Preventing Lead Poisoning In Children

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Objectives of this discussion

- **To develop (here) a program** to prevent lead poisoning of all Massachusetts’ children
- **To effectively identify and treat** all poisoned children living in or entering the State. (why in this order? Prevention is more powerful)
- **Educate** all parents, landlords, realtors, regulators and legislators about causes and effects of lead poisoning and how to avoid them
- **Design and agree on an integrated, statewide campaign** to:
  - Eliminate all lead throughout all housing stock (paint, dust, water, soil)
  - Minimize lead exposure in our children’s other environments = back yards, shelters, schools, churches
  - Replace all pipes that contain lead or lead solder and test water routinely
  - Teach the risks and consequences of childhood lead poisoning at different ages, from different environments, and with different blood levels, at prenatal & early childhood visits, in schools and parenting classes, at home visits by public health & educational programs who perform home visits
  - Screen all children per national guidelines
  - Manage infants and children with short and long term lead exposures
  - Legally mandate remediation of all significant lead hazards
Conflicts of Interest

• None.
• I’m considered an anathema by everyone having related financial interests (except perhaps deleading contractors)
We’re Doing Better
But Don’t Be Fooled
Why Then do we need to force so many people to spend so much money to delead?

• If we don’t, our children will continue for generations to suffer:

• (at best) low-level lead poisoning with loss of IQ points, challenges to their language acquisition, attention, and visual-spatial skills,

• And (at worst), higher chances of school failure, arrests, incarceration, lower-paying jobs, serious social and financial challenges in life.
We Have Just Begun
A LITTLE HISTORY

• We have known about the toxicity of lead and its sweetness for millenia
• Rome may have fallen because Romans made their wine tasty by adding lead
• Composer Beethoven, painter Goya, President Andrew Jackson may have died of lead poisoning
• Europe banned lead in house paint 100 years ago
• USA refused to until 1978 because it bowed to manufacturing and financial interests
Last 40 years

• When I was in medical school in the late 60s, the only patients we diagnosed with lead poisoning were seizing or dying
• Epidemiological and statistical studies started showing that most people in this country were poisoned because of exposure to paint and car exhaust
• Levels of concern started at >45, dropped to >0
• We started screening, and discovered strong associations of “low” lead levels with attention deficits, language delays, behavior disorders and mental health problems, incidence of crime
TYPICAL CASES WE’VE SEEN IN THE LAST MONTH

• 18 month old with a lead level of 20 on her 18 month screen
• 9 yo from Colombia with a level of 62 after being shot there and having shrapnel in his hip
• 13 yo from Cabo Verde with a screening level of 31
• 10 yo who is failing in school and whose parents want to sue a former landlord
ESSENTIAL QUESTIONS TO BE ANSWERED

• **Where?** – wherever children live & play – around their homes – inside and out
• Other sources: air, water, soil, solder, batteries, pottery, tiles, glazes, food, medicines, cosmetics
• **How?** – developmentally common behavior
  = crawling, exploring, mouthing, pica, hugging their dad or mom after work
• **When and For How Long?**
• **At what ages?** - fetal life, first 3+ years of life, rest of life
• Are the child’s behaviors related to lead poisoning?
Sources: universal objects

Everywhere in our Houses

Gasoline Fumes and Car Paint
Household objects

Pretty Pitchers

Nice Old Family Cookware
Paint, Woodwork and Renovations

Your Porch, your Sandbox
Your School, Your Church

Your Home Renovations
Doors, Windows
in and out

High end,
Short People

Gardens, Food & Water
Dust, and not just from next door
From Outside Home in

Parents bring lead from work and give it away at Home

Bullets are made of lead
From Outside the USA

Battery recycling in Cabo Verde

Mining in Africa
Essential Community Industries: Roofing Tiles in Mexico
Where Does Lead Go and How does it Poison Us?

- Lead gets into the body through the mouth, the air and from the mother
- Gets absorbed through the gut or lungs into the blood, gets into blood cells, esp. RBCs
- Passes into fatty tissues – especially the brain
- Gets bound in deep stores in the brain
- The body slowly excretes lead through the urine
A little Chemistry

• Lead looks like other divalent cations, eg, Calcium, Iron, Zinc and others with two positive charges

• It competes with, interferes with the essential activities of these other essential elements

• For instance, it competes with iron in the synthesis of heme

• It fouls up nerve transmission across synapses
Multigenerational toxicity

A young girl finds lead, likes it (it’s sweet and chewy), eats more

- Girl grows up (not as bright as she would have been if not poisoned), gets pregnant
- Her body “mobilizes” the lead into the blood and passes it to the fetus, poisoning the next generation
What does Lead Poisoning Do to children?

• Biggest increase in effect is from a lead level of nothing (0) to a lead level of something
• There is NO SAFE LEVEL OF LEAD
• For every increase in level of 10, children lose approximately 4 IQ points (statistical average)
• Specific problems caused = decreased attention, language acquisition, visual-spacial skills, impulse control
• Resulting in poorer school performance, lower likelihood of graduating HS, crime, job success
Increasing Toxicity

• At lower levels, 2-40, we cannot identify the specific contribution of lead poisoning to ADHD, school difficulties, etc.
• Social, educational, emotional, genetic, and nutritional factors are all contributing
• By levels of 40-60, you can get stomach pains, ataxia, dizziness
• At levels of 60 - 200, you can get somnolence, headaches, seizures, coma, and death
How do we **manage** children with levels between **0 – 10**?

- **>0 but less than 10:**
  - Discuss issue with parents
  - Stress keeping child away from peeling, chipping paint, anywhere, even furniture or old toys
  - Urge careful cleaning of house with Spic & Span or other household cleaner, not cooking with old pots
  - Feed foods rich in iron (why?)
  - Repeat lead and CBC in 3-2 months (or sooner if you suspect increased risk)
How do we **manage** Children with Levels 10 – 25?

- **>10 – 25:** Repeat all of the above, ask about other sources, grandmother’s place, day care.
- Ask about pica, parents’ work and good hygiene, recent or nearby renovations, proximity to an auto body shop or heavy work area (close windows on that side).
- Consult Regional Lead Poisoning Prevention Program.
- Ask parents to press landlord to inspect and delead the home.
- Start child on 2-3 mg/kg of elemental iron a day.
What if the parents don’t want to have an inspection?

- **ENCOURAGE** them to clean with household soap, act on their children’s behalf
- **LISTEN** - are they afraid to lose their housing
  - Because they are not living legally in that unit?
  - Are afraid that their hosts / relatives will be evicted?
  - Are afraid that they will be harassed or evicted?
- **EDUCATE** – law is on the tenant’s side, but not that strongly
- **ADVOCATE** - Help families get all the help available
How do we **manage** Children with Levels 25-50?

- All of the above
- **Now the State can intervene**, require a home inspection and deleading by certified contractor
- Refer to us, and we will chelate with DMSA (Chemet) – 3 doses a day for 5 days, then 2 doses a day for the next 14 days
- (What is the evidence that chelation helps?
- Repeat lead level after re-equilibration (10-14 days later) - (iron therapy is suspended during chelation – restart Fe after chelation till level <10)
- Lead level should drop 6-7 ug/dl each chelation
How do we manage Children with Levels > 50?

• Admit for chelation (no more provocation tests)
• Level below 60, CaNa2EDTA (iv preferably) x 5 days
• Level above 60, chelate with BAL x 3 days (started a few hours before EDTA) and EDTA for 5 days)
• Level likely to drop 20+ ug/dl
• Will have to re-chelate, probably with oral DMSA if lead level < 50 or 55
Effects of Chelation

- Lead is chelated from the blood not the other compartments
- Lead is constantly re-equilibrating between stores and blood and urine
- Remember that there may be lead in the GI tract as well – must check and clear the gut
- Remember also that we are usually sending children back to lead contaminated homes and communities
- Lead also causes anemia because it blocks several of the steps in heme synthesis. Iron competes with lead at all the enzymatic steps, so we continue iron Rx and food
Interventions that made a difference

• **Screening children routinely** (lots of push back)
  • 9 mos (why?), 18 mos, yearly till 6 (where?)
  • Must be venous, not capillary sampling
• **Getting lead out of household paint** (lots of push back)
  • That battle is over, but there is still lead in car paint
• **Getting lead out of gasoline** (lots of push back)
  • That battle is also over and made a huge difference
• Educating doctors, parents, homeowners, landlords, legislators (lots of ignorance, financial pressures)
  • (This battle will not be over in the foreseeable future)
• Passing legislation to make cleaning up the environment easier (massive pushback still)
Interventions that need to be continuously Reinforced

• Routine discussions before birth:
• Do you know if your house has lead?
• If the landlord claims he/she doesn’t know, any house built before 1978 has lead in it.
• Very careful renovations – who should do this?
• When must that conversation occur?
• Who should insist that this be done carefully? The paint companies?
• Who is allowed to renovate? And what are the requirements? Is “Moderate Risk” deleading safe?
• Official renovations / deleading – with tremendous care when pregnant, children or moms are in house
When should we be empowered to inspect?

• Whenever renting a housing unit
• Whenever selling a housing unit
• Whenever any child has a lead level above 2, 5, 10, 15 ??
• ?? Even if the likely source is outside the country (the child who died 10 yrs ago after immigrating to the US but was poisoned here)
• Whenever we see an older house with peeling paint
When should renters and sellers be **required** to delead?

- At every rental or sale - Why should this not be like Title 5?
- In which ways is lead contamination different than an inadequate sewer system?
- If a house is found to have lead, the landlord should have to delead it before renting it to anyone - or only if the next renter has children under 6?
- Can any landlord exclude renters with children?
- If there were realtors who only rent delead homes, should they be given tax or other advantages?
Should there be a new **tougher law**?

- To reflect the “new” science
- To enable action (inspections and deleading) on all cases of children 0-6 years old with lead levels > 5
- Elimination of loop-holes relating to “official residence”: if a child lives there, legally or not, the unit must be deleded
- All actions must be uncoupled from immigration / INS – (the issue is the housing unit not the child or family)
- To prevent owners from discriminating
- To prevent owners from lying about “not knowing”
- To reflect the real financial duties of renters and sellers
- To increase the housing stock available to families with children
What Additional Resources do we need?

- Sufficient staffing (inspectors, community health workers, social workers, access to lawyers) to manage each case closely
- More, readily accessible funds, or hefty tax breaks for landlords to delead (permanently)
- Coordination of oversight with other healthy homes / in-home educational services
- Funding for Early Intervention evaluations, and services for any that need it
EP = Erythrocyte Protoporphyrin

- One of the substrates in heme synthesis
- EP rises when lead blocks the enzymatic step that converts EP to the next compound
- Used to be used as screening tool when lead level of 45 was the level of concern
- Now EP is used to reflect the duration of poisoning – changes more slowly than blood PB – example:
What do I Train Doctors to Do?

• **Educate** every parent, every landlord, every realtor that lead is still a problem & know risks, signs and symptoms

• **Screen, routinely**, at 9 mos, 18 mos, and yearly till 6 years of age if child remains with elevated levels or at risk

• **Screen** immigrants up to 10 years of age who come from rural areas and/or developing countries where gas is still leaded, children and adults work and play around lead

• **Insist** that any housing unit a parent rents or buys be deleaded

• **Advocate** that all other places children are (day cares, schools, shelters, churches) be deleaded (some funds available, but we cannot require this to happen <25 ug/dl

• **If we are not insistent, this problem will not be solved**
What Can Parents Do?

• Have the knowledge and courage to care, to insist on knowing if there is lead in their homes, insist on getting the lead out
• Learn how to protect their children and themselves
• Enrich their children’s environments
• Establish strong, effective discipline
• Access the best schools
• Instill a strong desire in their children to learn
What does BLPPP do?

• I run the Boston clinic to meet, educate and treat patients and families
• We get all elevated lead levels run by the State Lab
• We are referred many children from their PCPs
• Boston PHC staff, who work with me, go to homes, know most of the addresses in Boston
• Evaluate homes, arrange inspections if legally allowed, perform “lead hazard reductions”, educate families about lead poisoning, etc..
• No longer funded directly
What should You Do?

• Help us get the lead out of every home, shelter, day care, school
• Work as a team
• If you’re not allowed to advocate, find articulate people who can and teach them
• As a citizen, urge legislators to provide more money and tighter laws