From the
Chemical & Material Risk Management Program,
Office of the Under Secretary of Defense for Acquisition, Technology & Logistics.

Chemical & Material Emerging Risk Alert

Revised Blood Reference Value for Lead

The Centers for Disease Control and Prevention recently lowered the childhood blood lead level reference value from 10 micrograms per deciliter (µg/dL) to 5 µg/dL. This change may impact soil screening concentrations, air quality standards, and occupational exposure limits.

What DoD applications use lead?

Lead is used in lead-acid batteries, bullets and shot, and may be part of solder, pewter, fusible or machinable alloys, and aviation gas. Lead compounds are used as pigments, stabilizing agents, and corrosion inhibitors. Lead also is a critical part of Department of Defense (DoD) munitions (e.g., double-base rocket propellants, percussion primers and gun propellants) and explosives (e.g., lead azide), personnel radiation protection, and may be used in various electrical and electronic systems/equipment (e.g., lead solder).[1,2,3,4]

What is the lower threshold for blood lead poisoning based upon?

Unlike most chemicals for which the daily intake (dose) is used to establish the exposure that will not result in adverse health effects in humans, blood lead level (BLL) measurement is used to predict whether adverse human health effects can occur as a result of exposure to lead. Until recently, the Center for Disease Control and Prevention's (CDC's) BLL reference value for children, who are more susceptible than adults to the neurological effects of lead, was 10 µg/dL. Based on a growing body of studies concluding that BLLs <10 µg/dL have adverse effects on the health of children, the CDC has lowered the BLL reference value for children to 5 µg/dL[5,6].

What are the potential impacts to the DoD's cleanup program?

The Integrated Exposure Uptake Biokinetic (IEUBK) model for lead can estimate the BLL that will result from exposure to lead by several exposure pathways[7]. This model was used by the U.S. Environmental Protection Agency (USEPA) in 1994 to establish a residential soil screening concentration for lead of 400 parts per million (ppm)[8] based on the then current CDC analysis, which indicated that BLLs >10 µg/dL were associated with health effects in children[9]. If the USEPA revises its soil screening concentration for lead based on the revised BLL reference value for children (5 µg/dL), the revised soil screening concentration may be less than one-half the current screening concentration of 400 ppm, probably about 150 ppm. Screening levels are not cleanup goals. However, they may be used to determine which sites or portions of sites require more comprehensive site characterization and a risk assessment should be used to establish site-specific cleanup goals.

What are the impacts to air regulations?

The National Ambient Air Quality Standard (NAAQS) for lead was last revised in 2008 and limits average emissions during a 3-month period to 0.15 µg lead in total suspended particles per cubic meter (m^3)[10]. In establishing the NAAQS for lead, the USEPA considered both the IEUBK lead model and the air-lead to BLL ratios[8]. Thus, the CDCs revision of the BLL reference value for children to 5 µg/dL may result in revision of the NAAQS for lead.

What are the potential impacts to DoD operations?

Lead is solid at ambient temperatures. Lead dust in ambient air deposits on residential surfaces becoming an ingestion exposure risk for children. The stationary sources contributing the greatest amounts of lead to ambient air in 2002 were coal-fired utility boilers and process

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heaters, iron and steel foundries, lead smelters, hazardous waste incinerators, followed by military installations[11]. The military facilities that contributed 75% of the lead emitted from over 300 military installations were a missile ammunition production plant and a weapons testing facility[12].

Although not directly related to the changes in the CDC's BLL reference value for children, the American Conference of Governmental Industrial Hygienists (ACGIH) is reviewing their occupational exposure guidelines for lead for potential revision. On 31 July 2012, the ACGIH Threshold Limit Values for Chemical Substances (TLV-CS) Committee placed lead (and other inorganic compounds) on their list of chemical substances under study list, meaning they may move forward with a Notice of Intended Changes (NIC) proposal in 2013. On 17 July 2012, the TLV-CS Committee added tetraethyl lead to their list of chemical substances for review of inhalable fraction and vapor (IFV) notation.[13]

Recommended actions.

Program managers responsible for applications that use lead or employees with the potential for lead exposure, including those responsible for the remediation of lead-contaminated sites should continue to monitor for proposed regulatory changes.[14] For remediation functions, actions would likely not be necessary until new cleanup standards are developed. For other DoD functions such as munitions development, program managers should examine the implications of the latest science and potential changes in lead regulations on their applications and take appropriate risk management actions.

[1] Emerging Contaminants Information Portal (EC Info Portal). https://www.ecportalinfo.org/, accessed 28 September 2012.
[2] Concurrent Technologies Corporation (CTC). 2010. Final Phase II Impact Assessment for Lead (Pb), Part A – Verification and Validation of Risks for Lead (Pb) and Compounds. October 8. Submitted to the CMRMD ODUSD(I&E), Arlington, VA, USA.
[3] USEPA. Corrosion, Scaling, and Metal Mobility Research: Brass and Solder. http://www.epa.gov/nrmrl/wswrd/cr/corr_res_brass.html, accessed September 28, 2012.
[4] CDPH (California Department of Public Health). 2009. Medical Guidelines for the Lead-Exposed Worker. CDPH Occupational Lead Poisoning Prevention Program. http://www.cdph.ca.gov/programs/olppp/Documents/medgdln.pdf, accessed September 28, 2012.
[5] CDC. 2012. CDC Response to Advisory Committee on Childhood Lead Poisoning Prevention Recommendations in "Low Level Lead Exposure Harms Children: A Renewed Call of Primary Prevention". http://www.cdc.gov/nceh/lead/ACCLPP/CDC_Response_Lead_Exposure_Recs.pdf, accessed 28 September 2012.
[6] CDC. 2012. Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention, report of the Advisory Committee on Childhood Lead Poisoning Prevention of the CDC. January. http://www.cdc.gov/nceh/lead/ACCLPP/Final_Document_010412.pdf, accessed 28 September 2012.
[7] USEPA. 1994. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. EPA 9285.7-15-1. February. http://www.epa.gov/superfund/lead/products.htm#user, accessed 28 September 2012.
[8] USEPA. 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive #9355.4-12. August. http://epa.gov/superfund/lead/products/oswerdir.pdf, accessed 28 September 2012.
[9] CDC. 1991. Preventing Lead Poisoning in Young Children. October. http://wonder.cdc.gov/wonder/prevguid/p0000029/p0000029.asp, accessed 28 September 2012.
[10] USEPA. 2008. National Ambient Air Quality Standards for Lead: Final Rule. 73 FR 66964, November 12. http://69.175.53.6/register/2008/nov/12/E8-25654.pdf, accessed 28 September 2012.
[11] USEPA. 2009. Memorandum: Process for Reviewing National Ambient Air Quality Standards. May 21. http://www.epa.gov/ttnnaaqs/pdfs/NAAQSReviewProcessMemo52109.pdf, accessed 28 September 2012.
[12] USEPA. 2007. Review of the National Ambient Air Quality Standards for Lead: Policy Assessment of Scientific and Technical Information. OAQPS Staff Paper. EPA-452/R-07-013. November. http://www.epa.gov/ttn/naaqs/standards/pb/data/20071101_pb_staff.pdf, accessed 28 September 2012.
[13] See http://www.acgih.org/TLV/Studies.htm, accessed 28 September 2012.
[14] One source of information on evolving regulatory information on ECs (such as lead) is the *EC in the News* newsletter. Individuals can register to receive the *EC in the News* at https://www.ecportalinfo.org/ (accessed 28 September 2012).

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