LEAD POISONING IN LANCASTER COUNTY

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OBJECTIVES

- Understand the negative affects of lead poisoning
- Present the current situation in Lancaster County
- Ongoing advocacy and solutions to problem
WHAT IS LEAD?

- 6500 BC. - Lead discovered in Turkey, first mine.
- 500 BC-300 AD. - Roman lead smelting produces dangerous emissions.
- 100 BC. - Greek physicians give clinical description of lead poisoning.

"Lead makes the mind give way."

_Dioscerides - 2nd BC_

“If we were to judge of the interest excited by any medical subject by the number of writings to which it has given birth, we could not but regard the poisoning by lead as the most important to be known of all those that have been treated of, up to the present time.”

_Orfila, 1817_
“Lead Poisoning remains the most common and societal devastating environmental disease of young children.”

PUBLIC HEALTH SERVICE - L. SULLIVAN, 1991
WHAT IS LEAD?

- Soft blue-gray metal
- Found in the natural environment
- Was added to paint and gasoline in past (up to 1978)
- Still used in consumer products
- Mexican candy, foot powder, jewelry, stained-glass, pottery etc.

the natural ore galena
HOW ARE PEOPLE EXPOSED TO LEAD?

- Dust, paint, and/or soil
- Contaminated food, water, or alcohol
- Some imported home remedies and cosmetics
- Endogenous exposure problem with increased bone turnover
AMISH "BOBBIES"
Nebraska or “old school”
Amish in Belleville, PA
ORAL ACTIVITY IS RISK FOR LEAD EXPOSURE

Source: Lynn Ringenberg, MD and PSR Florida
HOW MUCH IS TOO MUCH?

- One packet of sugar substitute is 1 gram.
- Current level of concern is 5 mcg/dl.
- A microgram is one millionth of a gram.
- A deciliter is one tenth of a liter.
- The average adult has 4-5 liters of blood. The average child 1-2 liters.
- So 50 millionth of a gram is enough to raise a child’s blood lead level to 5 mcg/dl.
- There are 20,000 “doses” of potential lead poisoning in one packet of sugar substitute.
HOW MUCH IS 50 MICROGRAMS?
EFFECTS OF LEAD

Adverse Health Effects of Lead Exposure

- Death
- Encephalopathy
- Nephropathy
- Frank Anemia
- Colic

- Decreased hemoglobin synthesis
- Increased vitamin D metabolism
  Increased risk of hypertension in adulthood
- Increased nerve conduction velocity
- Increased level of erythrocyte protoporphyrin
- Decreased vitamin D metabolism
- Decreased calcium homeostasis
- Developmental toxicity
  Delayed puberty
  Decreased growth & hearing
- Developmental toxicity
  Decreased IQ levels & academic abilities
  Attention-related behaviors
  Anti-social behaviors
CHILDREN AND LEAD EXPOSURE
OVERVIEW

► Chronic, low-level exposure can lead to subtle neurodevelopmental effects
► Sometimes not recognized until older grades requiring higher-level cognitive functions
► These can impact on children’s future education and employment status (as well as lead to societal costs)
► Newer studies indicate NO THRESHOLD for effects: NO LEAD IS GOOD LEAD
LEAD AND IQ...NO LEVEL IS SAFE

STUDIES OF ADVERSE EFFECTS OF LEAD EXPOSURE

- Inverse relationship between indices of lead exposure and IQ (cognition)

  - About 4-8 points as BLL increases to 10 µg/dL and 1-5 points as BLL reaches 20 µg/dL

- Decrease in proficiency in basic academic skills (math, reading), decreased school achievement and poor organizational skills

- Association with attention, learning, behavioral (distractibility and hyperactivity) problems

  - (REF: Lidsky and Schneider, 2006; Bellinger 2004; AAP 2005; Lanphear et al, 2005; Jusko et al, 2008; Canfield, 2003; CDC 2005; Binns, 2007)
### New Findings on Lead and Educational Attainment

<table>
<thead>
<tr>
<th>Blood Lead Levels</th>
<th>Educational Impact</th>
<th>Size of Study</th>
<th>Location of Study</th>
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<tbody>
<tr>
<td>≤ 3 μg/dL</td>
<td>Decreased end of grade test scores</td>
<td>More than 57,000 children</td>
<td>North Carolina (Miranda et al. 2009)¹</td>
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<td>Increased likelihood learning disabled classification in elementary school</td>
<td>More than 57,000 children</td>
<td>North Carolina (Miranda et al. 2009)¹</td>
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<td>Poorer performance on tests</td>
<td>35,000 children</td>
<td>Connecticut (Miranda et al. 2011)</td>
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<td>4 μg/dL at 3 years of age</td>
<td>30% more likely to fail third grade reading and math tests</td>
<td>More than 48,000 children</td>
<td>Chicago (Evens et al. unpublished data)</td>
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<td>More likely to be non-proficient in math, science, and reading</td>
<td>21,000 children</td>
<td>Detroit (Zhang et al. 2013)</td>
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<td>5-9 μg/dL</td>
<td>Scored 4.5 points lower on reading readiness tests</td>
<td>3,406 children</td>
<td>Rhode Island (McLaine et al. 2013)</td>
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<tr>
<td>≥10 μg/dL</td>
<td>Scored 10.1 points lower on reading readiness tests</td>
<td>3,406 children</td>
<td>Rhode Island (McLaine et al. 2013)</td>
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<td>10 and 19 μg/dL</td>
<td>Significantly lower academic performance test scores in 4th grade</td>
<td>More than 3,000 children</td>
<td>Milwaukee (Amato et al. 2012)</td>
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<td>≥ 25 μg/dL</td>
<td>$0.5 million in excess annual special education and juvenile justice costs</td>
<td>279 children</td>
<td>Mahoning County, Ohio (Stefanak et al. 2005)</td>
</tr>
</tbody>
</table>

SOCIETY PAYS THE PRICE

THE PB EFFECT

What happens when you expose a generation of kids to high lead levels? Crime and teen pregnancy data two decades later tell a startling story.

Sources: Rick Nevin, USGS, DOJ
LEAD AND JUVENILE DELINQUENCY

Analysis: Is Lead Exposure the Secret to the Rapid Rise and Fantastic Fall of the Juvenile Crime Rate?
Figure 6: Small Individual Effects Can Have Significant Population Effects
MARYLAND DEPARTMENT OF THE ENVIRONMENT
CHILDHOOD BLOOD LEAD SURVEILLANCE
STATEWIDE 1993-2014

CALENDAR YEAR
(Number of Children with BLL>=10mcg/dl)
(Number of Children Tested)
2006-2012 Lancaster County
Census Tract % EBLL (≥ 5mg/dl)
Age ≤ 7 Most Recent or Highest Test Value
Rate of children less than 7 years old with EBLs (elevated blood lead levels < 5) currently around 13%. The national average is.....5.4%

According to 2010 census children under age of 7 represent 10% of the population, which is number 1 per capita in the state.

The rate of testing for children 1 to 2 years of age was 7.64% which is half of most counties in PA and much lower than the national average of 16.2%.

PA ranks 4th in nation with housing units built prior to 1978.
Average EBLL by Distress Index and Housing Quartiles

- Variable:
  - Housing Stock Built Prior to 1978 Rate
  - Socio-Economic Distress Index

<table>
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<tr>
<th>Quartile</th>
<th>EBLL (%)</th>
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<tbody>
<tr>
<td>1</td>
<td>7.4%</td>
</tr>
<tr>
<td>2</td>
<td>9.3%</td>
</tr>
<tr>
<td>3</td>
<td>9.4%</td>
</tr>
<tr>
<td>4</td>
<td>18.5%</td>
</tr>
</tbody>
</table>

19.2% for Socio-Economic Distress Index
RACIAL DISPARITIES

Prevalence of Lead Poisoning in Children Under Age 6 by Race or Ethnicity in Wisconsin, 2004-2010

https://www.dhs.wisconsin.gov/lead/index.htm
Several “at-risk” groups including Latino population and Amish population.

No serious lead ordinances in county’s 63 separate municipalities, except Lancaster City.

There are playgrounds in Lancaster City which test very high for lead in soil.

Many community gardens may have high lead soil levels.

LANCASTER AND LEAD… A CONFLUENCE OF FACTORS
- Partnership for Public Health and Lancaster Lead Coalition
- New Funding from HUD
- Other grant funding
- Community Partnerships/ Legislative solutions
“Working collaboratively with local stakeholders to protect health, prevent disease and promote the health and well-being of all people in Lancaster County.”

Lead Coalition is a committee of the Partnership

Goal of Lead Coalition is to increase awareness, increase screenings rates, and decrease incidence of cases

www.partnershipforpublichealth.org
New Funding from HUD

- Lead Based Paint Hazard Control Grant
- $1.33 million to abate lead hazards in city and county
- A total of 92 homes will be remediated
  - 70 in the City limits
  - 22 outside the City
- The majority of units will be for homeowners with some rental units being served.
Other grant funding

- CHI/ St. Joseph Children’s Health
- Lowe’s Community Partners Grant
Community Partnerships/ Legislative solutions

- Advocating to legislators
- Developing better Lead ordinances
- Child-care ordinance in Lancaster City
- 211, single point of intake for children with EBLL
- Enhancing provider testing rates at LGH/ Penn Medicine
- Local solutions for local issues