

NOT SO BULLISH ON ARTIFICIAL TURF

My View

By Kurt Tramposch -Environmental Health Planner, Wayland , Mass.

Few major community investments have engendered such enthusiastic public support - yet simultaneously sparked spirited, sometimes contentious debate - as artificial turf athletic fields. While one might expect mild controversy over the usual host of concerns specific to financing, maintenance, and replacement costs, significant questions about environmental health and possible harmful chemical exposures to both athletes and community have acquired heightened relevance in the past two years of analysis and debate in the U.S., Canada, and the European Union (see SynTurf.org or AnInconvenientTurf.org).

Over the past few years, Sweden and Norway have performed extensive testing on synthetic fields and have banned additional recycled rubber fields because they contain "substances of very high concern." In Italy, a government-appointed commission reported in 2006 that tests found synthetic turf fields contained carcinogenic polycyclic aromatic hydrocarbons (PAHs), toluene, and heavy metals in excess of legal limits and that "the inhalation of the dust from these substances poses a risk to soccer players." The commission recommended that 130 tons of tire-crumb should be removed from each of the 200 existing playing fields - an endeavor that sports a price tag higher than the cost of constructing most artificial turf fields in the United States.

Such dramatic action abroad has been partially mirrored recently in the United States where health experts and officials are engaged in closer scrutiny of artificial turf and questioning earlier research that sanctioned the fields as "safe."

What is "artificial" or "synthetic" turf and where did it come from?

Original "chemgrass" was the 1950s brainchild of a former Newton school superintendent who, citing the advances of plastics chemistry, longed to create a synthetic grass so that urban children might have a low-maintenance, durable athletic surface alternative to gravel and asphalt playgrounds. After its installation in the Houston Astrodome, it was dubbed "Astro-turf" and led to over thirty years of urban, academic, and professional sports use. Because this "first generation" carpet was laid over concrete or asphalt surfaces, the fields did not drain sufficiently, often harbored bacteria and mold, presented tripping hazards as they became ragged and faded, and were associated with

innumerable player injuries to the ankle, knee, hip, spine, shoulder and head. Contact with the rough plastic carpet strands also caused "rug rash" or "turf burn," a serious dermal abrasion.

How has it changed? Why is this "new generation" of artificial grass so popular?

By the late 1990s, the Environmental Protection Agency was mandating proper disposal of mountains of used auto and truck tires. At the same time, the sports world was demanding safer and longer-lasting synthetic fields. The convergence of these factors led to experiments with pulverized waste tire "crumb," grain-sized particles of tire inserted or "in-filled" into the plastic polymer fibers of the "turf" carpet. This two- or three-inch cushion of rubber not only provided additional bounce to the surface, resulting in a safer playing surface for athletes, but also prolonged the useable life of the carpet fibers. Further enhancements, including flame-resistant polymers that prevent discarded cigarettes from igniting the carpet, and the addition of silica sand to the crumb rubber, made the synthetic playing field safer and respond more like a real grass surface. It also presented an easier to maintain surface than grass fields, and didn't require pesticides or fertilizers. Coaches and athletes generally found the surface to be "almost" as good as grass, with fewer of the injuries associated with the earlier Astroturf.

Why the recent concerns over environmental exposures from artificial turf?

The tire-infill artificial turf technology is a relatively recent innovation of the last eight years. This accounts for a growing awareness that the "new" turf still manifests a few of the same problems that characterized the original Astroturf - the incidence of dermal abrasions (even with softer, friendlier plastics), the potential for dramatically elevated heat of the playing surface, and the thorny issue of disposal after the 10- to-15-year useful life of the carpet. One Boston Parks Department employee was chagrined to learn that an older synthetic community field's carpet could not be replaced with the more desirable newer 'infill' system because the worn carpet was classified as a "special waste" and too expensive to remove.

Although one artificial turf manufacturer reported the release of heavy metals from their carpet, using recycled tires as infill - up to 120 tons per field - attracts the most health attention. For a typical football or soccer field this can total between 20,000 and 40,000 pulverized auto and truck tires. This "crumb" has a chemical identity which is identical to the chemistry of the original tire. For example, the French Alipure study (2007) identified 112 chemical compounds in their multiple-rubber leachate tests but chose only sixteen of those to evaluate for health risks. And the California OEHHA report (2007) summarized 46 studies in the scientific literature that identified 49 chemicals released from tire crumbs - seven of which are carcinogenic.

But tires are everywhere and prior studies have proven that recycled rubber products are safe. Why blame artificial turf?

With the introduction of the latest generation of synthetic field, manufacturers, brokers, and consultants promoting the product have provided facile answers to public concerns over tire-crumbs toxicity by repeatedly insisting that: 1) tires are everywhere and (therefore) are generally regarded as safe; 2) tire crumb infill does not disintegrate or release anything into the air or water; 3) once installed into the field the crumb stays in place and does not leach or migrate; and 4) if ingested by a player or carried home by static cling there is no harmful effect.

These proponents cite "studies" to back up these responses.

However, many of these studies have been funded by the tire or rubber manufacturers, the synthetic field industry, or agencies with a primary mission to dispose of tens of millions of used tires. These studies often lack peer review, use questionable procedures, or reach conclusions related to safety rather than health. Reports of metals or organic chemicals leaching from the tire crumb into surrounding waters are often dismissed as being "below regulatory limits" or merely of "local concern." Other studies suggest the leachate will experience rapid dilution as it moves from the source.

Numerous tests over the past several years have prompted renewed interest in the environmental impact of disposed tires. In 2006 Prof. William Crain of City College New York sent field samples of crumb to a Rutgers University lab which reported finding PAHs, zinc, arsenic, and lead in the crumb rubber. In October, 2006, a Wayland, Mass. Conservation Commission review of wetland regulatory issues concerning an artificial turf field prompted the commission to insist on "leachate" tests of the water runoff of several existing fields in other communities. The results from a certified lab indicated the presence of zinc, copper, chromium, arsenic, lead, iron, antimony, thallium, and a hormone-disrupting synthetic organic octylphenol. The level for lead, at 1.5mg/l exceeded the drinking water action level by 100 times and the highly toxic thallium exceeded the EPA action level by seven times. The test protocols requested by the consultant did not even look for most compounds of tires.

This past October the Fairfield, Conn. Conservation Commission held a similar regulatory review for a private school's proposed artificial turf and heard expert testimony about demonstrated toxic levels of zinc released. The commission denied the application principally on environmental grounds, and noted: "a prudent and safe alternative to artificial turf exists, namely grass."

But these local tests are limited and don't constitute "proof" of a problem with tire-crumbs.

Most earlier studies have focused on the use impacts of tire shreds for engineering applications (such as roadbeds) or landfills. Recently, there have been dozens of more rigorous studies demonstrating the potential for adverse toxicity of tire leaching to wetlands, aquatic organisms, and to humans but no "smoking crumb." This year, responding to the growing concerns, the Connecticut-based nonprofit Environment and Human Health, Inc. sponsored an exploratory study with the Connecticut State

Experiment Station in June, 2007 that demonstrated that four organic compounds were released from tire crumb and approximately two dozen others were detected but at lower concentrations (see www.EHHI.org).

The health impacts of the confirmed compounds ranged from eye and skin irritation or severe irritant to a recognized carcinogen and a suspected endocrine disruptor. As EHHI's toxicologist Dr. David Brown explained, "It is clear the recycled rubber crumbs are not inert, nor is a high temperature or severe solvent extraction needed to release metals, volatile organic compounds or semi-volatile organic compounds." He concluded that "tire crumbs constitute a chemical exposure for humans and the environment." As a result of this report, EHHI president Nancy Alderman said, "There is enough information now to place a moratorium on installing any new fields or playgrounds that use ground-up rubber tires until additional research is undertaken."

But that's one small recent study. Who will pay attention to that?

The EHHI testing and report released an avalanche of attention and concern upon all sides of the 'turf debate.'

At an August press conference in Hartford with EHHI, Connecticut Attorney General Richard Blumenthal found the concerns raised by the group serious enough to pledge \$200,000 for testing of fields to further explore these exposures, especially to children. Numerous Connecticut, New York, and Massachusetts communities which are considering constructing synthetic fields are beginning to discuss EHHI's findings (Larchmont, N.Y., Ridgefield, Conn.), examining additional health studies (Westport, Conn., Wellesley, Mass. and Nyack, N.Y.), and even hiring consultants to do a risk analysis (Concord, Wellesley, and Larchmont, N.Y.).

Last April, Betsy Gotbaum, Public Advocate for the City of New York City (and former Parks Commissioner), called for further environmental testing of artificial turf. And, in November, two New York Assemblymen submitted a bill calling for a state-wide moratorium on the construction of synthetic fields until the state performs an environmental health study of potential adverse effects. The bill also would require proposed fields to undergo a "site-specific" SEQRA environmental review.

If the synthetic turf doesn't require irrigation, how would metal leachate be carried into the groundwater below?

A popular selling point of artificial turf is there is no need to irrigate the fields as would a grass athletic field, typically a large consumer of water. Proponents of synthetic turf claim that it is not necessary to irrigate the fields to cool them on warm, sunny days. Unfortunately, many communities have believed the turf companies and consultants and have not provided for irrigation, often to discover after the field has been installed that they sometimes require cooling.

One Boston suburban high school - believing irrigation was unnecessary - discovered the first year how hot tire crumb can get. Officials have since improvised a fire hose hookup to cool their two-year old synthetic field when the outdoor ambient temperature exceeds 90 degrees with "finished" chlorinated drinking water from the municipal system. A Waltham private college, on the other hand, did have irrigation installed with their field several years ago but discovered that water sprayed onto hot crumb rubber turns into a steam bath for the players. Moreover, after 20 minutes the field returns to the higher temperature. The college no longer irrigates to cool the field.

But some sports such as field hockey have FIFA competition regulations that require the saturation of a crumb infill synthetic field prior to play to reduce injuries and help the ball run true. During the extreme drought and water bans in North Carolina this fall, Duke University received adverse national press coverage for heavily irrigating their artificial turf athletic fields in preparation for regulation field hockey competition.

A recent field study by a Wayland engineer reported that after repeated readings on synthetic turf infill surfaces when the air temperature is in the 70s, the fields can heat to 130-145 degrees, and when the temperature is 90 degrees the fields can exceed 150 degrees. The field (surface) temperatures regularly exceeded the temperature of nearby asphalt by 20 degrees. One synthetic turf caretaker for a suburban Boston high school field explained, "It feels like you're getting cooked from below and above at the same time." Extra monitoring is needed under these conditions to prevent athlete dehydration and heat exhaustion, and at such extreme temperatures games should be postponed.

Another form of water infiltration of the fields is by precipitation, which is approximately 42 inches a season on Nantucket. For example, an 80,000 square-foot field receiving 3.5 feet of rainfall a year, 6.4 acre-feet of water would filter through the tire crumb rubber, or approximately two-million-gallons a year. When temperatures rise in the summer months, heated water leaches metals from the tire crumb. Until *in situ* studies are conducted to get an accurate picture of the contents of the rubber leachate, the environmental or health impacts remain unknown. And there is the added water quality risk from typical synthetic field maintenance practices - chemicals to clean, disinfect, brighten, fluff, paint, and repair - all filtering into the aquifer below.

The Precautionary Principle suggests that if an action or policy might cause severe or irreversible harm to the public, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the proposed action. A tire-crumbs infill artificial turf athletic field sports-plex placed above an irreplaceable "sole source" aquifer is arguably the sort of complex system where the consequences may be unpredictable. The potential for harm to the athletes and environment of Nantucket from the introduction of hundreds of tons of used tires needs careful deliberation by all the island's residents. And as the Fairfield Commission determined after over 20 hours of testimony, a safe and prudent alternative to artificial turf exists - namely grass. **I**

- Kurt Tramposch led a 10-Citizen suit in 2007 which appealed Wayland's approval of an artificial turf field near town wells. After eight months the appeal forced the town to re-locate field discharge away from the wellfield and resulted in a DEP-mediated settlement requiring the town to perform future water testing and monitoring.

<http://www.nantucketindependent.com/news/2007/1212/Opinion/013.html>