

Artificial Turf and Children's Health

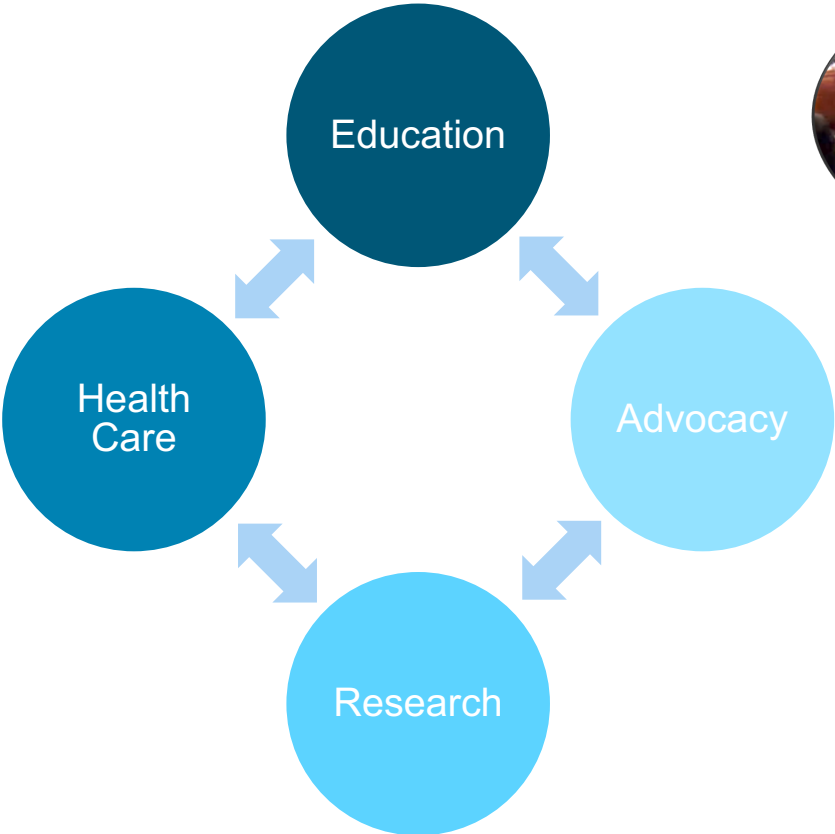
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Collaborative on Health and the Environment
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**Mount
Sinai**

Mount Sinai Institute for Exposomic Research Children's Environmental Health Center



Chronic diseases are on the rise

Your lifetime risk has doubled or tripled for many common diseases in the past 20 years



1 in 10

Alzheimer's Disease



1 in 12

Asthma



1 in 44

Autism



1 in 3 / 2

Cancer in Women/Men



1 in 12

Cardiovascular Disease



1 in 6

Developmental Disabilities



1 in 10

Diabetes



1 in 10

Food Allergy



1 in 10

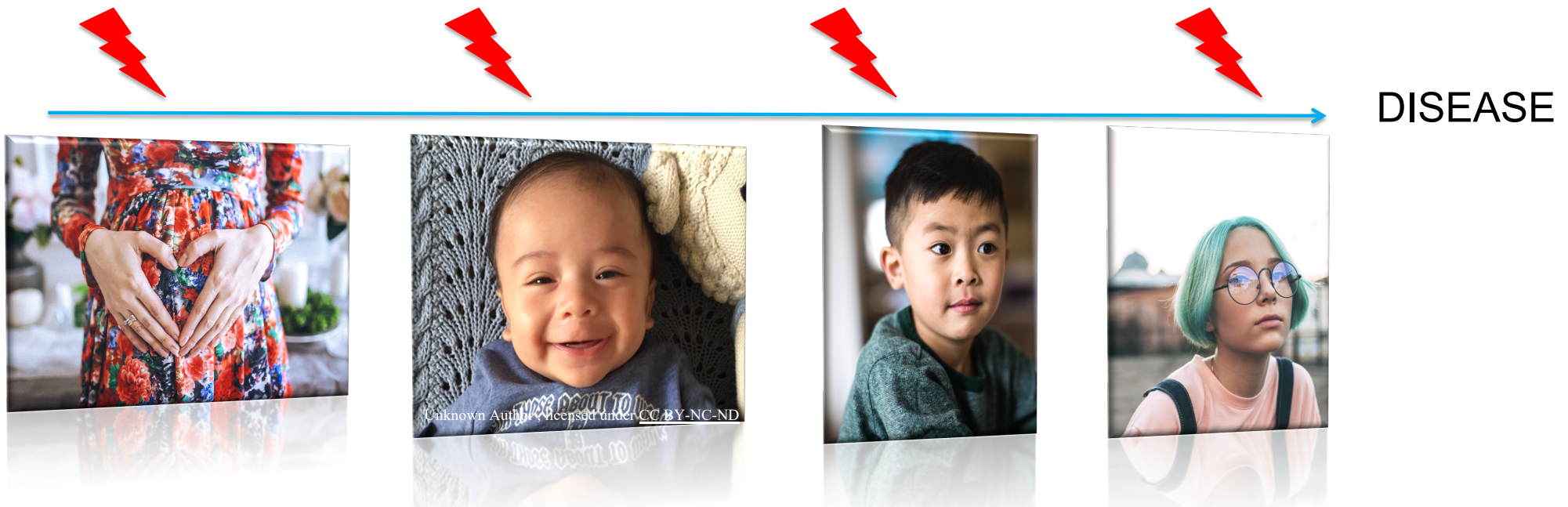
Infertility in Couples

Overview

- Vulnerable populations
- Chemicals of concern
- Heat
- Injuries and abrasions
- Tips for safer play

Windows of Susceptibility

Not just *what*, but *when*



During these time periods, developing systems are most sensitive to certain environmental toxins.

Children are not little adults



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GREENPEACE

Our Chemical Body Burden



- 200+ chemicals
- Some exposures higher in children
- Higher exposures in Black and Hispanic participants
- Chronic, low-dose + cumulative
- Clinical relevance?

<https://www.cdc.gov/nchs/nhanes/>

Chemicals of Concern in Turf

Carcinogens

- Benzene
- PAHs
- Styrene
- Cadmium
- Arsenic
- PFAS
- VOCs

Neurotoxicants

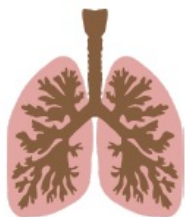
- Lead
- Zinc
- Phthalates
- VOCs

Reproductive Toxicants

- Phthalates
- Plasticizers

Respiratory Irritants

- VOCs
- Particulate matter
- Silica



Inhalation of chemicals and particles

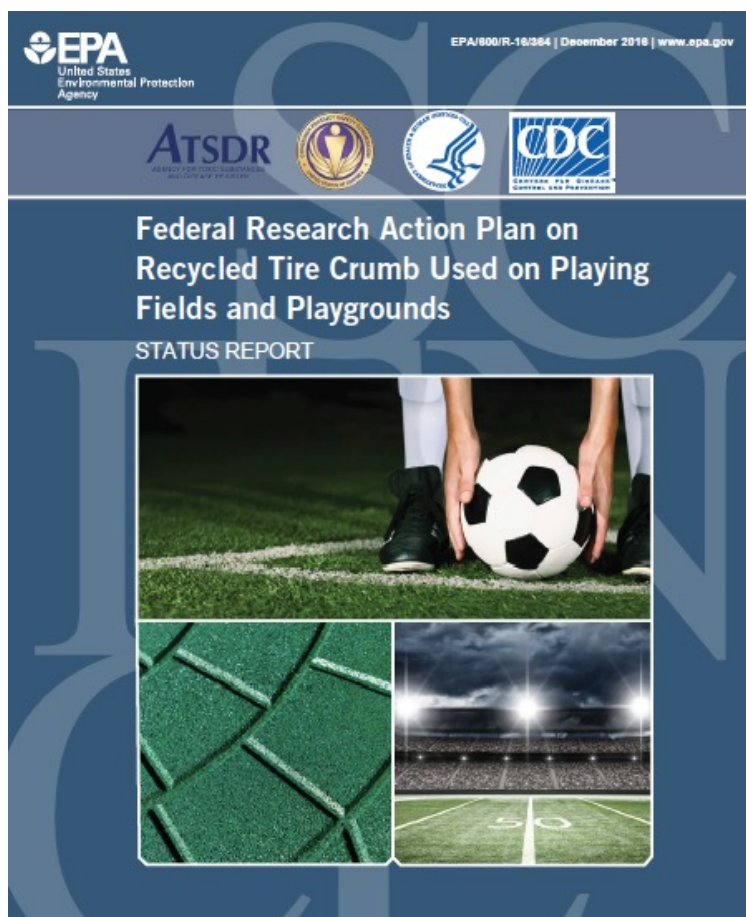


Dermal contact and absorption through the skin or open wounds



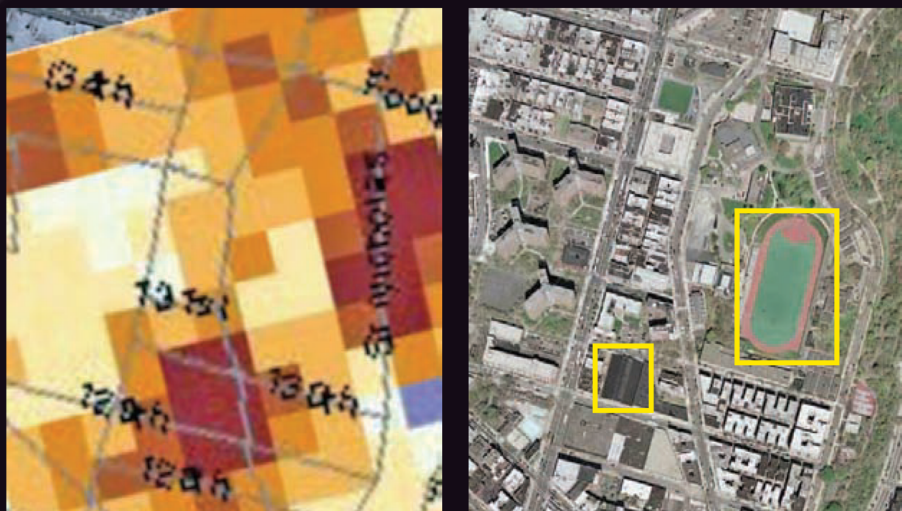
Ingestion of turf infill particles

Federal Turf Study



“Studies to date...have limitations and do not comprehensively evaluate the concerns about health risks from exposure to tire crumb rubber.”

Heat effects of turf



Thermal effect. An image taken 14 August 2002 by NASA's Landsat satellite (left) shows surface temperatures in upper Manhattan (red indicates warm temperatures, and blue indicates cool temperatures). A large synthetic turf field created high temperatures similar to those on a large black roof (see Google Earth image, right). Cool spots almost always correspond to urban vegetation, such as parks, street trees, and water bodies.

- Surface temperatures up to 200°F
 - 50°F higher than natural grass
 - 70°F hotter than air temp
- Increased air temperature at head height
- Watering provides limited cooling

Surface Temperature in Turf Field and Playgrounds

Crumb Rubber Infill Turf Field

Ambient temperature: 80°F

Surface temperature: 101.9°F

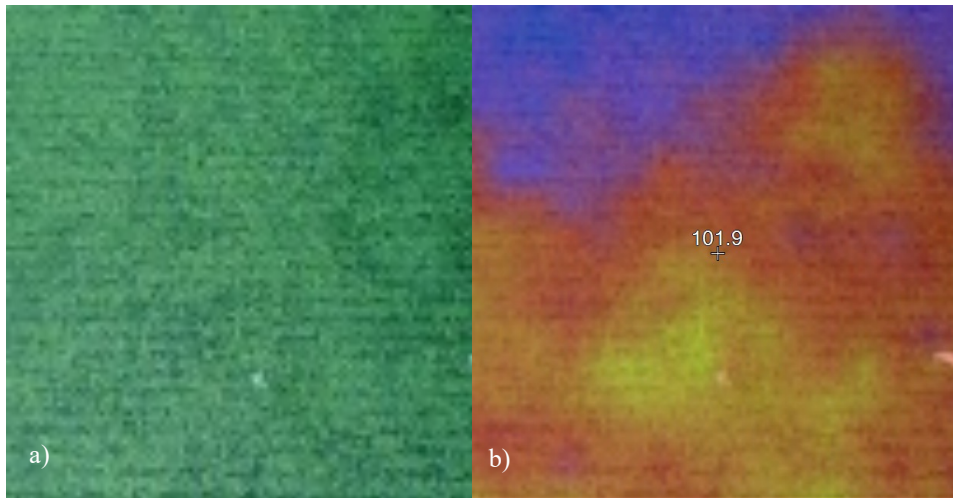


Figure. Measurement of Crumb rubber Turf Field Surface Temperature with Infrared (IR) Thermometer: a) Image of crumb rubber playground surface; b) IR Thermal image of surface. Ambient temperature: 80°F

Crumb Rubber PIP Playground

Ambient temperature: 85°F

Surface temperature: 157.4°F

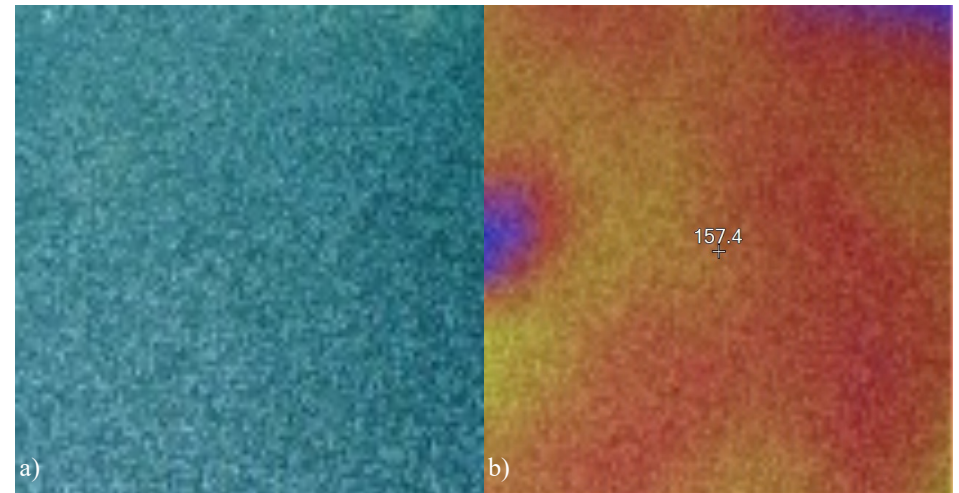


Figure. Measurement of Playground Surface Temperature with Infrared (IR) Thermometer: a) Image of crumb rubber playground surface; b) IR Thermal image of surface. Ambient temperature: 85°F

Courtesy: Homero Harari, Mount Sinai

Health effects of hot turf

- **Heat illness**

- #1 cause of death and disability in high school athletes
- Football players most impacted
- Marching bands also at risk

- **Skin burns**

- 1st degree: 118°F
- 2nd degree: 131°F



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Injuries and Abrasions

- Knee injuries
 - ACL, PCL
- Concussion
 - Temperature and maintenance are key
- “Turf burn”
 - Skin abrasion
 - May increase risk of chemical exposures
 - Increases risk of infection include MRSA



Sydney Leroux ✓
@sydneyleroux



This is why soccer should be played on grass!



10:53 PM · Apr 14, 2013



♥ 2.5K 💬 Reply 🔗 Copy link

[Read 397 replies](#)

Indirect health effects: climate change

- Heat islands
- Flooding
- Petroleum-based
- Greenhouse gas emissions



Extreme heat increases risk of illness and dehydration.



Poor air quality due to increased pollutants and pollen worsen asthma and other breathing and heart problems.



Warmer temperatures promote the growth of bacteria, viruses, and insects.



Extreme weather causes injuries, missed work and school, and mental health issues.



Food supply problems cause malnutrition.

Tips for Safer Play



Westport, CT

- Post **safety warnings**
- **Avoid** use on **hot days**; measure surface temperature
- **Avoid** lounging and **passive activities**
- **Wash hands** before touching face/eating
- **Clean cuts** immediately
- Remove and **shake out gear** and clothes
- Brush hair and **shower** ASAP
- **Monitor** for ingestion
- **Vaccuum** any infill that enters your home or car
- **Ventilate** indoor fields

Be a Smart Consumer

- Consider **properly maintained grass** fields
- Consider **wood mulch or pea gravel** on play grounds
- Be aware of **Greenwashing**
- Look for **transparency**
 - Composition
 - Hidden costs
 - Maintenance chemicals
- Consider the **site**
 - Wetlands?
 - Residential?
 - Shade?
 - **Environmental Justice** community?



Appropriate Surfacing

- Any material tested to ASTM F1292, including unitary surfaces, engineered wood fiber, etc.
- Pea gravel
- Sand
- Shredded/recycled rubber mulch
- Wood mulch (not CCA-treated)
- Wood chips

<https://www.cpsc.gov/s3fs-public/325.pdf>

The Partnership for Healthy Playing Surfaces

Home

Chemicals

Health

Environment

Science

Comparisons

For Players & Coaches

Learn more about different playing field surfaces and how they can affect your performance and safety.



For Parents

The choice of playing field surfaces can have implications for your child's future. Learn more.



For Policy Makers

A wide range of health and cost issues should be considered in the choice of playing field surfaces. Learn more.



For Medical Professionals

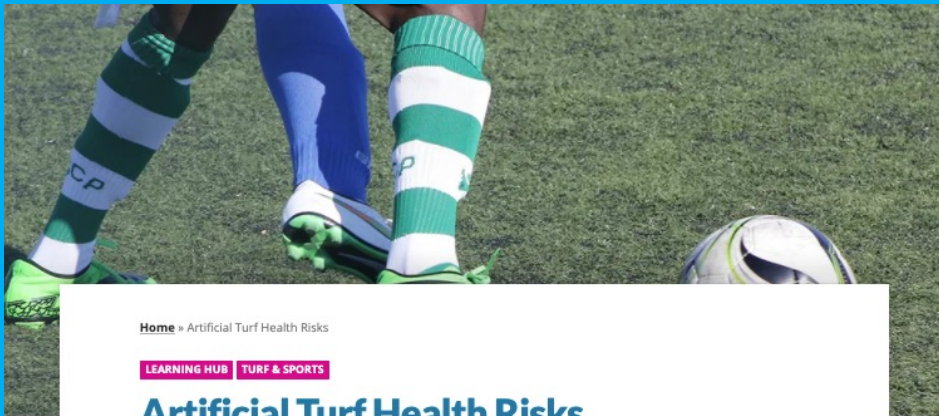
The materials used to construct playing field surfaces can present significant health risks. Learn more.



<https://www.healthyplayingsurfaces.org/>

Learn More

<https://sinaisexposomics.org/artificial-turf/>



[Home](#) » Artificial Turf Health Risks

LEARNING HUB | TURF & SPORTS

Artificial Turf Health Risks

August 3, 2021

Many turf products are available or “ecofriendly”, but it can be difficult for children. Read this entry to learn more and understand what the potential health risks may be.



Mount Sinai Children's Environmental Health Center

Position Statement on the use of Recycled Tires in Artificial Turf Surfaces

Position: Based upon the presence of known toxic substances in tire rubber and the lack of comprehensive safety studies, The Children's Environmental Health Center of the Icahn School of Medicine at Mount Sinai urges a moratorium on the use of artificial turf generated from recycled rubber tires.



Icahn School of Medicine at Mount Sinai
Children's Environmental Health Center

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Artificial Turf: A Health-Based Consumer Guide

If your school, community, or business is considering installing an artificial turf field, it's important to be an educated consumer. Many turf products are available and some are even advertised as “green” or “eco-friendly”, but it can be difficult to assess their safety for use by children because adequate risk assessment studies that assess all potential routes of exposure during realistic play conditions have not been conducted. This guide will help you dig deeper than the label on the packaging to learn what chemicals these products contain, how children may be exposed to these chemicals, and understand what the potential health risks may be.

This Guide will:

- 1) Describe turf infill options and chemicals of concern.
- 2) Identify how children can be exposed to these chemicals.

artificial turf products.
ers you want to hear).



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BPA and Phthalates

CHILDREN'S ENVIRONMENTAL HEALTH CENTER at the MOUNT SINAI INSTITUTE FOR EXPOSOMIC RESEARCH

Bisphenol A (BPA) and phthalates are chemicals that are added to some plastics.

Household Chemicals: Keeping Your Family Safe During COVID-19

CHILDREN'S ENVIRONMENTAL HEALTH CENTER at the MOUNT SINAI INSTITUTE FOR EXPOSOMIC RESEARCH

Proper cleaning, disinfecting, and handwashing are important to prevent transmission of COVID-19. However, chemicals in some products can be harmful to your health. Protect your family from both COVID-19 and chemical exposures by choosing safer products and practices.

Outdoor Air Pollution

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Air pollution refers to harmful gases or particles in the air that come from both natural and man-made sources.

Artificial Turf

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Synthetic or artificial turf is a multi-layer product used as a surface on athletic playing fields, golf courses, and residential lawns.

It typically consists of:

- A top layer of fibers usually made of nylon, polypropylene, or polyethylene designed to mimic natural grass blades; infill that provides cushioning and serves as a base for the blades; a backing layer; a drainage layer; and additional padding in some applications.

Artificial turf poses a health risk to children through chemical exposures.

Chemicals known to be carcinogenic such as heavy metals, volatile organic compounds (e.g. benzene), polycyclic aromatic hydrocarbons, and 1,3-butadiene have been detected in turf infill made from recycled tires. Further study is needed to characterize the complete chemical composition of infill made from materials other than tires.

Exposure can happen through:

- Inhalation of chemicals and particles
- Dermal contact and absorption through the skin or open wounds
- Ingestion of turf infill particles

Non-chemical exposures of concern to children are...

- Heat:** Turf surface temperatures can get up to 55°F higher than grass, and recorded as high as 200°F on a summer day.
- Turf burn:** Playing on artificial turf has been shown to result in more skin abrasions than grass.

People work out jobs where high expos contain

Glyphosate

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Glyphosate is a weed killer, or herbicide. It is the most extensively used pesticide in the world today for both residential and agricultural purposes.

Agency for Research on Cancer (IARC) has probably carcinogenic to humans based on strong evidence that it causes cancer in...

HOW ARE WE EXPOSED TO GLYPHOSATE?

Glyphosate is used on many crops and in many household products. It can be found in food, water, and the environment.

Pesticides

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Pesticides repel or kill unwanted pests such as insects (insecticides), rodents (rodenticides), fungi (fungicides), and weeds (herbicides). All pesticides have the potential to be toxic to humans. Pesticides sold in the United States must be registered with the Environmental Protection Agency (EPA).

HOW ARE WE EXPOSED TO PESTICIDES?

We are exposed to pesticides through food, water, and the environment. Pesticides can be found in many household products.

WHO IS MOST AT RISK FOR PESTICIDES?

- Children are at highest risk for exposure due to their proximity to the ground where...

Phthalates

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Phthalates are chemicals added to plastics to make them more flexible and to cosmetic and personal care products to help retain fragrance and color.

HOW ARE WE EXPOSED TO PHTHALATES?

- Food and Beverages: Phthalates can seep out of plastic containers and be ingested.
- Cosmetics and cleaning products: Soaps, lotions, makeup, cleaning agents, air fresheners, and other household products that contain fragrance are likely to contain phthalates.

WHO IS MOST AT RISK FOR PHTHALATES?

- Children are exposed to higher levels of phthalates because they are closer to the ground where chemicals can be dust, often put their hands in their mouths, and ingest more food for their body weight. They are more vulnerable to the health risks of phthalates because their bodies are still rapidly developing.

Flame Retardants

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Flame retardants are chemicals added to a number of products to meet regulatory standards for a product's ability to resist catching on fire. However, mounting evidence demonstrates that many of these chemicals are not effective at preventing fires. Furthermore, recent studies suggest that human health risks associated with flame retardants may outweigh their benefits.

HOW ARE WE EXPOSED TO FLAME RETARDANTS?

Flame retardant chemicals are released from everyday items that contain them and can then accumulate in house dust. Exposures are increased when foam is damaged or exposed. Flame retardant chemicals persist in the environment and accumulate in fatty tissues, which means they stay in the body for years. For these same reasons, animals may be exposed to flame retardants in the environment. Eating animal products can also be a source of exposure.

WHERE ARE FLAME RETARDANTS FOUND?

- Upholstered Furniture
- Carpet padding
- Baby products (e.g. car seats, changing pads, crib mattresses)
- Electronics

WHO IS MOST AT RISK FROM FLAME RETARDANT EXPOSURE?

- Children are at highest risk for exposure due to their proximity to the ground where dust settles and their hand-to-mouth behaviors. Infants in homes with a greater number of infant products (e.g. infant strollers, car seats, gliders, bouncer seats, changing pads, etc.) have higher levels of flame retardant chemicals in their bodies.
- Fetuses: Flame retardant chemicals have been shown to cross the placenta, and exposures during pregnancy are associated with hormonal, reproductive, cognitive, and behavioral changes in offspring in animal and human studies.
- Firefighters are at particular risk to exposure by inhalation as many building supplies and furnishings are treated with flame retardants which are released in the form of toxic smoke when they burn.

ICahn School of Medicine at Mount Sinai
Institute for Exposomic Research
icahn.mssm.edu/exposomics

HEALTHY WORLD, HEALTHY YOU

Story and Activity Book

Vol. 2

HEALTHY WORLD, HEALTHY YOU

Climate Change and Your Neighborhood

Story and Illustration by Valeria Menéndez, MPH
Tips for a Healthy Environment by Sarah Evans, PhD, MPH

<https://sinaieuxposomics.org/learning-hub/>

<https://icahn.mssm.edu/about/departments/environmental-public-health/cehc/information>

Acknowledgments



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New York State **Children's**
Environmental Health Centers

**The Mount Sinai Environmental
Health Sciences (EHS) Core Center**
(P30ES023515)