



On The Front Burner

Health and Safety Information for Today's Firefighter

Cancer Prevention for the Fire

Overview – Provides information related to the concern for cancer exposure for firefighters and identifies resources present within the document.

Cleaning and Decontamination – Provides information regarding the cleaning of PPE, clothing and equipment.

Personal Hygiene – Provides information regarding hygiene and decontamination to minimize exposure.

Storage – Provides information on the importance of how and where to store gear to minimize exposure.

Exercise and Detoxification – Provides information regarding the value of post exposure detoxification.

Medical – Provides information regarding types of medical screening procedures and process to follow.

Atmospheric – Provides information on types of atmospheric hazards such as diesel fumes and exposure to the sun.

Resources – Provides IPRF members with additional resources to supplement their cancer prevention training and awareness programs.



Overview

Firefighters are exposed to numerous hazards within their profession. The short-term dangers and risks from these exposures such as burns, and physical injuries are well known. Hazards associated with long-term health effects are becoming increasingly shared; with the risk of potential cancer exposure for firefighters are a particular concern.

Routes of entry for contaminants to enter the human body include inhalation, ingestion, and dermal absorption. Of the three routes of entry, two are of greatest concern: inhalation when firefighters do not wear or prematurely remove SCBA and dermal absorption, where toxins are absorbed through the skin.

The Center of Disease Control (NIOSH), *Findings from a Study of Cancer among U.S. Fire Fighters*; indicates cancer diagnoses among firefighters appeared to be concentrated to cancers associated with digestive, oral, respiratory, and urinary cancers.

Chemicals and materials within a burning structure can generate cancer causing or suspected cancer-causing agents that lace both the smoke and soot, which accumulates on firefighter gear, equipment, and skin.

Firefighters within a burning structure can encounter multiple types of materials that can create potential cancer exposure including, but not limited to arsenic, lead, mercury, phthalates, asbestos, benzene, formaldehyde, and hydrogen cyanide. These materials can be found in consumer goods, which are made with synthetic materials, flame retardants within products, and building materials.

The purpose of this document is to raise awareness and identify exposure prevention efforts to reduce the occupational risk to cancer. Within this document, IPRF members will find information that can be used within their department to minimize exposures. The document is divided into sections, reviewing:

1. Personal Protective Equipment (PPE)
2. Cleaning and Decontamination
3. Personal Hygiene
4. Storage
5. Exercise and Detoxification
6. Medical Screening
7. Atmospheric Hazards



Cleaning and Decontamination

Planning and preparation are key to having an effective cleaning and decontamination program. The goal of the program is to not only address the need for cleaning at the scene but to also incorporate steps that will prevent cross contamination and minimize the potential for re-exposure by contaminants that enter the apparatus or station.

Emergency vehicles should be equipped with the necessary equipment to allow for cleaning and decontamination at the scene. Items might include Garden hoses with nozzles, decontaminating cleaning solutions, soap, buckets, scrub

brushes, gear bags, sanitary wipes, hand sanitizer and additional personal protective equipment to be worn while completing the decontamination process.

Personal Protective Equipment (PPE)

The very equipment that firefighter's rely upon, to protect themselves from hazards at an emergency scene, can be another source of potential cancer exposure. Personal Protective Equipment (PPE), Bunker Gear, equipment and tools must be properly cleaned and decontaminated, after an emergency call, to further reduce the potential for dangerous particles entering the firefighter's body through inhalation, absorption, and digestion.

From photos or examples within your own Department, there are a number of situations where firefighters are observed wearing or storing contaminated PPE/bunker gear inappropriately, leading to potential contamination for themselves and others.

Examples might include:

1. Firefighters proudly wearing dirty and contaminated bunker gear as a sign of experience and achievement.
2. Firefighters not wearing or prematurely removing SCBA, as an example during overhaul.
3. Bunker gear going unwashed for prolonged periods of time.
4. Improper storage of contaminated bunker gear and PPE.
5. Bunker gear being stored in apparatus bays where it exposed to diesel exhaust.
6. Firefighters not having additional sets of turnout gear where dirty or contaminated gear is worn which gets re-contaminated.

To minimize exposure, your department should establish policies and allocate resources to ensure that proper decontamination and cleaning occurs. While concerns, regarding exposure to carcinogens apply to both career and volunteer departments, volunteer and combination departments have specific challenges that need to be addressed.

Both NFPA 1851: Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Firefighting and Proximity Firefighting, as well as the manufacture provide additional direction and guidance for departments and the individual firefighter.

As it pertains to potential cancerous particle exposure, anytime firefighters are exposed to any smoke, decontamination of their PPE and bunker gear is needed. Individual firefighter's need to be cognizant of the condition of his or her gear and keep that clothing clean and properly maintained.

In addition, Fire Investigations, for origin/cause, if not wearing bunker gear, their uniforms should be disinfected and cleaned as similar to the procedures for soiled PPE and bunker gear.

Manufacturers provide a large variety of what fire service needs to minimize firefighter exposure to carcinogens, each provide instructions for proper cleaning to remove contaminants. For example, when cleaning and disinfecting a SCBA, the manufacturer will provide instructions to properly decontaminate:

1. The respirator
2. Harness and buckles
3. The facepiece
4. The mask mounted regulator
5. Control modules
6. The cylinder

Instructions will include direction on the types of cleaning solutions that are recommended by the manufacturer, how to clean, and rinse the individual components. Clean and decontaminated personal protective clothing is a firefighter health and safety issue, and every department should ensure that their personnel have the equipment to properly launder and dry that gear.

Bunker Gear

Gross decontamination of the gear can be accomplished at the fire scene by rinsing off the gear with water and using a scrub brush. The soiled/contaminated gear should then be bagged and sealed before it is placed into a vehicle to avoid cross contamination from the gear to the apparatus. The contaminated gear must be cleaned to prevent re-exposure.

While bunker gear is being cleaned and decontaminated, members of your department will need a spare or second set of gear. This can be addressed through access to loaner gear, or a second set of gear assigned to the individual.

The decision to clean and launder bunker gear in house or use an outsourcing vendor is an important decision for each department. In either case, the objective is to meet the NFPA 1851: Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Firefighting and Proximity Firefighting, as well as the manufacturer requirements. Listed are some items for consideration to assist with the decision:

In House:

1. Capacity, style, and availability of washer-extractors.
2. Pre-programmed or programming ability of wash cycles to decontaminate bunker gear.
3. Spray and rinse options.
4. Quality and building components of the washer-extractor, such as industrial strength frames, stainless steel tubs and bearings so it will last a long time.
5. Types of foundations necessary for proper mounting of the washer-extractor.
6. Drying options such as air drying or gear dryers.

Outside Service Provider:

1. Compliance with NFPA 1851 and Manufacturer requirements
2. Capacity
3. Turnaround time
4. Ability for repairs
5. Offer loaner gear
6. Pickup and Delivery

Ultrasonic Cleaners

An option for cleaning contaminated firefighter gear qualified under NFPA 1851 is using ultrasonic cleaners. Ultrasonic cleaners work by converting an electrical charge into high frequency sound waves inside a cleaning tank. These waves create microscopic bubbles that scour the surface at a level that is hard to achieve by hand. This process has several advantages over tradition cleaning methods. Using ultrasonic cleaning on contaminated gear is that it doesn't require it to be disassembled and reassembled to be cleaned. The tiny bubbles easily reach into tight crevices reducing the cleaning time by up to 75 percent. Another advantage is the cleaning is less abrasive on equipment causing less damage to fragile gear. This eliminates hand washing of fragile material and helps prolong the longevity of the equipment.



Equipment and Tools

All equipment should be washed with soap and water. If the tools are transported to the station in a soiled condition the tools and the areas, they were transported in should be thoroughly cleaned. If the tools and appliances are not cleaned on the scene, or where impractical, the tools/appliances as well as the cabinets/storage areas should be thoroughly washed with soap and water while wearing protective gloves, so the firefighters do not re-expose themselves to the carcinogens.



Personal Hygiene

All on-scene personnel need to be aware of the importance of their personal hygiene. Departments should not only establish personal hygiene procedures, but also ensure that proper hygiene resources are available. These procedures further help prevent toxic materials from entering the body through three routes of entry: inhalation, absorption, and ingestion.

It is recommended to have soap and water available at the fire scene so members can clean their hands and face as well as exposed skin. This is especially true before firefighters drink water, eat food, as well as use restroom facilities.

Be cautious of shared coolers or containers for drinks and snacks for on scene rehab nourishment. Dirty hands could contaminate the contents with toxins.

Rescue wipes also provide an effective way to minimize the risk of contaminants and cancer-causing toxins from absorbing into the skin. They should be used to help remove soot and contamination from vulnerable skin areas exposed to fire and smoke. Some areas of the skin are more permeable than others, specifically the face, jaw, neck, throat, and groin.

It is recommended that a decontamination area is established in a safe location and the decontamination equipment is set up. Once a firefighter is finished at the fire, the member is rinsed off by another firefighter using a garden hose, scrubbed with soap and water, and rinsed off again.



The process is conducted by other firefighters who are wearing proper PPE. Once the gross decontamination is complete, the firefighter begins to doff his or her SCBA, helmet, balaclava, and gloves. Once the gloves have been doffed, the firefighter uses hand sanitizer/ Rescue Wipes to clean his or her hands. Then the firefighter should don nitrile gloves and use sanitary Rescue Wipes to wipe down their face, jaw, throat, neck, and groin.



As soon as possible the firefighter should take a shower and put on clean clothing.



Storage

Each emergency response represents a possible contamination event, until clothing and equipment can be cleaned. Proper storage of contaminated bunker gear and clothing is important to minimize cross contamination.

After a fire, a firefighter's gear and equipment is full of absorbed gases, liquids, and particles of soot, which can transfer onto other objects, as well as off-gas carcinogens into the environment. Inappropriate storage of clothing and bunker gear can lead to the contamination of the fire apparatus, station, work environment, personal cars, and homes, which expose others.

It is important to recognize that your station uniform, work clothes and underclothes can also become contaminated by any substance that may have bypassed your turnout clothing. This clothing must be removed and properly stored until it can be cleaned before going back to work or home.



To minimize cross contamination, until equipment can be properly cleaned:

1. Do not wear contaminated bunker gear into the living or sleeping areas of the fire station.
2. Do not throw your contaminated clothing on your bed or in your locker.
3. After the fire, bag up contaminated bunker gear and place it in a compartment outside of the passenger cab.
4. Do not transport or take contaminated clothing or gear home or store it in a vehicle, where you will further expose yourself and your family.
5. If using your personal vehicle, store contaminated bunker gear and PPE in a large plastic bag, in a closed zippered duffle bag or within a large rubber type of storage tote. Take the items back to the department so they can be properly cleaned.
6. Keep all gear out of living and sleeping areas, including your car.
7. Store all contaminated bunker gear or clothing only in designated areas as they await cleaning.

Architectural concepts for new construction or remodels should incorporate design features that help reduce exposure to cross contamination. Design features would include clear separation of living quarters from the apparatus floor. Designing appropriate locations for storage rooms to hold contaminated PPE and other equipment. These areas should have appropriate air flow that remove and capture gasses and particulates from passing through the HVAC systems.



Exercise and Detoxification

The health and overall well-being of firefighters have been adversely affected by exposure to a multitude of toxic substances. Exposures resulting from the job can be detrimental to a firefighter's health if not removed from the body. An element within your organization's cancer prevention program should include detoxification.

Detoxification is a process through which the level of toxic chemicals in the body is reduced. The detoxification process would occur after a firefighter returns from the fire scene and is commonly called "sweat it out." There are several ways of ridding the body of toxins, including urine, feces, and tears. However, sweating is by far the most effective. Studies out of the University of Alberta in 2011 proved that human sweat is 10 times more toxic than urine. The researchers measured 16 toxic metals and nine of them, including lead, aluminum, and cadmium – known to affect firefighters – are removed 10 times more efficiently via sweat than other natural avenues.

Your department should implement procedures that would encourage the firefighter to sweat as means to rid their body of any absorbed, digested or inhaled toxic material.

Programs involving moderate aerobic exercise or the use of detoxification saunas, or a combination of both are examples of procedures being utilized to facilitate sweat for toxin removal. The aerobic exercise increases blood circulation which helps mobilize toxins to excretory routes. The heat from the sauna helps raise body temperature which promotes sweating.

Cycles saunas as a tool to reduce toxic chemicals after fire fighting

There is a trend to use saunas and exercise to detoxify the firefighter's body of toxic chemicals after exposure following a firefighting event. Anyone using this approach must be cautious that firefighters are well hydrated and closely monitored to prevent dehydration.

The toxic dust, fume and vapor that arises from a fire contains hundreds of different toxic chemicals, including dioxins, PCBs, asbestos, silica, benzene, polybrominated diphenyl ethers, manganese of nitrogen, and sulfur.

Some fire stations have been installing cycle saunas that utilize infra-red technology to assist with detoxifying the body of toxic chemicals.

The firefighters enter the sauna and pedal a stationary bike for approximately 10 minutes. The heat and movement allow them to work up a sweat which then helps purge the deadly toxins from their bodies. This is followed by a normal shower. The saunas are designed so a person can ride a spin-bike inside the gently warm infrared environment and sweat quickly and profusely without raising their core body temperature. This means they remove chemicals via the sweat, without processing them through the organs in their digestive system.



The cycle sauna concept was originally designed for high level athletes to train in heat, but it is being adopted as a highly effective piece of detoxification equipment, first by medical doctors, and now by fire chiefs.

The immediate result, experienced by firefighter crews has been the noticeable lack of "fire smell" that typically emanates from the body up to a week after fighting a fire. It is the focused release of these absorbed toxins that firefighters hope will lessen the chance of developing cancer.



Medical

As an element within your cancer prevention and awareness program, the use of medical screenings and evaluations are an essential element for your organization.

Early detection of cancer increases the chances for successful treatment. Two major components of early detection of cancer are education to enhance early diagnosis and screening. As a note, the first cancer screening test was developed in 1943. The screening test involved a monograph which identified both precancerous and malignant cells.



Screening refers to the use of simple tests across a healthy population in order to identify individuals who have disease, but do not yet have symptoms.

Recognizing possible warning signs of cancer and taking swift action can assist with early diagnosis. Negative prognosis for cancers diagnosed at an advanced stage have been the driver behind research into techniques to detect disease before symptoms are manifest.

For certain cancers, detection, and treatment of “precancers” can prevent the development of cancer. For other forms of cancer, screening is a form of secondary prevention, aiming to improve outcomes through earlier diagnosis.

Every firefighter, within your department should obtain a thorough and confidential physical exam for prevention and early detection of cancers annually.

Medical evaluations are outlined within NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments. Within NFPA 1582, medical evaluations are identified as necessary to establish an initial baseline for surveillance, an annual medical evaluation and then an evaluation following an occupational exposure, illness, injury, or protracted absence from the job.

As your organization chooses who provides medical evaluations, it is important that your partner has the ability to also conduct cancer exams, labs, and screening tests.