with material variation, and will also vary with outdoor weather (temperature, wind, humidity and sun) conditions. Taking averages from fields across the country will be meaningless, and will only help the industry to expand its message of “found no harm”. An analogy might be to determine the health of a forest taking 4 samples from 40 locations, evenly spaced, but the sampling might easily miss a blazing forest fire. That one day might destroy living material exponentially, but it could easily be missed. Dangerous exposures can be unpredictable in this material due to the scope and scale, the toxic character, and the superheating characteristic.

65. A better approach is to carefully detect high yield days, and look THAT DAY for exposures in a child’s body during those periods.

Since the exposures might attenuate, the work would have to be done expeditiously. The harmful exposures may or may not be detectable a day or a month later in a child. Monitor both genders, for patterns that might lead to that awful air quality soccer camp in the city on a tire crumb field, on days when vomiting and melting shoes are commonplace. A focus on the impacts from the high end of those yields we believe will present exposures that are clearly, and unequivocally harmful from both heat injury perspective and toxicity exposure potential. We do not know for sure if the carcinogenic exposures from low dose regular exposures or from high dose “events” are more dangerous, but both need to be studied as separate situations, not as an average.

66. We urge your team to focus the study resources on primary measurements made in high use scenarios on hot days, and refrain from the approach used in earlier studies that look at chemical compositions during winter or rain conditions on limited number of fields.

67. The only reliable way to assess the risk to children from a particular field, or groups of fields, is to look at their direct exposures, and importantly look at bloodlevels of the known substances. Cooperation from both high use athletes and those exposed to chronic levels of materials will be important.

68. The Study Needs To Focus Also On Low Dose Exposure Risks
Trained immunotoxicologists look at the impacts of chronic low dose exposures to metals, PAHs, VOCs and many other materials in tire crumb. Their input is crucial to understanding risk of exposure in a developing child.

69. Characterization Mistakes

Studies look convincing, but miss the forest for the trees.

Tire recycling and tire crumb industry reports are quick to point out that when they find harmful materials in their samples, they are under the known safety limits. There are two interesting fallacies in that reasoning.

First, since the samples in several studies are few and not uniform, they fail to acknowledge the statistical significance of finding known regulated toxic material in 2 million pounds of powdered tires... if one finds the needle, is it luck, or is it because needles are more prevalent than expected?

Proof of presence is meaningful! For example, in the NY Study, PAHs were found, as were metals, benzothiazoles, and many substances. Their presence indicates a risk.

In a child's product, since many materials are not known how they affect children, just knowing they are there is enough to use a precautionary principle and prevent the exposure. Arguing that the materials appear under a limit (especially if that quantity is an average of multiple samples), or there is no established limit (because it has not been studied), are not as meaningful as the proof of their presence.

Second, though the conclusions of the industry reports may be of no harm found/safety, a close look at the data itself on PAHs, lead, cobalt, chromium, etc. is useful, since a) it proves presence, and b) at levels that suggest risk for **chronic exposure**. Chronic exposure risk is the subject of a great deal of new cancer research, and we care about all the materials, including those which are potentially toxic.

70. ARGUMENT FOR MORATORIUM BASED ON KNOWN CHARACTERIZATION FOR TIRE CRUMB

Because of the:

- a. known loss of 1-30 tons of material from the fields during the 8-10 year "life of the field" into air and water
- b. ingredients list: over 50% of its components are known carcinogens and pathogens, [cite Yale Study]
- c. massive scope and scale of this product, (the amount of material and surface area of these fields is enormous; scale/millions of pounds in each installation),

- d. inability to control the levels of toxic exposure to children, or even properly characterize them due to immense variation and chemical complexity of what happens on a hot day over a field, and around children. We cannot suggest mitigation strategies for the danger, because the material is inconsistent,
- e. Even if we did know for sure what was in each field, and suggest mitigation techniques and protections.... All the tire company has to do is change their recipe, or many recipes, as they do continually, and the study is worthless. Children are still being exposed to whatever is in the tire, the lot or that particular field..

71. Moving Target Analogy

Even if the study were completely successful, and the tire crumb material categorized properly, the trouble is, tire manufacturers could change the “recipe” for tires... and in fact they do this regularly... and the study results will be useless, or at best, diminish in usefulness.

Any attempt to study tire crumb safety on turf fields is analogous to trying to hit a moving target. Tire crumb is a waste product. Tires are not designed or intended to be used as infill for turf fields.

Ingestion, inhalation and absorption of fine particulate by children is not a consideration of tire manufacturers as they choose chemicals and compounds for their tires. Nor are they bound to maintain any safety considerations for such use by children.

So any study of present day tire crumb is a futile endeavor, because such study tells us nothing about a field that gets installed immediately after the study. Tire

manufacturers often change the chemical composition of tires and will likely do so again.

Even if a field passed safety concerns in a present day study, a new field could easily fail a hypothetical study conducted the day after the present study. So unless every field was tested using the exact same methodology after every installation, there is absolutely no way to assure the user that their new field is safe. Those new fields could easily have an entirely different chemical composition simply because tire manufacturers changed their tire ingredients.

So the present Federal Study is only a backwards looking study, not forward looking. Any conclusion must be transparent and clear on that issue - upfront and center. Otherwise the public is being misled into a false sense of security.

72. Sampling: Not Appropriate For Tire Crumb

The core pediatric toxicology problem in [industry based safety](#) studies, is that there appears to be an assumption that tire crumb is a uniform material, and behaves uniformly. It does not. There also appears to be an assumption that sampling will be an accurate method for studying tire crumb risk to children, and it is not. **Sampling will not be accurate to assess a nonuniform, heterogeneous material with multiple known toxic ingredients, high direct contact (dermal, hand to mouth, breathing zone) for pediatric use. Sampling cannot produce a single sample that is representative of the whole field, or even a part of the field, other than the sample itself.**

73. Methodology needs to study PERFECT STORM exposure conditions, and be able to calculate exposures during those relatively dangerous days.

Nor can sampling in the way it is proposed (samples from 40 fields across the US), illustrate impacts from a perfect storm of exposure conditions on a

particular field, say, during an intense soccer camp in in summer in Washington, DC with high ambient and field surface temperatures (ie 160F), bad air quality, no wind, when working athletes are breathing in particulate with high VOC, PAH, benzothiazoles, and carbon black... and many more compounds, on a particularly high yield day. Averages cannot be relied upon in sampling for this type of product, since they will further obscure the risk from exposures to hot spots of high risk material that are on fields. Averaging the results from a national distribution in various weather conditions simply obscures the acute risks further; it is useless for risk analysis. In layman's terms, it is like studying a forest using "x" number samples, but missing the forest fire that is blazing away at a nearby area of the park. For a child, it means that she plays on a field that was called "SAFE TO PLAY", after sampling, but in fact she might easily have been covered with multiple materials known to cause cancer, and in fact, that might be a regular event. The uncertainty of exposure frequency makes the risk higher, not less.

74. The core of the methodology used in the 50 studies asserted by the tire recycling industry were based on simple characterization of a single sample, but not on realistic, combined, nor worst case (the most important) use scenarios.

75. Multiple carcinogen and multiple pathogen combined effects need to be measured. Single material measurements could be only a fraction of the exposures, since the material exposures are likely to be from combinations of materials.

76. BIOMONITORING FRONT AND CENTER

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Because sampling presents inconclusive results, a methodology that relies on biomonitoring will be more meaningful. We suggest that more sophisticated approach be considered. Personal sampling monitors attached to children, dermal, urine, breathing analyses, and particularly, blood and tissue samples from frequent users, players on “Perfect Storm Days” and those expected to have chronic low dose exposures. We understand that biomonitoring raises more issues, but absent a good model, empirical data is the most reliable way to accumulate actual evidence of exposures and to be able to establish a reliable causal link to the cancers and diseases we predict from exposures.

77. IMMUNOTOXICOLOGY SUPPORT: RECRUIT THE BEST PEDIATRIC IMMUNOTOXICOLOGISTS AND RESEARCHERS. Some researchers and epidemiological professionals are already on the trail of better ways to identify actual exposures, and can create biomarker groups as indicators of presence of illness or exposures. These researchers have background in immunological toxicology, and can track subtle changes in an immune system that might be precursors to serious disease, like cancer, kidney disease, brain changes, and lung disease. It is possible to create biomarker group to prove tire crumb exposures in users and we believe that the preliminary proof of concept step could be accomplished in less than 6 months with cooperative athletes, and study volunteers, and modest budget. While we will not list them here, for protection of their privacy and frankly, for fear of industry retribution, we will nonetheless let you know that we have found multiple professionals who are capable and willing to work on this task, provided a protective forum and IRB standards are in place.

78. Immunotoxicology support: look carefully at the ages those immune system markers in all children who are using these fields, understanding that some metabolic types, and ages may be more vulnerable than others. In fact, there are early indications that certain age groups, such as prepubescent

females (age 8-11), may be more vulnerable to exposures to benzothiazoles, plastics, phthalates, and endocrine disruptors in general, and therefore might be at higher risk to contract cancer or disease from low dose particulate exposures from tirecrumb, and the plastic “grass” carpet particulate. We need to establish the datum from players to study this. We still do not know, but [some](#) indications exist. For that reason, we respectfully request that the study team include toxicologists and epidemiologists that are trained to keep these concepts front and center.

79. LOW DOSE EXPOSURE CONCEPTS and CONCERNS

Based on what we know now about low dose exposures to VOCs, PAHs, benzothiazoles, styrenes, carbon black, plastics, plasticizers, and metals, even at low, sub acute exposures, the fields could be very dangerous. That possibility was not considered in the CPSC study, EPA study, nor in multiple industry studies. These need to be assessed:

- Chronic exposure to metals, plastics and plasticizers
- Chronic exposure to carbon black mimics air pollution exposures
- Immune system reactions
- Endocrine disruption exposures from plasticizers and phthalates,
- Exposures from multiple low doses and chronic exposures

80. The study should calculate yield of material that leaves the fields, and how it leaves the fields. How much in the air, water pathways, and with users (in shoes, cars, etc.) Interviews with schools and vendors need to establish the replacement quantities of these fields, and how often new material is put into place, since it would affect exposures, and give an indication of gross yields. We estimate that the fields lose from 1-30 tons (estimated) of material, so exposures and impacts need to be measured in adjacent buildings, soils, and stormwater systems. With 12,000 existing

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facilities, this may need to be the subject of additional studies conducted to also assess if the fields shall be regulated as point source contamination under Clean Water Act and Clean Air Act. It is a very important metric, and a perfect opportunity to include it, with little incremental cost, in your study.

81. INTEGRITY STANDARDS. To track the history of the emergence of this product is to track effective lobbying for regulation changes that favored the tire industry, and the tire recycling industry. This industry took advantage of an enormous quantity of recalled and used tire stockpiles, and heavily sold and marketed the materials to schools, and sports centers where millions of children play. Central to the steps that catapulted this industry forward was the removal of the designation of artificial turf fields as children's products, based on the rationale that adults played on them, too. Yet the fields continue to be sold to elementary schools and to sports centers brimming with elementary, middle and high school players. The sales oriented industry was willing to submit children, schools and communities to the materials in tires in enormous amounts, and call them safe. As this claim is deeply questioned now, we also urge you to NOT allow the sampling or data collection to be conducted by an interested party, including schools, sports centers, athletic group personnel or administrators, field installers or laboratories or consultants hired by those groups, and establish peer reviewed standards for testing.

82. Any group or individual who does participate in the study, including regulatory staff, needs to sign an affidavit certifying that she or he, and her/his group has not received compensation or benefits in any form, including but not limited to sales commissions, direct payment, compensation, bonuses, grass to artificial turf grant, field financing, water savings rebates (State of California and possibly others), or physical benefits including but not limited to uniforms, facility enhancements

(restrooms, concession stands, parking lots, storage facilities, etc.), stadium components, or field equipment of any sort, from the field installers or tire crumb field industry and its assigns, and has no financial conflict of interest. The document should be filed with an appropriate agency and made public.

83. We ask for full transparency on all parts of the study process for parents, interested parties, and schools.