

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

New information about the health effects associated with lead exposure influence blood lead levels (BLLs) of concern for adults and children. The resulting progressively lower BLLs may impact air quality standards, soil screening concentrations, and occupational exposure limits.

What Department of Defense (DoD) applications use lead?

Lead is used in batteries, bullets and shot, and may be part of pewter, fusible or machinable alloys, and aviation gas. It may be used in various electrical and electronic systems and equipment (e.g., lead solder). Lead compounds are used as pigments, stabilizing agents, and corrosion inhibitors. Also, lead is a critical part of DoD munitions (e.g., double-base rocket propellants, percussion primers and gun propellants) and explosives (e.g., lead azide).^{1,2,3,4}

What is the blood lead level (BLL) threshold 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, BLL measurement is used to predict whether adverse human health effects can occur as a result of exposure to lead. Evidence from human epidemiological studies indicates that exposure to lead affects the cardiovascular system, IQ and other neurocognitive functions. Other likely health effects include those to the kidneys and immune system.⁵

Until recently, the Centers for Disease Control and Prevention's (CDC) BLL reference value for children was 10 micrograms per deciliter (ug/dL). Based on a growing body of studies concluding that BLLs <10 ug/dL have adverse effects on the health of children, the CDC has lowered the BLL reference value for children to 5 ug/dL.^{6,7} Also, new scientific insights indicate even small amounts of lead exposure can adversely affect the health of adults.^{8,9} The U.S. Department of Health and Human Services recommends that BLLs among adults be reduced to <10 ug/dL.¹⁰

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.¹¹ This model was used by the U.S. Environmental Protection Agency (USEPA) in 1994 to establish a residential soil screening concentration of 400 parts per million (ppm)¹² based on the then current CDC analysis.¹³ Although screening levels only determine the need for more comprehensive site characterization and risk assessment, cleanup goals at some sites may be impacted. Within DoD, lead contamination is most commonly associated with closed small arms firing ranges.

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 ug lead in total suspended particles per cubic meter of air (m³).¹⁴ In establishing the NAAQS for lead, the USEPA considered both the IEUBK lead model and the air-lead to BLL ratios.¹² It is uncertain whether the CDC's revision of the BLL reference value for children to 5 ug/dL will result in changes to the NAAQS for lead. Science and policy assessments completed by the USEPA in 2013 indicate that the current standard is adequate and no alternative revised standards need to be considered.^{5,15} According to the National Emission Inventory, 1.9% of the nation's lead emissions are attributed to military facilities and 75% of that amount was emitted by two facilities.¹⁶



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What are the potential impacts to DoD operations?

DoD can expect eventual changes to occupational exposure limits and associated BLLs for workers. For example, the American Conference of Governmental Industrial Hygienists (ACGIH) is reviewing their lead-related occupational exposure guidelines for potential revision. At the request of the DoD, the National Academy of Sciences (NAS) assessed potential health risks to DoD personnel who experience recurring exposures to lead, for example, personnel at small arms firing ranges.¹⁷ Their report indicates that current Occupational Safety and Health Administration permissible exposure limits and associated BLLs are inadequate to protect personnel. Currently, DoD employs the use of engineering controls, personal protective equipment, and other actions to protect workers; however, as a result of the NAS report the DoD is considering new BLL standards to further reduce risk for personnel who may be exposed to lead.

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.¹⁸ For remediation functions, actions would likely not be necessary until new cleanup standards are developed. For other DoD functions such as industrial hygiene, occupational medicine, and munitions development, program managers should watch for any changes in standards as a result of the NAS study and take appropriate risk management actions.

¹ Emerging Contaminants Information Portal. Available from: <https://www.ecportalinfo.org/>, accessed 5 December 2013.

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. Submitted to the CMRMD ODUSD(I&E), Arlington, VA, USA.

³ USEPA. Corrosion, Scaling, and Metal Mobility Research: Brass and Solder. Available from: http://www.epa.gov/nrmrl/wswrd/cr/corr_res_brass.html, accessed 5 December 2013.

⁴ California Department of Public Health (CDPH). 2009. Medical Guidelines for the Lead-Exposed Worker. CDPH Occupational Lead Poisoning Prevention

Program. Available from:

<http://www.cdph.ca.gov/programs/olppp/Documents/medgdln.pdf>

⁵ USEPA. 2013. Integrated Science Assessment for Lead. EPA/600/R-10/75F. Available from:

<http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=255721>, accessed 15 Jan 2014.

⁶ 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.” Available from:

http://www.cdc.gov/nceh/lead/ACCLPP/CDC_Response_Lead_Exposure_Recs.pdf

⁷ 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. Available from:

http://www.cdc.gov/nceh/lead/ACCLPP/Final_Document_010412.pdf

⁸ CDC. 2011. Adult Blood Lead Epidemiology and Surveillance – United States, 2008–2009. Morbidity and Mortality Weekly Report, 60(25): 841-845.

⁹ Kosnett MJ, Wedeen RP, Rothenberg SJ, et al. 2007. Recommendations for Medical Management of Adult Lead Exposure. Environ Health Perspect, 115:463-471.

¹⁰ CDC. 2013. Adult Blood Lead Epidemiology and Surveillance (ABLES).

Available from: <http://www.cdc.gov/niosh/topics/ables/description.html>, accessed 13 Jan 2014.

¹¹ USEPA. 1994. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. EPA 9285.7-15.1. Available from:

<http://www.epa.gov/superfund/lead/products.htm#user>, accessed 15 Jan 2014.

¹² USEPA. 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive #9355.4-12. Available from: <http://epa.gov/superfund/lead/products/oswerdir.pdf>

¹³ CDC. 1991. Preventing Lead Poisoning in Young Children.

<http://wonder.cdc.gov/wonder/prevguid/p0000029/p0000029.asp>, accessed 5 December 2013.

¹⁴ USEPA. 2008. National Ambient Air Quality Standards for Lead: Final Rule. 73 FR 66964, November 12. Available from:

<http://69.175.53.6/register/2008/nov/12/E8-25654.pdf>

¹⁵ USEPA. 2013. Policy Assessment for the Review of the Lead National Ambient Air Quality Standards: External Review Draft. Available from:

http://www.epa.gov/ttn/naaqs/standards/pb/data/010913_pb-draft-pa.pdf

¹⁶ 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. Available from:

http://www.epa.gov/ttn/naaqs/standards/pb/data/20071101_pb_staff.pdf

¹⁷ NAS. 2013. Potential Health Risks to DoD Firing-Range Personnel from Recurrent Lead Exposure. Available from:

http://www.nap.edu/catalog.php?record_id=18249, accessed 5 December 2013.

¹⁸ 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/>



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