

PEHSU National Classroom



PEHSU
Pediatric Environmental
Health Specialty Units

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Webinars

Series of scientific webinars that provide a forum for discourse on scientific issues.

Live and On-Demand

Case Conferences
Journal Clubs
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CE Available



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Evidence-based online courses on a variety of children's environmental health topics.

Interactive and Self-Paced

CE Available



Resource Catalog

Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals

Topics included:
Air Quality, Pesticides,
Natural Disasters, BPA,
Mold, Lead, Mercury



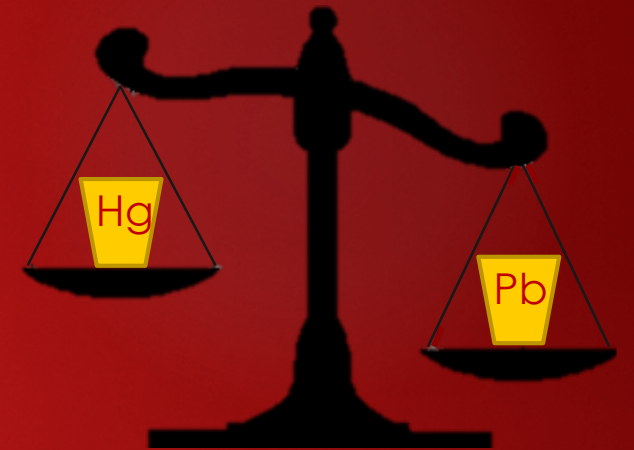
Southwest Center for Pediatric Environmental Health

TEXAS TECH UNIVERSITY
HEALTH SCIENCES CENTER
EL PASO

Lead & Mercury: Heavy Dangers for Kids

Plomo y Mercurio: Un Gran Peligro para los Pequeños

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SWCPEH AND WEST TEXAS REGIONAL POISON CENTER



Acknowledgments / Reconocimientos

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Objectives / Objetivos

- ▶ Review sources and adverse effects of lead exposure
 - ▶ Identify populations at greatest risk of lead poisoning
 - ▶ Identify the current blood lead reference level and place it in historical perspective
 - ▶ Review sources and adverse effects of mercury exposure
 - ▶ Recognize that lead and mercury poisoning are poisoning preventable
- ▶ Revisar las fuentes y los efectos adversos de la exposición al plomo.
 - ▶ Identificar las poblaciones con mayor riesgo de envenenamiento por plomo
 - ▶ Identificar el nivel de referencia actual de plomo en la sangre y su perspectiva histórica
 - ▶ Revisar las fuentes y los efectos adversos de la exposición al mercurio.
 - ▶ Reconocer que la intoxicación por plomo y mercurio se pueden prevenir

Lead sources,
adverse effects &
at-risk populations

Fuentes de plomo,
efectos adversos y
poblaciones en
riesgo



Uses of lead / Usos del plomo

- ▶ Batteries
- ▶ Pigments
- ▶ Rolled and extruded products
- ▶ Alloys
- ▶ Shot and ammunition
- ▶ Cable sheathing
- ▶ Gasoline additives

▶ From toxnet.nlm.nih.gov hazardous substances database, citing IARC monograph, 2006



Various lead pigments

- ▶ Baterías
- ▶ Pigmentos
- ▶ Productos laminados y extruidos
- ▶ Aleaciones
- ▶ Municiones
- ▶ Cubiertas de cables
- ▶ Aditivo en la gasolina
 - ▶ From toxnet.nlm.nih.gov hazardous substances database, citing IARC monograph, 2006

Various sources of lead exposure



Varias fuentes de exposición al plomo

- ▶ Lead paint
- ▶ Water
- ▶ Soil
- ▶ Cosmetics
- ▶ Ayurvedic and Traditional Chinese Medicines
- ▶ Toys
- ▶ Turmeric, tamarind, chili, and other foods
- ▶ Food containers
- ▶ Parental occupations and avocations
- ▶ Pintura con plomo
- ▶ Agua
- ▶ Tierra
- ▶ Productos de belleza
- ▶ Medicina tradicional ayurvédica y china
- ▶ Juguetes
- ▶ Cúrcuma, tamarindo, chile, y otras comidas
- ▶ Contenedores de comida
- ▶ Ocupaciones y vocaciones de los padres

Lead paint in the home

Pintura con plomo en la casa

Houses built before 1978 often have lead paint

Home repairs may release lead from layers below

Lead paint dust is the number 1 source of lead poisoning

Casas construidas antes de 1978 tiene frecuentemente pintura con plomo

Reparaciones de casa pueden arrojar el plomo

El polvo de pintura es la primera fuente de exposición al plomo



Lead in water

Plomo en el agua

Some plumbers still use lead solder for copper pipes, exposing water directly to lead.

Algunos plomeros todavía usan soldadura de plomo para tubos de cobre, exponiendo el agua directamente al plomo.



CONCERNED ABOUT LEAD IN YOUR DRINKING WATER?

Sources of **LEAD** in Drinking Water



Lead in the soil

Plomo en el suelo

- ▶ Have your soil tested
- ▶ Cover with thick grass, wood chips or gravel
- ▶ Pave it or cover with concrete
- ▶ Do not plant a vegetable garden in lead-contaminated soil



<https://www.webmd.com/children/lead#1>

- ▶ Haz que te analicen el suelo
- ▶ Cubrir con hierba gruesa, astillas de madera o grava
- ▶ Pave o cubra con hormigón.
- ▶ No plantar un jardín en suelo contaminado

Lead in toys / Plomo en los juguetes



Home Furnishings

Muebles



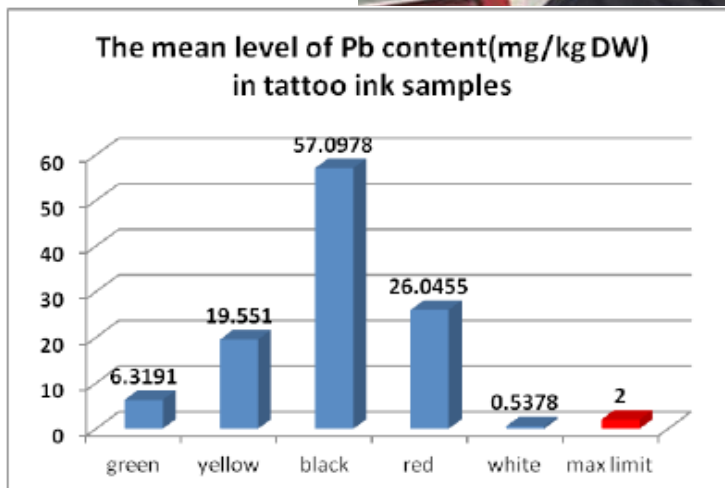
Cosmetics, jewelry & clothing

Cosmética, joyería y ropa



Cosmetics, jewelry & clothing

Cosmética, joyería y ropa



Food & Beverages

Comida y bebidas



Hobbies



"Of course you can do it!
I saw it on YouTube"

"¡Claro que puedes
hacerlo!
Lo vi en YouTube "

NEVER melt
lead
indoors!

¡NUNCA
derrita el
plomo en
interiores!

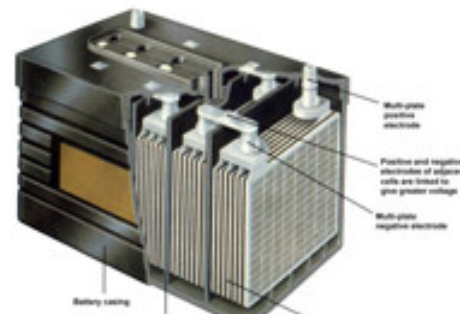


Lead at work

Plomo en el trabajo



Shooting range
Photo credit: CDC.gov



Inside a lead acid battery
batteryuniversity.com



Soldering
Toledo car radiator repair



Recycling lead acid batteries
Photo credit: idea-service.ca



Recycling "Duck Dynasty" style
Photo credits: youtube.com

Should I test for lead myself?

¿Debo hacer un a prueba de plomo?



- ▶ Recognized by US EPA for use on drywall and plaster
- ▶ The swabs test the surface only – lead paint 2 or 3 layers down could be missed
- ▶ Likely reliable if positive
- ▶ Use exactly as directed
- ▶ Reconocido por la US EPA para uso en paneles de yeso y yeso
- ▶ Los hisopos solo prueban la superficie: la pintura de plomo se puede encontrar 2 o 3 capas hacia abajo
- ▶ Probablemente confiable si es positivo
- ▶ Use exactamente como se indica

Lead – The dose makes the poison

Lead accumulates in the body and is stored in bone and blood

Children are at greater risk to develop lead toxicity than adults

Lead has particularly devastating effects on the growing nervous system

El plomo – La dosis hace el veneno

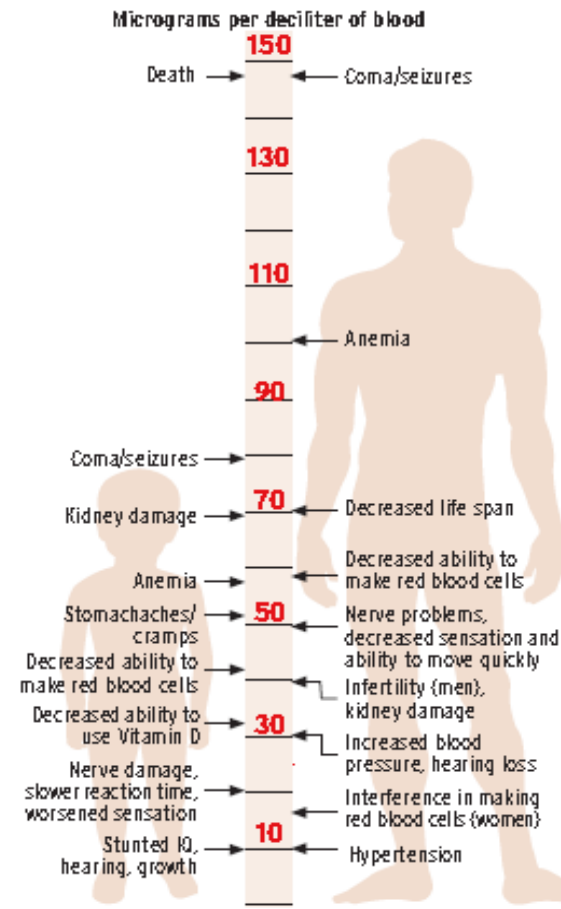
El plomo se acumula en el cuerpo y se almacena en los huesos y la sangre.

Los niños están a mayor riesgo que los adultos de desarrollar intoxicación por plomo

El plomo tiene efectos particularmente devastadores en el sistema nervioso del niño

HOW LEAD AFFECTS YOU

Studies show that long-term exposure to lead can affect a child's developing nervous system. Health effects of different blood-lead levels in a child compared to an adult:



SYMPTOMS TO LOOK FOR:

Contact your doctor if you notice these symptoms or believe your child is at risk.

- Decreased appetite
- Fatigue
- Irritability
- Difficulty concentrating
- Tremors
- Headaches
- Abdominal pain
- Vomiting
- Constipation
- Weight loss

SÍNTOMAS

- Disminución del apetito
- Fatiga
- Irritabilidad
- Falta de concentración
- Temblores
- Dolores de la cabeza
- Dolores del abdomen
- Vómito
- Estreñimiento
- Pérdida de peso

SOURCE: Register research
Graphic by Molly Zisk, The Register

Mother's elevated blood lead in pregnancy may:

Result in preterm labor

Be transferred across the placenta to the baby

Enter the breast milk

El nivel elevado de plomo en la sangre de la mamá puede:

Producir un parto prematuro

Ser transferido a través de la placenta al bebé

Contaminar la leche materna



Lead's effects on educational outcomes

El Plomo y sus efectos en los resultados educativos

- With a blood lead level of 5 mcg/dL, a child is 30% more likely to fail 3rd grade reading and math tests
- Con un nivel de plomo en la sangre de 5 mcg/dL, un niño tiene 30% más probabilidades de reprobado los exámenes de lectura y matemáticas de 3er grado

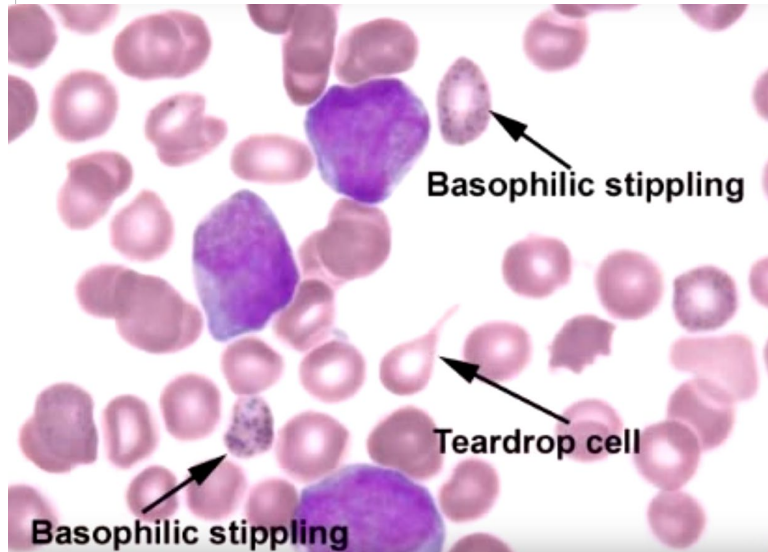
Blood Lead Levels	Educational Impact	Size of Study	Location of Study
≤ 3 µg/dL	Decreased end of grade test scores	More than 57,000 children	North Carolina (Miranda et al. 2009) ¹
4 µg/dL at 3 years of age	Increased likelihood learning disabled classification in elementary school	More than 57,000 children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

Moderate to severe lead poisoning

Anemia
Abdominal pain
Constipation
Lethargy
Encephalopathy
Wrist and foot drop

Intoxicación con plomo de moderada a severa

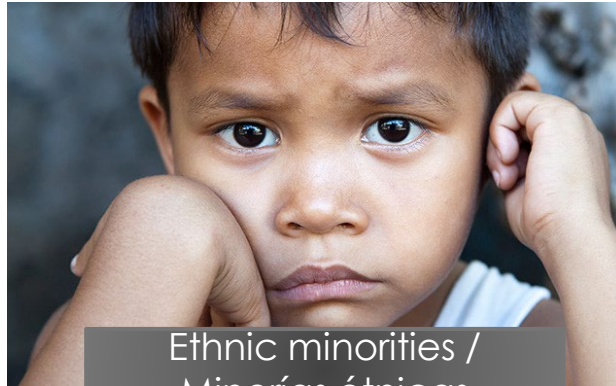
Anemia
Dolor abdominal
Estreñimiento
Letargo
Encefalopatía
Caída de la muñeca y el pie



Which children are at greatest risk? ¿Cuáles niños corren mayor riesgo?



The poor /
Los desafortunados



Ethnic minorities /
Minorías étnicas



Recent immigrants /
Inmigrantes recientes



Families in older housing /
Familias en casas antiguas



Children of lead workers /
Hijos de trabajadores con plomo

Which children are at greatest risk? ¿Cuáles niños corren mayor riesgo?

▶ Children with pica

- ▶ Pica is an eating disorder involving eating items not typically thought of as food, such as dirt, paint chips
- ▶ Pica is more often seen in children with:
 - ▶ Autism
 - ▶ Intellectual disability
 - ▶ Traumatic brain injury
 - ▶ Malnutrition and iron deficiency anemia



▶ Niños con pica

- ▶ La pica es un trastorno alimenticio que involucra comer sustancias que no son alimentos, como la tierra y las astillas de pintura.
- ▶ La pica se ve más a menudo en niños con:
 - ▶ Autismo
 - ▶ Discapacidad intelectual
 - ▶ Lesión cerebral traumática
 - ▶ Desnutrición y anemia ferropénica

Blood lead testing

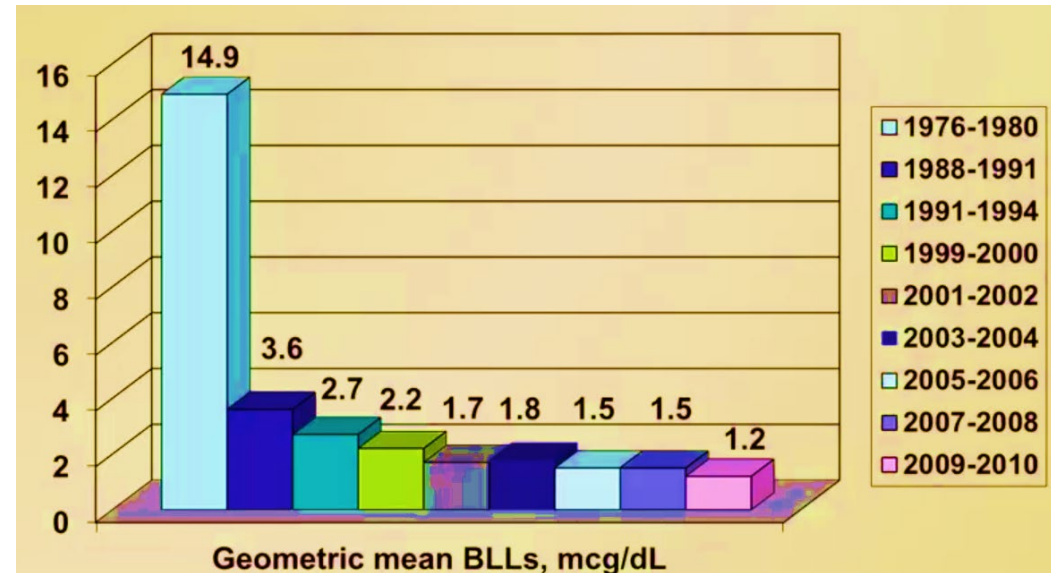
Pruebas de plomo
en la sangre



Blood lead levels (BLL) in perspective

Niveles de plomo en la sangre en perspectiva

- ▶ Current CDC reference level: 5 mcg/dL
- ▶ Percentage of children with BLL > 10 mcg/dL
 - ▶ 1976-1980 88%
 - ▶ 1988-1991 9%
 - ▶ 1999-2002 1.6%
 - ▶ 2010 <1%
- ▶ Blood lead level at which symptomatic patients are sometimes treated with chelation therapy: 45 mcg/dL



CDC, 2012. 4th national report on human exposure to environmental chemicals
Jones 2009 Pediatrics 123, e375-e385
Mahaffey 1982 N Engl J Med 307, 573-579

- ▶ Nivel de referencia de CDC actual: 5 mcg / dL
- ▶ Porcentaje de niños con BLL > 10 mcg / dL
 - ▶ 1976-1980 88%
 - ▶ 1988-1991 9%
 - ▶ 1999-2002 1.6%
 - ▶ 2010 <1%
- ▶ Nivel de plomo en la sangre en el que los pacientes sintomáticos a veces son tratados con terapia de quelación: 45 mcg / dL

How common are elevated BLLs?

Es frecuente el nivel de plomo elevado?

535,000

U. S. children ages 1 to 5 years
have blood lead levels high
enough to damage their health.



24 million

homes in the U.S. contain deteriorated
lead-based paint and elevated levels of
lead-contaminated house dust.



4 million of these are
home to young children.

<https://www.cdc.gov/nceh/lead/>

Testing children for lead poisoning

Varies state-by-state

In New Mexico, blood lead testing is mandated if:

1. Child enrolled or eligible for Medicaid (at age 12 months & 24 months and between 36 and 72 months of age, if not tested at 12 and 24 months of age)

2. Child enrolled in any public assistance program, including WIC or TANF

3. Parent answers yes to any question on the Child Lead Exposure Questionnaire (available in English and Spanish)

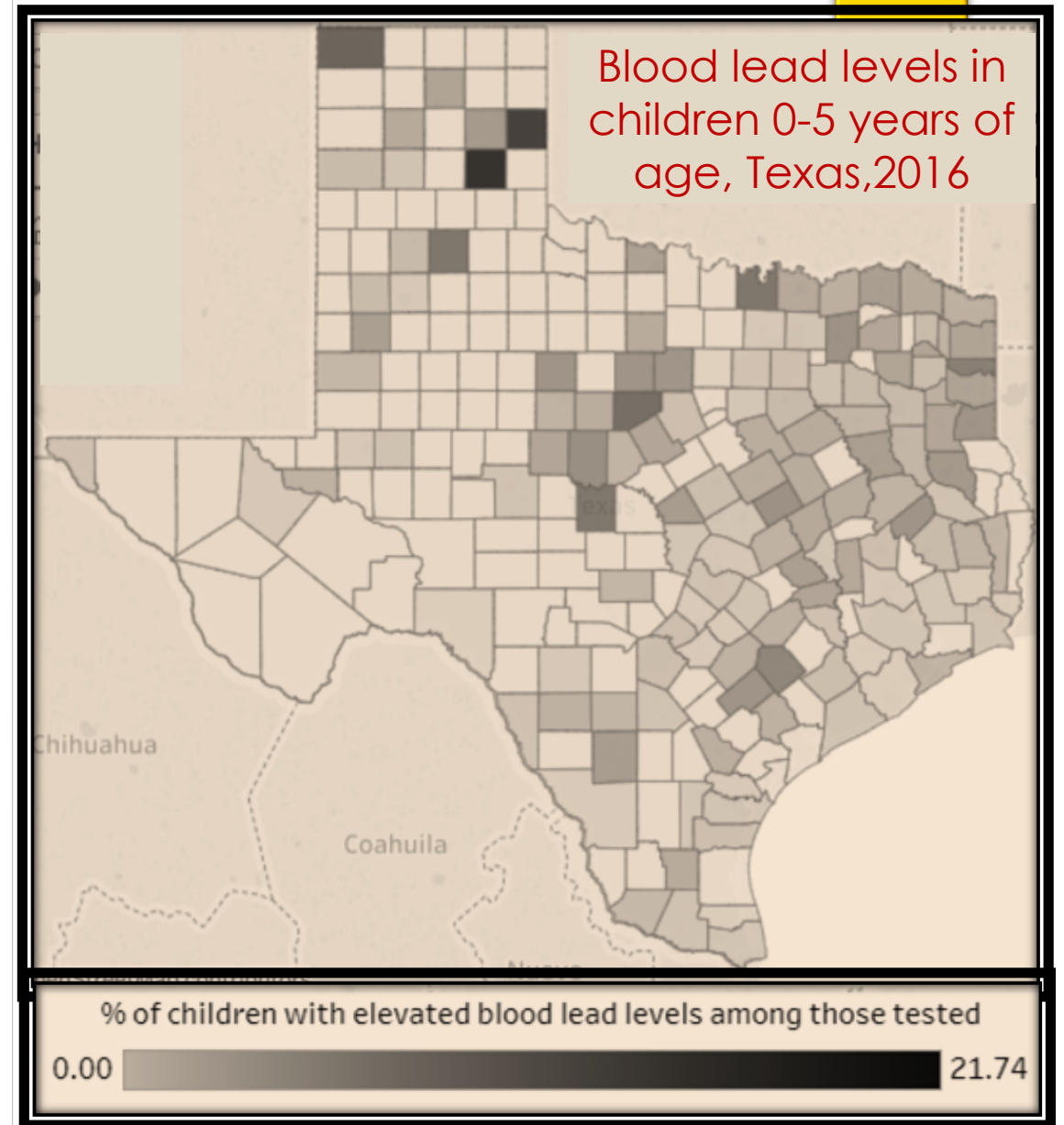
Please answer these questions with: **Yes**, **No**, or **Don't Know**. The answers will help you and your health care provider decide if your child needs a blood test for lead.

1.	Is your child enrolled in or eligible for Medicaid? <i>Children enrolled in Medicaid are required by law to be tested for lead at 12 months and again at 24 months of age, and between the ages of 36 months and 72 months of age, if not tested at 12 and 24 months of age.</i>	Yes	No	Don't know
2.	Is your child enrolled in any public assistance programs such as WIC or TANF?	Yes	No	Don't know
3.	Does your child live in, or regularly visit (for daycare or babysitting), a house built before 1950? <i>Older houses may have lead-based paint, which breaks down into dust that can be swallowed or inhaled by your child.</i>	Yes	No	Don't know
4.	Does your child live in or regularly visit a house that has recently been remodeled? <i>Remodeling in an older house, or even one built as late as 1978, can create dust that contains lead, if lead-based paint is present.</i>	Yes	No	Don't know
5.	Does any other child of yours or a child of a relative or friend have an elevated blood lead level?	Yes	No	Don't know
6.	Does your child live with or regularly visit an adult whose work or hobby uses lead?	Yes	No	Don't know
7.	Do you (or any family members, or a curandera or sobador) give your child orange, red, or yellow powder such as Greta or Azarcon, or use "Navajo" clay for stomach ache, nausea, and diarrhea?	Yes	No	Don't know
8.	Do you use Kohl, Alkohl, or Surma on your child's skin? Or use traditional Middle Eastern, Oriental, and Ayurvedic preparations?	Yes	No	Don't know
9.	Does your home have imported plastic/vinyl mini-blinds? <i>Some imported plastic mini-blinds made before 1996 have lead in them.</i>	Yes	No	Don't know
10.	Does your child eat, put things in his/her mouth, or chew on things that aren't food? <i>Dirt, wood (especially window sills), paint chips, jewelry, shell casings, fishing sinkers, lead shot, shoes, or socks can have lead or lead dust on/in them.</i>	Yes	No	Don't know
11.	Do you use imported pottery for cooking, storing, or serving food? <i>Some Mexican, Chinese, and Italian potteries have lead in the glaze, which can get into the food.</i>	Yes	No	Don't know
12.	Does your child live or play near a junkyard, dump, mine, smelter, busy street, or highway? <i>These places can have lead dust in the air or in the dirt. Even if the smelter or mine is closed, lead can still be in the dirt.</i>	Yes	No	Don't know
13.	Does your child eat tamarind/chile candy or salt/lemon/chile seasonings or chapulines that are made in Mexico? <i>Some of these products may contain lead.</i>	Yes	No	Don't know

If you answered **Yes** to any of these questions, your child may be at risk for being exposed to lead! Your child's health care provider will need to order a blood test.

Elevated blood lead levels in selected Texas counties, 2016

County	% Tested	% BLL >5 mcg/dL
El Paso	13.2	2.15
Hudspeth	14.19	0
Culberson	11.2	0
Reeves	34.22	3.6
Pecos	12.62	0
Donley	9.02	21.74
TEXAS	13.90	2.02



What if my child's blood lead level is "high?" ¿ Qué hago si el nivel de plomo está elevado?

- ▶ Prevent further absorption of lead! Inspect and abate lead paint, sources of lead in water, lead - containing toys, furniture, food or food containers
- ▶ Feed your child a healthy diet
- ▶ Talk to your pediatrician about:
 - ▶ Correcting anemia
 - ▶ In particularly severe cases, chelation therapy by an expert
- ▶ Talk to school officials about educational interventions, including:
 - ▶ Developmental assessments
 - ▶ Special education services



The good news: Lead poisoning is **100%** preventable.

Take these steps to make your home lead-safe.



Talk with your child's doctor about a simple blood lead test. If you are pregnant or nursing, talk with your doctor about exposure to sources of lead.



Talk with your local health department about **testing paint and dust in your home for lead** if you live in a home built before 1978.

<https://www.cdc.gov/nceh/lead/>

The good news: Lead poisoning is **100%** preventable.

Take these steps to make your home lead-safe.



Renovate safely. Common renovation activities (like sanding, cutting, replacing windows, and more) can create hazardous lead dust. If you're planning renovations, use contractors certified by the Environmental Protection Agency (visit www.epa.gov/lead for information).



Remove recalled toys and toy jewelry from children and discard as appropriate. Stay up-to-date on current recalls by visiting the Consumer Product Safety Commission's website: www.cpsc.gov.

<https://www.cdc.gov/nceh/lead/>

Mercury sources &
adverse effects

Fuentes de mercurio
y efectos adversos



Mercury / Mercurio

- ▶ Mercury is a heavy metal, liquid at room temperature and silvery-white in color
- ▶ Found in 3 forms:
 - ▶ Elemental (liquid pure mercury)
 - ▶ Organic (methylmercury, ethylmercury)
 - ▶ Inorganic: (mercuric chloride, mercuric oxide)



- ▶ El mercurio es un metal pesado, liquido en temperaturas ambientales y de color blanco plateado
- ▶ Se encuentra en 3 formas:
 - ▶ Elemental (mercurio líquido puro)
 - ▶ Orgánico (metilmercurio, etilmercurio)
 - ▶ Inorgánico: (cloruro de mercurio, óxido de mercurio)

Use of mercury / Uso del mercurio

- ▶ Electrical conductors
- ▶ Precious metal mining
- ▶ Thermometers and barometers
- ▶ Fungicide
- ▶ Dentistry
- ▶ Paper manufacturing
- ▶ Paint

- ▶ Conductores eléctricos
- ▶ Minería de metales preciosos
- ▶ Termómetros y barómetros
- ▶ Fungicida
- ▶ Odontología
- ▶ Fabricación de papel
- ▶ Pintura

Sources of elemental mercury

Fuentes del mercurio elemental

- ▶ Natural
 - ▶ Volcanoes
 - ▶ Forest Fires
- ▶ Anthropogenic
 - ▶ Coal (40%) & petroleum (25%)
 - ▶ Small-scale gold-mining
- ▶ Household
 - ▶ Fluorescent light bulbs, thermometers, manometers, batteries



- ▶ Natural
 - ▶ Volcanes
 - ▶ Incendios forestales
- ▶ Antropogénico
 - ▶ Carbón (40%) y petróleo (25%)
 - ▶ Minería de oro a pequeña escala
- ▶ Domestica
 - ▶ Bombillas fluorescentes, termómetros, manómetros, baterías.

Sources of inorganic mercury

Fuentes del mercurio inorgánico

- ▶ Ayurvedic medicine (India)
- ▶ Traditional Chinese medicine
- ▶ Mexican skin lightening creams



Figure 1. Ayurvedic medicine containing lead, mercury, and arsenic.

- ▶ Medicina ayurvédica (India)
- ▶ Medicina tradicional china
- ▶ Cremas mexicanas para aclarar la piel



Sources of organic mercury

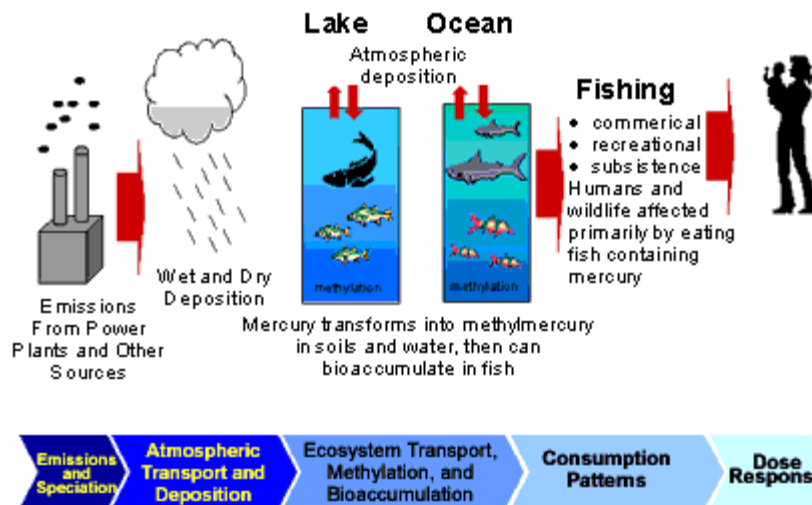
Fuentes del mercurio orgánico

► Fish consumption

- Lowest: shrimp, canned light tuna, salmon, pollock & catfish
- High: bluefish, Seabass, albacore tuna, yellowfin tuna
- Highest: mackerel, marlin, shark, roughy, swordfish, ahi tuna

► Medications

- Thimerosal in some vaccines



► Consumo de pescado

- Lo más bajo: camarones, atún claro enlatado, salmón, abadejo y bagre
- Alto: pez azul, lubina, atún blanco, atún de aleta amarilla
- El más alto: caballa, marlín, tiburón, rugoso, pez espada, atún aleta amarilla

Medicamentos

- Timerosal en algunas vacunas

Why is elemental mercury so dangerous? ¿Por qué es tan peligroso el mercurio elemental?

Even a teaspoonful of mercury hidden in a carpet can cause grave danger to a child!



Hasta una sola cucharadita de mercurio escondido en la alfombra puede causar peligro grave para un niño!

Prenatal exposure to mercury

Exposición prenatal al mercurio

- ▶ High dose exposure
 - ▶ Mental retardation
 - ▶ Cerebral palsy
 - ▶ Cerebellar ataxia and reflex anomaly
 - ▶ Failure to thrive
- ▶ Alta dosis de exposición
 - ▶ Retraso mental
 - ▶ Parálisis cerebral
 - ▶ Ataxia cerebelosa y anomalía de reflexión
 - ▶ Retraso en el desarrollo

The Sydney Morning Herald

The real price of gold in Lombok: Indonesian women with toxic mercury levels

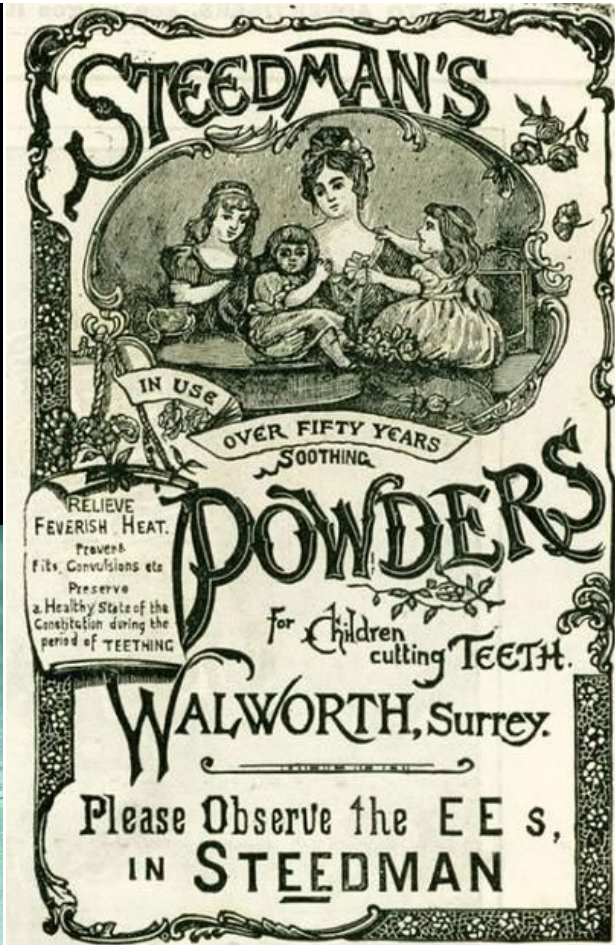
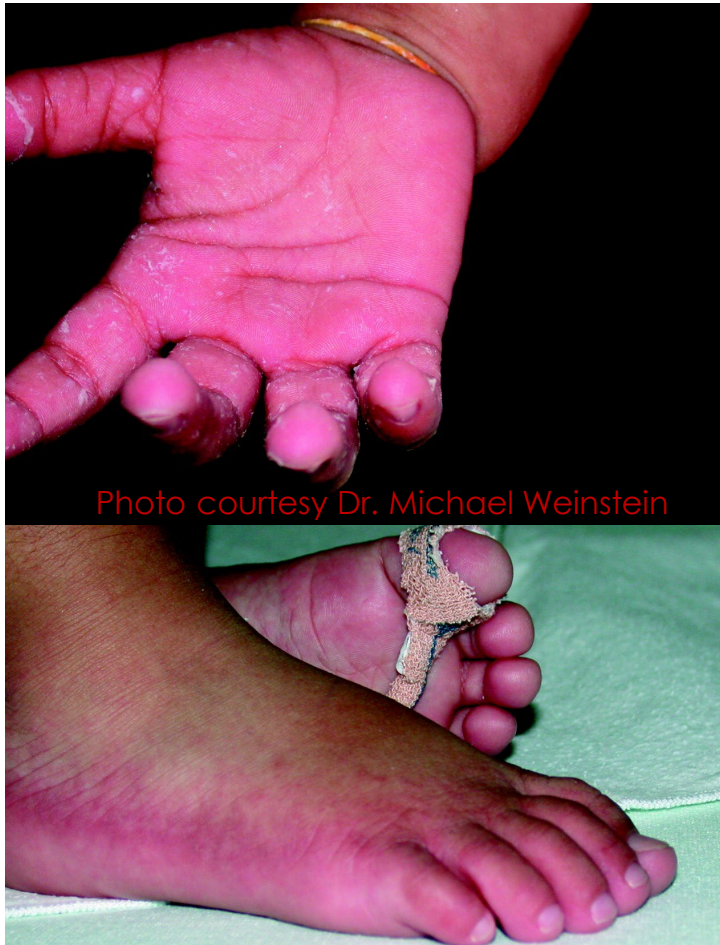
By Jewel Topsfield and Amilia Rosa
6 October 2017 – 3:45pm

Sekotong, Lombok: Elawati blames herself for what happened to her son.



Acrodynia ("Pink's Disease") Acrodinia ("Enfermedad Rosada")

- ▶ Irritability
- ▶ Weakness
- ▶ Anorexia
- ▶ Papular rash with desquamation
- ▶ Swollen red painful hands and feet
- ▶ Diaphoresis
- ▶ Hypertension
- ▶ Decreased reflexes



- ▶ Irritabilidad
- ▶ Debilidad
- ▶ Poco apetito
- ▶ Erupción papular con descamación
- ▶ Manos y pies hinchados, rojos y dolorosos.
- ▶ Sudoración intensa
- ▶ Alta presión sanguínea
- ▶ Reflejos disminuidos

Methylmercury – Minamata, Japan

Metilmercurio – Minamata, Japón

- ▶ Chisso Corporation dumped mercury into Minamata Bay from 1932 to 1968
- ▶ Minamata disease described in 1956, attributed to methylmercury
- ▶ Thousands of illnesses and deaths in cats, dogs, pigs, and humans



- ▶ La corporación Chisso arrojó mercurio a la Bahía de Minamata desde 1932 hasta 1968
- ▶ Enfermedad de Minamata descrita en 1956, es atribuida al metilmercurio.
- ▶ Miles de enfermedades y muertes en gatos, perros, cerdos y humanos.

Prevention of mercury poisoning

Prevención de intoxicación por mercurio

- ▶ Never attempt to clean up a mercury spill larger than a broken thermometer
 - ▶ Do not use a vacuum cleaner and follow EPA guidelines
 - ▶ Pregnant and breast-feeding women and children should:
 - ▶ Eat less than 12 ounces/week of lower mercury fish (salmon, catfish)
 - ▶ Limit albacore tuna to 6 ounces/week
 - ▶ Avoid shark, swordfish, king mackerel or tile fish
 - ▶ Avoid skin lightening creams, foreign medicines
 - ▶ Support the elimination of coal for fuel
- ▶ Nunca intente limpiar un derrame de mercurio más grande que un termómetro roto
 - ▶ No use una aspiradora y siga las pautas de la EPA
 - ▶ Las mujeres embarazadas, durante el periodo de lactancia y los niños deben:
 - ▶ Comer menos de 12 onzas / semana de pescado con bajo contenido de mercurio (salmón, bagre)
 - ▶ Limitar el atún blanco a 6 onzas / semana
 - ▶ Evitar comer tiburón, pez espada, caballa rey o el pez blanquillo.
 - ▶ Evitar las cremas para aclarar la piel, medicinas extranjeras.
 - ▶ Apoyar la eliminación del carbón como combustible.

Questions?

1-888-901-5665

24/7 English/Español

swcpeh@ttuhsc.edu

<http://swcpeh.org>

Southwest Center for Pediatric Environmental Health



TEXAS TECH UNIVERSITY
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EL PASO



PEHSU National Classroom



PEHSU
Pediatric Environmental
Health Specialty Units

www.pehsu.net/nationalclassroom.html



Webinars

Series of scientific webinars that provide a forum for discourse on scientific issues.

Live and On-Demand

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CE Available



Online Courses

Evidence-based online courses on a variety of children's environmental health topics.

Interactive and Self-Paced

CE Available



Resource Catalog

Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals

Topics included:
Air Quality, Pesticides,
Natural Disasters, BPA,
Mold, Lead, Mercury