

# **BEST PRACTICES FOR REDUCING FIREFIGHTER EXPOSURES TO CARCINOGENS**

A “Best Practice” is a technique that identifies a standard way of doing something that multiple organizations can use and adopt. Many departments across the nation are beginning to implement best practices to reduce exposures to carcinogens. Based on findings from the University of Arizona study, along with other research, the Tucson Fire Department is implementing a series of best practices. These best practices will be measured for effectiveness through “biomarkers of exposure” (urine, blood, buccal cells).

The best practice interventions include post-fire washdown of firefighting gear, engineers on air, and proper transport of contaminated gear from the fire scene to the fire station. It is recognized that doing all of these interventions can pose logistical challenges. It is the idea that we begin to do these things whenever practically possible to help reduce exposures. Reducing the risk involves taking a comprehensive, multi-step approach. It is likely that accumulation of low levels of exposure over time (chronic effects) can lead to the higher incidence of cancer in firefighters. Every step you can take to minimize your risk will help. The goal is not only to get everyone home safe, but also enjoy your retirement with your loved ones.

# WASH-DOWN ON SCENE

*Prior to removing the firefighting ensemble (including SCBA regulator) worn in the hot zone, a gross decon or wash-down shall be performed to remove potentially harmful contaminants.*

**Wash-down:** Members should brush large debris first, and then spray each other with water to remove loose particulates from turnouts and equipment. A study published in the Journal of Occupational and Environmental Hygiene found that 2 minutes of brushing with Dawn soap and water removed 80% of PAH's from the turnout ensemble. The wash down kit includes a bucket with a lid, 2.5" to green line reducer, hose, nozzle, brush, and Dawn soap. Dawn soap works well on the turnouts and is good at removing hydrocarbons. This is not a drenching of the gear, just a **quick two-minute rinse** that can help reduce secondary exposures. Fatigue, heat or other factors may not make this step possible, and the condition of the firefighter at the time should be taken into account. If this step is not completed, the turnouts should be taken off prior to entering the rehab area.



**Source:** Kenneth W. Fent, Barbara Alexander, Jennifer Roberts, Shirley Robertson, Christine Toennis, Deborah Sammons, Stephen Bertke, Steve Kerber, Denise Smith & Gavin Horn (2017): Contamination of firefighter personal protective equipment and skin and the effectiveness of decontamination procedures, Journal of Occupational and Environmental Hygiene, DOI: 10.1080/15459624.2017.1334904

# WASH-DOWN ON SCENE



The booster reel can also be used. To prevent over-saturation, the booster line nozzle should be gated down for low pressure and not from any pumper that has been used for an extended period, as the water can get very hot.

Continue to wash off your neck, face, arms, legs or anywhere else you can see contamination. Hand wipes are available and can be used in the absence of soap and water. Shower as soon as possible upon returning to the station, if possible, *shower within an hour!*

# ENGINEERS ON AIR

The FEMA funded study conducted by the University of Arizona found that engineers often had elevated levels of polycyclic aromatic hydrocarbons or PAH's in their urine post-fire. PAH's are known to be carcinogenic and it is assumed that this increased exposure is due to a lack of respiratory protection. First-in engineers operating at the pump panel or aerial and are securing utilities are often operating without an SCBA. As soon as practical, engineers should don their SCBA and be on positive pressure air while exposed to smoke.



## Why not a cartridge Filter?

Cartridge Filters may not filter out all of the potential toxins encountered at a fire (A U of A study actually found formaldehyde break through with previous cartridges). More information on cartridge filters limitations can be found here:

[https://www.osha.gov/dts/shib/respiratory\\_protection\\_bulletin\\_2011.html](https://www.osha.gov/dts/shib/respiratory_protection_bulletin_2011.html)

# TRANSPORTATION OF CONTAMINATED GEAR

We need to embrace a “clean cab” concept. This means treating the products of combustion the same as we would any other biohazard. Contaminated hose, tools, SCBA’s or any other contaminated equipment should be decontaminated on scene and/or transported in a manner as to not contaminate the cab of the truck. If an SCBA or other equipment cannot be decontaminated on scene, equipment should be bagged and transported in a compartment, in the crow’s nest, or by another vehicle i.e. EC/BC/Rescue.



# TRANSPORTATION OF CONTAMINATED GEAR

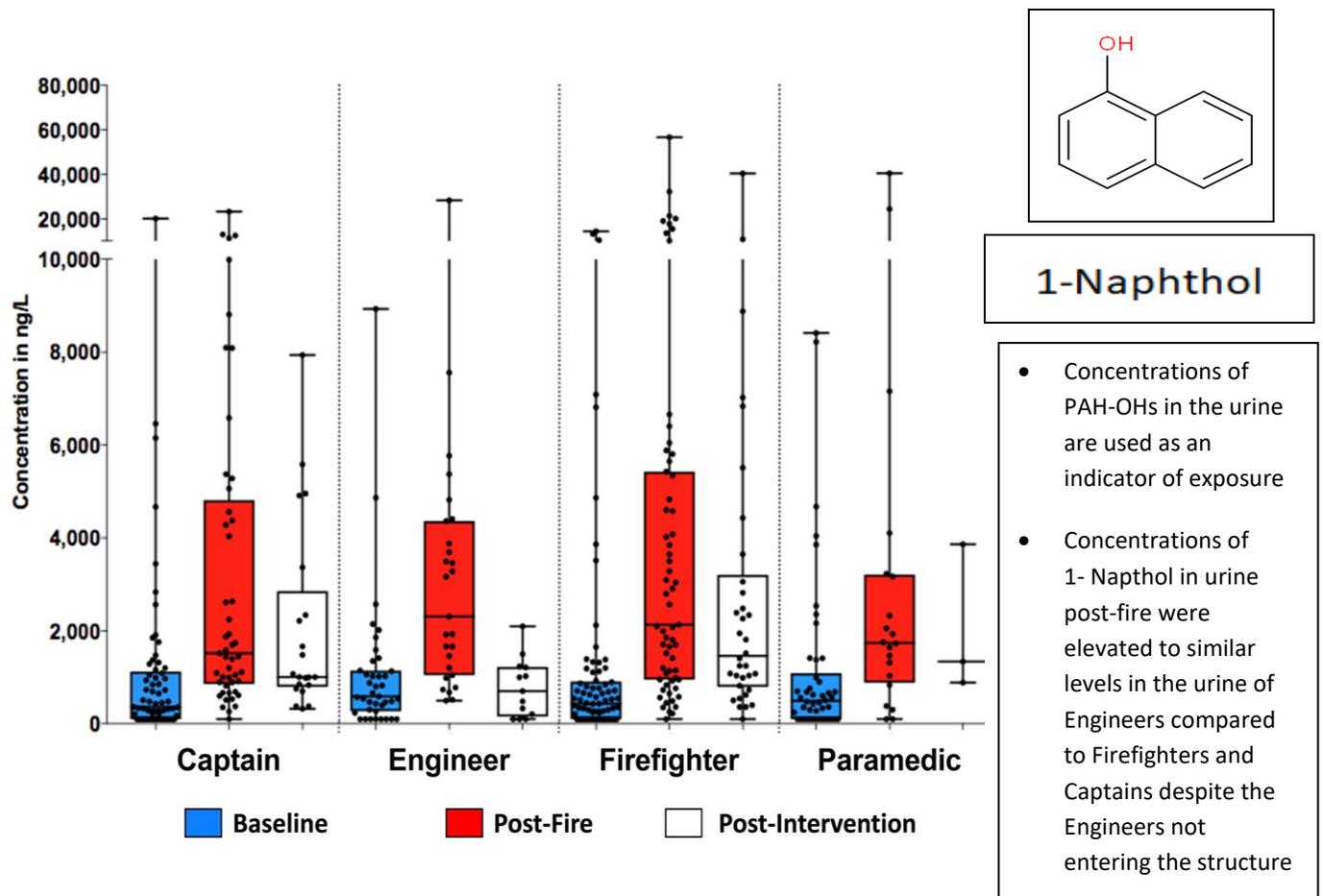
Clear plastic bags will be carried by each EC so that gear can be bagged and easily identified. Fire hose or any other dirty gear should be bagged or transported separately from the cab. Upon arrival back at the station, open the bags outside the bays and allow to “off gas” as long as possible.

- ***Wash all contaminated gear, making sure to use gloves and eye protection***
- ***Don't forget to scrub your boots!***
- ***Gloves present a challenge but should be washed by filling up a sink with warm water and mild detergent (small amount of Dawn or Joy will work), and then putting the gloves on and scrubbing back and forth. Put a pair of EMS gloves on while you do this. Make sure the water is less than 105 degrees.***
- ***Helmet pieces can be hand washed as well utilizing mild soap and water. Separate liner pieces and wash with a soft bristle brush.***
- ***Don't forget your SCBA facepiece!***



*\*\*While the “gross decon” can remove 85% of the contaminants, wash your gear in the extractor as soon as possible. Request help and offer help from your reliefs to facilitate washing and drying of turnouts\*\**

# UNIVERSITY OF ARIZONA FINDINGS:



The University of Arizona Cancer Study found 1-Naphthol (one type of PAH) in elevated levels post-fire versus baseline urine, despite engineers not entering the structure. These are indicators of exposure that can have cumulative effects over a career.

# PROPER CARE AND MAINTENANCE OF STRUCTURAL FIREFIGHTING GEAR

Structural firefighting gear (turnouts) are highly engineered to keep you as safe as possible. Wearing the turnout ensemble routinely for calls other than what it is intended for can reduce the protection factor and intended lifespan of the gear. Additionally, improper laundering, drying and storage of turnouts can damage turnouts and may not remove the contamination. NFPA 1851 and manufacturer guidelines should be followed:

- *Turnouts should be washed in front loading department extractors (washing machines) ONLY utilizing the approved automatic detergent dispenser. Do not add Tide or other types of detergents and never launder in RESIDENTIAL WASHERS!*
- *Turnouts should never be dried in direct sunlight or in a dryer that exceeds 105 degrees. UV light damages turnouts.*
- *Separate the outer shell and inner liner. Outer shells and inner liners are washed separately. Fasten all closures (zippers, pockets, etc.). Turn pants and coats inside out.*
- *DRD and suspenders should be removed and washed separately, or hand washed. Soaking prior to washing is also beneficial.*

# FIREFIGHTING HOODS

Recently, the firefighting protective hood has been studied as a potential route for dermal exposure. A study conducted by the IAFF found that small particles are able to penetrate the traditional nomex hood. The Tucson Fire Department has purchased and distributed particulate blocking hoods to our firefighters that can block the small particulates that the traditional hoods cannot. The results of a pilot burn conducted by Tucson Fire and the University of Arizona and were inconclusive about the effectiveness of newer hoods in regard to PAH's found in the urine post fire. The effectiveness of new generation hoods is being studied elsewhere.

A new edition of NFPA standard is due out soon which will list a particulate blocking hood as an option, but not a requirement as more study is needed to prove the effectiveness. The Safety Team will be monitoring the results of our study as well as other current studies to help guide future decisions regarding a hood design.



Tucson Fire has issued every firefighter a NFPA 1582 Compliant "Particulate Hood"

# HEALTH AND WELLNESS

While the main focus is on reducing our fire ground exposures, there are many modifiable risk factors involving health and wellness that should be employed as well. Multiple studies have shown increased cancer rates associated with lack of exercise, obesity, tobacco use, excessive alcohol use and poor sleep habits. Tucson Fire has a team of Peer Fitness Trainers, working with our occupational medicine provider WellAmerica and the University of Arizona. These resources include:

- Dr. Wayne Peate (*retired*) and the staff at WellAmerica to provide a full annual physical, including cancer screenings.
- Registered Dietician Ilene Yalen on staff with WellAmerica as a resource for nutrition.
- Peer Fitness Trainers listed at each station to help firefighters achieve fitness goals, conduct injury prevention initiatives and maintaining fitness for duty.
- University of Arizona sleep study and best practices research.
- Dr. Patricia Haynes, LCP on staff as a mental health and sleep expertise resource.

Maintaining healthy weight, participating in firefighting fitness routines, limiting alcohol use, eliminating tobacco use, and developing good sleep habits are all individual “best practices” for cancer reduction. For assistance with achieving your health and wellness goals and to reduce your profile risk for cancer, contact the TFD Safety and Wellness Section.

# RESOURCES

This document is meant to be a “living document”, residing in the station and updated as more research, advancement and innovation becomes available. As mentioned, this is an approach to implementing change to the fire service. These “Best Practices” are intended to reduce our cumulative exposures over the course of a career. There are challenges and limitations, but this is a necessary change that can positively impact your career and retirement. The partnership with the University of Arizona and the funding from FEMA for this study is invaluable, as is the commitment from the men and women of the Tucson Fire Department. Thank you!

The TFD Cancer Research Team consists of:

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# RESOURCES

## Additional Resources:

Fire Fighter Cancer Cohort Study

[www.ffccs.org](http://www.ffccs.org)

Firefighter Cancer Support Network

<https://firefightercancersupport.org/>

NIOSH/CDC Firefighter Cancer Factsheet

<https://www.cdc.gov/niosh/pgms/worknotify/pdfs/ff-cancer-factsheet-final.pdf>

NIOSH/CDC PPE Decontamination Procedures

[https://ulfirefightersafety.org/docs/FentEtAl\\_JOEH2017.pdf](https://ulfirefightersafety.org/docs/FentEtAl_JOEH2017.pdf)

Healthy In, Healthy Out

[http://wscff.org/?zone=/unionactive/view\\_page.cfm&page=Healthy2017n20Healthy20Out](http://wscff.org/?zone=/unionactive/view_page.cfm&page=Healthy2017n20Healthy20Out)