Fire Fighters and Cancer Risk

Fire fighters are rescue professionals who include emergency first responders, criminal investigators, building safety inspectors, and administrative professionals. Exposure to carcinogens (cancer-causing substances) among fire fighters can vary depending on their duties. While fighting fires, important factors include the setting of the fire, the size of the fire, and the protective equipment worn.

Toxic exposures associated with firefighting

Fire fighters can be exposed to a number of known and suspected carcinogens through their work:

- All types of fires create a mixture of toxic combustion products including liquids, gases, and particulate matter (a mixture of tiny solid particles and liquid droplets in the air).
- Fire fighter protective equipment can also contain chemicals that release suspected carcinogens called perfluoroalkyl substances (PFAS)[1].
- Other exposures, such as from diesel fumes[2], can come from vehicles at fire scenes and at fire stations.

Fire fighters can be exposed to these chemicals when breathing or through their skin.

In a report published in 2010, the **International Agency for Research on Cancer (IARC)**, part of the World Health organization (WHO), considered there to be sufficient evidence for several firefighting-related exposures causing different types of cancer:

- **Arsenic:** Cancers of the skin, lung, and liver
- **Asbestos:** Cancers of the lung, larynx, and gastrointestinal tract; mesothelioma
- **Benzene:** Leukemia
- **Benzo[a]pyrene:** Cancers of the lung, bladder, and skin
- **1,3 Butadiene:** Blood cancers
- **Cadmium:** Lung cancer
- **Formaldehyde:** Nasopharyngeal cancer
- **Radioactivity (gamma activity):** All cancer sites combined
- **Radionuclides (alpha-particle-emitting):** All cancer sites combined
- **Radionuclides (beta-particle-emitting):** All cancer sites combined
- **Silica (crystalline):** Lung cancer
- **Sulfuric acid:** Laryngeal cancer
- **2,3,7,8-tetrachloro dibenzo-para-dioxin:** Lung cancer, non-Hodgkin lymphoma, sarcoma; all cancer sites combined

Along with these exposures, there are also dozens of other firefighting-related exposures that IARC considers *probable* or *possible* carcinogens.

There is also evidence that night shift work may increase the risk of some cancers. Though the science on this topic is still evolving, the disruption of normal circadian rhythms (sleep/wake patterns) in people who work night shifts is thought to play a role. Despite these concerns, night shift work is essential for emergency responders such as fire fighters.

Does firefighting cause cancer?

It has been difficult to determine whether firefighting causes cancer. This is largely because research studies have had to include fire fighters who might have different backgrounds and exposures, such as:

- The number of years on the job
- Varying work schedules
- The amount of time and the types of exposures at fires (including some very brief

but strong exposures)
- The types of protective equipment worn at fires
- Each person's unique genetic susceptibility
- Other lifestyle choices that might affect a person's cancer risk, such as whether they smoke

An added layer of complexity is the potential impact of heat, air temperature, and chemical mixtures on exposure doses at fires. Finally, cancers take years to decades to develop, and it can be hard to know the most important window(s) of exposure in people who develop cancer, as well as whether cumulative lifetime exposure is important.

In general, the American Cancer Society does not determine if something causes cancer (that is, if it is a *carcinogen*). We look to other respected organizations, such as the International Agency for Research on Cancer (IARC) for help with this. However, the research we do contributes to the body of evidence used by these organizations.

In its latest review of the scientific evidence (from 2022), IARC has classified occupational exposure as a fire fighter as "carcinogenic to humans" (Group 1). This is based on:

Sufficient evidence for cancer in humans for:

- Mesothelioma
- Bladder cancer

Limited evidence for cancer in humans for:

- Colon cancer
- Prostate cancer
- Testicular cancer
- Melanoma of the skin
- Non-Hodgkin lymphoma

The IARC Group 1 classification is used when there is the strongest *level of evidence* that something can cause cancer. However, the classification doesn't say anything about the *level of cancer risk* from the exposure. For example, two substances might be in Group 1 because there's strong evidence that they both cause cancer, but one of these substances might still be much more likely to cause cancer than the other.

To learn more about how IARC and other organizations study and classify cancer causes, see Determining if Something Is a Carcinogen[3] and Known and Probable Human Carcinogens[4].

Ongoing research

Continued research on the possible links between firefighting and cancer is happening around the world. Here are two of the larger studies now examining this topic.

Fire Fighter Cancer Cohort Study (FFCCS)

The Fire Fighter Cancer Cohort Study (FFCCS) is a large national initiative funded by the US Federal Emergency Management Agency (FEMA). The FFCCS launched in 2016 and has a goal of studying 10,000 fire fighters over 30 years. Like our American Cancer Society Cancer Prevention Studies[5], this study is following people who have never been diagnosed with cancer to see who goes on to develop cancer and who does not, and then looking at the differences between these groups. However, the FFCCS will focus specifically on cancer risk among fire fighters. The study will use a combination of survey data, biological samples (such as blood and urine), and detailed job exposure data to better understand if and how firefighting may cause cancer. For more information, visit the FFCCS website at www.ffccs.org/[6].

National Firefighter Registry

In 2018, federal legislation was enacted requiring the Centers for Disease Control and Prevention (CDC) to set up a voluntary registry of fire fighters to track and analyze cancer trends and risk factors among the US fire service. The **National Firefighter Registry (NFR)** is enrolling both active and retired fire service members as of late 2022. For more information, visit the NFR website at www.cdc.gov/niosh/firefighters/registry.html[7].

Disability benefits for fire fighters

In most states in the United States and provinces in Canada, fire fighters are eligible for disability benefits under laws that recognize certain diseases as likely to be occupationally-related (“presumptive disability provisions”). Some cancers are included in this list, but coverage and eligibility vary by state and province. You can read a summary of presumptive law coverage in your state or province on the International Association of Fire Fighters website[8].

What fire fighters can do for their health

Aside from following standard safety procedures both during and after fires, there are other important things fire fighters can do for their health. For example, be sure your doctor knows if you have a history of firefighting. Because of the possibility of increased cancer risk, your doctor might advise you to get certain cancer screening tests[9] and to promptly report any suspicious symptoms.

Fire fighters are also at risk for the same types of cancer as everyone else, regardless of their exposures on the job. You can help lower your risk of cancer (and other diseases) by not smoking[10], staying at a healthy weight[11], getting regular physical activity[12], and eating a healthy diet[13] (including avoiding or limiting alcohol[14]).

ACS & IAFF partnership

On December 2, 2021, the American Cancer Society and the International Association of Fire Fighters (IAFF) announced a long-term collaboration[15] to help fire fighters and emergency medical services (EMS) personnel with prevention, detection, and treatment of cancer.

To learn more

Along with the American Cancer Society, other sources of information and support include:

International Association of Fire Fighters (IAFF) Website: www.iaff.org/[16]

National Institute for Occupational Safety and Health (NIOSH) Firefighter Resources, Cancer and Other Illnesses: www.cdc.gov/niosh/firefighters/[17]health.html[18]

National Firefighter Registry: www.cdc.gov/niosh/firefighters/registry.html[19]

Hyperlinks

1. www.cancer.org/cancer/risk-prevention/chemicals/teflon-and-perfluorooctanoic-acid-pfoa.html
2. www.cancer.org/cancer/risk-prevention/chemicals/diesel-exhaust-and-cancer.html

3. www.cancer.org/cancer/risk-prevention/understanding-cancer-risk/determining-if-something-is-a-carcinogen.html
4. www.cancer.org/cancer/risk-prevention/understanding-cancer-risk/known-and-probable-human-carcinogens.html
5. www.cancer.org/research/population-science/cancer-prevention-and-survivorship-research-team/acs-cancer-prevention-studies.html
6. www.ffccs.org/
7. www.cdc.gov/niosh/firefighters/registry.html
8. www.iaff.org/
9. www.cancer.org/cancer/screening/american-cancer-society-guidelines-for-the-early-detection-of-cancer.html
10. www.cancer.org/cancer/risk-prevention/tobacco.html
11. www.cancer.org/cancer/risk-prevention/diet-physical-activity/take-control-your-weight.html
12. www.cancer.org/cancer/risk-prevention/diet-physical-activity/get-active.html
13. www.cancer.org/cancer/risk-prevention/diet-physical-activity/eat-healthy.html
14. www.cancer.org/cancer/risk-prevention/diet-physical-activity/alcohol-use-and-cancer.html
15. www.iaff.org/fightcancer/
16. www.iaff.org/
17. www.cdc.gov/niosh/firefighters/health.html
18. www.cdc.gov/niosh/firefighters/health.html
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