



# Firefighter carcinogen exposure reduction West Kelowna FD JC

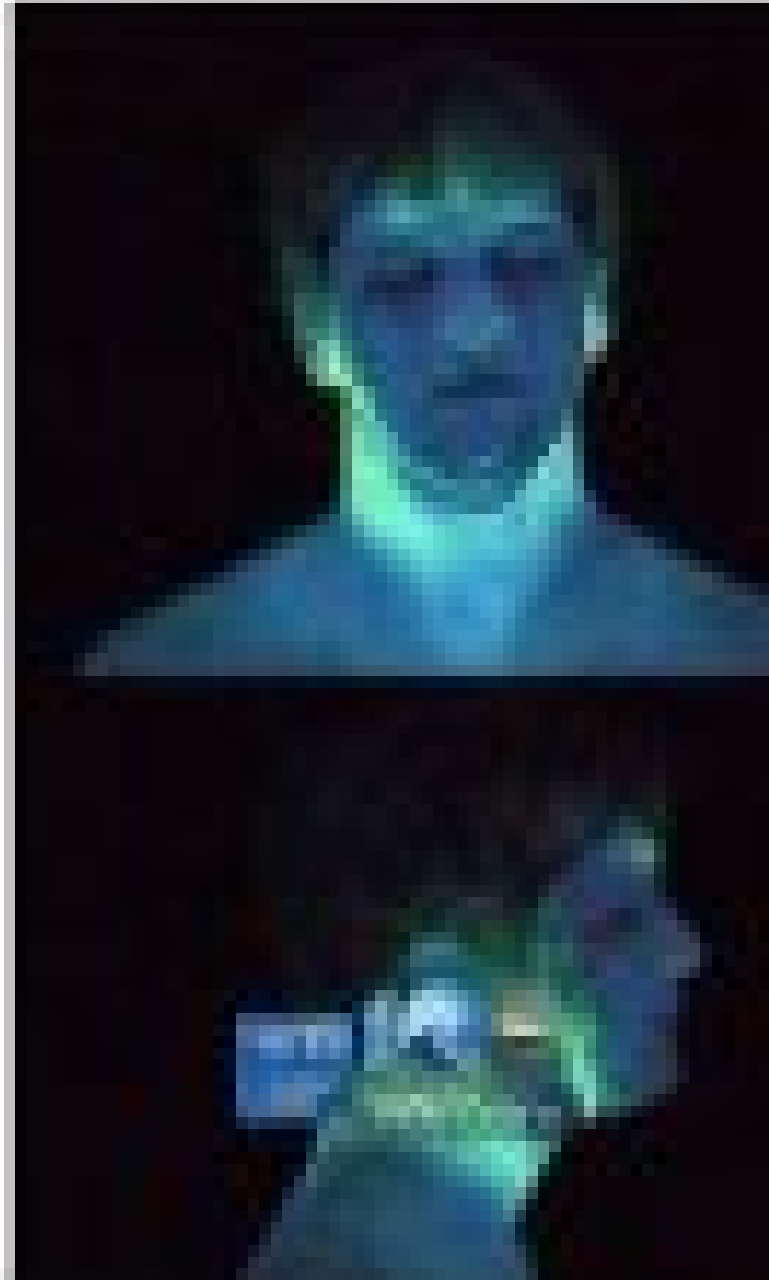
July 18, 2023

Presenter:

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From BCPFFA website





# Agenda

- Description of hazard and risk outcome
- Understanding Exposures
- Controls
- Opportunities
- Regulatory references and resources
- Questions



# Description of hazard and risk outcome

## Hazard:

- Prolonged exposure to hazardous substances and chemicals from during firefighter related activities increases the risk of getting cancer

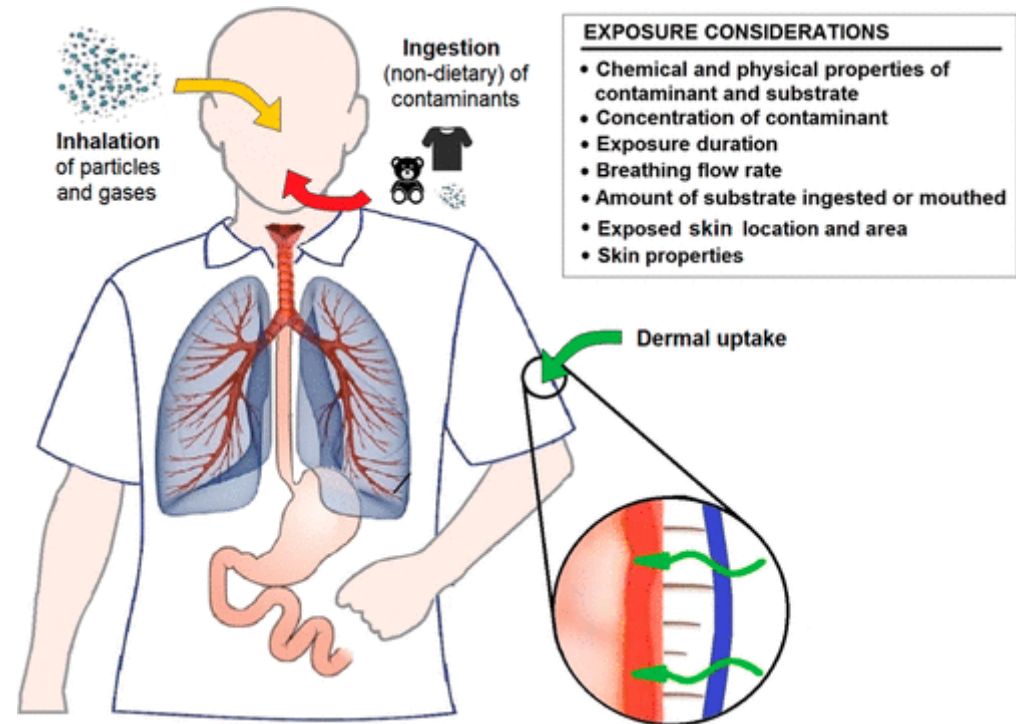
## Who is at risk:

- Firefighters (includes **trainers**, fire chiefs and fire investigators)
  - **~4600 career firefighters** (from 2016 census data) and
  - **~10,000 volunteer firefighters** (2009 report by Fire Services Liaison Group)
- ~390 community based fire departments

# Description of hazard and risk outcome

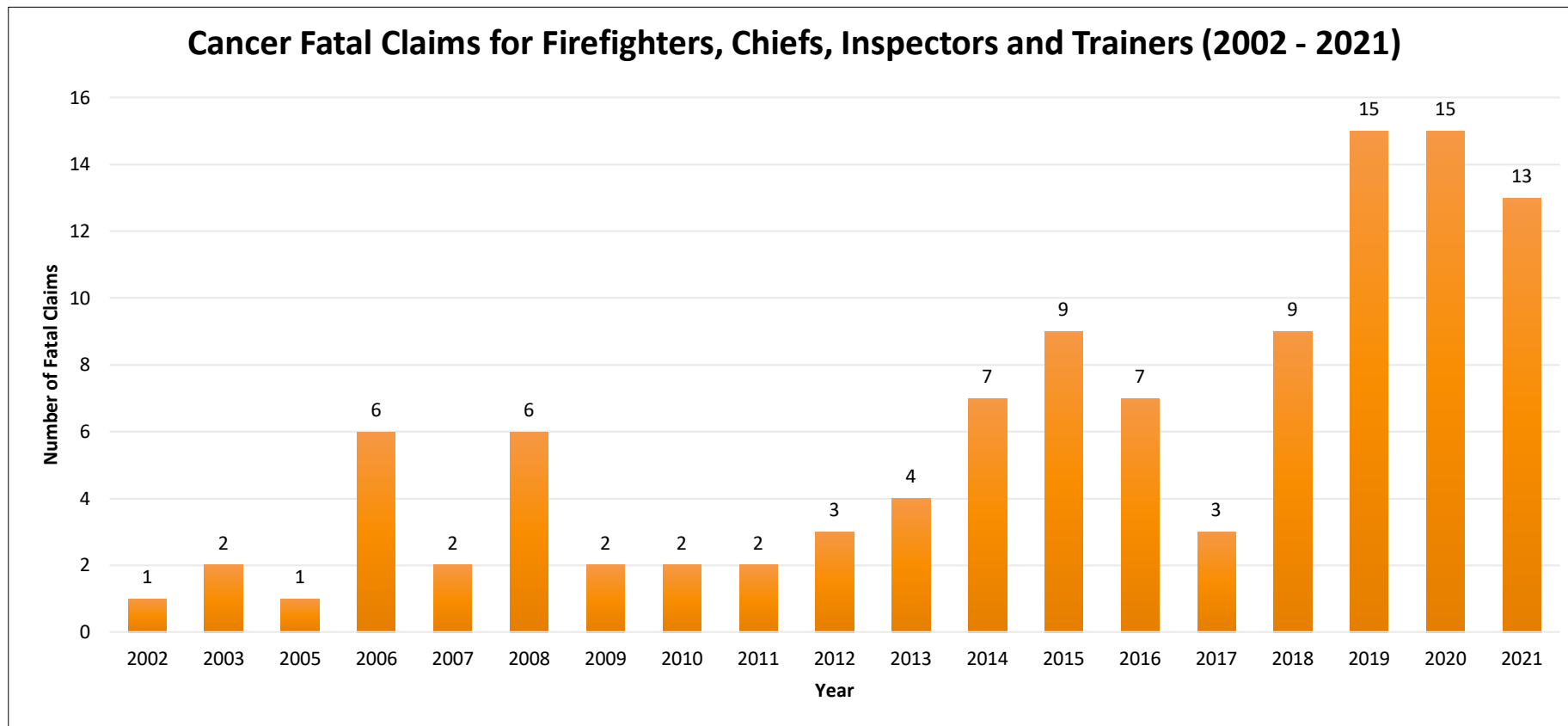
Why are firefighters at risk:

- Routes of exposure include dermal, inhalation and possible ingestion
- **Dermal uptake of contaminated gear/PPE likely a significant source of exposure**



# Evidence of current risk state

- The firefighter occupation accounts for 40% of non-asbestos fatal disease claims by occupation in the past 10 years in British Columbia



Data from "Work-related deaths: Data for planning health and safety in B.C" Public Tableau



# IARC - Firefighting as a Known Carcinogen

## *Group 1 Carcinogen – carcinogenic to humans*

- PAHs – polycyclic aromatic hydrocarbons
- VOCs – volatile organic compounds
- Particulates
- Flame retardants
  - Chemical flame retardants (FRs), including polybrominated diphenyl ethers (PBDEs), other brominated FRs, organophosphate FRs, and chlorinated FRs
- PFAS
  - Per- and polyfluoroalkyl substances (PFAS) PFAS have been used in Aqueous Film-Forming Foams (AFFF) and in firefighter turnout gear. Examples of long-chain PFAS include perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA)
- Diesel Exhaust

# Presumptive coverage

- Expansion of presumptive coverage

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## B.C. expands cancer coverage for firefighters

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(flickr.com)

B.C. firefighters will soon have easier access to workers' compensation benefits and support services in recognition of their higher risk of developing work-related cancers.

Occupational Disease/Injury	Min. Period of Cumulative Employment	Effective Date
Primary Site Leukemia	5 years	April 11, 2005
Primary Site Non-Hodgkin's Lymphoma	20 years	April 11, 2005
Primary Site Bladder Cancer	15 years	April 11, 2005
Primary Site Brain Cancer	10 years	April 11, 2005
Primary Site Colorectal Cancer	10 years	April 11, 2005
Primary Site Kidney Cancer	20 years	April 11, 2005
Primary Site Ureter Cancer	15 years	April 11, 2005
Primary Site Testicular Cancer	10 years	April 11, 2005
Primary Site Non-smoker's Lung Cancer	15 years	May 27, 2008
Primary site Esophageal Cancer	20 years	July 14, 2011
Heart Disease & Heart Injury	N/A	May 29, 2014
Primary Site Breast Cancer	10 years	March 31, 2017
Primary Site Prostate Cancer	15 years	March 31, 2017
Multiple Myeloma Cancer	15 years	March 31, 2017
Operational Stress Injury	N/A	May 17, 2018
Primary Site Cervical Cancer	10 years	March 31, 2022
Primary Site Ovarian Cancer	10 years	March 31, 2022
Primary Site Penile Cancer	10 years	March 31, 2022
Primary Site Pancreatic Cancer	10 years	November 8, 2022
Primary Site Thyroid Cancer	10 years	November 8, 2022

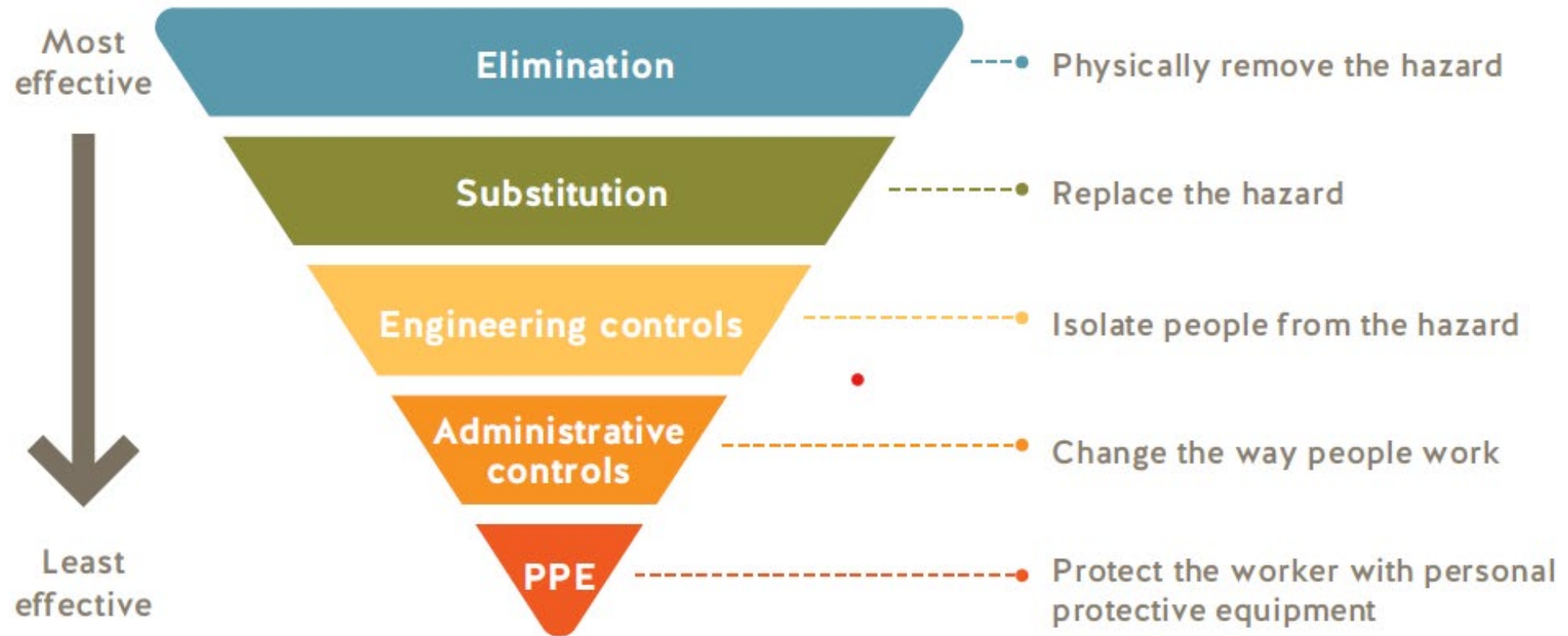





# Exposure considerations

- For compensation purposes, presumption is based upon minimum period of cumulative employment
- Cumulative carcinogen exposure in fire service considerations:
  - Intensity of exposure to carcinogens
  - Route(s) of exposure
  - Duration of exposure (each event)
  - Frequency of exposure (number of exposure events)
- Complicated (and often impossible) to calculate for each individual, generally arrange exposures by 'Job Exposure Matrix' or more useful by 'Similar Exposure Groups'
  - Likely varies with role, location (urban, suburban, rural, WWFF)

# Hierarchy of Control



**Table 3.** Control options for the fire service based on the hierarchy of controls approach.

Potential effectiveness	Types of controls	Options that are being researched
Least  Most	PPE	
	Inhalation	Consistent use of respiratory protection during all phases of a response
	Dermal	Tightening the interfaces of turnout gear, use of particulate-blocking hoods
	Administrative controls	Use of specific fire attack tactics, crew rotation, PPE donning and doffing practices, PPE decontamination, PPE retirement/removal from service, skin cleaning, fire apparatus cleaning, fire station cleaning
	Engineering controls	Fire station design, diesel exhaust capture, training prop design
	Substitution	Training fuel selection, use of simulated smoke and flame, replacing hazardous chemicals in products with less hazardous chemicals (e.g., fluorine-free foams), replacing diesel apparatus with electric or hybrid-electric apparatus
	Elimination	Public education programs (increased installation of smoke alarms and sprinklers), fuel reduction efforts to prevent exterior fires transitioning to structure fires

Gavin P. Horn, Kenneth W. Fent, Steve Kerber & Denise L. Smith (2022): Hierarchy of contamination control in the fire service: Review of exposure control options to reduce cancer risk, *Journal of Occupational and Environmental Hygiene*

# Hierarchy of Controls approach

- Substitution (training):
  - Selecting training fuels and scenarios to provide realistic training while limiting unnecessary exposures for firefighters and instructors
    - Using training fuels that are less hazardous to human health
    - Use of simulated smoke and flame
    - Using foam that is free of PFAS (Perfluoroalkyl and Polyfluoroalkyl Substances)
- Administrative:
  - Tactics (reduce exposure to toxics) – tactics (positioning, ventilation, exterior vs interior)
  - Decontamination practices
    - Cleaning skin as quickly as possible (preferably immediately after exiting the structure)
    - Showering as soon as possible following training
    - Laundering turnout gear after live-fire training (or field decontamination if laundering cannot be done)
- PPE:
  - Measures to prevent inhalation and dermal exposure to carcinogens
    - Donning SCBA before approaching the structure
    - Tightening the interfaces of turnout gear, use of particulate blocking hoods



# Training Exposures

- Live-fire training expose firefighters and instructors to hazardous chemicals
- Exposure will depend on the number of training fires and type of fuel package
- Instructors' PAH exposures may be higher from repeated training fires than responding to a single emergency residential fire
- Exposures from training fires over time could increase firefighters' and instructors' risk of developing certain types of cancer



# How to reduce carcinogen exposure

- Cleaning skin as quickly as possible (preferably immediately after exiting the structure)
- Laundering turnout gear after exposure to combustion products (or field decontamination if laundering cannot be done)
- Showering as soon as possible following exposure
- Selecting training fuels and scenarios to provide realistic training while limiting unnecessary exposures for firefighters and instructors

# Firefighter Cancer Action Plan Report Pilot Summary Worksafe Saskatchewan – 15 FD common gaps

- SCBA use throughout the duration of overhaul
- Gross on-scene decontamination
- Washing PPE in gear extractors
- Storage of fire gear
- Backup sets of PPE
- Particulate blocking hoods
- Diesel exhaust systems
- Exposure documentation
- Department based annual medical physicals

# Firefighter Cancer Action Plan Report Pilot Summary Worksafe Saskatchewan – Gap between career and volunteer

- PPE Extractors
- Backup set of PPE
- Particulate blocking hoods
- Storage of PPE in the apparatus bay
- Lack of diesel exhaust systems
- Medical exams
- Exercise equipment



# Opportunities

- Joint committees can play a critical role in ensuring new (and experienced) firefighters are aware of both hazards and best practices to reduce carcinogen exposure
- Training can both reinforce
  - Best practices: limit time in smoke, on-site decontamination
  - Reduce exposure: fuel selection, tactics
- Fire Service Associations can provide material/templates on best practices to reduce carcinogen exposure
- WorkSafeBC can reinforce best practices through education, consultation and enforcement



# Regulatory references

## OHS5.82(1)(b)

If a work process may result in harm to a worker from **contamination** of the worker's skin or clothing by a hazardous substance, the employer must **launder** or dispose of the protective clothing on a regular basis, according to the hazard.

OHS5.2(c) If a worker is or may be **exposed to a chemical agent**..., which could cause an adverse health effect, the employer must ensure that

(c) **written procedures** are prepared and implemented to **eliminate or minimize a risk of exposure ... by any route** that could cause an adverse health effect, and to address emergency and cleanup procedures in the event of a spill or release of a chemical agent or biological agent.



# Regulatory references continued

OHS 5.2(d) If a worker is or may be exposed to a chemical agent..., which could cause an adverse health effect, the employer must ensure that

(d) the **supervisor and the worker are trained** in and **follow** the measures required in this Part and Part 6 of this Regulation for the safe handling, use, storage and disposal of the chemical agent ...., including emergency and spill cleanup procedures.

OHS 31.4 The employer must ensure the **adequate instruction and direction** of firefighters in the safe performance of their duties.

# Sources of information

- [Research | UL's FSRI – Fire Safety Research Institute](#)
- [Firefighter Resources, Cancer and Other Illnesses | NIOSH | CDC](#)
- Bill C-224, an Act to establish a national framework for the prevention and treatment of cancers linked to firefighting (passed 2<sup>nd</sup> reading in Senate)
- [Firefighter Cancer Prevention | WorkSafe Saskatchewan](#)
- Fent et al (2019). Firefighters' and Instructors' Absorption of PAHs and Benzene During Training Exercises. *International Journal of Hygiene and Environmental Health*, 222(7), 991–1000. <https://doi.org/10.1016/j.ijheh.2019.06.006>
- [Firefighter cancer Bill C-224 has passed - Fire Fighting in Canada](#)

# Questions?

