



Elemental Mercury Poisoning in a Family of Seven

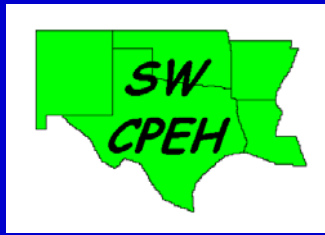
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Associate Professor, OHS
Co-Director, SW-CPEH

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Mercury in children

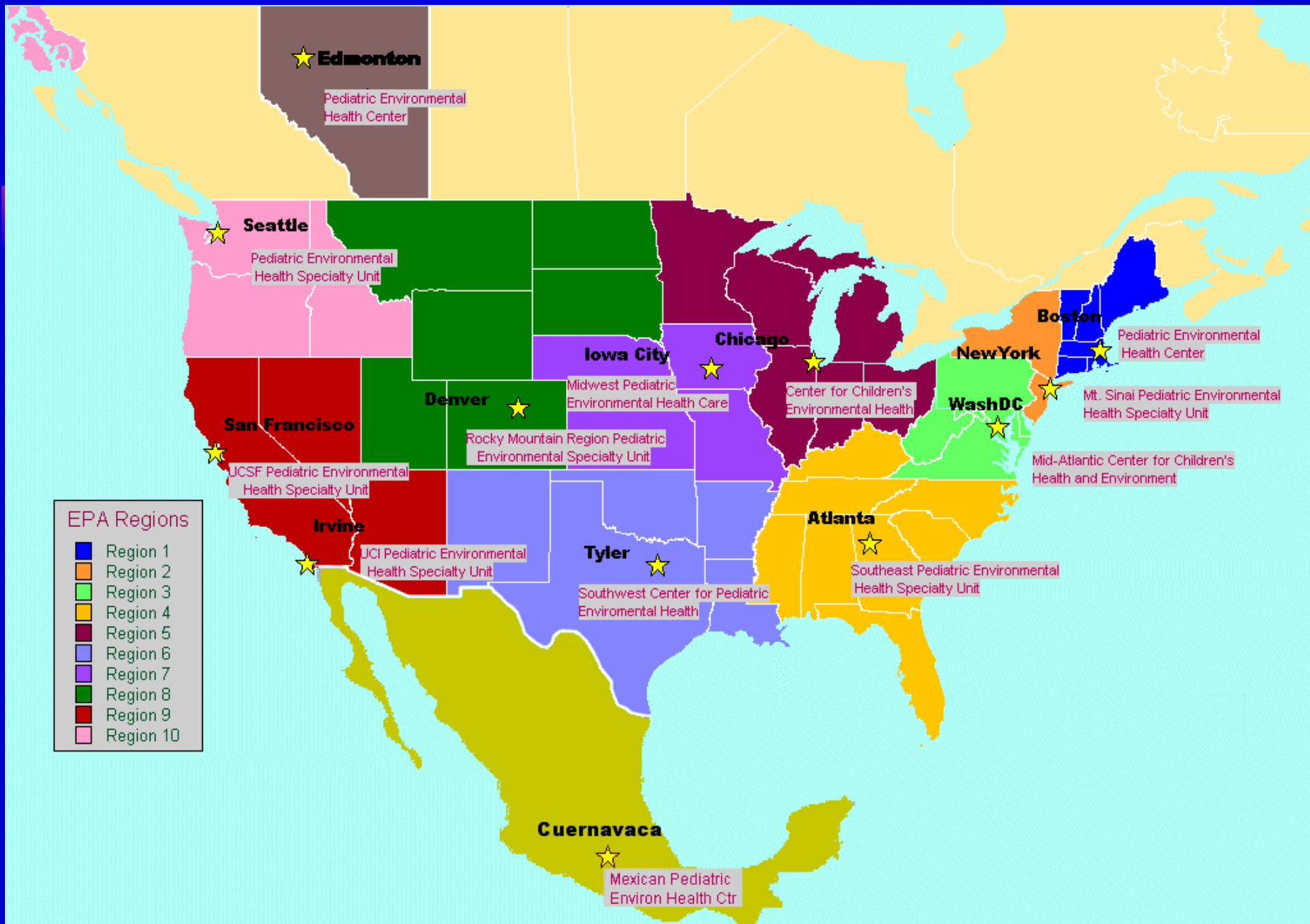


- The Texarkana Hg incident
 - Teens stole, disseminated Hg in community
- The gas regulator problem in Chicago
 - Gas regulators containing Hg replaced by contractor resulting in spilling of Hg in basements
- Hg, second only to molds in number of calls to the PEHSUs



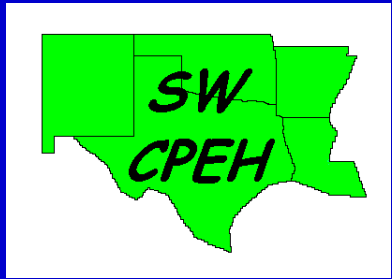
Overview of the SW-CPEH

- UTHCT center one of 13 in US, Canada and Mexico that serves AR, LA, OK, NM, and TX
- Provides education to bridge the gap between the pediatrician and OEM
- Provides 24/7 telephone consultation through toll-free number to health professionals and public



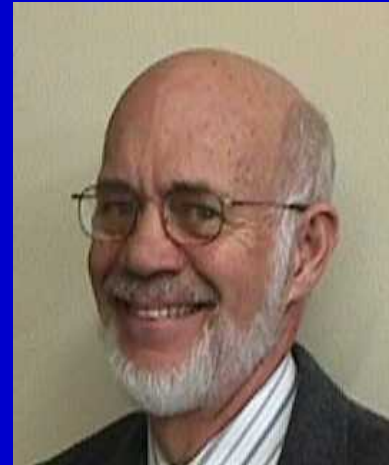
EPA Regions

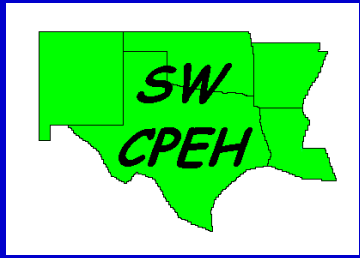
- Region 1
- Region 2
- Region 3
- Region 4
- Region 5
- Region 6
- Region 7
- Region 8
- Region 9
- Region 10



Our Tyler faculty

- Co-Directors
 - Larry Lowry, PhD
 - Jeff Levin, MD, MSPH
- Medical consultant
 - Debra Cherry, MD, MS

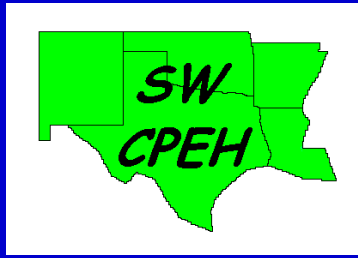




Pediatrics

- Barbara Huggins, MD
- Rodolfo Amaro, MD
- Vickie Butler, MD





Our New Partners

- UNM Program on Occupational and Environmental Health
- Regional Poison Centers & Health Departments
 - Arkansas
 - Louisiana
 - New Mexico
 - Oklahoma
 - Texas



Outline of presentation

- The case presentation
 - History and clinical
- The laboratory issues
 - Interpretation of data in children
- The environmental investigation
 - Initial remediation
 - Follow-up evaluation



Clinical history

- In 10/1999, a family of 7 moved to a trailer
- A plastic container of metallic mercury was found
- Mercury spilled on carpet
- The family did not realize that the trailer was contaminated



The index case

- 3 y/o Female saw local physician several times between 12/99 and 6/2000 with flu-like symptoms, screaming, anorexia, weight loss, and inability to talk
 - Hispanic family – communication difficulties?
- She was hospitalized 6/20/2000



Index case and family

- Index case:
 - Initial findings: thin, ataxic, not speaking, drooling, hypotonic, tremor
 - No rash or gum swelling
 - Initial impression: brain tumor
- Other family members
 - Not reported to be symptomatic
 - Not examined by a doctor
 - Subsequently evaluated for urine Hg



Lab and diagnostic tests

- CT of brain, MRI, EEG, ultrasound of abdomen
- GI series, CBC, Chem Panel, U/A, ESR
- Blood, urine and spinal cultures, blood levels of heavy metals



Initial clinical lab results

- All tests normal on except blood Hg of 295 $\mu\text{g}/\text{dL}$ (normal < 3)
- Referred to nephrologist, contacted the Poison Center for chelation recommendations
- Obtained 24-hr urine before chelation, initial HgU 1097 $\mu\text{g}/\text{day}$ (normal < 15)



Follow up action

- 6/26/00
 - Obtained urine Hg from family members
 - Ordered DMSA chelation for index case
 - No established Hg levels for chelation
 - Poison center recommended HgU > 50 $\mu\text{g}/24$ hrs
 - Subsequently ordered chelation for all
- 7/3/00 - Index case discharged
 - Condition much improved



Subsequent action

- 8/15/00 - Urine Hg determined second time
 - Results high, see table
 - Mother, grandmother did not return samples
- 8/30/00 - 2nd round of chelation, all
 - Done on outpatient basis, compliance?
- 10/26/00 - 3rd round of urine collections
 - Results lower, see table
 - Mother, grandmother did not return samples

Urine Mercury, $\mu\text{g}/\text{day}$ (Normal < 15 $\mu\text{g}/\text{day}$)

Patient	6/26/00	8/15/00	10/26/00
3 y/o F	1097	142	101
6 y/o M	1262	-	45
7 y/o F	1237	173	113
9 y/o M	600	142	147
16 y/o F	2940	267	128
27 y/o F	1085	-	-
52 y/o F	286	-	-



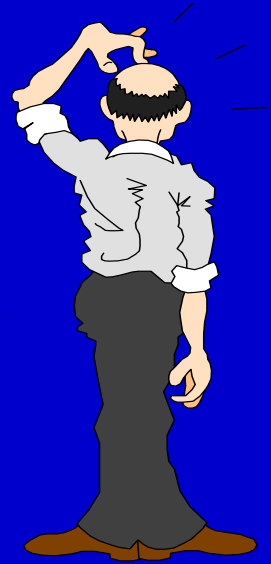
Laboratory issues, HgU

- Initial lab results expressed as $\mu\text{g}/\text{sample}$, later results as $\mu\text{g}/\text{day}$.
 - What was sample volume?
 - Was it a 24 hr collection?
- No external quality assurance program
- Internal QA data not available



Interpretation

- Guidelines based on $\mu\text{g}/\text{L}$ or $\mu\text{g}/\text{g}$ creatinine
 - Interpretation difficult especially in the five children ranging from 3-16 years old.
- Laboratory reported normals as $< 15 \mu\text{g}/\text{day}$
- BEI - $35 \mu\text{g}/\text{g}$ creatinine for a spot urine





Environmental history

- 6/26/00 - Family moves to Ronald McDonald Center
- 6-26/00 - 6/30 - Identify appropriate agency, TDH
 - Local health departments no help
- Toxic Substances Division TDH agrees to send out IH to investigate
- 6/30/00 – First find out about Hg jar in trailer
- 7/3/00 - Family moves in with uncle

Decontamination of trailer

7/28/00



- Owner gets colorimetric badges to test house
 - Initial tests "high" (no collection time noted)
- Hazmat team decontaminates trailer
 - Remove carpet, couch, some chairs
- Owner tests trailer 2-days later w badges
 - Results are "OK" (no collection time noted)
- Family moves back in, 7/30/00

Mercury badge

Front

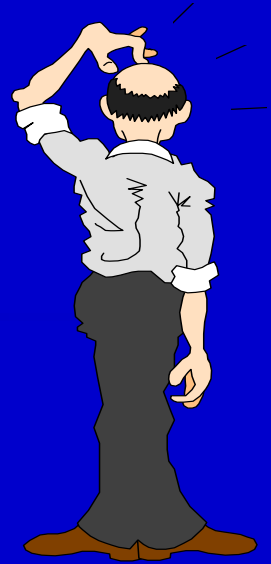


Rear



Interpretation

- Designed for workplace industrial hygiene use
- Diffusion design with an indicator behind selected filters on front of badge
- Should see gradation of colors
- Report highest concentration with color change
- Color related to concentration x time



Mercury badge

Front



Rear





Interpretation (2)

- Detection limits 0.1 – 1.0 mg/m³/hr
- Look at badge
 - Time of collection – 3-hrs
 - Is there a gradation of color?
 - Detection limit for 3-hrs – $0.125/3=0.042$ mg/m³
- *TLV-TWA for 8-hrs is 0.025 mg/ m³*
- Defective lot, interpretation impossible



Follow-up action

- 9/22/00 IH from TDH visits trailer
 - Takes measurements with Jerome Sniffer
- TDH IH advised family to clean the walls, coat the floor, and ventilate the home for a month
- Family eventually moved out of trailer for other reasons

The Jerome Mercury "Sniffer"

- Direct reading based on gold film technology
- Easily calibrated
- Widely used by EPA and IH's to monitor Hg spills





Hg in Air, Jerome Model 411 "Sniffer"

Location	Elevation	Hg, mg/m ³
Hall	Floor	0.011-0.017
Entry to bedroom	Floor	0.012
Living Room	3 ft above floor	0.009



Reference values

- ACGIH TLV - 0.025 mg/m³ 8-hr TWA
- TDH - 0.003 mg/m³
- WHO - 0.01 mg/m³
- EPA (ambient air) - 0.001 mg/m³
- Results exceed EPA, WHO, TDH guidelines



Recommendations & current status

- The index case is now symptom-free.
- Mercury levels in all family members have dropped considerably but remain moderately elevated
- Apparent continuing low-level Hg contamination



Lessons learned

- Family at risk for 8 months
- This case illustrates the need for primary care professionals, occupational health specialists, toxicologists, and industrial hygienists to work together and have an action plan to address environmental health problems.



Collaborators

- Debra Cherry, UTHCT
- Larissa Velez, North TX Poison Ctr
- D. Chris Keyes, North TX Poison Ctr
- Cindy Cotrell, North TX Poison Ctr
- Keller Thormahlen, TDH, Austin

Disclaimer, acknowledgements & fine print



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- This presentation represents the intellectual property of the authors. Use of these materials is encouraged with proper acknowledgement. The authors would appreciate feedback from users of this material.
- A manuscript has been published on this case in Family and Community Health, 24: 1-8, 2002