Fire Fighter Cancer Awareness and Prevention

Smoke Exposure

What Are Fire Fighters Exposed To?

The composition of smoke depends on the nature of the burning fuel and the conditions of combustion. No matter what the conditions are, all smoke and combustion products are toxic and can lead to occupational diseases and cancers.

There are over 265 known carcinogens in a typical residential structure fire.[1] If you are smelling the smoke or diesel exhaust while on an active fire ground, then you are being exposed to carcinogenic materials.

It is important to wear your self-containing breathing apparatus (SCBA) when responding to calls and through overhaul as these are some of the chemicals you may be exposed to when responding to most structural fires:

1. **Arsenic:** Heavy metal commonly found in smoke. Used to produce chromated copper arsenate, a wood preservative.
2. **Asbestos:** Naturally occurring minerals used in fireproofing and insulation. Primarily in buildings and building materials before 1989. Legacy asbestos is a common concern.
3. **Ash/Soot:** Incomplete burning of organic matter. Typically, black or grey powdery substance.
4. **Benzene:** Found in crude oil, gasoline, motor vehicle exhaust, tobacco smoke and wood smoke. Used to make plastics; primary component of PVC combustion.
5. **1,3 Butadiene:** Found in wildland fires, rubber, wood burning, cigarette smoke.
6. **Cadmium:** A type of metal used in the production of batteries, plastics and other industrial processes. Can be found in diesel exhaust.
7. **Diesel Exhaust:** Diesel exhaust comprises of a complex mixture of both particulate matter and gaseous substances, including diesel particulate matter, polyaromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs).
8. **Dioxins:** Formed during combustion processes: waste incineration, fuels (e.g., wood, coal, oil) plastic materials containing Polybrominated diphenyl ethers (PBDEs).
9. **Flame Retardants:** Added to consumer products, including upholstery furniture and mattresses.
10. **Formaldehyde:** Used in resins, adhesives for pressed wood products, particle board, furniture. Preservative in some medical labs and consumer products.
11. **Polychlorinated biphenyls (PCB):** Used as a flame retardant in electronic equipment, insulation, oil-based paint, caulking, fluorescent light bulbs, plastics, floor finish. No longer produced, but still found in consumer products.
12. **Per- and Poly-fluoroalkyl Substances (PFAS):** Used as a water, stain and grease repellent in consumer products; ingredients in some firefighting foams (AFFF) applied to liquid fuel fires.

13. **Polycyclic Aromatic Hydrocarbons (PAHs):** A group of over 100 chemicals formed during incomplete burning of coal, oil and gas, garbage or other organic substances like tobacco. Encountered on most fire grounds during fires and overhaul and cleaning of equipment, clothing and skin.
14. **Trichloroethylene:** It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids and spot removers.
15. **Various Gases:** Nitrogen Oxides, Hydrogen Sulfide, Carbon Dioxide, Carbon Monoxide, Hydrogen Cyanide, Ammonia.

Many of these chemicals can result in the development of occupational cancer:

Carcinogen	Cancer
Arsenic	Kidney, liver, prostate
Asbestos	Lung, mesothelioma
Benzene	Multiple myeloma, non-Hodgkin's lymphoma
Cadmium	Lung, prostate, kidney, pancreatic, bladder, breast
Diesel Exhaust	Lung, bladder, esophageal
Dioxins	Breast, lung, bronchus, trachea, larynx, prostate, multipole myeloma, bladder
Flame Retardants	Breast, non Hodgkin's lymphoma, thyroid
Formaldehyde	Nasopharynx, leukemia
Polychlorinated biphenyls	Non-Hodgkin's lymphoma, lung, soft-tissue sarcoma
Per- and Poly-fluoroalkyl Substances (PFAS)	Testicular, non-Hodgkin's lymphoma, prostate
Trichloroethylene	Kidney, liver, non-Hodgkin's lymphoma
Vinyl chloride	Liver
1,3-butadiene	Non-Hodgkin's lymphoma, leukemia

Source:

1. Lyon, F. (2006). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans Preamble. Retrieved from: http://monographs.iarc.fr/ENG/Preamble/CurrentPreamble.pdf.