

Lead

Health Effects and Reducing Exposure

Environmental Health
Education Center, University
of Maryland School of Nursing

Learning Objectives

- Describe characteristics and identify sources of lead
- Discuss health effects of lead
- Determine actions for reducing exposures to lead

Uses and Sources

- **Found at 1026 out of 1467 National Priority List sites**
- **Naturally occurring element**
- **Blue – gray metal**
- **Used in**
 - **Batteries**
 - **Ammunition**
 - **Solder and lead pipes**
 - **Ceramic glazes lead crystal**
 - **Medical, scientific and military equipment**
 - **computer monitors**

Where Is Lead?

- Air – from burning fuel, lead smelters, burning solid wastes
- Drinking water, from lead pipes and solder
- Rivers, lakes, and oceans contaminated by industry wastes or from air

Where Is Lead?

- Dust and soil, especially in old urban areas with lead paint and around landfills
- Food – builds up in the food chain
- Paint – banned in 1978 but still around

How Are We Exposed: Ingestion

■ Foods that may contain lead

- Fruits
- Vegetables
- Meats
- Grains
- Seafood
- soft drinks
- wine

■ Water

- Drinking or cooking with water that contains lead, lead dust from paint, or soil contaminated with lead

How Are We Exposed: Inhalation

- Dust from lead paint or soil
- Cigarette smoke



Where Does Lead Go?

- Initially may be stored in soft tissues, liver, kidneys, lungs, brain, spleen, muscles, and heart for several weeks.
- Then it may move to bone and teeth for longer storage.
- Adults retain 1% of what enters the body, children retain about 68%.
- Most lead stays in bone but can leach out during stress (aging, broken bones, pregnancy, breast feeding).

Health Effects: Acute

- Nausea
- abdominal pain
- Vomiting
- Tingling sensations
- Muscle weakness
- Excessive bleeding
- Irritability
- Insomnia
- Memory loss
- Impotence
- In severe cases:
 - Brain and/or kidney damage
 - Coma
 - Convulsions
 - Death

Health Effects: Chronic

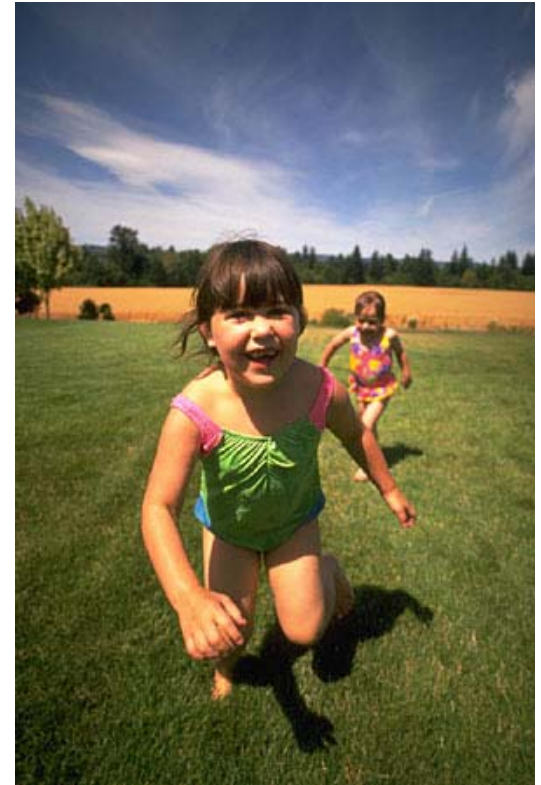
- Target system for adults and children is nervous system
- Weakness in fingers, wrists, and ankles due to nerve damage
- Hearing loss, high blood pressure, anemia
- High levels damage brain and kidneys, and cause miscarriage

Children's Special Concerns

- Children are more vulnerable to the effects of lead for several reasons:
 - have a higher adsorption rate from GI tract, particularly if they are iron deficient
 - Exposed in womb and through breast milk in addition to food and water
 - Nervous system is still developing
 - Play in the dirt, are lower to the ground, perform hand-to-mouth activities

Effects on Children

- Low birth weight
- Growth retardation
- Mental retardation
- Learning disabilities
- Muscle weakness
- Stomach cramps
- Anemia
- Kidney and brain damage



Measuring Environmental Exposure



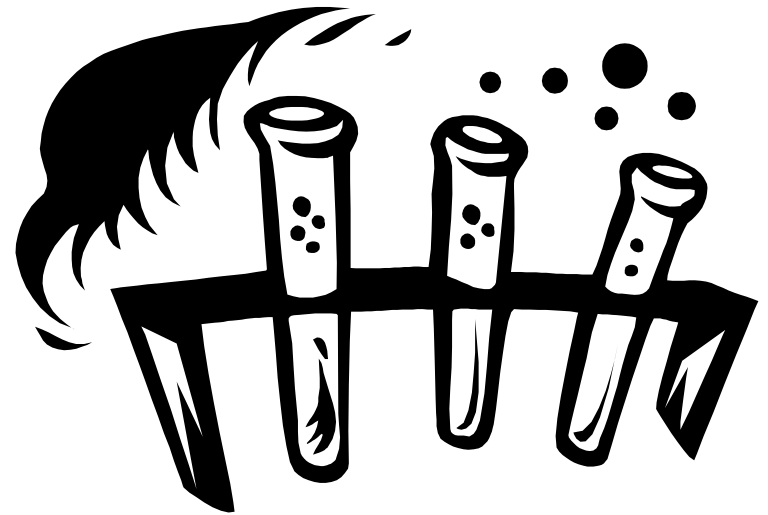
- Air Monitoring
- Lead-based paint chip sampling
- Dust sampling
- Water sampling
- Soil sampling

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Measuring Exposure in the Body

- Blood lead level (BLL)
- Indirect blood level measures
 - FEP
 - ZPP



How to Reduce Risk From Lead-Based Paint

- Have home tested for lead, especially if built before 1978
- Use proper protective equipment during renovations
- Wash hand frequently, especially before eating
- Ensure proper nutrition to counteract the effect of lead exposure
- Control dust in house, use a Hepa filter vacuum

How to Reduce Risk From Contaminated Soil

- Wash hands frequently, especially before eating
- Do not eat, drink, or smoke while working outside
- Wash vegetables thoroughly if grown in soil with high lead levels
- Control dust in house, use a Hepa filter vacuum
- Ensure proper nutrition to counteract the effect of lead exposure

How to Reduce Risk From Contaminated Water

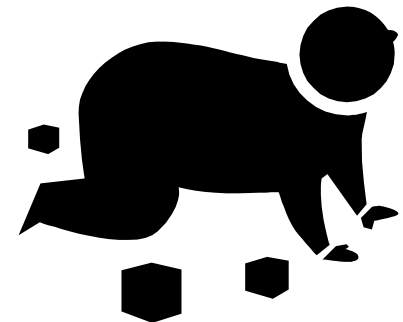
- have water tested for lead
- Run water 15-30 seconds if have lead pipes or lead solder
- Do not use hot water from the tap

How to Reduce Risk From Exposure at Work

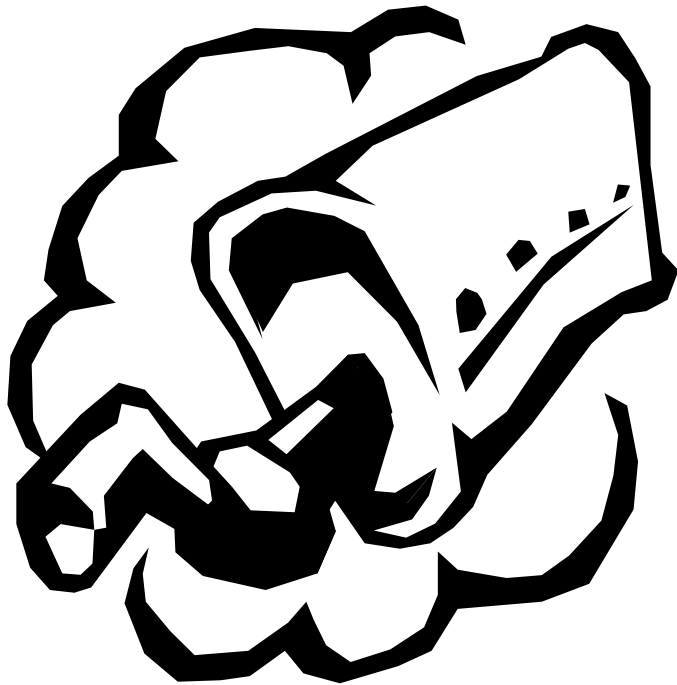
- Use proper protective equipment to prevent exposure to lead dust
- If exposed at work:
 - shower and change at work
 - Keep work clothes separate

Policy: Centers for Disease Control

- Recommended blood lead testing for all children under 2
- Blood lead level over 10 mcg/dl requires action
- Actions include:
 - Risk assessment to determine source of exposure
 - Follow up of elevated BLL's



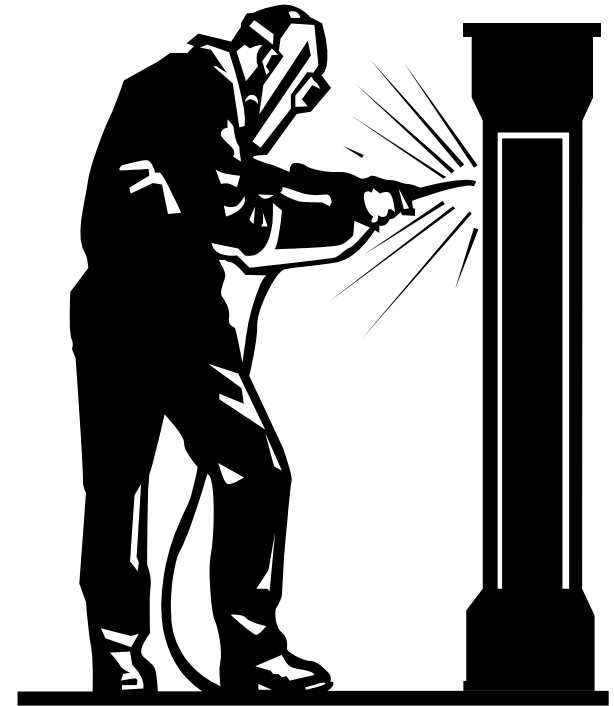
Policy: Environmental Protection Agency



- Air level maximum is 1.5 mcg/cubic meter
- Maximum Contaminant Level for drinking water is 0.015 mg/L

Policy: Occupational Safety and Health Administration

- Limit for Lead in workroom air is 30 mcg/cubic meter for an 8-hour day
- If a worker has a blood lead level of 40 mcg/dL or above, they must be removed from the exposure site



Policy

- Legislation:
 - Clean Air Act banned lead in gasoline December 1995
 - Lead Contamination Control Act, 1988 – regulates water coolers and drinking water in schools
 - Residential Lead – Based Paint Hazard Reduction Act, 1992 (Also known as Title X)

Resources

- ATSDR ToxFAQ's
www.atsdr.cdc.gov/tfacts13.pdf
- New Jersey Fact Sheet
www.state.nj.us/health/eoh/rtkweb/1096.pdf
- EPA Home Protection Report
www.epa.gov/opptintr/lead/leadpdf/e.pdf
- CDC Lead Poisoning Prevention
www.cdc.gov/nceh/lead/lead.htm

Resources

- Alliance to End Childhood Lead Poisoning www.aeclp.org
- National Safety Council Environmental Health Center www.nsc.org/ehc.htm

In Review

- What is lead and how are we exposed to it
- How does lead affect health
- How can we reduce our exposure to lead