DoD Firefighter Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Factsheet: A Guide for Department of Defense Firefighters and Other Personnel Who Perform Firefighting Duties

Introduction

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) refers to a large and complex class of man-made chemicals. PFAS are used in some household products and some industrial materials to:

- increase resistance to heat, stains, water, and grease (such as making sofas, carpets, and clothes stain resistant, and mattresses and boots waterproof),
- reduce friction and provide heat and chemical resistant electrical insulation,
- keep food from sticking to cookware, and
- act as a barrier to grease in food packaging.

PFAS are not unique to Department of Defense (DoD) activities.

In the 1970s, the DoD began using aqueous film forming foam (AFFF) fire suppressants containing PFAS. Because PFAS are resistant to degradation by chemicals and heat, AFFF formulations are able to quickly extinguish petroleum-based liquid fuel (i.e., jet fuel) fires, and prevent their re-ignition. This use has saved lives, materials, and vessels. The DoD currently limits the use of AFFF to only firefighting emergencies or where AFFF can be completely captured and disposed and has started to transition and replace AFFF with PFAS-free alternatives at military installations.

People are exposed to PFAS in several ways, including ingestion, such as through the consumption of drinking water that has been impacted with PFAS. According to the Agency for Toxic Substances and Disease Registry (ATSDR), absorption through the skin is not thought to be a significant pathway of exposure for humans. There is also potential for exposure to PFAS through inhalation of aerosols and particulates containing PFAS, however more research is needed to understand the magnitude of these exposures. Firefighters may also be exposed to PFAS from sources other than AFFF containing PFAS. These sources may include protective clothing containing PFAS, such as turnout gear, as well as PFAS released into the air as part of any type or class of fire.

Many PFAS compounds don’t break down in the environment or in the body. As a result, PFAS tend to remain in the environment for a long time. The CDC found that nearly every person tested for PFAS in the United States has detectable levels of several PFAS in their blood. The CDC is conducting a large research effort to determine whether there are potential adverse health outcomes associated with blood PFAS levels in people.

Additional information about exposures to PFAS can be found on the ATSDR website (“How can I be exposed?”) at https://atsdr.cdc.gov/pfas/index.html.

Health Effects

A large number of research studies have examined the possible relationship between blood PFAS levels in people and harmful health effects. Results from some of these studies have suggested an association between high levels of exposure to certain PFAS and the following health outcomes:

- Increased cholesterol levels
- Changes in liver enzymes
- Decreased antibody response to some vaccines
- Increased risk of high blood pressure and/or pre-eclampsia in pregnant women
- Small decreases in infant birth weights
- Increased risk of kidney cancer and testicular cancer

At this time, scientists are studying the relationship between PFAS and certain health effects and health officials have not established health-based screening levels for PFAS in blood. Additional information concerning PFAS health effects can be found on the ATSDR website at: https://atsdr.cdc.gov/pfas/health-effects/index.html

Why are DoD firefighters being tested for PFAS?

The National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2020 requires DoD to offer and provide blood testing for PFAS to all DoD firefighters beginning October 1, 2020. Currently, blood PFAS testing is offered to current DoD firefighters during their annual occupational medicine examination, to newly hired DoD firefighters in order to establish a baseline blood PFAS level in firefighters, and to other DoD personnel who perform firefighting duties as part of their job assignment (e.g., Navy damage control officers) as required by Section 707 of NDAA FY 2020 (Public Law 116-92) (DoDM 6055.05). This testing is not part of the occupational medical qualification or medical surveillance program, but a congressionally mandated exposure assessment. Each firefighter may accept or decline the test each year, without fear of adverse action.

The following PFAS compounds are associated with AFFF, specified in DoDM 6055.05, “Occupational Medical Examinations: Medical Surveillance and Medical Qualification,” and will be assessed in firefighter blood samples:

Target PFAS Analytes:
- perfluorodecanoic acid (PFDA)
- perfluoroundecanoic acid (PFUnDA or PUFA)
- perfluoroheptanesulfonic acid (PFHpS)
- perfluorohexanesulfonic acid (PFHxS)
- perfluorohexanoic acid (PFHxA)
- perfluorononanoic acid (PFNA)
- perfluorooctanoic acid - linear isomer (n-PFOA)
- perfluorooctanoic acid - branched isomers (Sb-PFOA)
- total PFOA (linear and branched PFOA isomers)

- perfluorooctane sulfonate – linear isomer (n-PFOS)
- perfluorooctane sulfonate - branched isomers (Sm-PFOS)
- total PFOS (linear and branched PFOS isomers)
- 2-(N-methylperfluorooctane sulfonamido) acetic acid (MeFOSAA)
- dodecafluoro-3H-4,8-dioxanoate (ADONA)
- perfluorododecanoic acid (PFDoDA)

The current procedures for performing periodic (annual) occupational medical examinations for DoD firefighters (civilian and military) are found in DoDM 6055.05, "Occupational Medical Examinations: Medical Surveillance and Medical Qualification."

What do the results of the blood test mean regarding PFAS exposure?
The test for PFAS in blood simply determines how much of each target PFAS analyte is in the blood. The blood PFAS levels determined in blood represents the historical accumulation of PFAS compounds, over time, from multiple exposures and multiple sources. An individual's blood PFAS levels cannot be used to identify when (date of exposure), how much (magnitude of the dose), how often (frequency), or where the PFAS came from (the source of exposure). Blood PFAS levels also cannot be used to determine the likelihood of developing any health effect, as there are currently no established health-based blood PFAS levels associated with any adverse health outcomes (reference levels).

Information concerning exposures to PFAS can be found on the ATSDR website at https://atsdr.cdc.gov/pfas/index.html.

What does it mean if PFAS is detected in a blood test?
It means a person has been exposed to PFAS in the past. Even if the source of the exposure is removed, it can take years for the human body to fully eliminate PFAS. Because PFAS are very slowly eliminated from the body, the level of PFAS in the blood is an accumulation of all past PFAS exposures. Detecting PFAS in blood or blood serum (the liquid part of blood) is not currently associated with any adverse health outcome.

CDC scientists report that some PFAS were detected in the blood of nearly all the people tested in the United States ATSDR PFAS Information for Clinicians: Factsheet. Data tables showing blood PFAS results for the general population can be viewed at https://www.cdc.gov/exposurereport/.

Currently, there is no specific treatment for PFAS exposure or for elevated blood PFAS levels. People who experience any signs or symptoms of any disease or illness should follow up with their healthcare providers for a medical evaluation.

How can an individual reduce future exposure to PFAS?

Given the widespread use of PFAS in commercial products and our environment, one probably cannot prevent all PFAS exposure, but strategies for reducing exposures to PFAS are described on the ATSDR website at: https://www.atsdr.cdc.gov/pfas/pfas-exposure.html.

Individuals in occupational settings where PFAS exposure is possible should follow industrial hygiene guidance to reduce or eliminate potential exposure. For firefighters, the proper care and use of protective ensembles (e.g., protective clothing, work uniforms, gloves, boots, and self-contained breathing apparatus) will reduce their exposure to PFAS.

Finally, over the last few years, the DoD has taken several actions to minimize the potential for occupational exposure to PFAS in AFFF by limiting AFFF use outside of emergency firefighting and replacing AFFF with PFAS-free alternatives at some military installations. The National Fire Protection Association, interagencies (including the DoD), and others are working to find adequate replacements for PFAS in the materials used to make firefighter protective ensembles, including clothing.

References and Additional Resources

Agency for Toxic Substances and Disease Registry. *An Overview of the Science and Guidance for Clinicians PFAS on Per- and Polyfluoroalkyl Substances (PFAS)*. US Department of Health and Human Services. Available at: https://www.atsdr.cdc.gov/pfas/index.html

Agency for Toxic Substances and Disease Registry. *PFAS Information for Clinicians*. January 18, 2024. Available at: https://www.atsdr.cdc.gov/pfas/docs/PFAS-info-for-clinicians-508.pdf

Agency for Toxic Substances and Disease Registry. *ToxFAQs™ for Perfluoroalkyls*. U.S. Department of Health and Human Services. Available at: https://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=1116&tid=237#bookmark09

Defense Health Agency PFAS Website: https://www.health.mil/Military-Health-Topics/Health-Readiness/Public-Health/PFAS

Department of Defense Manual 6055.05, *Occupational Medical Examinations: Medical Surveillance and Medical Qualification*. April 5, 2024. Available at: https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodm/605505m.PDF?ver=ag9MtySOX5CzK9HYHfkh3g%3D%3D.

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