Wildland Firefighting Cancer Awareness

Introduction

Wildland firefighters are exposed to many occupational hazards, including carcinogens (cancer-causing chemicals and agents). While research on the long-term health outcomes for wildland firefighters is developing, the International Agency for Research on Cancer (IARC) has classified occupational exposures associated with firefighting as carcinogenic to humans (Group 1) based on sufficient evidence for cancer.

Wildland fires expose firefighters to complex mixtures of smoke and other harmful chemicals. Plus, wildland firefighters often work in remote areas with limited facilities, work extended hours, and sleep and eat at a base camp close to the fire. Reducing firefighters' exposures requires specific precautions to minimize the risks and protect the health of workers. Workplaces must implement the most appropriate control measures with consideration given to the hierarchy of controls.

This tip sheet provides employers and workers with information on cancer-related hazards related to wildland firefighting and outlines control measures to minimize the risk of occupational cancer. The tip sheet does not replace incident management procedures, or wildland fire operational and fire behaviour guidance.

For more information on the hazards wildland firefighters may be exposed to, please refer to CCOHS' OSH Answers Fact Sheet Wildland Firefighter.

Occupational Sources of Exposure to Carcinogens

Wildland firefighters are exposed to a variety of combustion products that are known or probable carcinogens, including:

- Hexavalent chromium: A toxic form of chromium used in industrial processes; increases the risk of lung, nasal and sinus cancer.
- Polycyclic aromatic hydrocarbons (PAHs): A group of chemicals formed during incomplete combustion of organic material; many are carcinogenic.
- Acrolein: A pungent, irritating chemical produced during combustion; increases the risk of respiratory cancers.
- Acrylonitrile: A chemical used in plastics and fibers; increases the risk of lung and bladder cancer.
- Benzene: A volatile organic compound found in smoke and fuels; linked to leukemia and other blood cancers.
- Formaldehyde: A colorless gas with a strong odor used in building materials and released during combustion; increases the risk of leukemia and nasopharyngeal (throat) cancer.

Exposures can occur at any point during firefighting operations, but significant exposures can occur during:

- Mop-up (extinguishing a fire after it has been brought under control).
- Holding operations (making sure the active fire has not crossed the fireline).
- Fireline construction (providing a break in fuel by cutting, nozzling, scraping or digging).
- Operating open-cab mobile equipment, such as dozers.

Additionally, wildland firefighters may be exposed to other known or probable carcinogens, including:

- Chemicals in firefighting foams and retardants.
- Potential carcinogens absorbed by fireline workwear during the course of duties.
- Gasoline, aviation fuel, and diesel exhaust from vehicles, aircraft, chainsaws, power pumps, and other motorized equipment.
- Ultraviolet radiation from sunlight.
- Night shift work.
- Asbestos, silica, and other building materials that may burn in the vicinity.

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Routes of Exposure

Wildland firefighters can be exposed to chemicals in three ways; inhalation (breathing), dermal (skin) absorption, and ingestion (swallowing).

Inhalation is the most direct route of exposure, as workers can breathe in carcinogens released into the air from burning material. Inhalation exposures may increase due to:

- Sleeping and eating at a base camp where there is an active fire or smoky conditions.
- Lack of availability or use of appropriate respiratory protection.
- Handling equipment or personal protective equipment without appropriate respiratory protection.
- Improper fit or poor condition of respiratory protection.

Dermal (skin) absorption occurs when carcinogens pass through the skin. Unprotected skin can become exposed when:

- Firefighters come into contact with carcinogenic soot, dust, and ash on exposed skin, such as the face, neck, and hands.
- Touching harmful chemicals with bare hands, such as during cold trail operations when gloves may be removed to identify hot spots.
- Personal protective equipment, such as gloves and sleeves, is not available or used when cleaning equipment.
- Working in contaminated gear for extended periods.
- Handwashing, showering, and laundering facilities are unavailable after fire operations.

Ingestion happens when workers swallow carcinogens. Exposure can occur from:

- Accidental ingestion due to the mouth touching contaminated objects, such as hands, gloves or sleeves.
- Eating food in a contaminated environment or using unwashed hands.

Workplace Control Measures to Minimize Exposures

Consideration must be given to the hierarchy of controls when implementing control measures. For wildland firefighters, the elimination of all hazards is not always possible. It is recommended to take a layered approach, applying multiple control measures simultaneously, since a single measure alone is unlikely to be as effective and is not always possible. However, using engineering controls, administrative controls, and personal protective equipment together can significantly reduce exposure. Due to the unique and extreme working conditions of wildland firefighters, the consistent use of respiratory protection may be limited; however, it should be encouraged and required when it is safe to do so.

The following list of control measures are examples of workplace controls that can be used to reduce the risk of exposure to carcinogens during wildland firefighting. These controls should be layered, as every additional control measure that is implemented lowers the risk. When implementing controls, make sure that the controls selected do not introduce any new hazards.

Substitution

- Purchase per- and polyfluoroalkyl (PFAS)-free personal protective equipment for firefighters as it becomes available.

Engineering Controls

- Use the air recirculation mode in vehicles to minimize the intake of outside air during heavy smoke conditions.
- Use air scrubbers (air filtration units) where possible such as in incident base camps.
- Establish decontamination zoning using a red, yellow and green (or hot, warm and cold) system to separate contaminated areas from clean ones.
- Use appropriate air filtration systems in mobile equipment.

Administrative Controls

Policies and procedures

- Develop and communicate decontamination procedures, such as for personal protective equipment and crew vehicles.
- Implement medical screening programs for the early detection of illnesses, such as cancer, and encourage workers to attend.
- Establish protocols to prevent the accumulation of carcinogens and particulates inside vehicles and aircraft, such as a clean cab protocol.
- Record the measures taken to reduce exposures following an incident to improve future incident responses.

Work practices

- Minimize mop-up operations, where possible, by using roads or other natural features, such as rock bands, as indirect firelines to reduce the amount of time spent near the active fire's edge.
- Avoid travelling deep into the active burned area when not required.
- Reduce the amount of time performing work where bare hands are exposed, for example cold-trailing.
- Clean vehicle and aircraft cabins once they have returned to a base post-shift.
- Avoid parking vehicles in heavy smoke areas.
- Avoid transporting contaminated gear in personal vehicles.
- If transporting contaminated gear in personal vehicles cannot be avoided, personal protective equipment and fireline workwear should be bagged in a waterproof bag, sealed, and isolated from any occupant(s) in the vehicle. Hands should be washed or gloved when handling gear, and vehicles should be cleaned after transport. Fireline workwear should be laundered at the earliest opportunity upon returning to the base.
- Use and monitor air quality forecasting to locate camps and staging areas upwind of the fire and to limit smoke exposure.
- Avoid downwind positions when firefighting and reposition as required.
- Rotate workers out of areas with heavy smoke.
- If using water during mop up, use a light water pressure, where possible.
- Take frequent breaks in clean air, where possible.
- Wear sunscreen with a sun protection factor (SPF) of 30 or higher when the ultraviolet index (UV) is 3 or higher.
- Avoid contamination of food and water.

Worker education and training

- Leaders should recognize that dirty uniforms are sometimes viewed as "a badge of honour" and should provide education on the health risks associated with contaminated personal protective equipment and ensure proper cleaning protocols are followed.
- Train workers on exposures to carcinogens and ways to reduce their risk.
- Encourage workers to report health concerns and symptoms to their supervisors.

Laundering practices

- Provide laundry facilities and wash garments regularly.
- Launder fire-resistant garments separately from regular clothing.
- Clean contaminated fireline workwear using separate, dedicated facilities to prevent cross-contamination of clean gear, personal clothing, and living areas of the fire base. Use a specialized extractor, where possible.

Personal hygiene

- Make sure workers have clean clothing to wear at the base after showering.
- Practise good hand hygiene, including washing hands before eating or drinking.
- Provide workers with showers and clean clothing immediately after returning to base.

Personal Protective Equipment

- Ensure skin coverage, such as eye and face protection, to protect against splash back during hose operations.

- Clean, maintain and inspect personal protective equipment according to manufacturer specifications and the Canadian General Standards Board Standard CAN/CGSB-155.22-2014 (R2024) *Fireline Workwear for Wildland Firefighters*.
- Provide and encourage the use of appropriate personal protective equipment, when appropriate, which may include:
  - Fireline workwear (for example, one-piece or two-piece pant and shirt combination with full protection of exposed body parts).
  - Hand protection (for example, leather gloves or gloves made from flame resistant material).
  - Eye protection (for example, safety glasses) with ultraviolet (UV) protection when working under the sun.
  - Respiratory protection (for example, an N95 or air-purifying respirator equipped with appropriate filters or cartridge).

For more control measures, please refer to CCOHS' tip sheet Control Measures in the Fire Service to Protect Against Exposures to Carcinogens.

Recording Hazardous Exposures and Reporting Requirements

Wildland firefighters are exposed to many hazards while on the job and may become ill or require medical attention. Any workers experiencing symptoms, even mild ones, should notify their employer. Depending on the reporting requirements of your jurisdiction, employers may also have to inform the government department responsible for health and safety and workers' compensation board.

Additionally, workers should record details of their personal exposures following every incident. Hazardous exposure recording should be tailored to the organization and activities performed. Details can include:

- Date, time, and location
- Types of activities performed
- Duration of exposure by fire stage or activity
- Smoke conditions
- Control measures in place, such as personal protective equipment and gross decontamination
- Type of equipment operated
- Any symptoms experienced

Mental Health Support

Wildland firefighters are exposed to events that can negatively impact their mental health and lead to anxiety, depression, post-traumatic stress disorder (PTSD), and burnout. Early intervention for post-traumatic stress injuries (PTSI) can help prevent the development of PTSD. Mental health resources and support should be provided to all workers, including access to an employee assistance program, if available, and training on how to identify and manage stress.

Refer to the following mental health information resources:

- Mental health – Canadian Centre for Occupational Health and Safety
- Mental health support: Get help – Public Health Agency of Canada
- Mental health and wellness – Public Health Agency of Canada

This resource was developed in partnership with Health Canada to help raise awareness about the risk of occupational cancer for firefighters, in support of actions identified in the National Framework on Cancers Linked to Firefighting. This guidance reflects current understanding and may change as new information on firefighter health and safety is made available.