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PPE Update

8 ways to protect against cancer with PPE

Cancer-causing agents can reach a firefighter, even one in full PPE; here are simple steps to reduce your risk

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There was a time when dirty bunker gear was a badge of honor. In fact, firefighters often complained when they were forced to clean their gear and sometimes even became creative in finding ways to avoid having PPE appear newer.

Similarly, many firefighters delayed wearing SCBA during a structure fire and removed their facepieces as soon as they could get away with it. Fortunately, these practices have diminished significantly.

Yet, the dangers of firefighter exposure to carcinogens and other hazardous materials is still a serious problem. There are several proper PPE use and hygiene practices to reduce these exposures and the risks of cancer.

The fatalities statistics presented annually by the National Fire Protection Association and other organizations indicate that stress-related incidents often are the principal cause of firefighter fatalities. Nevertheless, these statistics do not show the alarming trend for increased incidences of cancer among firefighters.

Know the enemy

Certain types of cancers are prevalent among active firefighters. This is reason enough for focusing serious attention on finding ways to limit exposures during fireground operations, and just as importantly, providing information to firefighters who have been diagnosed with cancer.

To this end, the **Firefighter Cancer Support Network** was formed. This organization has engaged in a relatively aggressive awareness campaign and has been steadily growing. Its **website** provides one of

the most extensive lists of resources on firefighter cancer issues, including many references related to PPE use and cancer.

A [white paper](#) published this past summer captures many of the issues facing firefighters and provides specific recommendations involving PPE.

Many firefighters are under the false impression that simply wearing PPE is sufficient to limit exposure to most cancer-causing agents encountered on the fireground. SCBA, when worn, provides respiratory protection. But SCBA is not always worn, particularly during overhaul.

False sense of security

A significant number of chemicals absorb through skin and cause both acute and latent toxic effects. While it is true that gear has evolved extensively over the past several decades, its ability to prevent skin exposure to many fireground contaminants is quite limited. If not removed, contaminated exterior surfaces and inner layers of protective clothing and equipment results in exposure well after the incident.

Structural firefighting protective clothing has a moisture-barrier layer throughout most of the ensemble elements — coats, pants, gloves and footwear are all required to have these materials to prevent liquid penetration. Moisture barriers attenuate many contaminants but do not protect against all chemicals.

Certainly, the helmet shell is relatively impervious for protecting much of the firefighters head; the SCBA facepiece also protects the majority of the firefighter's face. Still, there are several parts of the ensemble that provide penetration pathways for smoke particulates and vapors to reach firefighters skin.

Helmet ear covers and hoods, and coat and glove wristlets all lack any form of barrier material. In addition, while garment closures are designed to be resistant to liquid penetration, they are not airtight. Interface areas between gloves and coat sleeves, footwear and pant trouser ends, the coat and pants, and the face/head/neck area are all relatively open to airborne contaminants.

The science

A recent [U.S. Department of Health and Human Services publication](#) examining firefighter exposure to potential carcinogens shows that the neck area is one of the most likely regions to become contaminated.

[Other studies](#) have clearly shown that many fireground gases penetrate the clothing and reach the firefighters skin. For example, [work done in Australia](#) showed specific carcinogens to be present on the firefighters' skin after simulated residential and industrial fires.

Many firefighters complain about the amount of soot that gets onto their face and neck areas not covered by the SCBA facepiece or main portion of their coat.

The reality is that firefighters are more likely to be exposed to hazardous materials during structure fires than they are during hazardous materials incidents. Not only are there differences in the manner

in which these emergency responses are carried out, but the most important distinction is that most structural fires create large volumes of hazardous gases and particulates, some of which are persistent and remain in the environment after the fire is extinguished.

In contrast, most hazardous material responses involve only a few chemical commodities and the response teams approach these emergencies with a high level of monitoring and caution.

Much the smoke in a structure fire consists of visible soot particles. However, the large amount of synthetic materials found throughout all structures contributes to a significant number of highly hazardous chemicals when they burn.

Lingering toxins

While most of these chemicals are relatively volatile and dissipate over time, the carbon-based soot particles absorb many of these vapors, holding them in place on surfaces including firefighter clothing and skin. These chemicals initially trapped on the particles, migrate into the surrounding environment and come in contact with the firefighter.

It is not surprising that analyses conducted on contaminated PPE often show a range of different types of chemical substances present. In some cases, these chemicals are not removed by washing.

So if PPE has limitations in preventing exposure to carcinogens and other hazardous substances, how can firefighters reduce their overall exposure? The Firefighter Cancer Support Network and other organizations have offered many specific suggestions for reducing exposures relative to PPE use and care as well as specific hygiene practices. Here are the top eight.

1. Wear SCBA through all stages of the fire, including overhaul.
2. Remove as much of the bulk contamination as possible while still at the fire scene by performing gross contamination.
3. Wipe soot from your head, neck, jaw, throat, underarms and hands using wet wipes immediately after the fire.
4. Change and wash station, work and other clothing right after returning to the station or leaving the fireground.
5. Shower after the fire.
6. Ensure that all gear is properly cleaned right after the fire.
7. Do not transport or take contaminated clothing home or store in a vehicle.
8. Keep all gear out of living and sleeping areas.

In addition to these recommendations, it is important to always wear gear properly. This includes wearing the hood, deploying ear flaps, extending the collar fully and making sure that all interface

areas are properly secured with sufficient overlap.

This is a start and there are certainly other practices that can reduce your risks that are not PPE-related. In coming editions, we will go into more detail on the PPE practices and explain some of the limitations and how you can overcome them.


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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