USACHPPM
Readiness thru Health

65-016-0503

Just the Facts...

Lead (Inorganic) - Medical

LEAD HAS NO USEFUL PURPOSE IN HUMANS, AND IT MAY BE HARMFUL IF EXCESSIVE AMOUNTS ARE ABSORBED INTO THE BODY.

GENERAL INFORMATION	Lead has been used for many commercial and industrial purposes. Although many uses have become limited in the US over the past two decades, it remains a useful product and is present as an environmental contaminant. Lead may still be used overseas; where the product levels and the environmental contamination levels may be much higher. Lead has no biological function in the body, and toxicity occurs if excessive amounts are taken into the body.
ROUTINE USES IN THE DEPLOYED SETTING	Lead is found in storage batteries, bullets, munitions primers, soft metal alloys (solder), lubricants, structural paints—especially marine and bridge applications, but also used in older residential paints and many overseas applications; cable and wire insulation covering, plumbing, and gasoline.
PERSONAL PROTECTIVE EQUIPMENT and COUNTERMEASURES FOR DEPLOYED PERSONNEL	• Good hand-washing technique minimizes entry through the gastrointestinal tract and respiratory tract (from smoking) • Use of fitted, respiratory protection prevents inhalation entry • Significantly lead-contaminated clothing requires special separate handling and washing • Wet methods control dust formation during handling and clean-up; when available, vacuuming controls release; do not air blow debris • Garrison activities involving regular lead exposure may be performed by contractors in deployed settings…Be sure to ask about activities and settings
QUESTIONS TO ASK REGARDING EXPOSURE	• Was protective equipment or other control measures used when knowingly working with lead? • Were there high dust levels from industrial areas while working or living? • Was “hot work” performed on painted surfaces? • Was any work performed on painted surfaces? • Did any medical complaints begin BEFORE dust or potential lead exposure? When did they begin?
EXPOSURE LEVELS HISTORICALLY ENCOUNTERED	Lead exposure levels in garrison are usually maintained below US occupational exposure standards of 50 mcg/m^3 by control measures. Except for areas where lead is used in plumbing supply and distribution systems, lead levels in drinking water in US water supplies are usually below the action level of 15 ppb (15 mcg/L). The TG 230 recommends a military exposure guideline (MEG) of 15 ppb for lead in water for 5L/day and 15L/day consumption rates. TG 230 also recommends a one-year soil MEG level of 2200 mg/kg for lead and 0.026 mg/kg for tetraethyl lead. A [BPb] of 30 mcg/dL corresponds to an inorganic lead inhalation exposure of 50 mcg/m^3 8h/day, 40h/wk exposure (ACGIH BEI). NHANES, 2003 reported US population level for 95%ile over 20 years of age is 5.2 mcg/dL.
AVAILABLE EXPOSURE DATA	Check for both general environmental levels and personal sampling levels. If exposure data are not available, **ASK** above questions concerning potential exposure to lead. Ambient (environmental) levels are available for some sites, but have not shown high levels. Little occupational monitoring data is available.

U.S. Army Center for Health Promotion and Preventive Medicine
Occupational and Environmental Medicine (DOEM)
5158 Blackhawk Road
Aberdeen Proving Ground, Maryland 21010-5403
http://chppm-www.apgea.army.mil/doem/

COMMON ACUTE AND CHRONIC HEALTH EFFECTS	ACUTE: GI complaints: metallic taste, nausea, abd pain (like acute appy), muscle weakness, shock, possible hemolysis; metal fume fever (MFF) syndrome of delayed onset flu-like illness after welding/cutting on painted metal surfaces, or other heated lead operations CHRONIC: behavioral changes, learning and memory disturbances, headache, "lead colic", arthralgias, motor neuropathy; Fanconi (nephrotic) syndrome; mild anemia; saturnine gout; hypertension
REVERSIBILITY OF HEALTH EFFECTS	Most significant effects are reversible with cessation of exposure and decline of blood lead level. Acute exposure to high concentration may cause hemolysis, shock, and rapid renal failure—rare. Encephalopathy rare in adults. Late, high exposure level effects of decreased renal function; peripheral nervous system motor>sensory findings; and male and female reproductive effects may be persistent.
TREATMENT REQUIRED/AVAILABLE FOR TOXIC EFFECTS	Cessation/control of exposure for both acute and chronic toxicity is essential; this initial, and often only, intervention must be promptly initiated when toxicity is attributed to lead exposure. Medical monitoring to follow resolution of clinical effects with decreases in blood lead and zinc protoporphyrin levels. With mild-moderate "excessive" chronic lead exposure: follow resolution of mild normo-/hypocytic, normo-/hypochromic anemia; saturnine gout. Chelation therapy as medically indicated in significant or severe adult cases—infrequently used for chronic exposure.
LONG TERM MEDICAL SURVEILLANCE REQUIREMENTS OF HEALTH EFFECTS MONITORING	Clinical tests: Blood lead level [BPb] should generally be < 20 mcg/Dl and zinc protoporphyrin level [ZPP] should generally be < 50-70 mcg/dL; [BPb] should decrease about 50% in 30-40 days with cessation of exposure; [ZPP] increases and decreases much more slowly (over several months).
SPECIAL RISK COMMUNICATION ISSUES	LOW LEVEL LEAD EXPOSURE (average Pb air concentration < 10 mcg/m^3 over a two-week period, or 1.5 mcg/m^3 averaged on an annual basis, and/or a [BPb] < 25 mcg/dL and [ZPP] < 50 mcg/dL): *individual has been exposed to low lead concentrations but present or future health has not been harmed*. MODERATE LEVEL LEAD EXPOSURE (environmental lead exposure levels exceed US occupational standards or Army TG 230 guidelines; average Pb concentration in air > 10 mcg/m^3 over a two-week period; or 1.5 mcg/m^3 averaged on an annual basis by a factor of two or less and an asymptomatic individual with [BPb] ranging from 25 to 50 mcg/dl and/or [ZPP] from 50-100 mcg/dl (that is not attributable to another etiology)): the level (provide level) is above an acceptable concentration by US or US Army standards. *If the exposure is not controlled, this level could result in harm to present or future health. The immediate priority is to control exposure to lead.* HIGH LEVEL LEAD EXPOSURE (environmental lead exposure levels exceed US standards or Army TG 230 guidelines; average Pb concentration in air greater than 20 mcg/m^3 over a two-week period; or 1.5 mcg/m^3 averaged on an annual basis by a factor of two or more.) The individual may be asymptomatic, or have mild signs or symptoms related to lead toxicity. The lead bioassay reveals a blood lead level [BPb] in excess of 50 mcg/dl and/or a zinc protoporphyrin level [ZPP] greater than 70 mcg/dl (that is not attributable to another etiology). The air, water, soil, food, or other source of exposure is considered excessive by United States or Army standards. *If the exposure is not controlled, this level could result in harm to present or future health. The immediate treatment is to stop the exposure to lead.* A mild-moderate elevation in [BPb] below 60 mcg/dL in asymptomatic individuals is best handled with exposure control. Organolead compounds (tetraethyl lead in "leaded" fuel) are highly neurotoxic and do NOT behave like inorganic lead compounds in the body.