Health Consultation

Lead in Artificial Turf

EASTER SEALS CHILD DEVELOPMENT CENTER
(a/k/a TUNDRA TYKES)
750 D STREET
ANCHORAGE, ALASKA
MUNICIPALITY OF ANCHORAGE BOROUGH

FEBRUARY 3, 2009

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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Prepared By:

Alaska Department of Health and Social Services
Division of Public Health, Section of Epidemiology
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry (ATSDR)

Summary and Statement of Issues

On October 16, 2008, the Alaska Department of Environmental Conservation (ADEC) notified the Alaska Division of Public Health's Environmental Public Health Program (EPHP) that the artificial turf at an Anchorage day care had been found to contain elevated levels of lead. The Municipality of Anchorage requested our assistance in evaluating the public health significance of the turf lead levels, and asked for our recommendations for appropriate public health interventions.

The artificial turf at the Easter Seal's Child Development Center ("Tundra Tykes") was tested for lead during the summer of 2008, following a Health Advisory from the Centers for Disease Control and Prevention (CDC) (1). The CDC advisory noted a discovery by the New Jersey Department of Health and Senior Services that some artificial turf (often used on football fields or other recreational areas) made of nylon or nylon/polyethylene blend fibers contained lead levels of potential public health concern. In response to the CDC Health Advisory, the Municipality of Anchorage and the ADEC partnered in an exploratory pilot to test the artificial turf at two different locations in Anchorage. The artificial turf field at Tundra Tykes contained 5,600 parts per million (ppm) of lead, which was similar to the elevated lead levels found in some New Jersey artificial turf fields. The second field tested had a very low lead concentration that was not of public health concern.

Background

Site Description

The Tundra Tykes child development center is located in downtown Anchorage, Alaska. The facility is one of only six day care facilities in Anchorage that is accredited by the National Association for the Education of Young Children (NAEYC). Tundra Tykes is housed in a building that was constructed about three years ago; the facility has been in operation since January 2006. The artificial turf at the facility was installed in the fall of 2005. The artificial turf at Tundra Tykes is on two outdoor play areas, which are each partially covered by age-appropriate play equipment. One play area of approximately 200 square feet is utilized by infants and one-year olds, while the other field of approximately 450 square feet is utilized by children aged two to six years.

Anchorage is the largest municipality in Alaska, with an estimated population of 278,700 in 2006, or about 40% of Alaska's total population (2). The racial makeup of Anchorage is approximately 72% white and 7% Alaska Native; other predominant races in Anchorage are black, Asian, Hispanic and Latino, and mixed race.

Site Demographics

Tundra Tykes provides day care services for children from six weeks to six years of age. The center is licensed to enroll eighty children; approximately seventy children are currently enrolled. The center is open for twelve hours a day, five days a week. Children play outdoors for an approximate ½ hour period twice per day in the winter, and an approximate one hour period twice per day in the summer. It is during their outdoor play time that the children are potentially exposed to the artificial turf at the facility, although they sometimes go on walks to off-site

locations instead. Approximately 60% of enrolled children have at least one parent who is employed by the federal government, as enrollment preference is extended to the children of federal employees.

Methods and Data Evaluated

Results of three distinct sampling events, involving three different sample types, were evaluated (Table 1).

Artificial turf fibers

During the first sampling event on July 21, 2008, a sample of the artificial turf fibers ("grass") was clipped from a relatively high traffic area of the turf. The sample was submitted to the ADEC's Environmental Health Laboratory for analysis. When a lead result of 5,600 ppm was reported for the sample, the Municipality of Anchorage obtained a second sample on October 21, 2008 to verify the result. The "duplicate" sample result was similar, with 6,100 ppm lead.

Wipe on turf surface using filter paper and 1% nitric acid

On October 23, 2008, the Municipality of Anchorage collected a wipe sample of the artificial turf surface in a relatively high-traffic area. The sample was collected by soaking a piece of Whatman® filter paper in 1% nitric acid, and wiping it on a 6-inch by 6-inch area to collect any dust particles that may have been on the turf surface. This was not a standard collection method of the U. S. Environmental Protection Agency (EPA), and it was problematic because the dilute nitric acid likely removed lead from within the fibers rather than assessing what was readily available to children for uptake from the turf surface (from the dust). Thus, the EPHP could not evaluate the results in terms of potential health impacts with this non-standard sampling method. The EPHP consulted with partners from state and federal health agencies to identify standard laboratory methods for additional wipe sampling, and appropriate public health guidelines to interpret the test results.

Wipe on turf surface using standard EPA methodology

The Municipality of Anchorage selected a laboratory, NVL Labs in Seattle, Washington, that is recognized by the EPA's National Lead Laboratory Accreditation Program (NLLAP) to analyze lead in dust wipes. Another round of wipe samples were collected on October 30, 2008, using Ghost Wipes® and standard methodology as recommended by the laboratory. Samples were collected by wiping one square foot of turf surface area and placing each sample in a sealed jar. A sample was collected from the same high-traffic area that had been tested before, and from a low-traffic area of the turf. The Municipality also checked for background contamination by sampling real grass outside a nearby building, and submitted a blank sample for analysis to assess laboratory data quality. The blank sample and off-site background samples did not contain lead at or above the laboratory reporting limit of 9 $\mu g/ft^2$ (micrograms per square foot).

Table 1. Lead levels in artificial turf samples from Tundra Tykes			
Sample date	**Sample Description**	**Lead Concentration**	**Footnote**
July 21, 2008	Artificial Turf Fiber	5,600 ppm	1
October 21, 2008	Artificial Turf Fiber	6,100 ppm	1
October 23, 2008	Wipe on turf using non-standard methods	26 µg/ft^2	2
October 30, 2008	Wipe on turf - High-traffic area	9 µg/ft^2	3
October 30, 2008	Wipe on turf - Low-traffic area	<9 µg/ft^2	3
October 30, 2008	Wipe on turf - Off-site Grass	<9 µg/ft^2	3

1: ppm = parts per million of lead in turf fiber

2: wipe of surface collected with Whatman® filter paper and 1% nitric acid; laboratory not NLLAP-certified

3: wipe of surface collected using Ghost Wipes® and standard EPA methods; laboratory NLLAP-certified

Discussion

Significance of lead levels in artificial turf

The lead contained within an artificial turf's fibers does not pose a health risk to people unless the lead is released from the turf (mainly through deterioration over time into dust) and taken into the body. When new artificial turf contains lead, the risk for harmful lead exposure is low because the turf fibers are still intact and the lead is unlikely to be available for uptake (1). Wipe samples of the Tundra Tykes turf were taken to see if the lead in the turf was available to people (see next section).

The possibility for harmful lead exposures can become greater as artificial turf ages. Over time, artificial turf becomes increasingly weathered and worn, and the turf fibers may become abraded, faded or broken. As the turf fibers break down they create dust, and the lead in the dust becomes potentially more available for uptake. The main pathways of lead exposure from degrading artificial turf include ingestion (swallowing) from hand-to-mouth activity, and inhalation (breathing in) of dust that contains lead.

The levels of lead in the artificial turf fibers from Tundra Tykes are in the same range as those found at three athletic fields in New Jersey (3,4). These fields were in use approximately 5 to 9 years before the turf was tested. Dust samples from two of these New Jersey turf fields, which were about five years older than the Tundra Tykes turf, revealed potentially unsafe concentrations of lead in dust from the artificial turf. Additional testing of one of these New Jersey fields found that the lead in the dust was bioaccessible under conditions that simulate the human digestive process, meaning that the lead was available for the body to absorb (4).

The significance of lead content in artificial turf is somewhat controversial. On July 30, 2008, the Consumer Product Safety Commission (CPSC) issued an advisory that stated "CPSC Staff finds Synthetic Fields OK to Install and OK to Play On" (5). Other scientists disagree with the CPSC's findings, and find fault with the agency's risk assessment methodology (6). On August 14, 2008 the Consumer Product Safety Improvement Act was signed into law, authorizing the CPSC to ban lead beyond minute levels in products for children 12 years or younger.

Significance of surface wipe test results

The most effective way to determine whether lead within artificial turf fibers is available for uptake by people is to test the dust that is lying on the turf's surface. To perform this test, a known area of the turf (usually one square foot) is wiped to remove the surface dust. The wipe is

placed in a glass container and sent to a laboratory, which measures the total amount of lead contained on the wipe.

Wipe test results from the artificial turf at Tundra Tykes were compared to an EPA benchmark (a health value below which is considered safe) of 25 μg lead/ft^2. The EPA developed this benchmark to evaluate lead in residential dust of Manhattan homes near ground zero after September 11, 2001. In Manhattan, families with children under the age of seven with wipe sample results greater than 25 μg lead/ft^2 were strongly encouraged to have their children's blood lead level tested (7). For comparison, another health-based benchmark for wipe samples from interior floors by the U.S. Housing and Urban Development is 40 μg lead/ft^2. We used the EPA benchmark because it is more conservative (protective).

The first wipe sample of artificial turf from Tundra Tykes was collected using a method developed for other types of environmental assessments. This method apparently over-estimated the available lead concentration, because the dilute 1% nitric acid solution in the filter paper likely extracted lead from intact turf fibers. The result of that wipe sample was 26 μg lead/ft^2, which is slightly above the EPA benchmark. However, additional sampling was needed to more accurately assess potential lead exposure to children under more realistic conditions.

For the second set of wipe samples, standard wipe collection methodology was used (8) and samples were analyzed by a NLLAP-recognized laboratory (9). A "blank" wipe sample that was not wiped on any surface, a "background" wipe sample from a nearby off-site lawn, and a wipe sample from a low-traffic area of turf at Tundra Tykes all tested negative for lead. This means the lead content in those three samples was less than the laboratory's reporting limit of 9 μg lead/ft^2. A wipe sample collected from a high-traffic area of turf at Tundra Tykes contained 9 μg lead/ft^2.

Since the amount of lead in the wipe sample from the high-traffic area was below the EPA health-based benchmark of 25 μg lead/ft^2, the artificial turf does not pose a current health hazard to children at Tundra Tykes. However, the fact that lead was detectable in wipes from the high-traffic area but not the low-traffic area at Tundra Tykes, combined with the results of the New Jersey studies, suggests that wear and tear from normal use will make the lead in the turf fibers more available to children over time. Lead in the artificial turf may pose a risk to children at some point in the future unless the exposure pathway is removed (either by removing the artificial turf or prohibiting children's access to it). For this reason, periodic wipe sampling of the turf using standard methodology is recommended to monitor the availability of lead to the children.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than adults; this means they breathe dust, soil, and vapors closer to the ground. A child's lower body weight and higher intake (breathing) rate result in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing and medical care, and for risk identification. Thus, adults need as much information as possible to make informed decisions regarding their children's health.

Children are more susceptible to lead toxicity than adults, because their brains are still developing (10). Lead can delay or impair brain development in children and adversely affect IQ, and affect their ability to learn and develop normally. Lead can also cause anemia and impaired metabolism of vitamin D. Children under the age of seven are considered most vulnerable to the harmful affects of lead. Absorption of lead appears to be higher in children who have low dietary iron or calcium intakes, so a healthy diet is important. Adequate intake of zinc is also important to help protect against health effects from lead exposure.

Children's exposure to lead can be minimized by practicing good hygiene. Always wash children's hands after they come in from outdoor play, and before they eat or drink. Wash hands for at least 20 seconds, using soap and warm water.

Children can be exposed to lead from a number of different sources. One common source of lead exposure is lead-based paint. Although lead was banned from most U.S. paints in the 1970s, some children are still exposed to lead from chipping, deteriorated paint from old houses or buildings. Although lead-based paint is not a major issue in Alaska, we have seen lead exposures from fishing weights, lead ammunition, toys, ceramic dishes, consumption of game shot with lead, and other sources (11). The CDC recommends that all young children be screened for potential lead risk factors (12), and in many parts of the country blood lead testing is part of standard pediatric practice. Parents who are concerned about their child's potential lead exposures may want to ask their pediatrician to test their child's blood lead level.

Conclusions

1) The artificial turf at the Tundra Tykes child development center contains 5,600 ppm of lead within its fibers. This is a relatively high concentration of lead; however, as long as it remains contained within the fibers, the exposure risk is low.
2) The artificial turf at Tundra Tykes is relatively new, and the fibers are not yet worn. Surface wipe tests show that the lead contained in the turf fibers is not available for uptake from the turf surface (e.g. dust) at a level of public health concern. Therefore, the artificial turf at Tundra Tykes currently poses no apparent public health hazard.
3) As the artificial turf at Tundra Tykes becomes worn with use and age, the turf surface will probably contain increasingly higher amounts of lead-containing dust as the turf fibers degrade. If exposure pathways to the degraded turf exist, the turf may become a public health hazard in the future.

Recommendations

1) Collect surface wipe samples from the Tundra Tykes artificial turf at least once per year. Use standard EPA methods for surface wipe collection, and have the lead content analyzed by a NLLAP-recognized laboratory.
2) Do not allow children under the age of seven to play on the turf if the surface wipe results are 25 μg lead/ft^2 or higher, without consulting first with a EPHP toxicologist to more thoroughly assess potential lead exposures through blood lead testing or modeling. As physical activity is critical to the healthy development of children, substitute play areas would need to be identified so that outdoor play opportunities are not diminished.

3) Follow general lead safety practices, which can help prevent children from being exposed to the many sources of lead in the environment. These include:
    a. Wash children's hands frequently, using soap and warm water. Always wash children's hands when they come in from playing outside, and before they eat or drink.
    b. Do not eat food or use pacifiers that have been dropped on the ground or on the artificial turf.
    c. Remove shoes when entering the child development center. Maintain one clean pair of shoes for indoor use, and reserve another set of footwear for outdoor play.
4) Blood lead testing is not necessary for children at Tundra Tykes, since wipe samples of the artificial turf do not show lead dust at levels of health concern. However, concerned parents may request that their pediatrician perform a blood lead test for their child for verification purposes and peace of mind.
5) Report elevated blood lead test results (≥10 µg/dL) to the Environmental Public Health Program at 907-269-8000.

Public Health Action Plan

Actions undertaken:

- Samples of artificial turf from Tundra Tykes child development center, including turf fibers and surface wipes, were tested to determine lead content and availability.
- EPHP, ADEC, Municipality of Anchorage, and the Tundra Tykes child development center have met to discuss the situation.

Actions under way:

- EPHP is developing a fact sheet for parents at the Tundra Tykes child development center.

Actions planned:

- EPHP will distribute the health consultation and fact sheet to Tundra Tykes administrators, parents, and the Municipality of Anchorage.
- EPHP will conduct an informal needs assessment after the documents are released, to determine what additional health education activities are needed.

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Certification

This Health Consultation (Lead in Artificial Turf, Easter Seals Child Development Center, aka Tundra Tykes) was prepared by the Alaska Department of Health and Social Services under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedures existing at the time the health consultation were initiated. Editorial review was completed by the Cooperative Agreement partner.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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