Understanding Health Risks

Technical Assistance for Brownfields Program
EPA Region 1

Sara Wakai, PhD

Assistant Professor, Center for Population Health

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UCONN HEALTH

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Understanding Health Risks

Welcome & Introduction

- Sara Wakai, PhD, Assistant Professor
  - UConn Health, Center for Population Health

Acknowledgement - Technical Assistance of Brownfields Program

- Marisa Chrysochoou, PhD, Professor and Department Head
  - Civil and Environmental Engineering, UConn
  - Program Director UConn Technical Assistance for Brownfields Program (TAB). Region 1 (New England States)
- Nefeli Bompoti, PhD, Assistant Research Professor
  - Civil and Environmental Engineering, UConn
  - Program Manager UConn Technical Assistance for Brownfields Program (TAB). Region 1 (New England States)

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Presentation Objectives

- Health risks commonly associated with brownfield sites
- Common brownfield contaminants
- Routes of exposure and ways to avoid exposure

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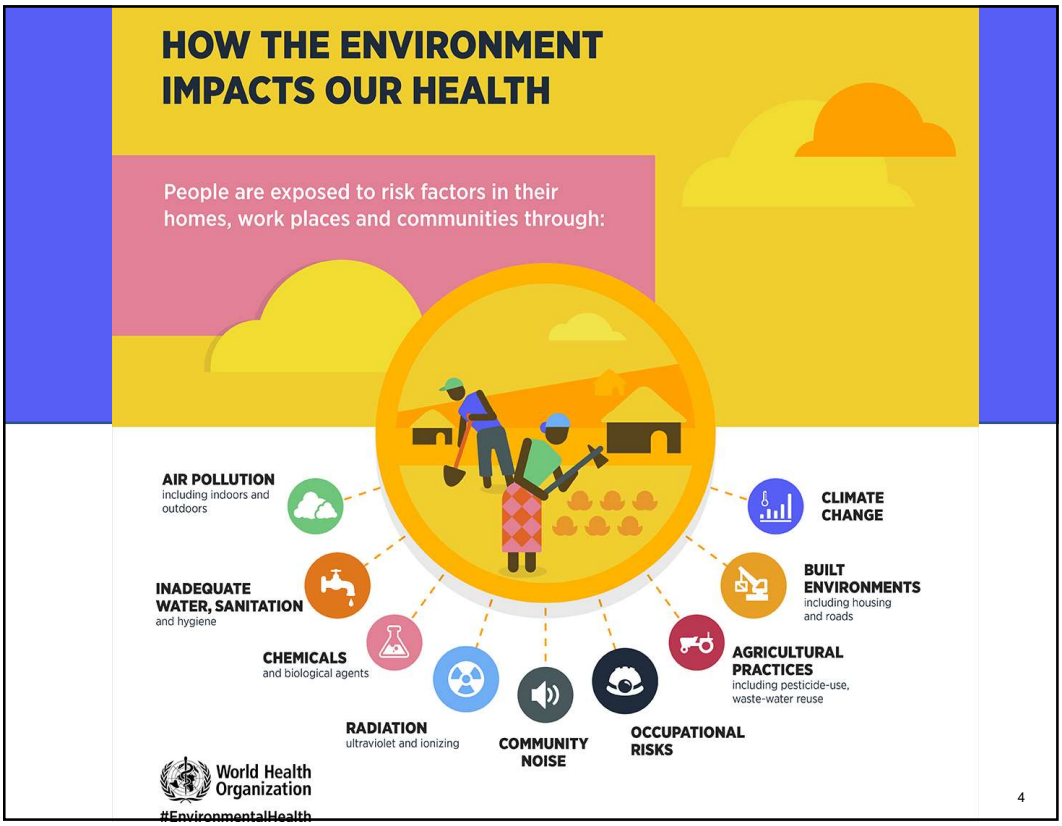

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Estimating Health Risk

Risk = Toxicity x Exposure

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Toxicity

- The potential of a substance to cause damage to living things.

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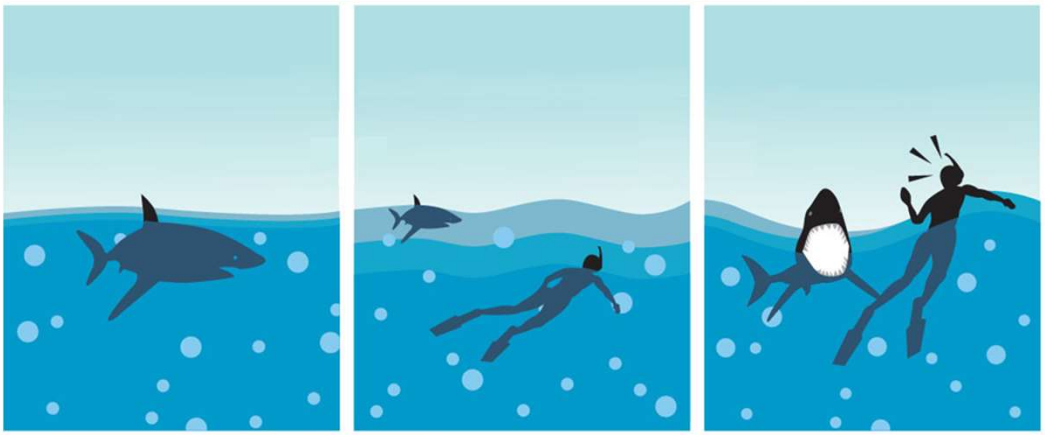
Exposure



https://synergist.aiha.org/202105-sharks-and-swimmers

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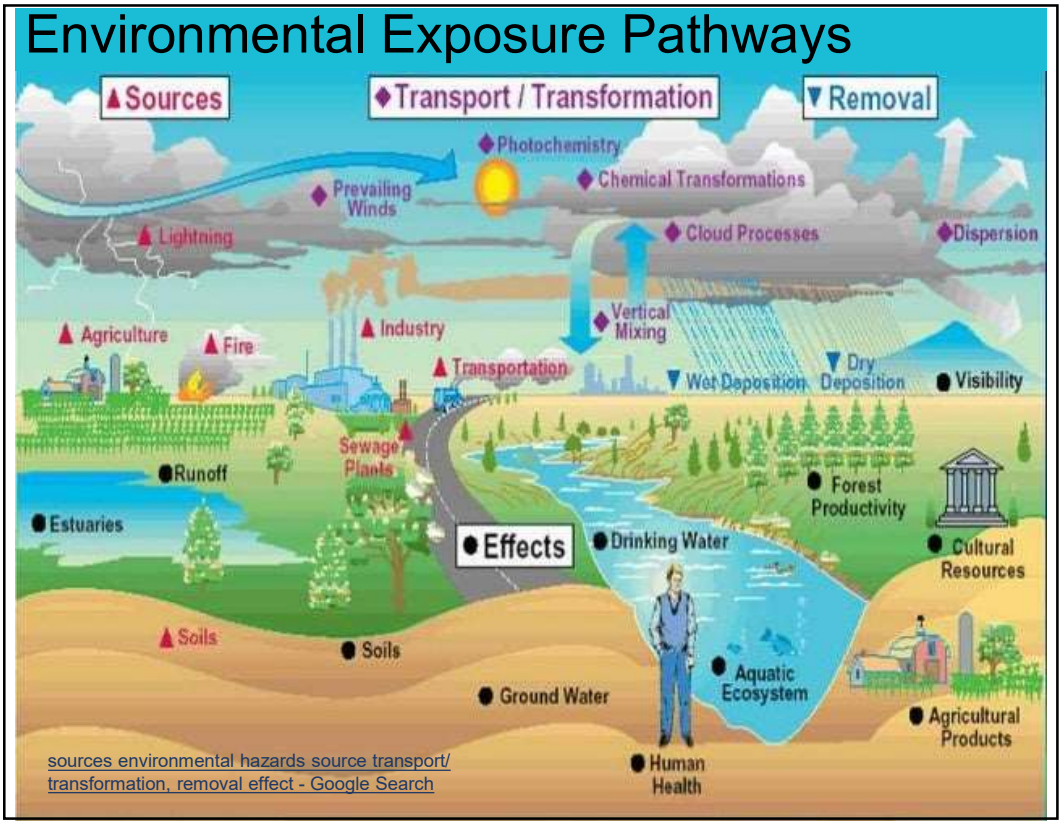
Environmental Exposure Pathways



sources environmental hazards source transport/ transformation, removal effect - Google Search

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Individual Exposure Pathways

1 Breathing

2 Eating or drinking

3 Direct contact with the skin

https://www.epa.gov/brownfields/understanding-brownfields

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Factors that may influence exposure

Distance from source

Wind / Weather

Length of Time

Brownfields and Public Health | US EPA

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Risks may be greater for some people

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Type of Exposure

The time duration and amount (dose) of exposure to a contaminant or toxic substance determines the imminent danger to life and health

Acute	Chronic
Short time period	Long time period
Short-term health effects	Long-term health effects

Dose Response Assessment Tables | US EPA 2021

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What is a Contaminant?

A contaminant may be a biological, chemical, physical or radiological substance that becomes harmful for humans or living organisms when introduced to air, water, soil or food.

www.safeopedia.com

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Environmental Contaminants Often Found at Brownfield Sites

Contaminant	Substance Type	Examples of Past Uses
1. Lead (Pb)	Metals	Mining, fuel, paint, inks, piping, batteries, ammunition
2. Petroleum	Oil, hydrocarbon compounds	Drill and refining, fuel, chemical and plastic production
3. Asbestos	Fiber in rock	Mining and processing, piping, insulation, fire proofing, brakes
4. Polycyclic aromatic hydrocarbons (PAHs)	Hydrocarbon compounds, combustion byproduct	Coal tar, creosote, soot, fire, industry/ manufacturing byproduct
5. Other metals	Metals	Metal fabrication, plating, mining, industry/ manufacturing
6. Volatile organic compounds (VOCs)	Manmade chemicals	Industry and commercial product solvents, degreasers, paint strippers, dry cleaning
7. Polychlorinated Biphenyls (PCBs)	Manmade chemicals	Heat and electrical transfer fluids, lubricants, paint and caulk, manufacturing, power plant
8. Arsenic (As)	Metals	Pesticides, agriculture, manufacturing, wood preservative

Environmental Contaminants Often Found at Brownfield Sites (epa.gov)

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Environmental Contaminants Often Found at Brownfield Sites

	Contaminant	Potential Health Effects
1	Lead (Pb)	Damage to brain, nerves, organs, and bone cancer
2	Petroleum	Headache, nervous system, immune, liver, kidney, and respiratory damage, cancer
3	Asbestos	Lung scarring, mesothelioma and lung cancer
4	Polycyclic aromatic hydrocarbons (PAHs)	Liver disorders; cancer
5	Other metals	Immune, cardiovascular, developmental, gastrointestinal, neurological, reproductive, respiratory and kidney damage; cancer
6	Volatile organic compounds (VOCs)	Eye irritation, nausea, liver, kidney and nervous system damage, birth defects; cancer
7	Polychlorinated Biphenyls (PCBs)	Disruption or damage to the immune, hormone and neurological system, liver and skin disease
8	Arsenic (As)	Nausea, vomiting and stomach pain, blood disorders, nerve damage, skin disease, lung and skin cancer

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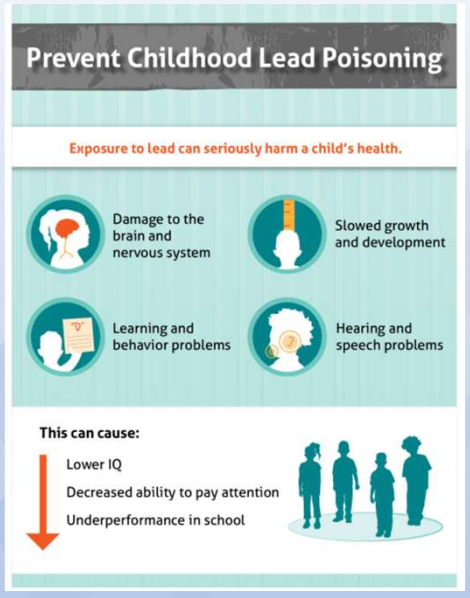
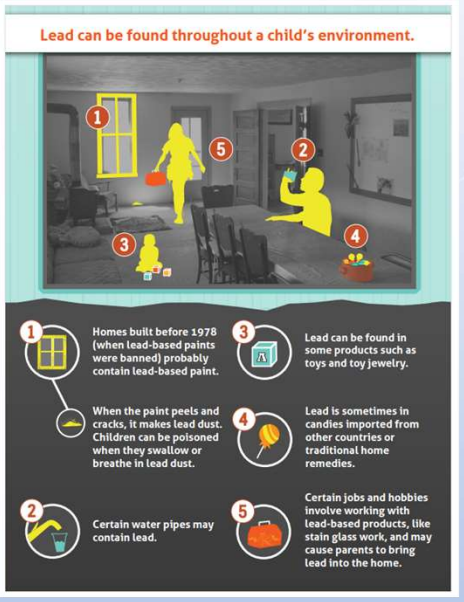
Lead





https://www.cdc.gov/nceh/lead/docs/how-to-prevent-lead-poisoning-in-children-h.pdf

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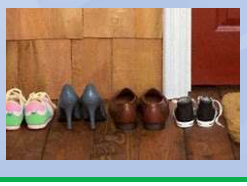
Lead

Minimize Exposures:



- Maintain painted surfaces to prevent paint deterioration.
- Clean around painted areas where friction can generate dust, such as doors, windows, and drawers.
- Wipe these areas with wet paper towels to remove paint chips or dust.
- Clean debris out of outlet screens or faucet aerators on a regular basis.
- Wash children's hands, bottles, pacifiers and toys often.
- Wipe and remove shoes before entering a home
- Wash hands often
- Eat well-balanced meals. Children with healthy diets absorb less lead. See Lead and a Healthy Diet, What You Can Do to Protect Your Child (PDF) | en español (PDF).
- If you are having home renovation, repairs, or painting done, make sure your contractor is Lead-Safe Certified, and make sure they follow lead-safe work practices (PDF).

Source: Learn about Lead | US EPA

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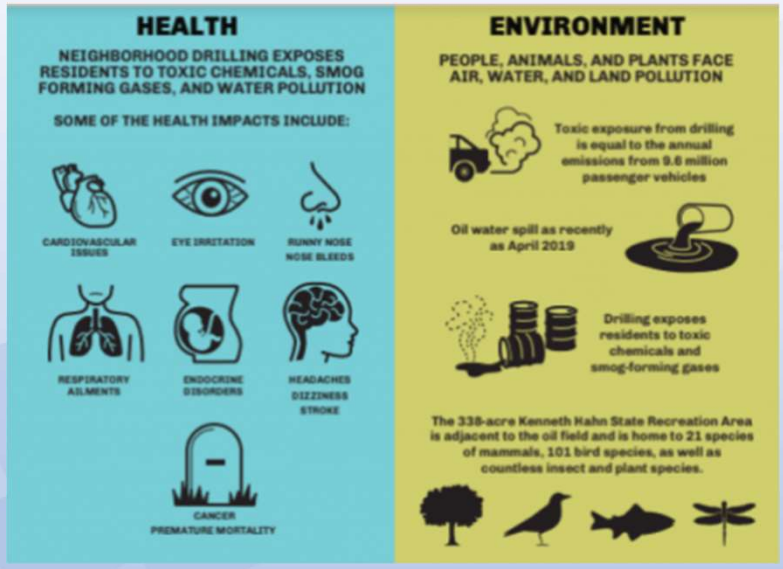
Petroleum



The Issues – CleanBreak

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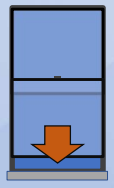
Petroleum

Minimize Exposures:

- Keep windows and door closed on windy days and when there is construction nearby
- Prevent contaminated dirt and dust from entering your home
- Identify possible sources and try to eliminate them
  - Underground fuel storage tanks are the most common petroleum contamination source
  - If you suspect your water is contaminated, get it tested and use bottled water or some other safe supply of water. Boiling or disinfecting water contaminated with toxic chemicals or fuels will not make it safe.



Keep windows & doors closed, especially on windy days

Remove footwear to reduce soil in living areas.

The Issues – CleanBreak

Removal of contamination source

Protect Your Home's Water | US EPA

Asbestos

Sources:

Occurs in Rock Formations

May be in building materials

May be in the soil

May be in atmospheric dust

Health: - Asbestos may cause damage to lung tissue

Some non-cancer diseases are related to asbestos exposure:

- Asbestosis
- Pleural disease

Some cancers are related to asbestos:

- Lung cancer
- Mesothelioma is a rare cancer almost always caused by asbestos exposure
- Other cancers: Asbestos exposure can cause cancer of the larynx and ovary, and may possibly cause cancer of the pharynx, stomach, and colorectum.

Source: https://www.atsdr.cdc.gov/asbestos/docs/limitingenvironmentalexposures_factsheet-508.pdf

Asbestos

Sources:

Occurs naturally in Rocks

Building materials

In the soil

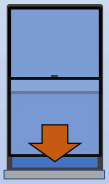
Atmospheric dust

Minimize Exposures:

- Identify possible sources and eliminate them
- Clean with a wet rag instead of a dry duster
- Prevent dirt and dust from entering your home
- Keep windows and door closed on windy days and if there is construction nearby

Wipe down surfaces regularly to reduce dust exposure

Remove footwear to reduce soil in living areas.

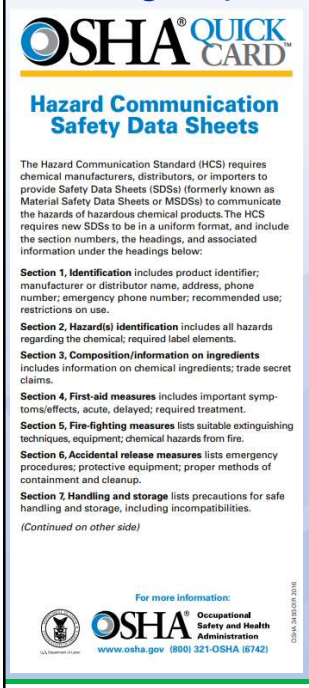


Keep windows & doors closed on windy days

Evaluation and removal by professional services may be needed

Source: https://www.atsdr.cdc.gov/asbestos/docs/limitingenvironmentalexposures_factsheet-508.pdf

Finding Exposure Information



OSHA® QUICK CARD™

Hazard Communication Safety Data Sheets

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. The HCS requires new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

Section 2, Hazard(s) identification includes all hazards regarding the chemical; required label elements.

Section 3, Composition/information on ingredients includes information on chemical ingredients; trade secret claims.

Section 4, First-aid measures includes important symptoms/effects, acute, delayed; required treatment.

Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.

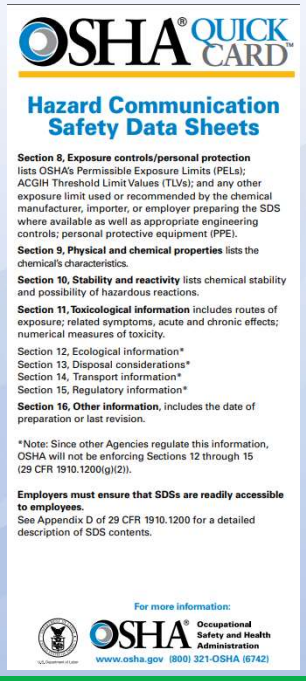
Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities.

(Continued on other side)

For more information:

OSHA® Occupational Safety and Health Administration
www.osha.gov (800) 321-OSHA (6742)

OSHA 3493-05R 2016



OSHA® QUICK CARD™

Hazard Communication Safety Data Sheets

Section 8, Exposure controls/personal protection lists OSHA's Permissible Exposure Limits (PELs); ACGIH Threshold Limit Values (TLVs); and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the SDS where available as well as appropriate engineering controls; personal protective equipment (PPE).

Section 9, Physical and chemical properties lists the chemical's characteristics.

Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions.

Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological information*
Section 13, Disposal considerations*
Section 14, Transport information*
Section 15, Regulatory information*

Section 16, Other information, includes the date of preparation or last revision.

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15 (29 CFR 1910.1200(g)(2)).

Employers must ensure that SDSs are readily accessible to employees.
See Appendix D of 29 CFR 1910.1200 for a detailed description of SDS contents.

For more information:

OSHA® Occupational Safety and Health Administration
www.osha.gov (800) 321-OSHA (6742)

Section 1 - Identification
Section 2 - Hazard Identification
Section 3 - Composition Information and Ingredients
Section 4 - First aid measures
Section 5 - Fire-fighting resources
Section 6 - Accidental release measures
Section 7 - Handling and storage
Section 8 - Exposure controls/personal protection
Section 9 - Physical and chemical properties
Section 10- Stability and reactivity
Section 11- Toxicological information
Section 12- Ecological information
Section 13- Disposal information
Section 14- Transport information
Section 15- Respiratory information
Section 16- Other information

https://www.osha.gov/sites/default/files/publications/OSHA3514.pdf

https://www.osha.gov/sites/default/files/publications/OSHA3493QuickCardSafetyDataSheet.pdf

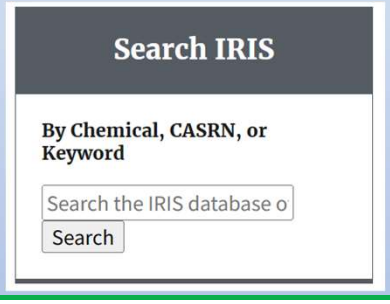
Finding Exposure Information
IRIS

United States Environmental Protection Agency

Integrated Risk Information System

- EPA's Integrated Risk Information System (IRIS) is a human health assessment program that evaluates information on health effects that may result from exposure to environmental contaminants.

https://www.epa.gov/iris



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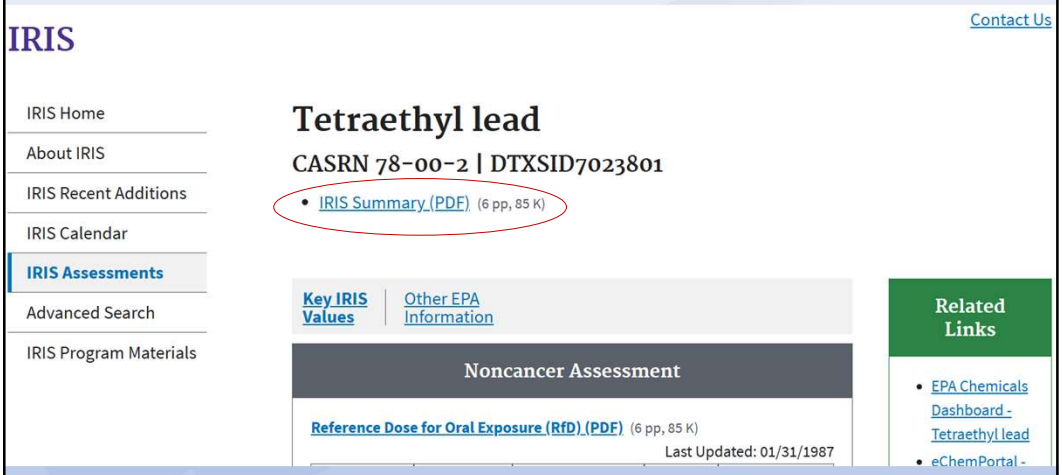
Finding Exposure Information
IRIS

United States Environmental Protection Agency

Human health risk information on hundreds of chemical commonly found in the environment



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Finding Exposure Information IRIS

PDF Summary document with detailed information

United States Environmental Protection Agency

Integrated Risk Information System (IRIS)
Chemical Assessment Summary

U.S. Environmental Protection Agency
National Center for Environmental Assessment

Tetraethyl lead; CASRN 78-00-2

Human health assessment information on a chemical substance is included in the IRIS database only after a comprehensive review of toxicity data, as outlined in the IRIS assessment development process. Sections I (Health Hazard Assessments for Noncarcinogenic Effects) and II (Carcinogenicity Assessment for Lifetime Exposure) present the conclusions that were reached during the assessment development process. Supporting information and explanations of the methods used to derive the values given in IRIS are provided in the guidance documents located on the IRIS website.

STATUS OF DATA FOR Tetraethyl lead

File First On-Line 01/31/1987

Category (section)	Assessment Available?	Last Revised
Oral RfD (I.A.)	yes	01/31/1987
Inhalation RfC (I.B.)	not evaluated	
Carcinogenicity Assessment (II.)	not evaluated	

I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

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Ways to Test for Contaminants

- Ambient concentrations
  - Measures amount of contaminate in the environment
- Exposure modeling
  - Estimates exposure by combining environmental contaminant concentrations and individual's activities and locations
- Personal monitoring
  - Measures exposure using a device
- Biomonitoring
  - Measures contaminants in the body

Exposure to Environmental Contaminants | US EPA

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Personal Protective Equipment (PPE)

PPE equipment may include:

- Gloves
- Safety glasses and/or goggles
- Hard hat or helmet
- Earplugs or earmuffs
- Mask or respirator
- Coveralls, vest, and full body suits
- Shoe covers
- Close-toed shoes

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Are you planning to visit a Brownfield Site?

- Avoid direct contact with any potential contaminants.
- Remove shoes before going inside your home or office to minimize “tracked-in” residue on floors.
- Avoid bringing personal items such as handbags and backpacks to the brownfield which may be exposed to potential contaminants.
- Avoid visiting a brownfield site on a windy day to reduce airborne dust exposure or wear a mask.
- Find out if PPE will be provided at the site and where you should dispose of it.

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More resources about environmental contaminants.

Common Types of Brownfields and their Contaminants | US EPA

factors_to_consider_march_2019.pdf (epa.gov)

Envirofacts | US EPA

EFH-COMPLETE.PDF

Examining urban brownfields through the public health "macroscope". (nih.gov)

public-health-carroll-tribal-response-programs-february-2021.pdf

Hazardous Waste Sites, EnviroAtlas National Data Fact Sheet, May 2020 (epa.gov)

Toxic Release Inventory (TRI), EnviroAtlas National Data Fact Sheet, May 2020 (epa.gov)

Brownfields Public Health and Health Monitoring (July 2006) (epa.gov)