GRASSROOTS
Environmental Education
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Synthetic Turf Fields
Fact Sheet

Background Information

• Used or "scrap" rubber tires present significant problems in solid waste management as their sheer numbers, flammability and indestructible nature make them persist in the environment. When disposed of in landfills, they take up massive amounts of space, leach toxic chemicals and collect water that creates a fertile breeding ground for disease-transmitting mosquitoes.

• There is a considerable effort to find uses for recycled rubber tires. Historically they have been used as fuel in the paper and cement industries, as road construction materials and in construction of drainage fields for septic systems, among other industrial applications. However, with the growing number of used tires and prohibitions for their disposal in landfills, new markets for this hazardous waste product are actively being sought.

• A relatively recent use of ground up used rubber tires, also known as "crumb rubber," is to cushion or infill synthetic turf fields or create playground surfaces. Up to 40,000 tires are recycled into crumb rubber pellets to use as infill material for a single field.

• The Resource Conservation and Recovery Act (RCRA) of 1976, our nation's primary law governing disposal of solid and hazardous waste, gives the EPA the authority to control hazardous waste from "cradle-to-grave," including used rubber tires. But it also states that the recycling of a hazardous waste product into a useable consumer product automatically exempts it from RCRA requirements, even if the end product it creates is more toxic than other similar products on the market. This loophole means that new products that have been manufactured from recycled hazardous waste, such as synthetic turf crumb rubber infill or recycled rubber playground surfaces, are not monitored.

Chemical Composition of Crumb Rubber

• The exact chemical composition of tires is largely determined by the intended use for the tire and the manufacturing location. Typical tire rubber contains 40-60% rubber polymer, 20-35% reinforcing agents, up to 28% aromatic extender oil, vulcanization additives, antioxidants, antiozonants, and processing aids (plasticizers and softeners).

• Examples of **chemicals of concern** in the above categories and their potential health effects:

1,3 Butadiene – human carcinogen
4-(t-octyl) phenol – corrosive to mucous membranes
Arsenic – human carcinogen
Benzene – human carcinogen, developmental and reproductive toxicant
Benzothiazole – acutely toxic, respiratory and eye irritant, dermal sensitizer
Butylated Hydroxyanisole – human carcinogen, suspected endocrine and immune system toxicant
Cadmium – human carcinogen
Carbon Black – possible human carcinogen (makes up to 40% of rubber tires)
Flouranthene – human carcinogen
Latex – allergic reactions in susceptible individuals
Lead – neurotoxin
Manganese – neurotoxin
Mercury – neurotoxin
N-hexadecane – eye, skin and respiratory system irritant
Octylphenol – endocrine disruptor
Phthalates – endocrine disruptors, developmental and reproductive toxicants
Polycyclic Aromatic Hydrocarbons (PAHs) – reproductive and respiratory toxicants, liver toxicants, suspected blood or cardiovascular toxicants
Styrene – reasonably anticipated to be a human carcinogen, mutagen
Toluidine – human carcinogen
Trichloroethylene – human carcinogen

Crumb Rubber Health Concerns

• Crumb rubber pieces can become lodged in mouths, ears and noses, and crumb rubber dust and fibers can be easily inhaled as they become disturbed during play. Also, many of the above listed chemicals are volatiles (chemicals which outgas), which means that they will create inhalation exposures, especially in warmer temperatures. Given the number of different sources for ground up rubber tires and the unique chemical components of each individual field, an absolute determination of safety (or risk) is impossible. In addition, since many of these chemicals are toxic at any level of exposure, the presence of even one of these chemicals on fields where children play should trigger a public health concern.

There have been reports of higher than usual cases of lymphoma and leukemia among athletes using synthetic turf fields filled with crumb rubber, especially soccer goalies. While no peer-reviewed studies have been conducted to confirm a link, there is an urgent call by doctors, parents and coaches for more independent, scientific research and the establishment of a health agency registry to track athletes who've been diagnosed.

Other Health Concerns

• **High temperatures on synthetic turf fields** - A comprehensive study on the temperature of synthetic turf fields was conducted by Brigham Young University. They found that the amount of light (electromagnetic radiation) had a greater impact on heating the fields than air temperature. The hottest field surface temperature recorded was 200° F on a 98° F day. Even on cooler days, field temperatures of 120° F to 174° F were recorded. In general, the surface temperature of the synthetic turf was 37° F hotter than asphalt and 86.5° F hotter than natural grass.

Serious heat-related health problems are associated with playing on synthetic turf fields, including dehydration, heat stroke and heat exhaustion. More frequent water breaks are a necessity and many players concur that the heat issue impacts their ability to perform their best. There are also many reports of burns and blisters on the soles of players' feet that occur when turf temperatures are dangerously high, even when they are wearing socks and shoes.

Water cannons or other irrigation systems can cool down a field for only about 20 minutes before the temperature rebounds to an unsafe level, requiring prodigious amounts of water and interrupting games or practices numerous times on hot days.

• **Body fluid contamination** – There is always potential for body fluid contamination on a playing field during normal sports activities, including blood, saliva, sweat and vomit. Natural grass fields have the advantage of soil microbes to help break down pathogens, but plastic surfaces on synthetic turf need to be disinfected after games to ensure safety. However, in practice, this is rarely, if ever, done and the use of chemical disinfectants (pesticides) adds an additional concern for the health and safety of players.

• **Injuries** – Although there is not enough research comparing injuries incurred on synthetic turf versus natural grass fields, there is compelling data indicating that joint injuries (especially ankles and knees) are more common on synthetic turf surfaces. The Hospital for Special Surgery in New York notes that despite progress by synthetic turf manufacturers in making their fields feel more "natural," players still suffer from debilitating turf toe (sprain of the main joint of the big toe), which is unique to artificial playing surfaces. Testing the surface for compaction (and resiliency) is recommended by manufacturers to avoid dangerously hard surfaces, but it is typically not part of field maintenance protocol. Almost 75% of NFL players feel that playing on synthetic turf increases soreness and fatigue.

• **Turf burns or abrasions and infections** – Skin abrasions (turf burns) are more common on plastic synthetic turf fields than natural grass fields and are typically larger in size, providing more opportunity for infection. Research on the causes of MRSA (Methicillin-resistant Staphylococcus aureus) outbreaks in sports teams is ongoing, but there appears to be an association with traumatized skin, as seen in turf burns, and this serious antibiotic-resistant staph infection. Medical experts have found that staphylococci and other bacteria can survive for more than 3 months on polyethylene plastic, the material used in the manufacture of synthetic turf carpets and grass blades.

• **Chemical flame retardants** – One of the more recent developments in the controversy over synthetic turf has been the vandalizing of fields by setting them on fire. Rubber tires (and tire crumbs) burn for long periods of time, releasing highly toxic smoke, which

could be hazardous for those living in close proximity to a school or park where a field is located. Because of this, manufacturers of synthetic turf are now treating the fields with chemical flame retardants. Polybrominated diphenyl ethers, or PBDEs, are commonly used flame retardant chemicals that belong to a broader class of chemicals called polyhalogenated aromatic hydrocarbons, or PHAHs. PBDEs are intrinsically hazardous because they are persistent in the environment, accumulating in the fatty tissue and especially breast milk of humans through biomagnification and bioaccumulation. They are linked to endocrine disruption (mainly thyroid function) and neurological impacts. They are considered possible human carcinogens.

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Grassroots Environmental Education is a 501 (c) (3) non-profit organization with a mission to inform the public about the health risks of common environmental exposures and to empower individuals to act as catalysts for change in their own communities. We strive to accomplish this using science-driven arguments for clean air, clean water and a safe food supply, and for stricter regulation of chemical toxins. More information at www.Grassrootsinfo.org.

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