

RECYCLED RUBBER INFORMATION PACKET



June 2019

Know the Facts About Recycled Rubber Infill

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Recycled Rubber Information Packet

KNOW THE FACTS ABOUT RECYCLED RUBBER INFILL

OVERVIEW

Recycled Rubber and its Uses

- Recycled rubber is rubber that has been derived from scrap materials such as used tires.
- Since 2007, an estimated 4.5 billion square feet of synthetic turf have been installed around the world, including 800 million square feet in the U.S. Recycled rubber infill is used in over 98% of the 12,000+ synthetic turf sports fields.
- Recycled rubber infill benefits sustainability efforts.
 - The use of this infill helps by conserving water, reducing fertilizers, pesticides and herbicides, and diverting millions of tires from landfills.

Recycled Rubber Infill is Safe

To date, over 90 studies have been published that determined there is negligible or very low human health risk from exposure to recycled rubber infill.

- Since 1990, there have been over 90 technical studies and reports, conducted by leading universities, toxicologists, and government agencies, that have delved into various health and human safety questions relating to the use of recycled rubber as an aftermarket product, including its use as infill in synthetic turf sports fields.
- These existing studies have evaluated many aspects of safety; they have looked a multitude of chemicals, at all major exposure pathways—ingestion, inhalation, skin contact—and have used many methods.
 - These studies and reports have failed to find any link between recycled rubber infill and cancer or any other human health risk.

Recent Studies on Recycled Rubber

- In 2016, President Barack Obama pushed for a comprehensive look at the health risks and the Centers for Disease Control and Prevention and the U.S. Consumer Product Safety Commission, announced they would look into the issue and conduct their own research. This is despite the fact that the EPA had previously looked into the issue and had not raised concerns.
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- The federal study was to last one year and industry cooperated with EPA because we believed it was to our benefit to help them accomplish the study. However, after two years of data collection and study, it is still ongoing.
- There has also been an abundance of additional reputable scientific research made publicly available since February 2016 that support the safety of recycled rubber. These studies include:
 - A study by the Washington Department of Health, that while limited in its scope, found the premise of reports of soccer players with cancer—a key driver of attention to the issue—to be false.
 - A Dutch government (RIVM) risk assessment that concluded, "...because the substances are more or less 'enclosed' in the granulate, which means that the effect of these substances on human health is virtually negligible."
 - A European Chemicals Agency (ECHA) study of the health effects of playing on recycled rubber infill fields including exposure to metals, PAH's and volatiles through skin contact, inhalation and ingestion—which concluded there is a very low level of concern and found no reason to advise against playing on fields using recycled rubber infill.
- Dr. Archie Bleyer, an expert in pediatric oncology with over a decade of experience and the former chair of the Children's Cancer Group, has done extensive research on the topic. He published a peer-reviewed commentary in *Sports Medicine*, saying that the available science does not support the hypothesis that recycled rubber is unsafe, and, in fact, promotes a healthier lifestyles through physical activity. He also published a peer-reviewed study in *Cancer Epidemiology* that concludes that the avoidance of synthetic turf fields and playgrounds for fear of increased cancer risk is not warranted.
- The Cal Ripken Sr. Foundation commissioned a study of the chemical and physical properties of recycled rubber infill and found that cancer risks were "at or below one in a million."
- Dr. Michel D'Hooghe, Chairman of the International Federation of Football Associations (FIFA) Medical Committee, wrote the following in a public letter to FIFA members: "A large number of studies have further confirmed that the effect of SBR rubber are as negligible as the effect of ingesting grilled foods or exposure to tyre wear on roads in everyday life."
Recycled rubber is rubber that has been derived from scrap materials such as used tires.
- Michael Peterson, a toxicologist, published a peer-reviewed study in *Environmental Research*. His multipathway risk assessment of chemicals found within recycled rubber infill found no elevated public health risk from playing on this material.
- The Tire Industry Project conducted extensive ambient air testing and found the presence of tire and road-wear particles (TRWP) to be below all human health and regulatory thresholds. The report states that "based on a comprehensive risk assessment, the studies demonstrated that TRWP are considered safe for human health and the environment."

ONLINE RESOURCES



Safe Fields Alliance

<http://www.safefieldsalliance.com/>



ISRI Institute of
Scrap Recycling
Industries, Inc.

Voice of the Recycling Industry

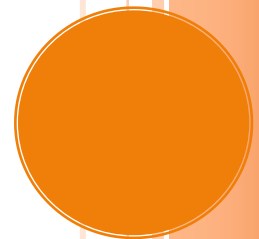
<http://www.recycledrubberfacts.org/>



Synthetic Turf
COUNCIL

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

SELECTED RECENT RESEARCH



Peer-Reviewed Study in *Cancer Epidemiology* (February 2018)

To read the full study, click here:

<https://www.sciencedirect.com/science/article/pii/S1877782118300237>



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Incidence of malignant lymphoma in adolescents and young adults in the 58 counties of California with varying synthetic turf field density

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ABSTRACT

Background: Case reports of cancer among soccer players raised concerns that the crumb rubber infill in synthetic turf fields may cause malignant lymphoma. One prior epidemiologic study on the topic found no association.

Methods: An ecologic evaluation of county-level incidence of lymphomas by race/ethnicity and socioeconomic status for the state of California with data obtained from the National Cancer Institute Surveillance, Epidemiology, and End Results Program. Synthetic turf field density by county was obtained from the Synthetic Turf Council. During 2000–2013, 7214 14- to 30-year-old Californians were diagnosed with malignant lymphoma.

Results: Annual lymphoma county incidence trends were not associated with the county-level synthetic turf field density. None of 20 sub-analyses by race/ethnicity, sex and county median household income indicated a correlation of lymphoma incidence with synthetic turf field density. In California, there was no evidence at the county-level that synthetic turf fields are associated with an increased incidence of lymphoma in adolescents and young adults.

Conclusion: Our findings in the state with the greatest number of such fields and a large, diverse patient population are consistent with those of a prior study observing no association between individual-level exposures to turf fields and cancer incidence. Avoidance of synthetic turf fields for fear of increased cancer risk is not warranted.

1. Background

A University of Washington soccer coach noticed an apparent cluster of young adult soccer players, particularly goalkeepers, who had been diagnosed with lymphoma [1]. The crumb rubber infill in the synthetic turf fields on which they played became the primary suspect since it contains some potentially carcinogenic chemicals such as polycyclic aromatic hydrocarbons [2]. The synthetic turf fields are now the focus of intense toxicology research efforts in California and elsewhere in the United States [3–8]. These are expected to require years to complete, with collection of tire crumb rubber from recycling facilities

during 2002–2015 while 6 to 24 years of age, and compared their cancer incidence with expected age-specific cancer incidence. This study found no evidence for a greater-than-expected increase in the observed numbers of lymphoma or other cancers in the soccer players, regardless of age, intensity of play, or as goalkeepers, who are more contact with crumb rubber. The study found that goalkeepers and outfield players had lymphoma rates that were statistically-significantly lower than expected [11].

Lymphoma incidence in young Americans varies with race/ethnicity and socioeconomic status ([12–17], Supplementary Fig. S1), factors that were not assessed by the Washington State investigators. They also

Peer-Reviewed Risk Assessment in *Environmental Research* (October 2017)

To read the full study, click here:

<https://www.sciencedirect.com/science/article/pii/S0013935117303936>



Contents lists available at ScienceDirect

Environmental Research

journal homepage: www.elsevier.com/locate/envres



Comprehensive multipathway risk assessment of chemicals associated with recycled ("crumb") rubber in synthetic turf fields



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ARTICLE INFO

Keywords

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ABSTRACT

Background: Thousands of synthetic turf fields in the US are regularly used by millions of individuals (particularly children and adolescents). Although many safety assessments have concluded that there are low or negligible risks related to exposure to chemicals found in the recycled rubber used to make these fields, concerns remain about the safety of this product. Existing studies of recycled rubber's potential health risks have limitations such as small sample sizes and limited evaluation of relevant exposure pathways and scenarios.

Objective: Conduct a comprehensive multipathway human health risk assessment (HHRA) of exposure to chemicals found in recycled rubber.

Methods: All available North American data on the chemical composition of recycled rubber, as well as air sampling data collected on or near synthetic turf fields, were identified via a literature search. Ingestion, dermal contact, and inhalation pathways were evaluated according to US Environmental Protection Agency (US EPA) guidance, and exposure scenarios for adults, adolescents, and children were considered.

Results: Estimated non-cancer hazards and cancer risks for all the evaluated scenarios were within US EPA guidelines. In addition, cancer risk levels for users of synthetic turf field were comparable to or lower than those associated with natural soil fields.

Conclusions: This HHRA's results add to the growing body of literature that suggests recycled rubber infill in synthetic turf poses negligible risks to human health. This comprehensive assessment provides data that allow stakeholders to make informed decisions about installing and using these fields.

1. Introduction

Synthetic turf fields containing recycled rubber (also called "crumb rubber") infill have been in use for decades. These fields typically consist of bottom backing layers composed of polypropylene, polyurethane, or latex, with polyethylene, nylon, or polypropylene blades woven into the material (Synthetic Turf Council, 2011). After the field is laid down, infill is added to soften the field and allow the individual turf blades to stand up (Fig. 1). One of the most common types of infill

is recycled rubber, often mixed with sand (Synthetic Turf Council, 2011). Recycled rubber infill is typically made from recycled automobile and light truck tires, which are ground, shredded, and sorted into uniformly sized pieces (Synthetic Turf Council, 2011).

In the mid-2000s, a US Environmental Protection Agency (US EPA)¹ investigation identified the presence of lead in a synthetic turf field in New Jersey, and it was eventually determined that the source of the lead was a yellow pigment used on the synthetic turf's blades (US EPA, 2017a). This finding resulted in the initiation of multiple regulatory

Synthetic Turf Fields, Crumb Rubber, and Alleged Cancer Risk

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Abstract Most synthetic turf fields have crumb rubber interspersed among the simulated grass fibers to reduce athletic injuries by allowing users to turn and slide more readily as they play sports or exercise on the fields. Recently, the crumbs have been implicated in causing cancer in adolescents and young adults who use the fields, particularly lymphoma and primarily in soccer goalkeepers. This concern has led to the initiation of large-scale studies by local and federal governments that are expected to take years to complete. Meanwhile, should the existing synthetic turf fields with crumb rubber be avoided? What should parents, players, coaches, school administrators, and playground developers do? What should sports medicine specialists and other health professionals recommend? Use grass fields when weather and field conditions permit? Exercise indoors? Three basic premises regarding the nature of the reported cancers, the latency of exposure to environmental causes of cancer to the development of clinically detectable cancer, and the rarity of environmental causation of cancer in children, adolescents, and young adults suggest otherwise.

Key Points

In 2014, crumb rubber in synthetic turf fields was hypothesized to cause cancer in adolescents and young adults who used the fields, particularly lymphoma and primarily in soccer goalkeepers.

The concern has induced some school systems and park departments to abandon plans to install synthetic turf fields and governments to initiate major toxicology studies, the results of which are expected to take years to obtain.

Meanwhile, the state of the science of adolescent and young adult cancer causation does not support the hypothesis.

On the contrary, the potential for decreasing exercise by reducing access to playgrounds and sports fields may increase the rate of cancer occurrence in later life.

1 Background

A hypothesis that synthetic turf fields can cause cancer was publicized after a soccer coach at the University of Washington collected a list of young adult soccer players, particularly goalkeepers, who had been diagnosed with lymphoma and other cancers [1]. Because crumb rubber infill, the shock absorption layer within synthetic turf derived from recycled automotive tires, contains some potentially carcinogenic chemicals, the turf has been

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implicated. As goalkeepers are more likely than outfield players to ingest or inhale the crumb or absorb crumb constituents via their skin, the hypothesis gained credence. As a result, some school systems and park departments have abandoned plans to install synthetic turf fields, and some states have introduced bills to ban such installations [2]. In 2015, the California Office of Environmental Health Hazard Assessment began an Environmental Health Study of Synthetic Turf, and in early 2016, three US federal agencies launched the Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields [3–5]. Millions of dollars have been earmarked for these studies [6] that are expected to take years to complete.

2 State of Science

Several studies of human cancer and/or non-cancer risk using data from direct measurements or data reported in the literature have been reported [7–14]. Other studies have focused directly or indirectly on the toxicity of one or more constituents of crumb rubber [14–23]. None of these studies have identified a significant human carcinogenic risk from exposure to crumb rubber at synthetic turf fields. Menichini and co-investigators [22] estimated that 0.4 ng/m³ of benzo(a)pyrene at an indoor facility had a potential for an excess lifetime cancer risk of 1 in a million athletes after an intense 30-year activity level. Marsili and coauthors [24] considered the hazard indices and cumulative excess risk values for cancer to be below levels of concern for measured chemicals; they reasoned that polycyclic aromatic amines in the crumb rubber could potentially increase cancer risk after long-term frequent exposures at fields under very hot conditions (60 °C). Polycyclic aromatic amines have been implicated in some studies as an occupational lymphomagen, but the most recent systematic review and meta-analysis of cohort studies refuted the association [25]. Kim and colleagues [18] proposed a potential risk for children with pica behavior through ingestion of crumb rubber material at playgrounds. The most recent review published in a peer-reviewed journal concluded that users of artificial turf fields, even professional athletes, are not exposed to elevated risks [26]. Since this review, the most detailed studies of potential carcinogenicity conducted to date, by the Washington State Department of Health in USA and the Dutch National Institute for Public Health and the Environment, did not find an association between the fields and an increased incidence of cancer in the susceptible age group [27, 28].

Meanwhile, what should parents, players, coaches, school administrators, and playground developers do and physicians recommend? Avoid synthetic turf fields and use

grass fields when weather and field conditions permit? Three basic premises suggest otherwise.

2.1 The Cancers Cited in Media Reports About Soccer Players are Precisely those Cancers that are Expected to Occur in the Age Group of Concern

Not only is lymphoma the most common cancer in high-school and college-age persons, the other cases in the reported cohort—leukemia, sarcoma, testis cancer, thyroid cancer, and brain tumors—are the next most common cancers in the age group. Together with lymphoma, these cancers account for 80–90% of the cancers in male individuals of middle-school, high-school, and college age and 50–80% of female individuals in the age group (Fig. 1) [29]. In other words, the suspect cancers are precisely those expected without having to invoke exogenous factors.

The issue then is whether the absolute frequency is more than expected. An ecologic investigation applied to the state with the largest number of synthetic fields, California, and to 17 other regions of USA, did not indicate that the incidence is greater in counties and regions with synthetic fields or that the incidence is proportional to the prevalence of such fields when race/ethnicity and socioeconomic status of those who have access to synthetic fields are included in the analyses [30]. The method used did not, however, directly measure the incidence in soccer players per se and could miss an increase of lymphoma in them, particularly if only a small percentage of cases have exposure to synthetic turf fields. In the State of Washington, about 25% of 15-year-old individuals have been estimated to play soccer at some point in their lives [27]. The proportion is likely to be higher in California, given the more conducive weather and the greater Hispanic population. If so, the ecologically derived data are more meaningful in assessing the risk than the face value of the results. A more complete ecologic study of all 58 counties in California is in progress.

2.2 Exposure to Environmental Causes of Cancer During Childhood, Adolescence, and Early Adulthood Results in Cancer Later in Life

Figure 2 shows two established causes of cancer resulting from exposures during childhood and adolescent: melanoma after ultraviolet radiation and breast cancer after chest radiation. The type of melanoma caused by ultraviolet rays is rarely diagnosed before the age of 35 years (Fig. 2, brown curve) and breast cancer caused by chest radiation for cancer has a median latency of 14 years [31] and rarely occurs before 30 years of age (Fig. 2, pink curve). When melanoma occurs in younger persons, it is

Fig. 1 Prevalence of the suspect cancers of all cancers by age and sex. Source: US National Cancer Institute Surveillance, Epidemiology, and End Results Program, SEER 18 Regions, 2000–2013 [29]

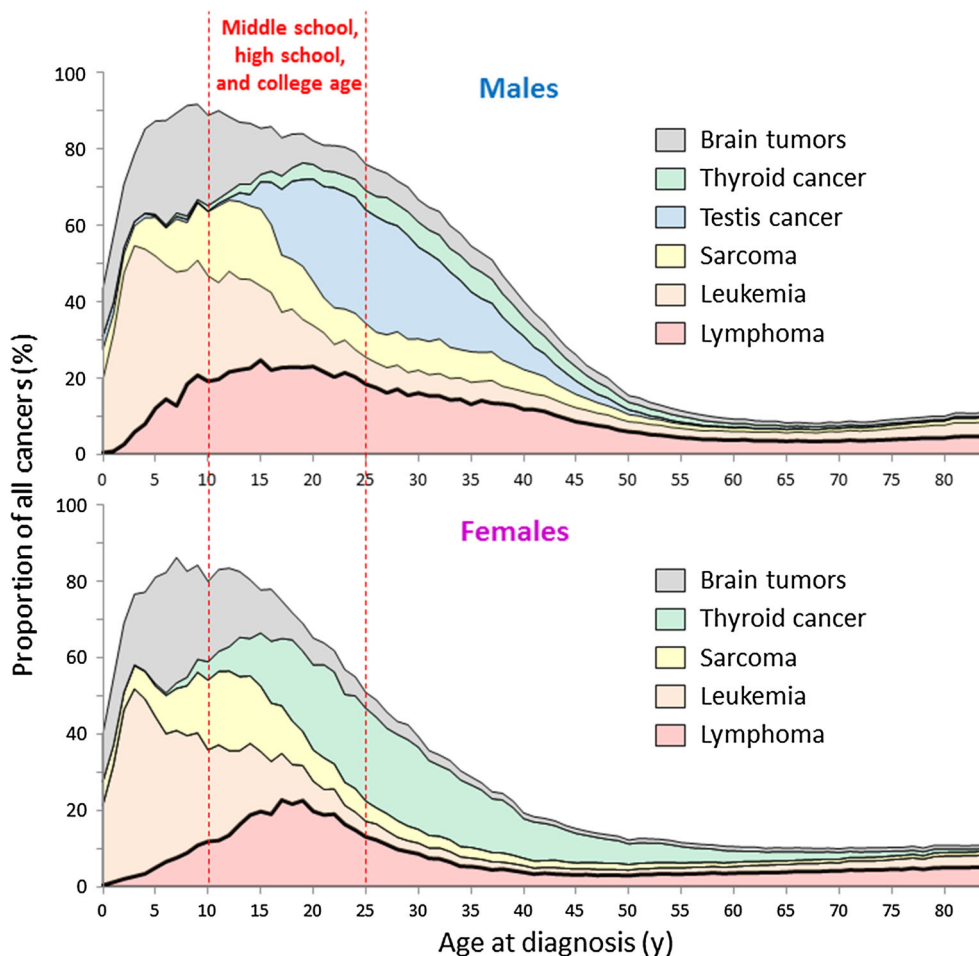
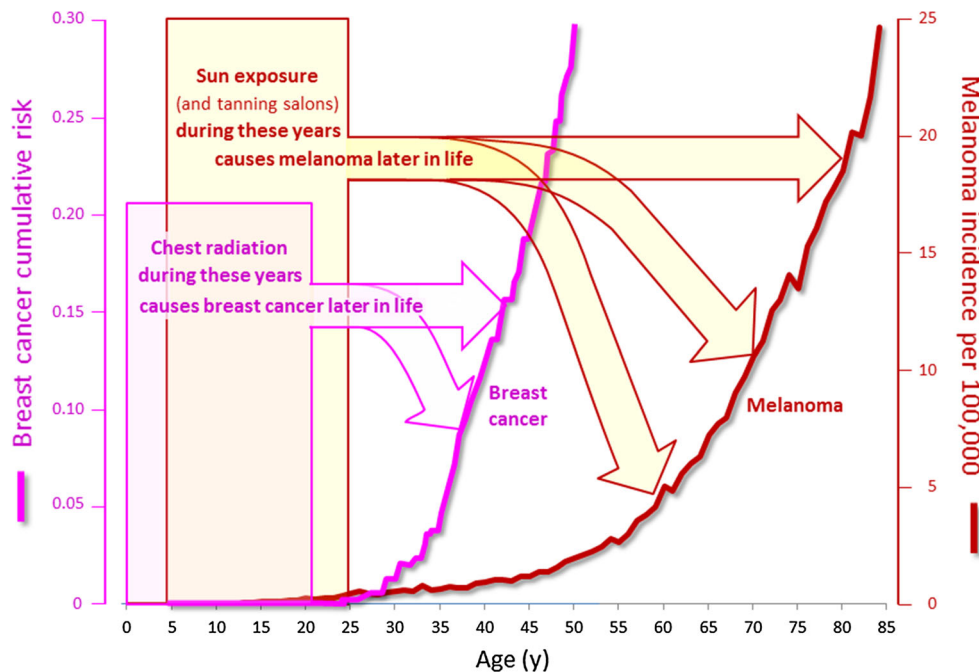


Fig. 2 Incidence of melanoma in sun-exposed areas of skin (face, lips, ears) and, in female individuals, breast cancer after chest radiation during childhood or adolescence, and latency to clinical manifestation. Source: the melanoma data are from the US National Cancer Institute Surveillance, Epidemiology, and End Results Program SEER 18 Regions, 2000–2013 [29] and the breast cancer data are from Moskowitz et al. [31]



nearly always not related to external exposure. If crumb rubber causes cancer in young athletes, it would be expected to become clinically detectable at an older age than during adolescence or early adult years.

2.3 Environmental Causation of Cancer in Children, Adolescents, and Young Adults is Rare

During the 1990s, the world's largest pediatric cancer research organization, the Children's Cancer Group, was awarded millions of dollars of research grants to determine what caused cancer in the young. None of those studies, nationally and in multistate surveys, within homes and with environmental sampling, of childhood and prenatal exposures, and a host of other variables, uncovered evidence for an environmental factor that "might explain more than a small fraction of the observed cases" [32]. The conclusion was that, with few exceptions, cancer during childhood, adolescence, and early adulthood is a mistake of nature—spontaneous mutation to malignancy—and not the result of exogenous causes [33].

3 Conclusion

All the prior studies and the perspectives expressed here cannot completely exculpate crumb rubber as a cause of cancer. Even the Washington State study of the very soccer players whose cancer raised the concern is not without significant limitations, as fully expressed by the investigators [27] and critiqued by others [34]. The concern of parents, coaches, school administrators, sports medicine specialists, other healthcare professionals, and the players themselves is reasonable, especially when, if the hypothesis were true, the adverse outcome is potentially preventable. After all, cancer is one of the most feared diseases [35] and to have it happen in the young could not be worse.

It is also human nature to blame. Blaming autism on vaccines is a recurrent quintessential example. It also illustrates another human behavior: refusal to believe objective scientific irrefutable evidence [36] and this anti-science attitude appears to be increasing in our society [37, 38]. This human need and attendant denial causes unnecessary alarm, especially when cancer is the fear and especially in the United States. When American adults were asked which of five major diseases they were most afraid, 41% said cancer, 31% said Alzheimer's disease and only 6–8% named heart disease, stroke or diabetes [39].

Regular physical activity during adolescence and early adulthood helps prevent cancer later in life [40]. Restricting the use or availability of all-weather year-round

synthetic fields and thereby potentially reducing exercise could, in the long run, actually increase cancer incidence, as well as cardiovascular disease and other chronic illnesses [41]. That the Washington State study found a much lower incidence of cancer in their soccer players than expected from their general population [27] supports the concern that restricting access to such fields and playgrounds may lead to the opposite of what was intended.

Compliance with ethical standards

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Conflict of interest Archie Bleyer has no conflicts of interest directly relevant to the content of this article.

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Dutch National Institute for Public Health and the Environment **Playing sports on synthetic turf fields with rubber granulate is safe**

Publication date: 20 December 2016

Modification date: 07 March 2017

New research by the Dutch National Institute for Public Health and the Environment (RIVM) shows it is safe for people to play sports on synthetic turf fields with an infill of rubber granulate. Rubber granulate contains numerous substances which were found to be released from the granulate in very low quantities. This is because the substances are more or less 'enclosed' in the granulate, which means that the effect of these substances on human health is virtually negligible.

Playing sports on synthetic turf fields

Rubber granulate contains numerous substances, such as polycyclic aromatic hydrocarbons (PAHs), metals, plasticisers (phthalates) and bisphenol A (BPA). There is little variation in the concentrations of substances between fields and between the measurement points per field. Therefore, the results properly reflect all fields with SBR rubber granulate in the Netherlands.

No link with leukaemia

No indications were found in the available literature of a link between playing sports on synthetic turf fields with an infill of rubber granulate and the incidence of leukaemia and lymph node cancer. Moreover, it is clear from the composition of the rubber granulate that the chemical substances that are capable of causing leukaemia or lymph node cancer are either not present (benzene and 1,3-butadiene) or are present in a very low quantity (2-mercaptobenzothiazole). Since the 1980s, a slight rise has been observed in the number of people aged between 10 and 29 who get leukaemia. This trend has not changed since synthetic turf fields were first used in the Netherlands in 2001.

Recommendation for adjusting the standard

RIVM recommends adjusting the standard for rubber granulate to one that is closer to the standard applicable to consumer products. Rubber granulate is required to satisfy the legal requirements for 'mixtures'. The standard for consumer products is far more stringent: it allows far lower quantities of PAHs (100 to 1000 times lower) compared with the standard for mixtures. The quantity of PAH in rubber granulate is slightly higher than the standard for consumer products. The European Chemicals Agency (ECHA) is currently conducting research to determine a suitable standard for rubber granulate.

RIVM also completed a study on the consumer product standard for rubber shock absorbing tiles.



European Chemicals Agency

Recycled Rubber Infill Causes a Very Low Level of Concern

ECHA has evaluated the risk of substances in recycled rubber that is used on artificial sports pitches. Based on the evidence, ECHA has concluded that the concern for players on these pitches, including children, and for workers who install and maintain them is very low. ECHA will update its evaluation as and when new information becomes available.

Helsinki, 28 February 2017 – In June 2016, the European Commission asked ECHA to evaluate the risk to the general population, including children, professional players and workers installing or maintaining the pitches.

A number of hazardous substances are present in recycled rubber granules, including polycyclic aromatic hydrocarbons (PAHs), metals, phthalates, volatile organic hydrocarbons (VOCs) and semi-volatile organic hydrocarbons (SVOCs). Exposure to these substances through skin contact, ingestion and inhalation was considered.

Based on the information available, ECHA concludes that there is, at most, a very low level of concern from exposure to recycled rubber granules:

- The concern for lifetime cancer risk is very low given the concentrations of PAHs typically measured in European sports grounds.
- The concern from metals is negligible given that the data indicated that the levels are below the limits allowed in the current toys legislation.
- No concerns were identified from the concentrations of phthalates, benzothiazole and methyl isobutyl ketone as these are below the concentrations that would lead to health problems.
- It has been reported that volatile organic compounds emitted from rubber granules in indoor halls might cause irritation to the eyes and skin.

In the studies that ECHA evaluated, which are listed in the report, the concentrations of PAHs in recycled rubber granules were well below the limits set for carcinogenic, mutagenic and reprotoxic (CMR) substances for consumers in REACH.

ECHA has also highlighted several uncertainties in its evaluation. Therefore, ECHA suggests the following action to be taken:

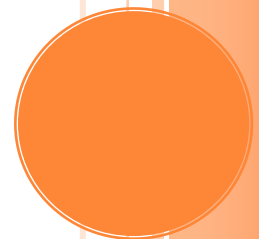
1. Consider changes to the REACH Regulation to ensure that rubber granules are only supplied with very low concentrations of PAHs and any other relevant hazardous substances.
2. Owners and operators of existing (outdoor and indoor) fields should measure the concentrations of PAHs and other substances in the rubber granules used in their fields and make this information available to interested parties in an understandable manner.
3. Producers of rubber granules and their interest organisations should develop guidance to help all manufacturers and importers of (recycled) rubber infill test their material.
4. European sports and football associations and clubs should work with the relevant producers to ensure that information related to the safety of rubber granules in synthetic turfs is communicated in a manner understandable to the players and the general public.

5. Owners and operators of existing indoor fields with rubber granule infills should ensure adequate ventilation.

In addition, ECHA recommends that players using the synthetic pitches should take basic hygiene measures after playing on artificial turf containing recycled rubber granules.

ECHA's evaluation has been sent to the European Commission. The findings are preliminary and will be updated when new information becomes available.

STATE AGENCY
AND
REGULATORY
BODY
CONCLUSIONS





Washington State Department of Health

Synthetic Turf and Crumb Rubber

Investigation of Reported Cancer among Soccer Players in Washington State

In 2009, the University of Washington Women's Associate Head Soccer Coach, Amy Griffin, became concerned that several soccer goalies had developed blood cancers at around the same time. By 2014, the coach had compiled a list of soccer players with cancer. The initial information included 30 current or former Washington residents who played soccer and developed a variety of cancer types between the mid-1990s and 2015. By 2016, the number on the coach's list had grown to 53 people.

In light of this, public health officials at the Department of Health and researchers at the University of Washington School of Public Health formed a project team to investigate issues related to soccer playing and cancer. The overall purpose of the investigation was to explore whether the information from Coach Griffin's list warranted further public health response. The primary goals of the investigation were to:

- Determine whether the number of cancer diagnoses among the soccer players on Coach Griffin's list was higher than would be expected if rates of cancer among these soccer players were similar to rates among all Washington residents of the same ages.
- Describe individuals on the list in terms of their demographics, factors related to cancer and history of playing soccer and other sports.

Note: The investigation was not designed to determine if soccer players in general were at increased risk of cancer due to exposures from crumb rubber in artificial turf.

Frequently Asked Questions

Can you explain the type of study conducted? What did it consist of?

We conducted a cluster investigation of reported soccer players with cancer in Washington. Generally, cancer cluster investigations are within a geographic area, and look at whether that area has an increased rate of a specific cancer compared to the rest of Washington. This investigation wasn't only geographically defined, but also defined by those who had played soccer in Washington. In that way, it's more similar to an investigation among a particular occupation group. The concern was that too many cancer diagnoses were being seen among soccer players on Coach Griffin's list so we looked to see whether the number of cancers on her list was higher than we would expect based on Washington state rates.

Is it safe for my kids to play on synthetic fields made with crumb rubber?

Based on what we know today, the Washington State Department of Health recommends that people who enjoy soccer continue to play regardless of the type of field surface. Our recommendation is based on our investigation and the available research on crumb rubber which currently does not suggest it poses a significant public health risk. Assurances of the safety of artificial turf with crumb rubber are limited by the lack of adequate information on potential toxicity and exposure.

What about carcinogens or substances in the crumb rubber that are known to cause cancer? Should parents be concerned?

Parents should be aware, but not concerned. We know that crumb rubber is made from tires that contain chemicals that have been shown to cause cancer. However, what is critical to consider are the routes of exposure and potential dose someone receives. The available research suggests exposures from crumb rubber are very low and will not cause cancer among soccer players. The Washington State Department of Health recommends that people who enjoy soccer continue to play regardless of the type of field surface.

How can I continue to reduce my kid's exposure to chemicals in crumb rubber?

While the available research does not indicate a significant health risk, there are several ways to minimize any potential exposures to chemicals from synthetic turf fields.

- Always wash hands after playing on the field and before eating.
- Take off shoes/cleats, sports equipment and soiled uniforms outside or in the garage to prevent tracking crumb rubber into the house.
- Shower after play, and quickly clean any cuts or scrapes to help prevent infection.
- Athletes who accidentally get crumb rubber in their mouths should spit it out; don't swallow it.
- Will my child get cancer if he/she plays on these crumb rubber fields?

With very few exceptions, no one knows if someone will develop cancer in their lifetime. That being said, our investigation did not find the number of cancers on Coach Griffin's list to be concerning, and the available research does not suggest that playing soccer on artificial turf causes cancer.

Can you rule out, with 100 percent certainty, that there is nothing in the synthetic turf that can cause cancer?

No, synthetic turf fields made with crumb rubber infill do contain chemicals that have been shown to cause cancer. However, what is critical to consider are the routes of exposure and potential dose someone receives. The available research suggests exposures from crumb rubber are very low and will not cause cancer among soccer players. The Washington State Department of Health

recommends that people who enjoy soccer continue to play regardless of the type of field surface.

Who did you interview for this study?

For this study, we interviewed people or parents of people on Coach Griffin's list to obtain information on demographics, cancer-related factors, and history of playing soccer and other sports.

Why did you only look at soccer players?

We focused on soccer players, because this was the original group of concern, and most of the individuals on Coach Griffin's list played soccer. A relatively small number of people played a variety of other field sports. Because cancer takes time to develop and be diagnosed, we also required a time lapse of about five months (0.4 years) between first playing soccer and diagnosis.

What would you tell communities who are considering installing a synthetic field? Or deciding not to install a synthetic field?

It is important for Washington communities to build and support environments that make it easier for adults and youth to be physically active. Physical activity can slow the increase in the proportion of adults who are obese, reduce rates of chronic disease, and improve the quality of life. The currently available research does not suggest that crumb rubber presents a significant public health risk.

How many soccer fields did you include in your study?

We did not do any testing of soccer fields. We did interview people on Coach Griffin's list reported to us as having cancer and having played soccer. The interviews revealed that the 35 people interviewed had practiced on about 110 soccer fields in Washington.

How does Washington compare with the other states regarding rates of cancer in ages five through 24?

During 2009–2013, the age-adjusted cancer incidence rate for all types of cancer combined among people ages five to 24 years was statistically significantly higher in Washington than in the United States (23.6 and 22.4 per 100,000 people, respectively), so our age adjusted rate has about 1.2 more cancers per 100,000 than nationally.

Why did you limit the time period for people meeting the case definition to 2002–2015?

We limited the time period for people meeting the case definition to 2002–2015 because reports of people with cancer on the coach's list were more likely to be complete during this time period than in earlier time periods. The only person who was diagnosed with cancer before 2002

was diagnosed in the mid-1990s before artificial turf fields with crumb rubber fields were installed in Washington.

Why did you limit the case definition to people who were ages six to 24 years?

We limited the case definition to people who were ages six to 24 years when diagnosed because processes leading to the development of cancer are often different for children and adults. Most cancer investigations and research focus on children and adults separately, with children defined as under ages 15 or 20 years old. We opted to include people diagnosed up to age 24 years because we wanted to include as many people as possible in the case definition without becoming so inclusive that it would lessen the potential to find a problem if one existed. This age group included about 70 percent of people reported to our team.

Did you find that any one position, e.g., goalies, had an increased number of cancer diagnoses?

Our investigation explored whether there was an increased number of cancer diagnoses among soccer players on Coach Griffin's list compared to what we would expect if soccer players experienced the same cancer rates as Washington residents of the same ages. We were able to look at all people on the list with a history of playing soccer, as well as goalkeepers on the list and neither group had an increased number of cancer diagnoses.

Why didn't you look at expected cancers among players on crumb rubber turf fields?

To be able to look at the expected cancers among players on crumb rubber turf fields, we would have had to be able to identify who the soccer players were overall who had played on turf fields. We had no way to assess this. We did look at select and premier players on Coach Griffin's list to see if they had an increased number of cancer diagnoses compared to what we would expect, but they did not. We hypothesized that they likely had longer playing experience and would have greater exposure to crumb rubber.

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH



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Commissioner

Dannel P. Malloy
Governor
Nancy Wyman
Lt. Governor

**EHS Circular Letter #2015-02
(Follow up to Circular Letter #2014-26a)**

DATE: January 20, 2015
TO: Local Health Departments and Districts
FROM: Brian Toal, Gary Ginsberg
Environmental and Occupational Health Assessment
RE: Recent News Concerning Artificial Turf Fields



Brief Video Clip for Local Health Departments – *Click Here* →

This letter and video clip are being sent to update you regarding the news story that has circulated since last spring regarding potential cancer risks at artificial turf fields. Various media outlets have continued to run this story and a number of local health departments have inquired as to its validity. Since many Connecticut towns have installed or are considering artificial turf fields an elevated cancer risk would be an important consideration. However, this news story is still based upon very preliminary information and does not change CTDPH's position that outdoor artificial turf fields do not represent an elevated health risk.

The Connecticut Department of Public Health has evaluated the potential exposures and risks from athletic use of artificial turf fields. Our study of 5 fields in Connecticut in 2010-2011 was a comprehensive investigation of releases from the fields during active play. This study was conducted as a joint project with the CT DEEP and the University of CT Health Center and was peer-reviewed by the Connecticut Academy of Science and Engineering. Our study did not find a large amount of vapor or particle release from the fields confirming prior reports from Europe and the US. We put these exposures into a public health context by performing a risk assessment. Our risk assessment did not find elevated cancer risk. These results have been published as a set of 3 articles in a peer review journal and are available on the DPH artificial turf webpage (<http://www.ct.gov/dph/cwp/view.asp?a=3140&q=464068>).

The news story suggests soccer players and especially goalies may have an elevated cancer risk from playing on artificial turf fields. This is based upon anecdotal observations of a university soccer coach (<http://www.komone.com/news/local/Soccer-coach-Could-field-turf-be-causing-cancer-259895701.html>). Reportedly the coach is developing a list of soccer players who have contracted cancer. However, the types of cancer are undocumented and so it is impossible to say whether they



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represent a common effect and there has been no reporting on how long the goalies played on artificial turf fields to see if there was plausible exposure and latency. There are many reasons why someone collecting a list of cancer cases may appear to find a cluster including the fact that when you have a single-minded focus on finding cases you do not capture all the non-cases that would tend to disprove the cluster. Documentation of an increased rate in soccer players would require an epidemiological study in which the total number who play on turf fields in a given region was also known so that a cancer rate could be established and compared to those that do not play on artificial turf fields. The current news report does not constitute epidemiological evidence and thus is very preliminary.

Our risk assessment did cover carcinogens that are known to be in recycled tires and the crumb rubber used to cushion fields. Once again, we found there to be very little exposure of any substances, carcinogenic or not, in the vapors and dust that these fields generate under active use, summer conditions. Background levels of chemicals in urban and suburban air from heating sources and automobile traffic are much more significant sources of airborne carcinogens. The fact that we sampled 5 fields (4 outdoor and 1 indoor) of different ages and composition suggests that the results can be generalized to other fields, a conclusion supported by the fact that results were similar to what was found in California, USEPA and European studies. Our study did not evaluate ingestion of the crumb rubber itself as players are unlikely to ingest an entire rubber pellet. However, two studies, one in California and one at Rutgers University did evaluate the cancer risk if children ingested a mouthable chunk of playground rubber (10 gram), using laboratory extraction methods to estimate the amount of chemicals that might become available in the stomach and absorbed into the body. Both studies found very low cancer risk from this scenario (Cal OEHHA 2007; Pavilonis et al. 2014). Thus, CT DPH finds no scientific support for a finding of elevated cancer risk from inhalation or ingestion of chemicals derived from recycled tires used on artificial turf fields. US EPA has a similar position: "At this point, EPA does not believe that the field monitoring data collected provides evidence of an elevated health risk resulting from the use of recycled tire crumb in playgrounds or in synthetic turf athletic fields."

<http://www.epa.gov/epawaste/conservation/materials/tires/health.htm>

In summary, federal and state authorities have taken seriously the concerns that artificial turf fields may present a health risk due to contaminants in recycled rubber. The best way to investigate these concerns is via an exposure investigation. Studies conducted in Connecticut and elsewhere have shown a very low exposure potential, less than from typical outdoor sources of air pollution. The current news reports of a list of soccer players with cancer does not constitute a correlation or causality and thus raises a concern that currently lacks scientific support. Thus, the CT DPH position expressed in 2011 at the conclusion of the Connecticut study, that outdoor artificial turf fields do not represent an elevated health risk, remains unchanged. For further information please contact Brian Toal or Gary Ginsberg at 860-509-7740.

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C Suzanne Blancaflor, M.S., M.P.H., Chief
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To the members of FIFA

Zurich, April 2017
MDH/awe

A statement on potential cancer risks from exposure to SBR in artificial turf fields

Dear Sir or Madam,

During the recent FIFA Medical Committee meeting on the 13 March 2017, the issue of potential cancer risks from exposure to SBR on artificial turf fields was discussed and we are very pleased to share this information with you.

FIFA first responded to media coverage of the topic in 2006 when an open letter was published following several high profile articles that stipulated that there may be a link between the crumb rubber particles known as SBR (Styrene Butadiene Rubber) in artificial turf fields and the occurrence of cancer in players exposed to these surfaces. Studies dating until 2006 from various scientific disciplines found no evidence that contact with SBR was linked with the emergence of cancer. FIFA reiterated this position ahead of the FIFA Women's World Cup 2015 in Canada that was played on artificial turf surfaces based on published studies up until that date.

In light of increased public interest in the topic in 2016 and further studies carried out in the past months, FIFA would like to clarify its position on the use of artificial turf fields containing SBR infill.

FIFA has taken note of ECHA/PR/17/04 in which the European Chemicals Agency has found "at most, a very low level of concern from exposure to recycled rubber granules". Regulating authorities are conscious of the presence of potentially carcinogenic components in the compounds used for the production of tyres, the main source of SBR rubber and have labelled these products accordingly. In particular the presence of polycyclic aromatic hydrocarbons (PAH's) is undisputed but equally there is no scientific evidence of these being bioavailable in their application as car tyres and infill for artificial turf fields thereafter. The newest findings by Van Rooj and Jongeneelen (2010) concluded that "If there is any exposure, then the uptake is very limited and within the range of uptake of PAH from environmental sources and/or diet". A further study from New Jersey's State Medical School indicated that health risks to children and adults from extensive contact with crumb rubber ranged from none to negligible (Pavilonis et al. 2014).

Looking at specific issues such as ingestion or air pollution, a number of studies has investigated the intake of PAH from artificial turf and found less or comparable exposure than for grilled food products, smoked salmon or log burning. As a result, Dye et al concluded in 2006 that "on the basis of environmental monitoring, artificial turf football fields present no more exposure risks than the rest of the city".

While it will never be possible to exclude risk completely or prove this negative, the newer studies have confirmed the previous findings that there is no evidence of link between contracting cancer

and playing on artificial turf with SBR infill. A large number of studies have further confirmed that the effect of SBR rubber are as negligible as the effect of ingesting grilled foods or exposure to tyre wear on roads in everyday life.

As with all aspects relating to player safety, FIFA will continue to monitor the developments within the scientific debate and consider any future findings.

Yours faithfully,

FÉDÉRATION INTERNATIONALE
DE FOOTBALL ASSOCIATION



Dr Michel D'Hooghe
Chairman FIFA Medical Committee
Member of the FIFA Council

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