

# Community Presentation in Pueblo, Colorado

## Lead and Arsenic Exposure Near the Former Colorado Smelter in Pueblo, Colorado

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# Agency for Toxic Substances and Disease Registry (ATSDR)

## What is ATSDR?

- A federal health agency
- Based in Atlanta, Georgia
- Charged with
  - Finding environmental health hazards in communities
  - Preventing exposures to harmful substances
  - Educating communities to increase the knowledge about the health effects from chemical and radiation exposure.

# **Colorado Smelter Exposure Investigation (EI)**

- **The soil near the former Colorado smelter and the soil in the slag pile are contaminated with lead and arsenic.**
- **Community members living within half a mile of the former smelter are at increased risk for exposure to lead and arsenic.**
- **No previous blood lead testing and urinary arsenic testing took place near the former Colorado smelter.**



## **Slag Pile**

**Partially unrestricted access  
and evidence of children  
riding bikes**

## **Why is ATSDR involved?**

- **The Pueblo City County Health Department (PCCHD) asked ATSDR to test community members living near the former smelter for lead and arsenic.**
- **ATSDR collected blood to test for lead and urine to test for arsenic.**
- **Your child/children may have been exposed to enough lead to cause harm to their health.**

# Outline

- ❑ **What is exposure?**
- ❑ **Why are children more likely to be exposed?**
- ❑ **Lead**
  - ❑ Sources of exposure
  - ❑ Health effects from low level lead exposure
  - ❑ Why prevent lead exposure?
- ❑ **Arsenic**
  - ❑ Sources of exposure
  - ❑ Health effects
  - ❑ Why prevent arsenic exposure?
- ❑ **Colorado Smelter Exposure Investigation**

# What is exposure?

- ❑ Exposure is contact with a substance in the environment—in soil or dust, water, or air.
- ❑ You can be exposed to a substance by
  - swallowing it
  - breathing it
  - getting it on your skin
  - getting it in your eyes

# **Why are children at higher risk for environmental exposure to harmful substances?**

- They put everything in their mouths**
- Their bodies are smaller**
- They breathe faster**
- They crawl and creep on carpets and floors**
- Their bodies absorb more lead when exposed**

**Environmental Health Perspectives. September 1995; 103(Supplement 6):7-12.  
How Are Children Different from Adults? Bearer, C F.**

# Lead

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# Sources for Lead Exposure

| <b>Environmental sources</b>                                     | <b>Prevention strategy</b>                     |
|------------------------------------------------------------------|------------------------------------------------|
| <b>Year house built &lt;1978 (lead-based paint)</b>              | <b>Identify/Evaluate/Remediate</b>             |
| <b>Dust from paint chips</b>                                     | <b>Control sources</b>                         |
| <b>Soil contaminated with lead</b>                               | <b>Restrict play area/cover source</b>         |
| <b>Drinking water</b>                                            | <b>Check information from water department</b> |
| <b>Old plumbing (lead solder)</b>                                | <b>Check for lead solder</b>                   |
| <b>Home renovation</b>                                           | <b>Proper containment</b>                      |
| <b>Worker take-home contamination</b>                            | <b>Shower/Remove shoes and clothes</b>         |
| <b>Some hobbies</b>                                              | <b>Proper use/storage/ventilation</b>          |
| <b>Some imported toys, cosmetics/spices and ceramic cookware</b> | <b>Avoid use</b>                               |

# How can I prevent exposure to lead from contaminated soil?

- **Avoid direct contact with the soil; cover the soil with grass/mulch.**
- **Supervise your children's play to prevent eating contaminated soil from hand-to-mouth behavior and pica.**
- **Wash children's hands, face, pacifiers & drinking bottles regularly.**



# How can I prevent contaminated soil from being tracked into the house?



- **Clean pets' paws before letting them in the house and bathe pets regularly.**
- **Take shoes off and leave them at the entryway.**

# How can I prevent exposure to lead from lead-based paint chips and dust in houses built before 1978?

- Ask the local health department to do a healthy home inspection to find out if your house-paint has lead.
- If lead is found in the paint the health department will show you how to minimize exposure.



# How can I prevent exposure to lead from renovations of homes built before 1978 with lead-based paint?



- **Ask your local health department**
- **Control leaded dust**

# How can I prevent my children exposure to lead from contaminated imported toys from China?

**Test imported toys for lead content.**



# How can I prevent my family exposure to lead from imported ceramic cookware?

Test imported ceramic cookware for lead content.



# How can I prevent my family's exposure to lead from imported colorful food spices?

**Avoid use of any imported spices.**



# How can I prevent exposure to lead from hobbies such as making leaded crystal?

- Use and store materials properly
- Wear appropriate protective clothing
- Ventilate the work area



# Risk Factors That Increase Lead Exposure

|                                                  |                                                                                                                                                                                                     |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Age</b>                                       | <b>Infants, and children 1 – 5 years old</b>                                                                                                                                                        |
| <b>Sex</b>                                       | <b>Males younger than 6 years of age</b>                                                                                                                                                            |
| <b>Pica behavior</b>                             | <b>Eating non-food items such as contaminated soil, paint chips, lead dust</b>                                                                                                                      |
| <b>Diets without Calcium<br/>Vitamin C and E</b> | <b>Children that are malnourished</b>                                                                                                                                                               |
| <b>Low income families</b>                       | <b>Less access to nutritional food sources</b>                                                                                                                                                      |
| <b>Cultural practices</b>                        | <b>-Wearing eye make-up containing high levels of lead<br/>-Using food spices sold by street vendors or specialty shops abroad and in U.S.<br/>-Serving food in lead containing Mexican pottery</b> |

# Health Effects in Unborn Babies and Children from Low Level Lead Exposure

# How does low level lead exposure harm health?

Even blood lead levels\* under 5 micrograms per deciliter\*\* can cause harmful health effects in

- unborn babies (fetus)
- young children
- adults (including pregnant women)

\* Blood lead level=Amount of lead in blood

\*\* Blood lead level under 5 micrograms per deciliter is like dissolving less than one grain of salt in 4 ounces of water.

# How does low-level lead exposure in pregnant women harm the health of unborn babies?

| Blood lead level in pregnant women        | Unborn baby                                                                      | There is evidence of                                                                             |
|-------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Even less than 5 micrograms per deciliter | <ul style="list-style-type: none"><li>• Affects growth and development</li></ul> | <ul style="list-style-type: none"><li>• Small fetus</li><li>• Delivery of a small baby</li></ul> |

National Toxicology Program (NTP), 2012

# How does low-level lead exposure harm children's health?

| BLLs in Children                                                                       | Effects in children's                                                            | There is evidence of                                                                                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Below 10 micrograms per deciliter, and even at levels below 5 micrograms per deciliter | <ul style="list-style-type: none"><li>• Brain</li></ul>                          | <ul style="list-style-type: none"><li>• Poor school performance</li><li>• Lower IQ (Intelligence Quotient)</li><li>• Attention problems</li><li>• Behavior problems</li></ul> |
|                                                                                        | <ul style="list-style-type: none"><li>• Sexual Organs</li><li>• Growth</li></ul> | <ul style="list-style-type: none"><li>• Sexual organs take longer to develop</li><li>• Reduce general growth</li></ul>                                                        |

National Toxicology Program (NTP), 2012

# How does low-level lead exposure harm adults health (including pregnant women)?

| Blood Lead Level                                                                       | Health effects          | There is evidence of                  |
|----------------------------------------------------------------------------------------|-------------------------|---------------------------------------|
| Below 10 micrograms per deciliter, and even at levels below 5 micrograms per deciliter | • Kidneys               | • Kidneys working slowly              |
|                                                                                        | • Heart & blood vessels | • Higher risk for high blood pressure |
|                                                                                        | • Brain                 | • Tremors                             |

**Resource: National Toxicology Program (NTP), 2012.**

# Prevention

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# When to Test for Lead?

## Take your child to be tested for lead if

- Your child lives in a high risk area
- Your child is younger than 6 years of age
- Your child's last blood lead level was above 5  $\mu\text{g}/\text{dL}$
- Your child eats dirt (has pica)
- Another child in the house has increased blood lead level
- The house where your child lives or visits frequently (grandparents, caretakers) was built before 1978

## Pregnant women should discuss their risk factors for lead exposure with their doctor.

# What affects lead uptake?

## The body's uptake of lead

### Decreases with intake of

- Calcium (milk, cheese, yogurt)
- Vitamin B2 (cheese, almonds and beef)
- Vitamin C and (leafy veggies, peppers, OJ)
- Vitamin E (spinach, nuts, sunflower seeds)

### Increases with

- Poor nutrition
- Diet high in fat

# Arsenic

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# Arsenic

## Forms of arsenic

### ☐ Organic

- Non-toxic
- Found mainly in fish and seafood

### ☐ Inorganic

- Very toxic, can cause cancer
- Affects heart and blood vessels
- Found mainly in ground water and some food products, such as apple juice and rice (especially brown rice)

# Sources of Exposure

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# How can I be exposed to arsenic?

| Environmental sources                                                                                         | How to prevent exposure                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p data-bbox="170 515 913 615"><b>Soil contaminated by industrial activities such as a former smelter</b></p> | <ul data-bbox="952 404 1686 843" style="list-style-type: none"><li data-bbox="952 404 1647 561">• <b>Avoid direct contact with the soil; cover the soil with grass/mulch.</b></li><li data-bbox="952 575 1686 732">• <b>Regularly wash your/your children's hands and children's toys, pacifiers, bottles.</b></li><li data-bbox="952 746 1609 843">• <b>Do not eat outside in areas where soil is contaminated.</b></li></ul> |
| <p data-bbox="170 953 813 1053"><b>Foods such as rice (especially brown rice), and apple juice</b></p>        | <ul data-bbox="952 953 1721 1282" style="list-style-type: none"><li data-bbox="952 953 1721 1282">• <b>All people (including pregnant women) should eat a well balanced diet for good nutrition and to minimize potential adverse effects from consuming an excess of any one food.</b></li></ul>                                                                                                                              |

# Health Effects

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# How can arsenic harm my health?

| <b>Non-Cancer Health effects</b>                                                                             | <b>Prevention of exposure</b>                                                                  |
|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Nausea</li><li>• Vomiting</li></ul>                                  | <ul style="list-style-type: none"><li>• Avoid ingestion of arsenic contaminated soil</li></ul> |
| <ul style="list-style-type: none"><li>• Changes in skin color (arsenic exposure causes dark spots)</li></ul> |                                                                                                |

**Naujokas MF, Anderson B, Ahsan H, et al. The Broad Scope of Health Effects from Chronic Arsenic Exposure: Update on Worldwide Public Health Problem. Environmental Health Perspectives. March 2013; 121(3).**

# How can arsenic harm my health?

| Cancer Health Effects                                     | Prevention of exposure                                                                                                       |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Lung</li></ul>    | <ul style="list-style-type: none"><li>• Avoid inhalation and avoid ingestion of arsenic contaminated soil and dust</li></ul> |
| <ul style="list-style-type: none"><li>• Skin</li></ul>    | <ul style="list-style-type: none"><li>• Avoid ingestion of arsenic contaminated water</li></ul>                              |
| <ul style="list-style-type: none"><li>• Bladder</li></ul> |                                                                                                                              |

# Prevention

# How can I prevent arsenic exposure?

## In general

- Don't let your children play in bare soil.
- Don't let your children eat soil (pica).
- Don't let your children put dirt-covered objects (like toys) in their mouths.

## Regularly

- Wash your children's hands and toys (especially after playing outside).
- Wash pacifiers and drinking bottles.
- Damp-mop floors and damp-wipe window sills.

## Feed your children nutritious foods rich in folate, such as

- Black-eyed peas, chick peas, green peas, black beans, lentils, spinach, collard greens, lettuce, avocado and beets ;

# Colorado Smelter Exposure investigation (EI)

Field work: September – November 2013

# **Who was tested for lead and arsenic?**

**People living within ½-mile of the former smelter and belonging to one of the following groups:**

- Children from 9 months to less than 6 years (blood lead testing only)**
- Children from 6 to 16 years (blood lead and urinary arsenic testing)**
- Pregnant women and women of childbearing age (blood lead and urinary arsenic testing)**

## **What are the target blood lead levels for children under 6 years and pregnant women?**

- **The level of lead in blood should be less than 5 micrograms per deciliter.**
- **No safe blood lead level for children and pregnant women has been identified.**

## **What did ATSDR find about lead exposure?**

- 135 people were tested for lead.**
- Some children living within ½ mile from the former smelter had blood lead levels high enough to harm their health.**
- Some of the blood lead levels found are higher than levels found in children in others parts of the country.**
- The pregnant woman tested did not have elevated lead level in her blood that will put her at greater risk for harm.**

## **What did ATSDR find out about arsenic exposure?**

- **ATSDR tested 99 participants in September 2013 and 65 participants in November 2013.**
- **Participants lived within half a mile of the former Colorado Smelter.**
- **ATSDR did not find elevated arsenic in participants' urine.**

## **ATSDR Recommendations**

- **Prevent exposure to contaminated soil outside –cover the soil with mulch or grass.**
- **Prevent exposure to contaminated soil in the home – remove shoes, damp mopping.**
- **Take additional measures to protect children 1 to less than 6 years –separate children from sources of exposure.**
- **Educate area health care professionals on how to prevent soil lead and arsenic exposures.**

## **ATSDR Recommendations (cont...)**

- 1. Continue testing blood lead levels in children under 6 years, pregnant women and women of childbearing age.**
- 2. Characterize the nature and extent of lead and arsenic soil contamination in Pueblo.**
- 3. Stop or reduce people's exposure to mining wastes in residential soil and slag pile.**
- 5. Develop an environmental health education program for the area.**
- 6. Keep area doctors informed about the health education efforts of the site.**

# Public Health Action Plan

- 1. PCCHD was awarded an EPA grant for 5 years to help the community of Pueblo by;**
  - **Conducting health education**
  - **Conducting blood lead level testing**
  - **Coordinating the evaluation of children affected by lead exposure**
- 2. In 2014, EPA listed the Colorado Smelter site on the National Priority "Superfund" list for clean-up.**
- 3. ATSDR published its EI report and is holding public meetings in the community.**

# **Thank you!**

## **Any questions?**

**For more information please contact Agency for Toxic  
Substances and Disease Registry**

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