An unexplained case of elevated blood lead in a Hispanic child

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Initial contact

- TDH regional office asked SWCPEH to assist a pediatrician from an east Texas town
  - 11 month old child with a history of elevated blood leads, 36-41 μg/dl over a 4 month period
- Referred to Dr. Cherry for follow-up
  - Discussed case of Hispanic family and sources of lead in the home
Health issues as reported by child’s pediatrician

- Breast-fed child exclusively for 6 months
- Initial blood lead elevated at 6 months
- Solid foods began at 6 months
- Mild anemia, otherwise normal growth and development
- No apparent source of lead based on discussion with mom
Family demographics

- Mom 2nd generation immigrant from Mexico homemaker
  - Blood lead of 14 μg/dL in 3/14/02
- Dad employed as roofer
- Granddad, part-time roofer, caregiver
- 5-year old sister negative for blood lead
Timeline

- Child born 8/01
- First tested at 6 mo for lead on 3/14/02 (41 μg/dL)
- Repeated testing 3/22/02 (36 μg/dL)
- Oral chelation with Succimer 4/02
- Lead test No. 3, 4/30/02 (40 μg/dL)
- Initial TDH inspection, 5/02
- Repeat testing on 6/12/02 (37 μg/dL)
- SWCPEH contacted, late 7/30/02
Initial visit by TDH

- First visit by TDH hygienist in May
  - No sources of lead in the home or outside
  - All items on standard 6 page questionnaire tested, all negative
  - Paint, floors, surfaces, dirt outside, mini-blinds, all negative
- Family lived in a mobile home that was immaculately clean
Found in the back yard by garbage can – positive for Pb
Next steps

- Early 8/02 - Case discussed with Drs. Lowry, Levin, Brady, Huggins, Cherry
  - Talk by phone with family and pediatrician regarding sources of lead and preventive steps (hand washing, high calcium diet, etc)
  - Blood level 9/02/02 – 42 µg/dL
- 10/02/02 – Revisit to home by Drs. Cherry, Brady and Mr. Frambrough, TDH
October visit by Drs Cherry & Brady

- Additional family history
- Extensive evaluation of non-traditional sources of lead
  - Toys, crib, tub, foods, pots, cosmetics, ceramics, imported foods & candies, key chains, herbal remedies, folk remedies, lead fishing sinkers, etc.
  - All negative for lead
- Broken pottery and discarded cupola + for Pb
Environmental history

- Cooked beans in Pb-glazed pottery during pregnancy and until 6 mo old
  - Discontinued at 6 mo lead check
- Diet - breast milk only for 6 mo, both breast milk and baby foods until about 1 yr, then table foods, bottled water only
- Mobile home – no lead paint
  - PVC plumbing, city water, no pets, no pacifier, jewelry negative
The search for lead

- Additional testing of carpet dust (negative)
- Dr. Brady conversed with granddad, dad and mom in Spanish
  - No specific cultural exposures identified
  - No use of Greta or Azarcon
- Food sources of lead not likely
Mexican pottery
Lead-glazed Mexican pottery

- **General**
  - Traditional use from the old country
  - Contain high levels of lead
  - Can be leached by acid foods (Salsa)
  - Significant source of lead in diet

- **Specifics**
  - Broken piece found outside by garbage can
  - Not likely direct source of lead in child
**Additional blood lead data, $\mu g/dL$**

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Follow up information

- Mother admits to using Mexican pottery during pregnancy
  - If Pb high, then 5 yo should have elevated PbB also
- Pb in breast milk about 30% of maternal value
  - Not expected to be a significant source of lead
- Reported cases of pica in adults among Hispanics along the border
- Could this be the case here?
- Can we reconstruct estimated blood lead levels in mom and child at birth
Hypothesis

- Lead exposure occurred in utero from pica activity of mom, and not from cooking in Mexican pottery
Evidence

- Presence of lead in mom and child links the two to a common source
  - Not likely to be cooking in Mexican pottery
- Lead levels in child slowly dropping for 8 months, from initial age of 6 mo to current age of 14 mo
  - Elimination half-life from blood, 27 days
  - Elimination half-life from bone, $10^5$ days
- Chelation (compliance not verified) did not lower blood lead in child
  - Expected to lower blood level if major depot in body
Discussion and speculation

Mom possibly ingested some chips of pottery (pica) while pregnant, giving her and child high initial dose of lead

- Rapid elimination of first (blood) compartment during first 6 months
- Slow elimination from bone over years

Most likely, 2- compartment elimination, rapid from the blood and slow from the bone

Lead levels in child and in mom reflect washout of lead from bone stores
Elimination kinetics evidence

- Elimination kinetics for mom and child similar linking the possible exposure
  - $k_{el}$ for child is 0.07 $\mu$g/dL/day
    - Slope of curve with $n=7$
  - $k_{el}$ for mom is 0.05 $\mu$g/dL/day
    - Slope of curve with $n=2$

- Elimination kinetics imply slow release from bone

- Cannot calculate elimination half-life as it is likely a 2-compartment model and there is no data for the early rapid elimination phase from blood
Follow-up health surveillance

- Based on elimination rate, predict drop of PbB of 2-3 μg/dL per month
  - Monitor blood lead quarterly
- Further chelation not indicated
- Abdominal x-rays to rule out GI source, not indicated
- Enroll in early childhood intervention program
  - Monitors neuro-developmental progress to 6th grade
CDC recommendations

- Re-check PbB monthly if PbB > 20 μg/dL
- Surveillance for neurobehavioral effects if PbB remains above 20 μg/dL
- Maintain diet high in Ca, Fe, Vitamin C
- Use dairy products regularly as source of Ca
What are long term consequences?

- Children exposed to very high Pb in Idaho in 1970s (PbB 50-150 μg/dL) evaluated in mid 1990s
- Normal PbB, elevated bone lead (XRF), mild neurobehavioral decrement compared to controls
Summary

- Environmental questionnaire essential
- Possible sources of lead must be investigated and tested
- Do not neglect cultural issues
- Keep an open mind
- It's not only paint
Epilog

- Mother admitted to pica behavior with Mexican pottery
Thanks to my co-investigators

- Debra Cherry, MD
- Tim Brady, DO
- Cecil Fambrough, IH