

## What to Know About Artificial Turf Fields

### Which artificial turf fields are of concern?

Not all artificial turf fields are constructed the same way. Early artificial turf fields were like coarse carpets, while newer artificial turf fields are more complex, layered surfaces. These layers are often cushioned with “infill”. Of concern are the “infilled” fields, which consist of blades of plastic infilled with a mixture of crumb rubber and sand or just crumb rubber.

### What is infill crumb rubber?

Infill crumb rubber consists of tiny black pellets or granules, approximately 1 mm in diameter. The main component of crumb rubber is recycled tires<sup>1</sup>. Note that each company has its own installation method and source for crumb rubber, so there will be variation from field to field.

### What chemicals can be contained in the infill crumb rubber?

Because infill crumb rubber is made from recycled tires and other recycled materials, it can contain a mixture of chemicals. These chemicals include rubber, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and heavy metals (lead, zinc, iron, and manganese)<sup>1</sup>.

### How can people be exposed to these chemicals?

(1) Inhalation: Exposure to airborne chemicals was recently studied by Connecticut’s Departments of Public Health and Environmental Protection, their Agricultural Experiment Station, and UCONN Division of Occupational and Environmental Medicine. They studied both indoor and outdoor turf fields. Results showed that each field had a different mixture of airborne chemicals. When the amount of airborne chemicals at outdoor turf fields was compared to background (non turf field) levels, they did not find a difference. However, there were more airborne chemicals (e.g. benzothiazole) in one indoor field as compared to outdoor fields<sup>2</sup>. This result supports the idea that chemicals remain in the air longer with decreased ventilation. Based on these measurements, the Connecticut Department of Health found that health risk from playing on turf fields (even indoors) was “...within typical risk levels in the community from ambient pollution sources and are below target risks associated with many air toxics regulatory programs”<sup>2</sup>. However, one limitation of the Connecticut findings is that chemical measurements were taken on summer days when the temperature was below 90 degrees. They did not assess the potential for increased chemical release with hotter temperatures typical of summer heat waves.

(2) Ingestion: Pellet infills can stick to the hands and bodies of children playing on the fields. This can lead to ingestion in young children who often put hands and toys into their mouths<sup>4</sup>.

(3) Skin: Certain chemicals may be absorbed through direct skin contact. This is of greater concern in young children whose skin barrier is not as thick, or keratinized, as older individuals<sup>4</sup>.

### What are the health and environmental effects of chemical exposures related to infill rubber?

Exposures to chemicals present in crumb rubber at very high levels, typical of animal or occupational studies, are known to cause birth defects, neurologic and developmental deficits, and some can even cause cancer<sup>4</sup>. These are higher exposures than would be found in infilled tire crumb. What is not yet known is the extent to which these chemicals actually enter the bodies of children playing on turf fields. Several studies have attempted to approximate exposure to concerning components of crumb rubber by using theoretical estimates of inhalation, ingestion, and dermal exposure; these studies found that

exposure would in most cases be too small to have health effects<sup>4</sup>. A limitation of these studies is that exposure level is only theoretical. In addition, the long term health effects of very small doses is still unknown.

Another concern is the extent to which chemicals may leach from the fields into the surrounding environment, soil and groundwater. The New York State Department of Environmental Conservation is investigating the impact of chemicals in rubber infill on groundwater and the environment. Results, as of May 2009, have not shown significant groundwater contamination, however, the study is still ongoing<sup>8</sup>. Lastly, the ability of infill-related chemical exposure to cause allergic reaction or irritation (skin or respiratory) has not yet been studied.

### **What are the proven hazards of turf fields?**

(1) Heat: It is unsafe for children to be playing on surfaces at extreme temperatures as they can develop heat-induced illnesses (eg. dehydration, heat stress, heat stroke, and heat burns)<sup>4</sup>. Temperatures on artificial turf fields are elevated as compared to natural grass turf. At the University of Missouri's turf field, surface temperature reached 173° F and "head level" height temperature reached 138°F on a 98°F day<sup>4</sup>. Heat levels on artificial turf fields are slightly lower in areas shaded from sunlight<sup>4</sup>.

(2) "Turf burn" or friction abrasions: Athletes who fall on turf fields can get friction abrasions called "turf burns", which should be cleaned with soap and water. However, injuries on turf fields are not increased with respect to injury rate or severity as compared with natural grass fields<sup>3,5,6,7,9,10</sup>.

### **Are there alternative infills?**

Yes. Some infill companies have begun to shift away from recycled tires and move towards alternative – non-recycled - infills. In NYC, all new fields will either be "carpet-style" –without infill – or use alternative infill materials<sup>1</sup>. NYC will also require suppliers of synthetic turf to provide information on chemical content as well as heat absorbancy (in addition to inspecting and testing existing fields)<sup>1</sup>. The health and environmental effects of these newer infills have not yet been studied.

### **Summary:**

Concerns about artificial turf are primarily the heat effects, the variability of crumb rubber composition, the risks of exposures due to frequent hand to mouth behavior in young children and the lack of research addressing multiple exposures to vulnerable populations including children. For fields with high usage such as soccer and football fields, NYC plans to use a replacement for recycled tire derived infill and has set standards that ensure fields are lead free. Further consideration of design elements that minimize heat effect should be considered. However, given the availability of safer alternatives natural grass fields should be strongly considered when feasible, especially for passive recreation areas.

### **Tips for safer use of artificial turf fields:**

- Do not use turf fields on extremely hot days.
- Parents and coaches should be educated on prevention and recognition of heat-induced illness.
- "Turf burns" should be cleaned with soap and water.
- When playing indoors, maximize ventilation by opening doors/windows and using fans.
- Monitor young children to prevent ingestions.
- Do not use turf fields for passive recreation (eg. sitting, lying).
- Always wear shoes on turf fields.
- At home, take off shoes and shake out your children's equipment and clothes outside the home or over the garbage.
- Have your child wash thoroughly after playing on the field.

## References:

1. Fact Sheet on Synthetic Turf Used in Athletic Fields and Play Areas. New York City Department of Health and Mental Hygiene Web site. Updated 2009. Accessed 10/5, 2010.
2. Ainslie V, Barr D, Borak J, et al. Committee report: Peer review of an evaluation of the health and environmental impacts associated with synthetic turf playing fields. The Connecticut Academy of Science and Engineering 2010.
3. Bjerneboe J, Bahr R, Andersen TE. Risk of injury on third-generation artificial turf in norwegian professional football. *Br J Sports Med.* 2010;44(11):794-798.
4. Denly E, Rutkowski K, Vetrano KM, et al. A review of the potential health and safety risks from synthetic turf fields containing crumb rubber infill. New York City Department of Health and Mental Hygiene. 2008.
5. Ekstrand J, Timpka T, Hagglund M. Risk of injury in elite football played on artificial turf versus natural grass: A prospective two-cohort study. *Br J Sports Med.* 2006;40(12):975-980.
6. Fuller CW, Dick RW, Corlette J, Schmalz R. Comparison of the incidence, nature and cause of injuries sustained on grass and new generation artificial turf by male and female football players, part 1: Match injuries. *Br J Sports Med.* 2007;41 Suppl 1:i20-6.
7. Fuller CW, Dick RW, Corlette J, Schmalz R. Comparison of the incidence, nature and cause of injuries sustained on grass and new generation artificial turf by male and female football players, part 2: Training injuries. *Br J Sports Med.* 2007;41 Suppl 1:i27-32.
8. Lim L, Walker R. An assessment of chemical leaching, releases to air and temperature at crumb-rubber infilled synthetic turf fields. New York State Department of Environmental Conservation; New York State Department of Health. 2009.
9. Meyers MC. Incidence, mechanisms, and severity of game-related college football injuries on FieldTurf versus natural grass: A 3-year prospective study. *Am J Sports Med.* 2010;38(4):687-697.
10. Soligard T, Bahr R, Andersen TE. Injury risk on artificial turf and grass in youth tournament football. *Scand J Med Sci Sports.* 2010.