

Grasshoppers, Dust, and Salsa— An Old Toxin in a New Setting

A Fresh Look at Lead Poisoning in Migrant Populations

Migrant Clinicians Network

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Migrant Clinicians Network

- MCN is the oldest and largest clinical network for the mobile underserved
- Founded in 1984 by clinicians working in migrant health
- The mission of MCN is to be a force for justice in healthcare for the mobile poor
- Over 5,000 constituents
- 157 federally funded Migrant Health Centers

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A Collaborative Project

- Texas Tech University
- Migrant Clinicians Network
 - ▶ In partnership with the Community Health Center of Lubbock

With Funding From the US Environmental Protection Agency



Learning Objectives

- Identify the composite risks and sources of lead poisoning in migrant populations
- Incorporate migrant-specific clinical guidelines for lead prevention and treatment into established guidelines for care
- Identify and access resources for the prevention and treatment of lead poisoning as part of a primary care setting serving migrants.
- Differentiate the lead prevention needs of adult migrant workers, pregnant women, and children



Why?



On the One Hand...

- Elevated blood lead levels (EBLL) are falling in all age and ethnic groups - CDC via NHANES
- Environmental sources such as paint, exhaust, and food cans - regulated and eliminated in the US
- Widespread screening in Medicaid populations shows EBLLs occur no more often than in non-Medicaid groups (CDC, *MMWR*, 2009)
- Worksite protocols are available in high-risk industries
- Local surveillance is deemed satisfactory



But On the Other Hand...

- Many sources of lead are imported
- Some sources of lead are culturally-based
- Mexican-American children had the highest rates of EBLL on NHANES and yet the further breakdowns only refer to non-Hispanic populations (CDC, *MMWR*, 2009)
- Many migrant and immigrant groups are not Medicaid eligible or enrolled and so the statistics don't apply
- Local surveillance doesn't take into account migration exposures



Blood Lead Levels in Lubbock Children

- From 2000 - 2005, an average of 6.8% of Lubbock children < 5 years old were tested for lead
- 41.4% of children tested in Zip Code 79403 had a BLL > 5 $\mu\text{g}/\text{dL}$
- In the rest of NE Lubbock, 25% of children tested had BLLs > 5 $\mu\text{g}/\text{dL}$
- ~10% of children tested from the rest of Lubbock had a BLL > 5 $\mu\text{g}/\text{dL}$



Case Studies: Two Boys

Two boys, ages 7 and 6, presented to a local health department for “school shots.” They had moved from Mexico in the past year. One mother had a note from the school that the 7 year old needed testing for ADHD. They both received immunizations and physicals. Both were mildly anemic. Both were a bit delayed on school readiness, and a bit “hyperactive.” Despite it not being required, they were tested for lead.



Case Studies, cont'd: Two Boys

Both boys had EBLL in the range of 50-60 $\mu\text{g}/\text{dl}$. An environmental study of the homes showed no source in the dust or paint or fumes. No previous BLL results were known. Family members were tested and were normal. The boys did not share a history. Oral chelation was given in consult with the children's hospital. Lead levels decreased and then rose again over time, reflecting bone leaching and long term toxicity. Lead was suspected as an agent in the neurodevelopmental issues experienced by these "hyperactive" boys.



Case Study: Prenatal Cravings

A 22 year old woman is in her second trimester of pregnancy when she presents for care at a clinic. She has just moved to the area. Originally, she is from Oaxaca, Mexico. Everything seems pretty routine. The nurse asks if she has any cravings, and the patient responds she loves her treats. Fortunately, she is asked to list her dietary recall in the past 24 hours.



Case Study, cont'd: Prenatal Cravings

An interpreter familiar with Oaxacan culture recognizes the treats are dried grasshoppers (*chapulines*) and candies. Though not routinely done, a BLL is obtained. The patient is found to have a EBLL of 20 $\mu\text{g}/\text{dl}$. A sample of the grasshoppers and homemade candy is sent for lead testing also and found to have high levels.



Case Study: Day Labor

A 31 year old farmworker comes in to be seen for a sore back. Your center takes every opportunity to provide comprehensive care. You do a careful occupational assessment. He is working in the berry fields. He'll be here about 6 weeks and then move on. You get him up to date on shots. You ask where he'll move next and he doesn't know. He says he doesn't like this work, he likes what he was doing last.



Case Study, cont'd: Day Labor

- Always on the lookout for occupational health issues, you ask what he did last. He worked in construction. But he also volunteers he worked in a scrap metal yard, and that was a steady job. You ask when he last had any blood checked, and he can't recall. His baseline BLL is 35 $\mu\text{g}/\text{dl}$.



Sources of Lead: The Usual Suspects

- Lead paint chips
- Dust and dirt around homes and buildings that have had lead-based paint, even if present paint is lead free.
- Soil near historically high car traffic areas.
- Paint from non-US sources. May be found in coatings on imported toys and furniture.
- Occupational sources such as smelting plants, auto repair, battery recycling, rubber and plastics manufacturing, metal working, glass work.

<http://www.doh.wa.gov/ehp/lead/oldhomes.htm>

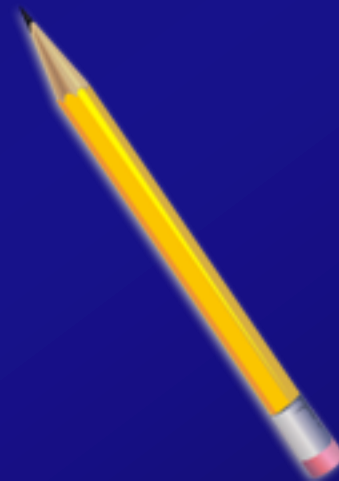


Sources of Lead: Keeping Us Guessing

- Imported ingestibles: candy, food, vitamins, traditional medicines, teas, grasshoppers...
- Imported cosmetics and dermal remedies
- Imported ceramics and food prep vessels
- Chile powder, spices, salsa that can leach lead from the containers
- Craft work such as stained glass, jewelry making, print making
- The stray bullet!



But don't sweat the lead pencil 😊





Routes of Poisoning

- Ingestion
- Inhalation
- Maternal-fetal blood transfer



Variations in Toxicity

- Infants and Children
- Pregnant Women
- Adults



Infants and Children

- The population is well studied
- No “safe” lead level
- Intervention and follow-up at threshold of 10 $\mu\text{g}/\text{dl}$ whole blood
- Screening with capillary blood but f/u with venous
- Universal screening part of EPSDT but may vary with local context or zip code



Infants and Children, cont'd

- Currently screen children at 12 and 24 months of age
- Screen children 36-72 months of age if never before screened
- States may drop universal screening if data supports it in local settings
- Recent immigrants, refugees, foreign adoptees considered high-risk

Migrant Infants and Children

- May or may not be “recent immigrants”
- May, however, have same risk exposures as immigrants: travel outside US, access to imported ethnic foods and meds, household goods with lead-based paint or ceramics with lead glaze, periodic dwelling in substandard housing with lead dust
- Also do not have “local” zip code, so no assurance of exposure history

Photo © Alan Pogue



Migrant Infants and Children

- Often present for care because of school requirements
- May be older than 72 months and yet affected by past or ongoing exposure
- May be difficult to find source of exposure
- May have been intrauterine exposure
- Chelation doesn't quell chronic toxicity



Signs and Symptoms of Lead Exposure in Infants and Children

- Typically silent at lower levels
- Affects red blood cells, kidneys, nervous system
- Mild anemia: hypochromic microcytic with iron deficiency
- Renal fibrosis and hypertension
- “Soft” neurologic signs such as poor fine motor control, inattention, hyperactivity



Signs and Symptoms cont'd

- Developmental impairment, even at low levels: early developmental delay, decrease in verbal IQ, dyslexia, later risk for school drop-out and delinquency
- Acute poisoning: constipation, fatigue, anemia, abdominal pain, peripheral neuropathy to full-blown encephalopathy in severe poisoning
- Children are treated more aggressively than adults—see protocols

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Blood Lead Screening Criteria for Medicaid-Eligible Children (Aug. 09, MMWR)

- Child suspected by parent or provider to be at-risk for exposure **Provider consider risk for migrant**
- Child with sibling or playmate with EBLL
- Child a recent immigrant, refugee, or foreign adoptee **Add migrant**
- Child's parent or caregiver works with lead **Remember day labor**
- Child's household uses traditional, folk, or ethnic remedies or cosmetics or routinely eats food informally imported **High probability in migrant**
- Child's family designated at-risk by health dept. surveillance **May miss mobile factors**



Diagnosis and Plan for Infants and Children

- Blood lead level $<5 \mu\text{g}/\text{dl}$: “normal”
- Blood lead level $5\text{-}9 \mu\text{g}/\text{dl}$: exposed, retest
- EBLL $10\text{-}25 \mu\text{g}/\text{dl}$: environmental investigation, testing of family members, retesting of child every 1-3 months until stable x 3. Keep child as high risk and test again in year.
- EBLL $25\text{-}45 \mu\text{g}/\text{dl}$: “aggressive” environmental intervention, repeat testing as above
- EBLL >45 : consult pediatric specialist. Chelation protocols vary. Toxicity life threatening at levels over 70 or with symptoms of encephalopathy.



Suggested Protocol for Screening Migrant Infants and Children

All migrant farmworker children ages 0 to 6 years old should receive a minimum of two lead tests--one at approximately 1 year of age and the second at age 2. Consider testing any child without a previous history of testing. If the blood lead level is greater than or equal to 5 $\mu\text{g}/\text{dL}$ in either of these evaluations, if a sibling has EBLL, or if the health care professional suspects that a child is exposed to lead, then additional and more frequent blood lead determinations are indicated.



Pregnant Women and Newborns

Consider migrant women to be at risk for chronic or acute lead toxicity and screen for risk factors at their first prenatal visit

- ▶ Born outside US
- ▶ Pica
- ▶ Use of ethnic remedies, cosmetics, foods
- ▶ Jewelry, ceramics, cookware
- ▶ Occupational exposure
- ▶ Family member with occupational exposure



Pregnancy and Lactation

- Increase the release of stored lead from the bones
- Aggravated by low calcium and poor nutrition
- High BONE levels of lead at time of childbirth associated with lower birth weight, lower infant weight gain in the first month, and reduced head circumference and birth length

Photo by Anna Rorfi



Signs and Symptoms of Lead Toxicity in Pregnant Women

- None
- Hypertension
- Pre-eclampsia
- Intrauterine growth retardation
- Miscarriage
- Pre-term labor
- Neurologic symptoms similar to children up to encephalopathy

Diagnosis and Treatment of Lead Toxicity in Pregnant Women

- Blood lead level 0-4 $\mu\text{g}/\text{dl}$: “normal” range
- Blood lead 5-9 $\mu\text{g}/\text{dl}$: education, risk review, iron deficiency, calcium, vitamin C evaluation, notify pediatrics, repeat test in 1 month
- Categories of Toxicity:
 - ▶ 10-19 $\mu\text{g}/\text{dl}$
 - ▶ 20-44 $\mu\text{g}/\text{dl}$
 - ▶ ≥ 45 $\mu\text{g}/\text{dl}$



Medical Management of Pregnant Women

- BLL 10-19 $\mu\text{g}/\text{dL}$
 - ▶ Consider occupational exposure
 - ▶ Refer to an occupational health clinic if potential occupational exposure is found
 - Visit www.aoc.org to locate an occupational clinic in your region
 - ▶ Provide nutrition counseling to reduce absorption of ingested lead
 - ▶ Iron, vitamin C and calcium (non-bone) supplementation PRN



Medical Management of Pregnant Women

■ BLL 20-44 $\mu\text{g}/\text{dL}$

- ▶ Evaluate for other symptoms
- ▶ Refer woman to the local health department for environmental investigation if occupational exposure, hobbies and folk remedies have been ruled out as a source of lead exposure
- ▶ For advice about patient counseling concerning teratogenic effects, consult a Teratogen Information Service



Medical Management of Pregnant Women

- BLL ≥ 45 $\mu\text{g}/\text{dL}$
 - ▶ Consult with lead poisoning specialist to consider hospitalization and chelation with CaNa_2EDTA if pregnancy is in late 2nd or 3rd trimester
 - ▶ Immediate removal from the contaminated environment may be indicated

Source: adapted from NY State and NYC protocols



Recommended Blood Test Schedule for Lead-Exposed Newborns (0-6 months)

- If maternal BLL ≥ 10 at anytime during the pregnancy, test infant's BLL within 2 weeks of birth and at least monthly.
- Coordinate care with pediatric provider.
- Breastfeeding is generally safe for women with elevated BLL.
- If the infant's BLL is $10 \mu\text{g}/\text{dL}$ or greater and rising, and no remediable environmental source of lead can be detected, breastfeeding should be discouraged.



Adult Occupational Exposure

- Workplace regulations 3 decades old
- Don't consider agriculture
- Younger workers at higher neurodevelopmental and reproductive risk
- At least 100 industries with lead use

Occupational Tasks: many found in farmwork, or also done by migrants

- **General Industry** Lead production or smelting; brass, bronze, copper, or lead foundries; Ammunition/explosives production; Scrap metal handling; Firing ranges; Machining or grinding lead alloys; Manufacture of radiation shielding; Repair/replacement of refractory material in furnaces; Ship building/repairing/breaking; Mining; Battery manufacturing or recycling; Automotive radiator repair; Lead soldering; Ceramic manufacturing; Cable/wire stripping, splicing or production; Rubber manufacturing; Plastics manufacturing; Lead glass manufacturing; Paint/pigment manufacturing

Occupational Tasks: many found in farmwork, or also done by migrants

- ***Construction***, renovation, repair or demolition of structures with lead paint; Welding or torch-cutting painted metal; Sandblasting, sanding, scraping, burning, or disturbing lead paint; Use or disturbance of lead solder, sheeting, flashing, or old electrical conduit; Plumbing, particularly in older buildings



Non-Occupational Exposure

- Immigration should be recognized as an environmental risk: Asia, Mexico and Central America have particularly high levels of lead still available in everyday products. Industrial pollution in Asia is a well-known source.
- Lead solder in stained-glass artwork
- Lead-soldered cans
- Lead-contaminated candies
- Backyard scrap metal recycling
- Moonshine (liquor from a homemade still)
- Antique pewter plates, mugs, utensils, toys; Imported brass or bronze kettles, cookware; Lead-glazed tableware or cooking vessels



Non-Occupational Exposure

- Remodeling or painting pre-1978 housing
- Peeling paint
- Ethnic medicines or folk remedies (e.g., azarcón, greta, pay-loo-ah, kandu, some Ayurvedics)
- Ethnic Foods --fried grasshoppers, self-imported spices, and candies. The wrappers of these foods may also contain lead, as has been shown with candies
- Pica (ingestion of lead-containing nonfood items, e.g., soil or ceramics, plaster, or paint chips)
- Leaded crystal tableware
- Mine tailings
- Beauty products such as kohl eye make-up, certain hair dyes



Non-Occupational Exposure

- Retained lead bullet or fragments
- Melting lead for fishing weights, bullets, or toys
- Imported vinyl miniblinds
- Recreational target shooting
- Lead-contaminated drinking water supply
- Using lead glazes for ceramics, food dishes, and cookware. Acidic foods like salsa can leach even more lead from these containers
- Painting/stripping cars, boats, bicycles



Signs and Symptoms of Lead Toxicity

- May be subtle
- Nervous system, GI, and musculoskeletal
- HTN, neuropathy, ataxia, tremor, gout, nephropathy, anemia
- High levels with seizures, encephalopathy, delirium, stupor, lead colic, coma
- Worse if already impaired with HTN, diabetes, other illnesses that impact CNS, renal, GI



Diagnosis and Treatment in Adults

- Occupational and environmental history of ALL work in past year
- Travel history
- Family history
- PE
- Blood lead testing if indicated



Medical Management

- Surveillance program if in specified job with airborne lead at $30 \mu\text{g}/\text{m}^3$
- Also consider if any evidence of lead exposure at work
- Intermittent vs. constant; low levels vs. high
- Baseline BLL
- Monthly x 3 months in high risk jobs
- More frequently in intermittent jobs such as construction where high dose in short time can occur



Medical Management

- Protective Clothing
- Clean eating areas
- Wash-up areas
- Showers
- Separation of home from workplace



Adult Blood Lead Levels : 10-29 μ g/dl

- History as noted
- Exposure investigation
- Workplace communication
- Collaboration with public health, occupational medicine
- Reduce hazard
- Consider complicating medical factors regarding continuing work (renal disease, etc)
- Education
- F/u BLL per surveillance protocol



Adult BLL: 30-79 μ g/dl

■ Additionally...

- ▶ Remove from lead exposure
- ▶ Possible chelation if BLL >50 with signs/symptoms of toxicity
- ▶ Medical surveillance as protocol



Adult BLL: $>80\mu\text{g}/\text{dl}$

- Immediate removal from lead exposure
- Refer for urgent medical evaluation
- Consider chelation
- Medical surveillance



Medical Removal: General Industry

- BLL ≥ 60 $\mu\text{g}/\text{dl}$
- OR
- Average ≥ 50 $\mu\text{g}/\text{dl}$ on last 3 tests or all tests over last 6 months (whichever is longer)
- Unless last test is < 40 $\mu\text{g}/\text{dl}$



Medical Removal: Construction

- BLL ≥ 50 $\mu\text{g}/\text{dl}$
- Continue until two consecutive levels < 40 $\mu\text{g}/\text{dl}$



Chelation

- Rare
- Signs and symptoms of toxicity
- Over 80 $\mu\text{g}/\text{dl}$ typically



Follow-Up in Industry

- Last blood lead level $< 40 \mu\text{g/dl}$: 6 mos
- Last blood lead level $\geq 40 \mu\text{g/dl}$ but didn't need medical removal: 2 mos
- Recheck annually if blood lead level $\geq 40 \mu\text{g/dl}$ and medical removal wasn't required



Resources

- www.migrantclinician.org
- Clinical Guidelines
 - ▶ Migrant Children, Adult Workers, Pregnant Women
- Clinical Tools
 - ▶ Exposure History Forms
- Patient Education – in Spanish
- Association of Occupational and Environmental Clinics www.aoec.org
- Pediatric Environmental Health Specialty Units <http://www.aoec.org/pesu.htm>
- Organization of Teratology Information Specialists <http://www.otispregnancy.org/hm/>



Streamline

- Bimonthly, peer reviewed publication with educational information for our clinicians



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