

Are artificial turf fields carcinogenic?

by Samuel Liu

I used to think a lot of things.

For example, I used to think the football field some sort of crowning jewel, an expanse of even green out of a Windows screensaver. I used to jog on that field, barefoot after a cross country workout, the soft, fake grass cushioning the knees and comforting the back. I used to brag to non-Saratogans about our campus, how we have both a “dream” football field and a “dream” basketball court. I don’t boast about our school so much anymore.

I am an editor of this newspaper, and I am always looking for new story ideas. But when Saratoga parent Bill Breck told me that this artificial turf was carcinogenic, I refused to believe him. This was the field on which I had practiced, on which I had run, on which I had even slept (the old pre-cross country meet nap). Thousands of schools across the country use artificial turfs. How could we all be wrong?

Yet, as he sent me study after study, I began to have my doubts. These weren’t, as I’d initially assumed, nutjobs or environmental terrorists. These were high-powered doctors, public health professionals, lawyers, all concerned with this topic, and the reason I hadn’t heard of it yet was because the research was relatively new.

Before I begin, I should note that this is a story without a solution. Even if after reading this you believe that the field is carcinogenic, you would have a hard time persuading the administration to tear up the \$527,000 turf it just installed last summer. You’d even have a hard time persuading them to halt construction on the two new artificial turfs, in the baseball field and the multipurpose field. And what about the school activities that live on this field? Pragmatism often trumps environmental concerns, and this isn’t always a bad thing.

If anything, be skeptical. I am no scientist; this is no research paper. Read the studies that I cite, and decide whether or not science suggests these fields carry too high a risk.

Understand too that life is full of risks, and that most of us have a far higher chance of dying in a car accident than by inhaled carcinogens. This article only aims to illustrate the dangers of artificial turfs, and asks a simple question: Are we comfortable with this risk?

Crumbs and carcinogens

Across the country, thousands of artificial turfs blanket playing fields and playgrounds. California alone boasts more than 1,000 artificial turfs.

Standing on our field, one manufactured by the company FieldTurf, it's impossible not to notice the crumb rubber. A black, pellet-like substance the size of a cracker crumb, Styrene Butadiene Rubber (SBR) is the predominant constituent of artificial fields. Run your hand through the field, and you'll pick up black dust, similar to the consistency of pencil graphite. It's easy to spread, too, and many a morning SBR clogged my shoes as I tracked black into AP Chemistry.

The crumb rubber comes from recycled tires, which 11 states have banned from landfills, due to their propensity for burning endlessly.

The Environment and Human Health, Inc. (EHHI), a non-profit made up of doctors, public health professionals and policy experts, first investigated artificial turfs in 2006 because it was alarmed by what artificial turf companies were presenting to schools.

Dr. David Brown, a public health toxicologist and a board member at the EHHI, told me that "the problem is the [artificial turf] industry has a very, very strong marketing program — they hire studies and collect them in a huge bound notebook, and they read through and say there are thousands of papers showing that these things are safe. The conclusions [we saw] weren't supported by the evidence."

The scientists at EHHI decided to test the fields for themselves. They sent samples of artificial turf to the Connecticut Agricultural Experiment Station, a lab associated with Yale University. There, scientists identified several harmful chemicals in crumb rubber, from Butadiene, a carcinogen linked to leukemia, to Polycyclic Aromatic Hydrocarbons (PAHs), a harmful organic compound.

Dr. Barry Boyd, the director of Cancer Nutrition Health at Yale Health System and a board member at the EHHI, warned that "because artificial turf playing fields are disproportionately used by children and adolescents, these childhood exposures to environmental carcinogens may add to lifelong risk of cancer."

The EHHI is not alone. A notable critic is Dr. Phillip Landrigan of the Mount Sinai School of Medicine, who submitted a letter to the New York City Planning Department last year expressing concerns over the carcinogens in tire crumbs.

He wrote that the principal chemical components of crumb rubber are Styrene and Butadiene — Styrene is neurotoxic, and Butadiene is a proven human carcinogen that has been shown to cause leukemia and lymphoma.

“There is a potential for all of these toxins to be inhaled, absorbed through the skin and even swallowed by children who play on synthetic turf fields,” Dr. Landrigan wrote. “Only a few studies have been done to evaluate this type of exposure risk.”

A 2012 study from the highly respected international journal *Chemosphere* identified many of the chemicals the EHHI found. The study said that many of these hazardous substances were at high or extremely high levels, and also confirmed that the particles are volatile (turn into gases) even at room temperatures.

“The presence of a high number of harmful compounds in these recycled rubber materials ... should be carefully controlled, and their final use should be restricted or even prohibited in some cases,” the study concluded.

It’s worth noting here that the previous study was conducted in Europe, which has taken a far more cautious approach to the installation of artificial turf fields. Italy’s ministry of health has even proposed to ban the fields, labeling the rubber-infill fields a “potential carcinogen.”

Around the world, countries are beginning to take notice of the possible dangers in these turfs. The Korea Times reported that an environmental group had found harmful substances in artificial turfs. Australia has issued a moratorium on artificial fields.

“The health of thousands of children may be at risk from long-term exposure to toxic chemicals from artificial turf,” *The Sydney Morning Herald* wrote. “Residents in some Sydney suburbs have successfully fought the introduction of synthetic grass.”

Defending the turf

When I first dived into my research, I was terrified by what I had found. Page after page of carcinogens and acronyms and Poly Aromatic Hydrocarbons and health risks — I jumped to the conclusion that I was going to get cancer.

“Don’t let Timmy [my baby brother] walk on the field,” I warned my father.

But it’s important to understand that this is not hard science. While there is a plethora of evidence to suggest that artificial turfs may present health risks, there have yet to be any substantiated reports linking artificial turfs to cancer. Crumb rubber is not the new asbestos (yet), and I am not Erin Brockovich (ever).

There is little doubt that there are carcinogens in these fields. What is unclear is whether they are actually harmful. Ingesting these particles can be damaging; some studies suggest that just breathing the air above the tire crumbs can produce adverse health effects.

A Norwegian study conducted under scientist Christian Dye found various carcinogens that, when totaled, give a lifetime chemically increased cancer risk of 18.8 cancers per million through inhalation.

This is a troubling number. The California Environmental Quality Act established that the significance threshold was one person per million — Dr. Brown said that the 18.8 figure is in the area that the Environmental Protection Agency would normally regulate.

Matthew Hagemann, a certified hydrogeologist and former director of the U.S. Environmental Protection Agency's West Coast Superfund program, said in an online report that this cancer risk is twice as high as the cancer risk experienced by someone living adjacent to the Chevron Richmond refinery, a manufacturer of petroleum products and other chemicals (Hagemann declined to comment for this article).

"A child playing on SBR crumb rubber as few as 30 times per year would experience a cancer risk of 19 per million — almost 20 times higher than the CEQA significance threshold of 1 per million," Hagemann wrote.

Dr. Brown, the toxicologist, said that, if true, the 18.8 people per million statistic represented a cancer threat similar to that perceived by a moderate smoker.

However, the cancer risk in the Dye study may have been overestimated. According to a study by California's Office of Environmental Health Hazard Assessment (OEHHA), the data gathered in the Dye study was overestimated because it was gathered from indoor fields, which have less ventilation.

"This suggests there is a low risk for [negative inhalation] health effects in soccer players," the OEHHA study wrote.

This is not to say that there is no substantial risk from inhalation — claims that OEHHA declared artificial surfaces free of risk are prime examples of what Dr. Brown called "conclusions not supported by evidence."

The OEHHA recognized several significant gaps in data, writing that the risk of airborne metals and organic compounds has not been adequately assessed. Their disputation of the 18.8 figure did not address the airborne risk of PAH's and other particles, and the study is far from a safe bill of health.

With the plethora of studies in dispute, as is common in scientific process, the research on cancer risk is far from conclusive. In the meantime, we have put the cart before the horse: We have built these potentially toxic fields before clearing them for safety.

There are carcinogens everywhere, the cynical argument goes. But that's never been a good reason to ignore risk: By that reasoning, we shouldn't worry about any toxins at all. These fields may present a significant cancer risk — if Hagemann's comments are correct, just the inhalation risk is comparable to that of living next to a chemical refinery — and the real-life consequences of these threats have yet to be realized.

Other countries have taken far more cautious approaches toward artificial turfs. America, however, has forged ahead, rationalizing that because there have been no reported cases of cancer, these fields must be safe. We are forgetting that it takes years for cancer to develop, and decades for people to start to realize where the cancer is coming from. Asbestos killed thousands before proper national attention was raised. Lead, too, was widely prevalent in paint before this country finally banned it in 1977. And it took 40 years for people to realize that Hexavalent Chromium, Brockovich's Grendel, was tainting water and causing cancer.

Even if there have yet to be credible cases linking crumb rubber to cancer, it's imprudent to cite this in its defense, for it may take a long time to establish a link between the two. Until we have definitive proof of the safety of crumb rubber, perhaps cynicism would be better replaced by skepticism.

The turf decision

In the summer of 2005, Saratoga installed its first artificial turf. The controversy, then, was centered around the installation of the lights and how they would affect the surrounding neighborhood. A triumph nonetheless, the field was met with much fanfare; for the first time, the football team could play "home" games at home instead of at Los Gatos. By most accounts, school spirit rose.

But it's possible that this turf may have contained significant amounts of lead, a developmental toxicant. In September of 2008, then attorney general (and now governor) Jerry Brown led a lawsuit against AstroTurf, Beaulieu Group and FieldTurf (the company that makes the school's turfs) for violating California's Proposition 65 by knowingly failing to disclose that their products contained lead.

The lead was reportedly present at 5,000 parts per million, more than 10 times above the legal threshold (parts per million and cancer risk are measured differently). Eventually, the three companies settled and agreed to reduce the amount of lead in their products. This doesn't, however, change that for years students around the nation may have been exposed to high levels of lead on the old fields.

After six years, the school's field began showing symptoms of wear and tear. In 2010, the SHS Foundation began planning and fundraising for a new field. Last summer, Saratoga (with the company FieldTurf) installed a new football field, which employs one of the newest technologies. The new turf uses Coolplay, which adds a sparse layer of cork on top of the crumb rubber. Whether this can mitigate the effects of crumb rubber is unlikely, as the SBR is present in far greater quantities than the cork, and is still easily kicked into the air.

The SHS Foundation and the administration had heard about the presence of carcinogens in these turfs prior to installation, but was dissuaded by John Wadas, a marketing and fundraising specialist working with the SHS Foundation. Last spring, Breck, the Saratoga parent, attempted many times to bring the research about these fields being carcinogenic to

the administration's attention, but each time he was dismissed. The argument, Breck said, was, "Everyone is using these fields."

School officials said they relied extensively on scientific research. After Breck's query, Wadas sought help from a FieldTurf salesman, Andrew Rowley. Principal Paul Robinson told Breck that these were "definitive answers" to his questions.

"Fields installed with SBR rubber have been proven over and over by many independent studies to be perfectly safe," Rowley, a salesman, wrote. "These studies have been done by doctors, scientists, universities, government agencies, etc. from around the world. Ninety-nine percent of all turf fields today are still installed with SBR rubber." (Interview requests to Rowley and Wadas were not returned.)

Besides not even addressing or acknowledging the presence of carcinogens in the field, Rowley's letter — and the administration's acceptance of it — reveals a mistake of oversight, and a startling trend among American schools nationwide.

High schools are easy targets for artificial turf salesmen: There are no David Browns and Matthew Hagemanns to look into the studies put out by the artificial turf companies, and the factor of boosting sports and spirit overruns the few negative Nancies. If we don't have these fields, the feeling is, we can't compete with others, and this raw crusade "for the team" has blinded many a school. Foundations like the SHS Foundation, composed of parents genuinely looking to do good for the school, are instead tricked by salesmen because the parents lack the science background to see through the paperwork companies present. (An analysis of a FieldTurf report can be found online at www.saratogafalcon.org).

Robinson has defended these fields vehemently. He told me that our football field was "the most advanced field in Northern California," and a "model for other schools." But when I cited my studies, Robinson told me they were "opinions" and "completely biased." Robinson said there were many studies supporting the safety of turfs, but declined to cite specifics.

I asked Dr. Brown what he thought of Robinson's statements, and he bristled when I told him that the studies the EHHI had done were "opinions."

"[The laboratory we used] is one of the leading laboratories in the world, closely associated with scientists from Yale," he said. "One of the reasons we did the study was because a woman who had a child with leukemia came to us and asked us if these fields were safe. Our answer was no."

Perhaps a similar question can be asked to both the administration and the community: Would you, knowing what these fields contain, but not knowing the consequences, put other parents' children on these fields?

The last question

Throughout all of my research and reporting, I have hoped to be mistaken, because I know there's not much we can do. Breck told me of an organic infill that is used in Santa Clara University (he was a strong advocate of it, and it's worth looking into), but I know that the chances of this school tearing up its field and contract with FieldTurf are slim. Perhaps the only plausible area for change is with the two grass fields yet to be transformed into artificial turf.

I see a school, and a country, where we're putting kids on a field of carcinogens, and assuming that they won't get cancer. We know there are carcinogens in here. We know there is exposure. The only question is — and this isn't a question we should be using kids as guinea pigs to answer — how much is the exposure?

I asked Dr. Brown when he thought that people would start to take notice of the cancer-related harms of artificial fields. Ten years? Fifteen? I expected ambiguity — he had been helpful, but he had been reserved with his words, as scientists are and lawyers are not.

“Five,” he said. “Five years. Because we're putting first graders and cancerous materials together.”

He continued: “And when the cancer starts, people like myself will be sorry we didn't argue more effectively.”

For more information, contact the writer at samuel.liu@saratogafalcon.org.

[See copy of related letter to the editor below.]

<<http://www.saratogafalcon.org/content/are-artificial-turf-fields-carcinogenic>>

Saratoga Falcon [Saratoga HS] 1 November 2013

Praise for “Are artificial turf fields carcinogenic?”

To the Editor:

About a year and a half ago, my older sister Allison Toh (2012 alumna) participated in the girls’ powderpuff team during Spring Fling week. Despite all of the fun she got from the games, she also was left with a small gash on her knee that was a result from a tackle on the football field. Our whole family thought that it was “no big deal” and that since it looked like a little cut, it would heal eventually.

However, a few weeks later, the skin around the knee looked very infected, which I won’t spend time describing, because her knee looked absolutely disgusting. I’d always see her itching her knee from time to time, but no one really knew why the rash on her knee would quickly spread to everywhere on her leg. Since her knee got in an extremely bad condition one night, we immediately brought her to the emergency room. The doctors said that the chemicals from the crumb rubber on the artificial turf contaminated her knee, and if they don’t do anything soon, the chemicals can hurt her bones and kidney. She got hospitalized right after, and fortunately got better. Our family still wanted to know what chemicals were actually in the “treasures” of the turf and if people actually cared about the effects of these chemicals, since they almost nearly killed my sister.

When I read last week’s issue, I noticed that there was finally an article on artificial turf fields so I quickly flipped to read it. All of the facts included in the article helped answer my questions. I also showed my family and my sister the article, and they were really happy that someone finally paid attention to the carcinogens on the football field.

I do agree that we should change out our artificial turf, but like you said, the chances are very slim. Not many people know the effects of the carcinogens in the turf, but hopefully they will all read your article because it is very informative and worth reading. Thank you, and sorry that I wrote a super long letter!

Eileen Toh

<<http://www.saratogafalcon.org/content/letters-editor-praise-are-artificial-turf-fields-carcinogenic>>