Lead Awareness Training for City Workers
Learning Objectives

★ Familiarize city workers with the OSHA Lead Standard
★ Learn possible occupational exposure to lead
★ Understand routes of entry
★ Describe symptoms of overexposure
★ Identify control measures
Lead

- Chemical Symbol - Pb
- Heavy Gray Metal
- Soft and Pliable
- Galena most common lead-containing ore
Characteristics of Lead

- Prevents Corrosion
- Kills Mold and Mildew
- Easy to Shape (Melts at 621°F)
- Durable
- Poor conductor of heat and electricity
- Blocks Radiation
- Blocks Sound
- Helps Paint Dry
- Paint Pigment
Where is Lead Found?

The process of extracting lead from ore (Smelting)
History of Uses

★ 6500 B.C.: earliest known object made of lead

★ Roman Times: 80,000 tons/year
  * vessels, aqueducts, glazes

★ Industrial Age: occupational exposure accelerated

★ 1923: Leaded gasoline goes on sale

★ 1930: Company founded in England to sell leaded gas overseas

★ Up to 1980: paint pigments, construction materials, water and sewer pipes, chemical additives
Historical Accounts

★ 370 B.C. - Hippocrates documented lead colic
★ 1427 - France and Spain prohibited adding lead to wine
★ 1786 - Benjamin Franklin wrote letter on Lead Poisoning
★ 1887 - US medical authorities diagnose childhood lead poisoning
★ 1913 - Dr. Hamilton wrote a pamphlet on protecting painters from lead hazards
★ 1921 - National Lead Company admits lead is a poison
Historical Accounts

★ 1922 - League of Nations bans white-lead interior paint; US declines to adopt

★ 1924 - NY Board of Health bans sales of Tetraethyl lead (TEL) - enhanced gasoline

★ 1926 - Ethyl is back for sale

★ 1936 - 90% of gasoline in US contains Ethyl
OSHA Lead Standards

★ 1984  29 CFR 1910.1025
OSHA Lead Standard for General Industry

★ 1993  29 CFR 1926.62
OSHA Standard for Lead in Construction
Employee exposure monitoring is performed with air samples collected in the workers “Breathing Zone” to measure permissible exposure levels

- (Action level 30µg/M³ and PEL 50µg/M³ over 8hrs)
OSHA Requirements

- One employee can be used to perform sampling in a work environment or assignment (task-specific)
- The samples are analyzed by a laboratory and the results assist in selecting worker protection
- Sampling results must be available for employees to review.
- Lead Awareness Training for workers with incidental contact
  - Incidental contact - minor/limited exposure
For construction related work there are 3 classes of worker presumed exposure, class I, II, III

- **Class I**: includes manual scraping Lead paint, and exposures are expected up to $50\mu g/M^3$

- **Class II**: Includes Lead burning and an exposure of up to $500\mu g/M^3$ can be expected

- **Class III**: Includes abrasive blasting and an expected exposure of more than $2,500\mu g/M^3$
Occupational Exposure to Lead

★ Work activities with potential exposure to lead
- Lead-based paint
  ➢ Disturbance
- Firing ranges
  ➢ Trainers/Maintenance Staff
- Construction sites
  ➢ Demolition/Repair
Occupational Exposure to Lead

- Bridge work
  - Sand-blasting paint
- Plumbing
  - Burning/soldering pipes
- Elevator repair
  - Babbitt
Medical Monitoring/Surveillance

★ When affected workers exposure reach the action level, blood sampling under a medical surveillance program is used to record a worker’s blood lead level (BLL)

★ The blood sampling is typically performed every 2 to 6 months and more frequently when the BLL remains above 40 micrograms per deciliter (µg/dl)

★ In extreme cases of exposure, if the BLL remains persistently above 50 µg/dl, worker is medical removed from the work environment
Hierarchy of Controls

Together with engineering controls, administrative controls and personal protective equipment can reduce worker exposure to below permissible levels

★ Engineering Controls
★ Administrative Controls
★ Personal Protective Equipment
Engineering Controls

- Methods built into the design of equipment or a process to minimize the hazard.
- Isolate area with plastic sheets over doors, and floors to prevent the spreading of lead dust.
- Ventilate the work area to allow airborne contamination to be exhausted away from workers.
Administrative Controls

- Changes in work procedures, such as written safety policies, schedules, and training with the goal of reducing the duration, frequency, and severity of exposure.
- Employee rotation to reduce worker exposure
- Conduct employee training, toolbox talks, etc.
Work Practice Controls

- Workers involved in cleaning tasks, can use a High Efficiency Particulate Air (HEPA) filter Vacuum cleaner to prevent dust dispersion.
- Using wet methods to reduce dust generated by activities like scraping paint.
- Prompt collection and containerizing of any debris also contributes in avoiding increased exposures.
Work Practice Controls

★ Good personal hygiene practices
  * During work assignment/zone
    ➢ Do not eat, drink, or smoke in work area
    ➢ Wash face and hands following work assignments

★ Don personal protective equipment when working in restricted areas

★ Discard used personal protective equipment in designated receptacles
Personal Protective Equipment

★ Personal protective equipment is the least desired option to reduce worker’s exposure, the primary way of reducing the hazard is a combination of engineering controls and good work practices

★ Selection of personal protective equipment will based on a risk assessment
  Examples includes, disposable coveralls, gloves, foot covers and eye protection

★ Air sampling results may indicate the type of respiratory protection needed
Respirators

Respirators can vary from a N-95 particulate dust masks for some maintenance work, to air-filtering respirators that require medical clearance. When respiratory protection is required for work, a program must be implemented.
Respiratory Protection Program

★ Agency must develop a written program that details medical clearance, fit testing, respirator selection and maintenance

★ The type of respirator is based on worker exposure, monitoring results and the type of work performed.
  * Scraping lead paint vs. melting lead

★ N-95 respirators can be used for low dust producing task
  * Work that generates high dust and fumes will require cartridge respirators (Burning a lead Babbitt)
Sources of Lead (fix fonts)

- Storage Batteries
- Ceramic Dishware
- Leaded Gasoline
- Drinking Water
- Paint and Varnish
Lead in Paint
Lead in Paint

★ Tens of millions of houses contain some lead-based paint (LBP)
★ Deteriorating paint/paint chips sources of leaded dust
★ Dust and soil are the major routes of exposure
  * Enters soil through deterioration
  * Young children ingest through normal hand-mouth activity
  * Poor diet can increase absorption
Where is lead paint found?

★ Before 1950
* Everywhere – inside and outside (all coatings)

★ Between 1950-1960
* Probably outside, may be inside
* Trims, doors, windows, kitchens, bathrooms, etc.

★ Between 1960-1978
* May be outside, less likely inside

***Before 1978 we assume lead!!!
United States Restriction of Lead Use

- Late 1950’s – Paint manufacturers voluntarily reduced lead content of most paint for residential use.
- 1978 – Consumer Product Safety Commission limits paint for residential use to 600 ppm.
- 2011 – CPSC resets limit for paint for residential use to 90 ppm.
- Lead paint for non-residential use is still sold.
The Consumer Product Safety Commission (CPSC) banned lead paint for use in residential and child occupied buildings. However, lead paint can still be used in industrial settings.

Currently, in commercial or public buildings that have no child care facilities the OSHA standard would still apply.
**Environmental Sampling**

- Lead Paint is usually detected with the use of an X-Ray Florescence machine or with paint chip analysis.
- In NY, paint with 1mg/cm² or 0.5% by weight is considered a lead based coating.
- Dust sampling is sometimes used to assess if there is a high level of lead in settle dust.
Routes of Exposure

★ Ingestion
* normal hand-to-mouth activity (indicate here that workers should use PPE)
  ➢ children are more likely to ingest lead

★ Inhalation
* adults are more likely to inhale lead
* usually occupational exposures
What Happens to Lead in the Body?

★ Absorbed

★ Distributed
  * red blood cells
  * soft tissue
  * bone

★ Eliminated
  * kidneys
  * gastrointestinal system (GI tract)
  * perspiration
Blood Monitoring

★ The blood lead level is the best initial measurement for evaluating lead exposure.
★ The blood lead level
  * indicates the amount of lead circulating in the blood stream
  * may be a measure of recent exposure
Where is lead stored in the body? For how long?

★ **Blood**
  - 5-10%, half-life ~ 1 month

★ **Kidney**
  - 5-10%, half-life ~ 1 month

★ **Bone**
  - 80-90%, half-life ~ 25 years
Overexposure Symptoms (Acute)

- Colicky abdominal pain
- Constipation
- Diarrhea
- Brain damage
- CNS
- Irritability
- Fatigue
- Weakness
- Muscle pain
- Vomiting
- Tremors
- Drowsiness
- Restlessness
- Destruction of red blood cells
Overexposure Symptoms (Chronic)

- Impaired blood formation
- Central nervous system
- Peripheral nervous system
- High blood pressure
- Reproductive system
- Damage to developing fetus
Adult Reactions to Lead

★ 15 µg/dl
- increase blood pressure
- joint and muscle aches

★ 25 µg/dl
- reproductive problems

★ 40 µg/dl
- kidney
- blood formation
Adult Reactions to Lead

★ 60 μg/dl

- anemia
- nerve damage
- constipation
- stomach pains
- irritability
- fatigue

- memory and concentration problems
- clumsiness
- drowsiness
- sleep problems
Adult Reactions to Lead

80 μg/dl and above
- blue line on gums
- shaking of hands and wrist
- wrist and foot drop

- hallucinations
- brain damage
- coma
- death
Problems Caused by Lead Exposure

- Brain Disorders
- Hematological Problems
- Kidney Problems
- Decreased Red Blood Cells
- Nerve Disorders
- Reproductive Problems
- Slower Reflexes
Body Systems Most Affected

- Central nervous system (CNS)
- Cardiovascular system (heart)
- Kidneys (renal)
- Hematopoietic system (Blood forming)
United States Reduction of Lead in Product

- Lead gasoline \( \Rightarrow 0.05 \) grams/gallon
- Soldered cans \( \Rightarrow \) banned
- Lead-based paint \( \Rightarrow \) reduced to 0.06 \% by weight

Decreased average blood lead levels from 13.7 \( \mu g/dL \) to 3.2 \( \mu g/dL \)
For additional safety and health information

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