

AOEC Medical Management for Lead Exposed Adults



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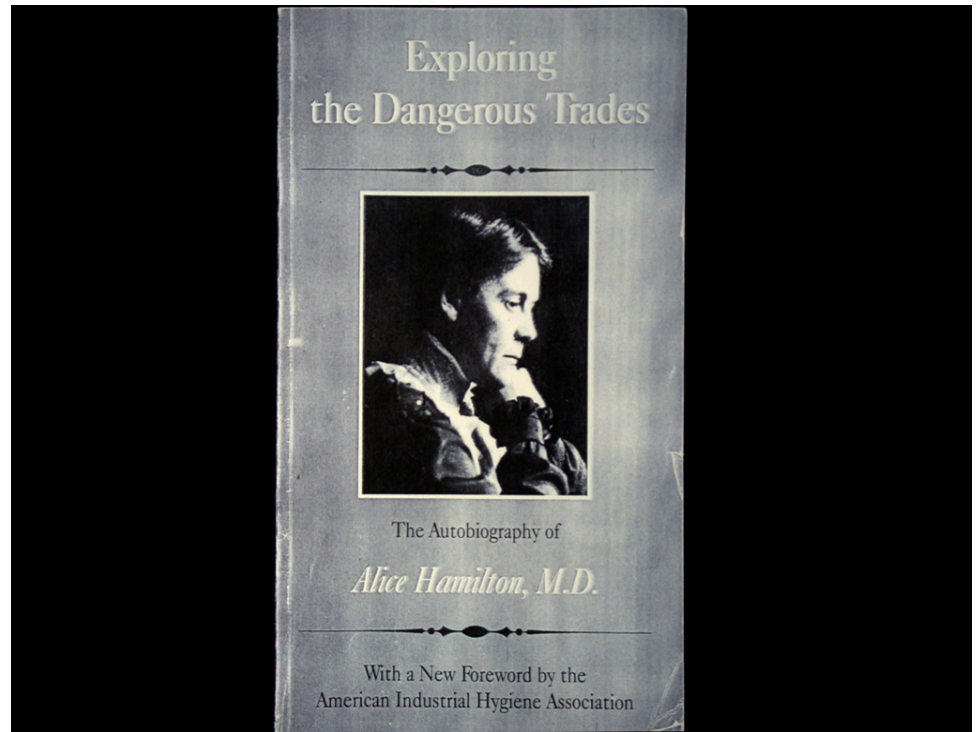
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Ramazzini

Diseases of Potters: “First their hands become palsied, then they become paralytic, splenetic, lethargic, cachectic, and toothless, so that one rarely sees a potter whose face is not cadaverous and the color of lead.”

In the early 1900's, working first for the State of Illinois and later for the Federal government, Dr. Alice Hamilton investigated hundreds of cases of lead poisoning in the smelting, enameling and paint industries.



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“Despite improvements, exposure to lead remains a substantial (largely occupational) health problem in the United States.”

Why do we need new guidelines for clinical management of lead exposed adults ?

- ❑ NHANES: adult lead levels in 1970's – 15mcg/dl; now < 2 mcg/dl
- ❑ OSHA lead standard has not been updated since 1978 !
- ❑ Significant advances in medical research on lead health effects to not only children but also adults
- ❑ Urgent need for guidance to health care providers treating adults with lead exposure

LEAD TOXICITY

- Routes of entry: Lung, GI
 - Add skin for organic lead
- Transport by RBCs throughout body
 - Crosses BBB and placenta
- Target Organs: CNS, PNS, Kidney, Reproductive, Cardiovascular, GI
- Storage: Bone
- Elimination: Kidney
- Multiple mechanisms of toxicity; genetic factors

TABLE 3
Health Effects to Lead Exposed Adults by Blood Lead Level

Blood Lead Level ($\mu\text{g/dL}$) ($\mu\text{mol/L}$)				
5-9(0.24-0.43)	10-19(0.48-0.92)	20-39(0.97-1.88)	40-79(1.93-3.81)	$\geq 80(\geq 3.86)$
<ul style="list-style-type: none"> ›Possible adverse population effects suggested by epidemiological studies 	<ul style="list-style-type: none"> ›Possible spontaneous abortion ›Reduced newborn birth weight ›Possible blood pressure changes ›Possible renal dysfunction 	<ul style="list-style-type: none"> ›Spontaneous abortion ›Reduced newborn birth weight ›Possible blood pressure changes ›Possible renal dysfunction ›Possible non-specific symptoms <ul style="list-style-type: none"> -Headache -Fatigue -Sleep disturbance -Anorexia -Constipation -Diarrhea -Arthralgia -Myalgia -Decreased Libido -Mood Swings, personality changes ›Possible CNS effects -Memory and attention deficits 	<ul style="list-style-type: none"> ›Spontaneous abortion ›Reduced newborn birth weight ›Non-specific symptoms ›CNS effects ›Sperm effects <ul style="list-style-type: none"> -lowered counts -abnormal sperm ›Subclinical peripheral neuropathy ›Possible hypertension ›Possible anemia ›Possible renal damage ›Possible gout 	<ul style="list-style-type: none"> ›Spontaneous abortion ›Reduced newborn birth weight ›Non-specific symptoms ›CNS effects ›Sperm effects ›Peripheral Neuropathy ›Hypertension ›Anemia ›Abdominal Colic ›Nephropathy ›Gout

TABLE 1**Jobs and Industries with Potential Lead Exposure**

<i>General Industry</i>	
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 Leaded glass manufacturing Paint/pigment manufacturing
<i>Construction</i>	
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

TABLE 2**Non-occupational and Environmental Sources of Lead Exposure**

Remodeling or painting pre-1978 housing	Lead solder in stained-glass artwork
Peeling paint	Lead-soldered cans
Ethnic medicines or folk remedies (e.g., azarcon, greta, pay-loo-ah, kandu, some Ayurvedics)	Lead-contaminated candies
Pica (ingestion of lead-containing nonfood items, e.g., soil or ceramics, plaster, or paint chips)	Backyard scrap metal recycling
Retained lead bullet or fragments	Moonshine (liquor from a homemade still)
Melting lead for fishing weights, bullets, or toys	Antique pewter plates, mugs, utensils, toys
Imported vinyl miniblinds	Imported brass or bronze kettles, cookware
Recreational target shooting	Lead-glazed tableware or cooking vessels
Lead-contaminated drinking water supply	Leaded crystal tableware
Using lead glazes for ceramics	Mine tailings
Painting/stripping cars, boats, bicycles	Beauty products such as kohl eye make-up, certain hair dyes

Typical Scenario- Case # 1

23 year old woman whose job is packaging lead-tin solder comes in with her husband to discuss family planning. You draw a blood lead level. It is 10 mcg/dl. What do you advise?

Typical Scenario- Case #2

You are the occupational consultant to a steel mill. You are doing a medical surveillance exam on a 35 year old African American man who works in the blast furnace. He has difficult to control hypertension and his lead levels have been running in the mid-30's (mcg/dl). What do you advise him and his employer?

Typical Scenario- Case #3

Mr. Smith is referred to you by his attorney. He is depressed, irritable, and his wife says he is “not the same man I married”. He has worked at a brass foundry for 15 years. His lead level has been as high as 62 mcg/dl in the past but has been <30 for the past 2 years. He wants to switch jobs from furnace operator to shipping and receiving. His company doesn't want to do this, and the company doc says his problems are due to alcohol.

Little guidance for health care providers until now...

- ❑ AOEC Medical Management Guidelines for Lead-Exposed Adults
http://www.aoec.org/documents/positions/MMG_FINAL.pdf
- ❑ Kosnett MJ et al, "Recommendations for medical management of adult lead exposure", 2007, EHP, 115:463-471.
- ❑ EPA review of lead research (10/06)
<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=158823>

AOEC Guidelines for Medical Management of Lead Exposed Adults

- ❑ 2003- AOEC convened a panel to review medical management of lead exposed adults.
- ❑ 2005- AOEC produced initial draft of guidelines, which were reviewed by membership and updated several times.
- ❑ 2007- Present guidelines have been approved by 58/60 member clinics.

Clinical Assessment

- ❑ Detailed medical, occupational and environmental history
- ❑ Physical exam: BP
- ❑ Blood Lead Level (BLL)
- ❑ Other labs: CBC, BUN, Cr, U/A, EP
- ❑ Urine and hair lead levels usually not helpful

Exposure Investigation

- ❑ Identify the source (exposure history)
- ❑ MSDSs
- ❑ Information from employer, such as air level testing, biologic monitoring (with worker permission)

Health Based Medical Management

- ❑ Consider individual, health issues, risk factors, exposure factors, family and social context.
- ❑ Consider both BLL and estimate of cumulative dose.
- ❑ Seek advice (OM, Tox, AOEC)
- ❑ Removal from exposure – When?

TABLE 4 Health Based Management Guidelines

Blood Lead Level ($\mu\text{g/dL}$) ($\mu\text{mol/L}$)

5-9(0.24-0.43)	10-29(0.48-1.40)	30-79**(1.45-3.81)**	$\geq 80(\geq 3.86)$
<ul style="list-style-type: none"> ‣Lead education <ul style="list-style-type: none"> -Occupational -Environmental -Reproductive ‣Follow-up blood lead levels (BLLs) 	<ul style="list-style-type: none"> ‣Consider clinical assessment <ul style="list-style-type: none"> -History: <ul style="list-style-type: none"> occupational environmental medical -Exam, labs -Identify risk factors -Family BLLs ‣Exposure investigation <ul style="list-style-type: none"> -MSDSs -Air testing -Workplace communication ‣Consider consultations <ul style="list-style-type: none"> -Occupational Medicine -Industrial Hygienist -Public Health department ‣Lead hazard reduction ‣Consider removal from lead exposure if warranted ‣Lead education ‣Follow-up BLLs (See Medical Surveillance recommendations) 	<ul style="list-style-type: none"> ‣Lead education ‣Clinical assessment <ul style="list-style-type: none"> -History -Exam, labs (BUN, Cr, CBC) -Identify risk factors -Family BLLs ‣Exposure Assessment ‣Consultations as appropriate ‣Lead Hazard Reduction ‣Removal from lead exposure** ‣Possible chelation for BLL>50 with signs or symptoms of toxicity ‣Medical Surveillance <ul style="list-style-type: none"> -Follow-up BLLs -Follow-up clinical assessments <p><i>**Note this is the recommendation by AOEC. Consult the OSHA Standard for the levels currently defined in regulation which provides workers' protections.</i></p>	<ul style="list-style-type: none"> ‣Immediate removal from lead exposure ‣Refer for immediate/urgent medical evaluation and consideration of chelation therapy ‣Clinical assessment ‣Lead education ‣Exposure investigation ‣Consultations ‣Lead hazard reduction ‣Medical surveillance

Medical Surveillance

- ❑ OSHA standard not protective
- ❑ Recommend surveillance for any worker with potential harmful exposure to lead
- ❑ More frequent early biologic monitoring (BLLs)
- ❑ More flexibility in surveillance that accounts for variability in jobs and exposures.

Treatment (? Chelation)

- ❑ STEP #1: Removal from exposure
- ❑ No evidence-based guidelines for chelation due to lack of good studies
- ❑ Decision to chelate based on lead level and acute symptoms, particularly CNS
- ❑ Oral chelation has largely supplanted parenteral chelation.

Chelation Therapy

- ❑ *recommended* for adults with BLLs 100 $\mu\text{g}/\text{dL}$ (4.83 $\mu\text{mol}/\text{L}$) or greater,
- ❑ *strongly considered* for BLLs 80 to 99 $\mu\text{g}/\text{dL}$ (3.86-4.78 $\mu\text{mol}/\text{L}$)
- ❑ *possibly considered* for BLLs between 50 and 79 $\mu\text{g}/\text{dL}$ (2.41-3.81 $\mu\text{mol}/\text{L}$) in the presence of lead-related symptoms

Pregnancy and Breast Feeding Concerns

- ❑ Fetal blood lead = 80% mother's BLL
- ❑ Exposure to lead in utero may be the most devastating in a child's development
- ❑ Recommend BLL < 5 mcg/dl for pregnant women and women considering pregnancy
- ❑ Lead in breast milk is much lower than in blood; thus benefits of breast feeding generally outweigh risks.

Key Points of Guidelines

- ❑ The toxic effects of lead can occur without overt symptoms.
- ❑ Long term low dose can lead to progressively larger cumulative dose and long term health effects.
- ❑ Current occupational standards are not sufficiently protective and should be strengthened.
- ❑ Prevention of lead exposure should remain the primary goal of health care providers, public health professionals, and employers.

Further Information about AOEC

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