

The Silent Killer **“die with their boots off,”**

Firefighters & Cancer

According to the International Association of Firefighters, cancer is the leading cause of death in firefighters at 63%.

Based on previous studies of fire fighters, the cancers of primary concern were cancers of the lung, brain, stomach, esophagus, intestines, rectum, kidney, bladder, prostate, testicular, leukemia, multiple myeloma, non-Hodgkin lymphoma

How Modern Furniture Endangers Firefighters

Consumer goods are increasingly made of synthetic materials and coatings. The carcinogens they give off when they burn could be driving high cancer rates among first responders.

Tony Stefani had been a firefighter in San Francisco for nearly 28 years when, one January day in 2001, he was out jogging and began to feel weak. “The last mile I could barely run, I had to walk,” he told me recently. When he got home, he urinated blood. He was soon diagnosed with transitional cell carcinoma, a rare cancer of the kidney.

Chris Miller, a firefighter in Kentucky, had lymphoma 10 years ago. He got chemo, went to rehab, spent six weeks in a hospital, and lost 60 pounds. He took four months off work. The chemo wore him out and made his limbs tingle. It made him sterile. He will be 45 in November.

Florida Firefighter, Keith Tyson had recently retired after 34 years of firefighting in Miami when doctors found an aggressive cancer in his prostate. He says roughly a third of his department has had some form of cancer in the past three years.

“I’m not saying that every single one of those cancers was caused by the job,” Tyson said. “But at the same time ... we have a problem.”

Ironically, the most dangerous thing about an occupation that involves running into burning buildings isn’t the flames, but the smoke. Cancer is the leading cause of firefighter line-of-duty deaths in the United States, and according to the International Association of Fire Fighters, about 60 percent of career firefighters will die this way, “with their boots off,” as they call it.

There’s a misconception that only the firefighters who responded to the World Trade Center attacks on 9/11 risk developing cancer, because of their exposure to asbestos and jet fuel. But in fact, cancer threatens firefighters everywhere, every day.

Although a causal link has not yet been proven, the association between firefighting and a greater cancer risk began to build about 10 years ago. A [meta-analysis](#) found that firefighters have a higher risk of

multiple myeloma, and possibly a greater risk of contracting non-Hodgkin lymphoma, prostate, and testicular cancers.

Rise in Firefighter Cancer Deaths Since 1950

From there, more evidence rolled in: Research into Massachusetts firefighters [found](#) greater odds of developing brain and colon cancers. Firefighters in their 30s and 40s from five [Nordic countries](#) were found last year to have a greater chance of developing prostate and skin cancers. In 2013, researchers studying 30,000 firefighters in three U.S. cities found the profession was associated with “small to moderate increases” in risk for various cancers, particularly respiratory, digestive and urinary malignancies. The study [also found](#) that the risk of lung cancer increased with every fire they fought.

“The longer you’re a firefighter, the greater your chance of getting some kind of cancer,” says Susan Shaw, the executive director of the Marine & Environmental Research Institute and a professor of environmental health sciences at the State University of New York in Albany. “These are people who have a gladiator mentality, and they’re really tough. [But] now you have a different kind of danger.”

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The problem is our stuff. Possessions make our lives cozy and convenient, but when they catch fire, they become noxious fuel. The cancer rates are being driven up, researchers believe, by chemicals that lace the smoke and soot inside burning buildings. Consumer goods are increasingly manufactured using synthetic materials, and fires are more toxic as a result.

A century ago, we furnished our houses with wood, cloth, metal, and glass. Today, it’s plastics, foams, and coatings—all of which create a toxic soup of carcinogens when they burn. Fire experts say synthetic materials create hundreds of times more smoke than organic ones; flame retardants alone double the amount of smoke and increase toxic gasses 10-fold. Your TV, your kid’s Barbie, your Saran wrap, your couch: all of them can be poisonous when they’re ignited and their fumes are inhaled.

“Every substance, when it burns, changes its chemical structure,” said Timothy Rebbeck, a professor at the Dana-Farber Cancer Institute and the Harvard School of Public Health. “Particularly when you burn

something that's synthetic or man-made, you're creating strange compounds that we don't know what they'll do.”

Among the chemicals Shaw and others suspect might be harmful are benzene, found in furniture wax; the formaldehyde in cleaning materials; hydrogen cyanide, which is used in the manufacture of synthetic fibers; stick- and stain-resistant coatings like Scotchgard and Teflon; and the flame-retardants that are added to the foam inside furniture.

In 2012, Shaw had blood drawn from 12 firefighters after they responded to a fire. Their samples contained three times the level of flame retardants as the general population. Their blood levels of per fluorinated chemicals, which are used as non-stick coatings, were twice as high as those of the World Trade Center first responders.

Some flame retardants were phased out in 2005 after studies showed they were building up in human breast milk, but they were replaced with new compounds. Most new couches contain flame retardants, and researchers know little about their health impacts. “The chemical industry replaces the phased-out chemical but with something similar, but it has one bond difference,” Shaw said. “Scientists are trying to follow the market and figure out, ‘What's in it now?’ It's extremely frustrating.”

The American Chemistry Council has defended flame retardants. “Protective chemistries like flame retardants help prevent fires from starting, slow their spread, and reduce their intensity,” the industry group said in a statement.

All people are exposed to these household chemicals, but fires magnify this exposure. When flame retardants and other compounds burn, they create reactive oxygen species—molecules that bind to DNA and cause mutations that can lead to cancer.

“Think about smoke as a bunch of carcinogens, because that’s basically what it is,” said Virginia Weaver, a professor of environmental health at Johns Hopkins University. “The more synthetics there are in the home, the more chemicals are present in the smoke, and the more chemicals that are carcinogens.”

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Firefighters have between one and two minutes to get ready when they’re called. That’s 90 seconds to don 25 pounds of “turnout gear”—thick pants, a coat, boots, gloves, a hood, and mask. The coat and pants don’t seal together. Smoke snakes up under the coat and clings to the body; toxic soot settles in the gaps between gloves and sleeves. Around their necks, firefighters wear permeable, sweatshirt-like hoods that are porous to chemicals.

The suit itself soaks up toxins and later “off gasses” them. Studies have confirmed that firefighters’ gear and skin gets coated in higher levels of potentially carcinogenic compounds, such as phthalates—chemicals that are added to plastics to make them soft—as well as arsenic, lead, and mercury.

The extreme heat helps chemicals enter through the skin: With every 5 degrees that body temperature rises, skin absorption rates increase by as much 400%.

The gasses creep in through mouths and noses. As a firefighter at a house fire, you wear a mask connected to a can of compressed air that you carry on your back. Each breath is effortful and makes a faint sucking sound. The mask is unbearably hot and uncomfortable—it feels like swimming goggles encasing your entire face. You sweat, and it slides around. Leaving a burning building, the only thing you want to do is rip it off and gulp fresh air.

That’s also the worst thing you could do. The “overhaul” period—when the fire is mostly out but the embers are still smoldering—is often when a fire is at its most toxic. Some fire departments have begun stationing safety monitors at overhauls to make sure firefighters don’t take off their masks prematurely.

To reduce their cancer risk, firefighters must remove their gear immediately after leaving a fire and take a shower. (Walking around the firehouse in turnout pants—as firefighters are sometimes depicted doing in movies and TV shows—needlessly increases exposure.)

Ideally, the turnout gear would be laundered immediately. But it requires specialized washing machines that are expensive and not widely available.

To further reduce risk, firefighters should have a second set of turnout gear to wear in case there’s a fire while the first set is being cleaned. But that would cost at least an additional \$1,500 per firefighter—a sum many pinched municipalities don’t have.

In the meantime, firefighters around the country are educating each other about strategies to prevent cancer despite their departments’ budgetary limitations. Ryan Pennington, a firefighter in Charleston, West Virginia, said he sometimes takes two or three showers after responding to a fire. The tough-guy image of firefighters, their faces smeared with soot, is actually a dangerous one, he says.

“We all think of firefighters as gritty folks with black all over faces,” he said. “But really, we need to be the squeaky clean people who could go into an office.”

There are precautions that can be taken to help decrease our exposure to dangerous carcinogens and to deal with them after we have been exposed.

1. Always wear your PPE and SCBA on fires (structure, vehicle or any other fire where applicable), including during overhaul.
2. Prior to leaving the fire scene, perform a gross decontamination to remove potentially toxic contaminants from your turnouts and gear.
3. Rinse and wipe off hands, arms, face, neck, etc. immediately after the fire.
4. After the fire, store turnout gear in a compartment OUTSIDE of the passenger cab to avoid unnecessarily inhaling off-gassing carcinogens.
5. Upon returning to the station (after EVERY call or outing), immediately hook up the Plymovent or use alternative exhaust mitigation methods to minimize exhaust fumes in the engine bay and living quarters.
6. If available, a second (clean) set of turnouts should be used upon returning to the station, and the contaminated turnouts should be thoroughly cleaned. If a second set of turnouts is not available and/or thoroughly cleaning turnouts is not an immediate option, care should be taken to clean as much of the contaminants off as possible, and turnouts should be hung in a well ventilated area away from crew or apparatus passenger compartment until proper cleaning is possible.
7. After returning to the station and outfitting your equipment, crew members should thoroughly shower to remove carcinogens from skin and hair, and then they should change into clean cloths.
8. Immediately clean contaminated clothing and gear at the station. Do not throw your contaminated clothing on your bed or in your locker where it will contaminate your bedding, other clothing or off-gas in the crew quarters. Do NOT take contaminated materials, clothing or gear home where you will further expose yourself and your family to the carcinogens from the fire.
9. Do not wear or bring turnouts (Inside the station) (dirty or clean) into living or sleeping areas. The days of stowing bunker pants next to the bed should be a thing of the past as the practice contaminates the living space and exposes crew members to off-gassing toxins while they sleep.

Document your exposures in either a PERS (Personal Exposure Reporting System) or a personal binder. At minimum, keep track of the date and time, run ID #, crew present, exposure or materials burning, duration of exposure, etc. Even though many departments are accepting a “presumptive” illness claim with cancer, we often have to “prove” we were exposed at work.