Medical Surveillance Exams of Army Personnel Exposed to Fuel

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Introduction

Army personnel can be exposed to many types of fuel during the course of their routine duty day. Common types of fuel include gasoline, kerosene, diesel, and aviation fuel (e.g., JP-8, AvGas, Jet-A). Soldiers and civilian personnel with an increased risk of fuel exposure include aviation and ground vehicle mechanics, refuelers, petroleum technicians, generator operators, and construction/engineering personnel. Exposure by inhalation, absorption through the skin or mucus membranes, and ingestion are the primary routes of exposure for fuel products.

Health Effects of Fuel Exposure

Gasoline is composed of a mixture of toluene, butane, xylenes (o-, m-, p- isomers), 1,2,4-trimethyl benzene, ethyl alcohol, ethylbenzene, and benzene. Symptoms of gasoline exposure include: irritation of the eyes, skin, and mucous membranes; dermatitis; headache; lassitude (weakness, exhaustion); blurred vision; dizziness; slurred speech; confusion; and convulsions. Other serious effects are chemical pneumonitis (from aspirating liquid) and possible liver and/or kidney injury. Gasoline may also be carcinogenic.

Kerosene consists of alkanes, naphthenes, alkylnaphthalenes, and alkylbenzenes. Ingestion of kerosene is harmful or potentially fatal. Symptoms of kerosene exposure include: irritation of the eyes, skin, nose, and throat; burning sensation in the chest; headache; nausea; weakness; exhaustion; restlessness; incoordination; confusion; drowsiness; vomiting; diarrhea; and dermatitis. Chemical pneumonitis may also occur if kerosene is inhaled.

Diesel can be made from various compounds including: petroleum, biomass, animal fat, biogas, natural gas, and coal liquefaction. Symptoms of exposure include: eye irritation, pulmonary function changes, Diesel fuel has also been identified as a possible occupational carcinogen.

Aviation fuel can be made from thousands of different chemicals. Hydrocarbons are combined with various additives such as antioxidants, metal deactivators, biocides, static reducers, icing inhibitors, and corrosion inhibitors. Other principal components include n-heptane and isooctane. Symptoms of exposure include: central nervous system (CNS) depression; headache; dizziness; nausea; sleep disturbances; mood disturbances; irritability; memory impairment; chest pressure; and respiratory tract irritation.

Occupational Safety and Health Administration (OSHA) Standards and Recommendations Regarding Personnel Exposed to Fuel and its Components

Overall, there are no specific OSHA or Army standards that regulate fuel products. However, there are components of certain fuel products, e.g., benzene (29 CFR 1910.1028), that do have standards that require medical surveillance by law. It is important to take note of the contents of each fuel product. There are OSHA standards (29 CFR 1910.178, Powered industrial trucks; 1910.1000, Air contaminants; 1910.1200, Hazard communication), Federal Register notices (rules, proposed rules, and notices), directives (instructions to OSHA staff), letters of interpretation (official letters of interpretation of the standards), and other federal standards that are related to fuel and they should be reviewed by occupational health personnel.

Guidelines and Recommendations Regarding Medical Surveillance of Army Employees and Service Members Exposed to Fuel

Medical surveillance exams of Army personnel exposed to fuel products should be tailored to the specific fuel type and its individual components. A history of fuel exposure and any related symptomatology along with a physical exam focused on the cardiovascular, respiratory, dermatologic, neurologic, and hematologic systems should be completed and documented. If an exposure exists and has been severe enough to cause CNS depression or loss of consciousness, consideration should be given to obtaining the following tests: complete blood count (CBC), aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactic dehydrogenase (LDH), bilirubin, alkaline phosphatase, blood urea nitrogen (BUN), creatinine, albumin, and urinalysis. A chest X-ray may be helpful if acute or chronic respiratory symptoms are present. Referral to an appropriate specialist should be made if any exam findings reveal a work-related exposure has caused abnormal findings during the medical surveillance examination.

References:

29 CFR 1910 Subpart Z, Toxic and Hazardous Substances

American Conference of Governmental Industrial Hygienists® TLVs and BEIs. 2018

NIOSH Pocket Guide to Chemical Hazards.
https://www.cdc.gov/niosh/npg/default.html

https://www.atsdr.cdc.gov/ToxProfiles/tp76-c3.pdf

https://www.atsdr.cdc.gov/toxprofiles/tp121-c2.pdf

https://www.osha.gov/SLTC/dieselexhaust/standards.html

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