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PPE Update

Fireground environment, not turnout gear, provides carcinogen exposure risk

Further study may be needed, but turnout gear claims ignore common carcinogen exposure sources

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Over the past several months, there has been a relatively volatile dialogue in the fire service revolving around the potential hazards of wearing firefighter turnout gear, including assertions that the gear releases and exposes firefighters to hazardous chemicals.

The specific contention has been that turnout clothing off gases fluorooctanoic acid (PFOA), which has also been grouped as part of a larger class of chemicals, known as perfluoroaklyloxy alkanes (PFAs) or simply C8. Given the documented increased rates of cancer among firefighters, these allegations have unnecessarily created anxiety over the safety of firefighter gear, and in fact are creating distractions from other areas far more deserving of attention.

It is important to get past the rhetoric that has been spewed of late. First, there is no doubt that PFOA is a dangerous substance, having been classified as a possible carcinogen by the International Agency for Research on Cancer. There have also been a number of animal and human studies that suggest several additional health risks from PFOA exposure. It is further a persistent environmental contaminant that has been found in moderate levels in the blood of a representative cross section of the U.S. population.

The question is whether turnout gear is one of the contributing PFOA exposure sources for firefighters. (Photo/FEMA)

This means that – like other long-term hazardous contaminants, such as lead, phthalates and dioxin – this chemical is present in the environment and people (not just firefighters) are continuously exposed to it through various sources.

PFOA EXPOSURE SOURCES

The question is whether turnout gear is one of the contributing PFOA exposure sources for firefighters. Most of the major manufacturers involved in the fabrication of turnout clothing and the suppliers of the key materials used in production have indicated that they do not use PFOA in the manufacture of turnout gear and other consumer products.

These indications have been provided in part because much of the industry has complied with voluntary restrictions imposed by the U.S. Environmental Protection Agency for the use of PFOA that began in 2006. About a decade ago, PFOAs and related chemicals may have been present in minute amounts as processing aids in the manufacture of certain materials and repellent treatments. Thus, it is possible but unlikely that these substances may be present in very low levels in the turnout clothing materials that were manufactured in the United States prior to the voluntary phase-out.

The more plausible source for PFOA and related chemicals are the environmental exposures that arise from structural fires. You do not have to be a chemical engineer to realize that burning practically anything is going to create toxic soup containing a multitude of different hazardous chemicals.

There is a long history for the use of PFAs in a variety of products, and heating and combustion of those products in fires places firefighters at risk for being exposed to a variety of contaminants, including PFAs. In fact, environmental monitoring of fireground smoke and air, as well as analysis of residual surface contaminants found on and in turnout clothing identifies a serious and threat for continuing firefighter exposure to carcinogens and other hazardous chemicals.

This information is backed up by a pilot study evaluating various persistent chemicals in the blood of a small group of firefighters within 24 hours of a firefighting event. The study found the mean PFOA concentration was approximately twice the levels compared to the U.S. population. In addition, the

results show levels that were two-four times lower than levels from World Trade Center responders [1].

A separate study found evidence of elevated PFOA levels for firefighters that had not cleaned their turnout gear in the prior year [2]. Clearly, the firefighting environment itself is significant contributor to PFOA exposure. This exposure is prolonged when gear is not properly cleaned and contamination, including PFOAs, is permitted to accumulate. The subsequent continued wearing of unclean gear creates additional exposures.

MINIMIZING RISK OF EXPOSURE WITH PPE

Everyone connected to the fire service industry is horrified by the elevated rates of cancers and other health disorders being sustained by firefighters. A substantial amount of culture change is needed to ensure that firefighters:

- Properly wear their turnout gear and remain on air through all phases of the fire event, including overhaul and gross decontamination,
- Remove their gear as soon as possible after exiting the fire,
- Properly clean their gear after every fireground exposure, and
- Practice good hygiene, such as using wipes on exposed skin after removing their turnout gear, changing their station/work uniforms and under clothing and taking a shower as soon as practical following a fire.

These are the changes that need to be instituted as part of firefighting operations sooner, rather than later.

I can agree that a study for potential contaminants from firefighter gear itself could be useful to the fire service for putting to rest the notion that turnout gear is a contributor for firefighter exposure to dangerous substances. However, such a study would need to be properly designed to isolate the environmental contaminants from the original constituents within the gear itself.

Still, I find this study to be a lower priority compared to other areas of ongoing research, including evaluating the effectiveness of gross decontamination techniques, setting cleanliness standards for laundering turnout clothing, answering questions about firefighter hygiene practices and coming up with practical solutions to control firefighter contamination exposure.

References

1. Shaw SD, Berger ML, Harris JH, Yun SH, Wu Q, Liao C, Blum A, Stefani A, Kannan K. Persistent organic pollutants including polychlorinated and polybrominated dibenzo-p-dioxins and dibenzofurans in firefighters from Northern California. “Chemosphere” 2013;91(10):1386-1394.

2. Dobraca D, Israel L, McNeel S, Voss R, Wang M, Gajek R, Park J-S, Harwani S, Barley F, She J, Das R. Biomonitoring in California firefighters: metals and perfluorinated chemicals. “J Occup Environ Med”

2015;57(1):88-97.

About the author

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Jeffrey and Grace Stull are president and vice president, respectively, of International Personnel Protection, Inc. They are members of several NFPA committees on PPE as well as the ASTM International committee on protective clothing. Mr. Stull was formerly the convener for international work groups on heat/thermal protection and hazardous materials PPE as well as the lead U.S. delegate for International Standards Organization Technical Committee 94/Subcommittees on Protective Clothing and Firefighter PPE. They participate in the Interagency Board for Equipment Standardization and Interoperability and have authored the book, "PPE Made Easy." Send questions or feedback to the Stulls via email.

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