



Health Risks for First Responders

Cancer Awareness

Bogota, Sept. 2019, Christoph Feyerabend

Health Risks for First Responders

The challenge – why it matters

Health & Wellness



The challenge

- Medical studies show a strong increase of cancer cases within fire departments during and after active duty.
- The cause is seen in First Responders' exposure to various hazardous substances, but especially smoke. Modern materials form a more hazardous mix of gases and particles when on fire than before. These substances cannot only be inhaled, but also absorbed by the skin



Health Risks for First Responders

Common hazardous substances from incident sites

Toxic or carcinogenic substances

- Asbestos
- Arsenic
- Benzene
- Benzopyrene
- Cadmium
- Carbon Monoxide
- Chlorphenols
- Chromium
- Dioxins
- Ethylen Oxides



- Formaldehyde
- Glutaraldehyde
- Ortholuide
- Polycyclic Aromatic Hydrocarbons
- Polychlorinated Biphenyls
- Vinyl Chlorides
- Sulfur dioxide
- ...



Increased hazards from new building materials, insulation, fuels, paint, flooring, electrical equipment, rubber, dyes, cleaning agents, solvents, etc.

Battery electric vehicles – additional fire hazards?

vehicles. In the immediate vicinity and in unfavourable ventilation situations, however, electric vehicle fires lead to new and potentially more severe chemical hazards. The pollutant analyses point to critical concentrations of the heavy metals cobalt and manganese as well as lithium in the form of aerosols. These pollutants do not occur in such high concentrations in conventional vehicle fires and are toxic to humans and the environment. It is assumed

Research Project: Electric mobility and road tunnel safety – hazards of electric vehicle fires (Switzerland, publ. 2018)



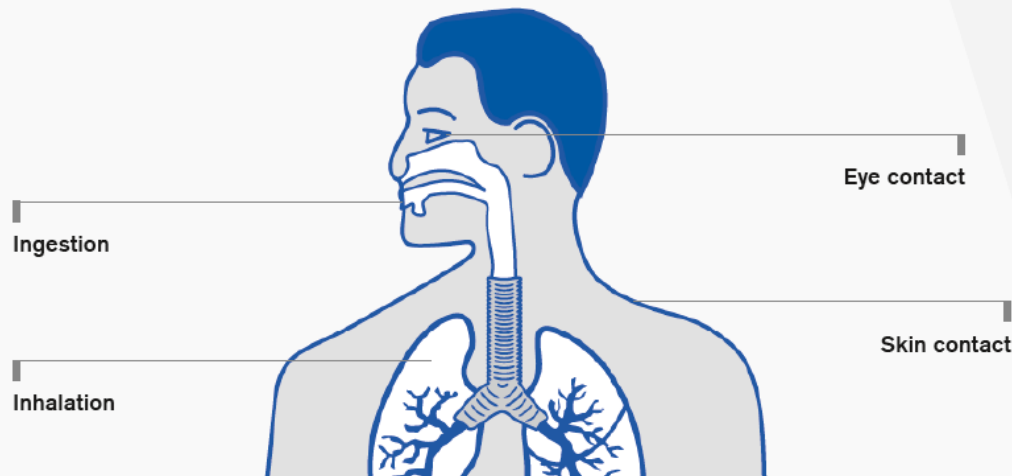
Battery chemistry may add to the hazard, but depends on the battery technology used!

Health Risks for First Responders

Routes of intake

How can toxic substances enter the body?

What determines the severity of a toxic effect?



Hazardous substance concentration

Exposure time

Aggregate state of the hazardous substance

Frequency of exposure

Ambient temperature

Health Risks for First Responders

Contamination risks present in all major applications



Training

- direct exposure to the harmful substances in smoke and soot
- indirect exposure via contact with contaminated equipment and personal



Incidents

- direct exposure to the harmful substances in smoke and soot
- indirect exposure via contact with contaminated equipment and personal

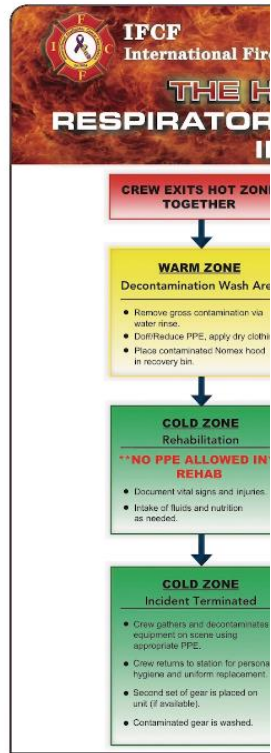


Readiness (Logistic, maintenance and cleaning):

- indirect exposure via contact with contaminated equipment and personal

Health Risks for First Responders

Solutions – strict implementation of SOPs



CANCER PREVENTION

Officers make numerous operational decisions everyday and must develop policies that will reduce the risk of cancer for their crew. It is time to change the culture.

SET THE STANDARD

- Set the example by properly donning PPE and also.
- Establish policies for mandatory decontamination ground. This includes:
 - Using hose lines to perform gross decontamination.
 - Providing wet wipes to remove contamination.
 - Switching crews to B-set gear (if available).
- Ensure all crew members change and wash before returning to the station and can "shower" when possible.
- Station policies often include the routine washing of hoods and gloves.
- Ensure personnel are properly trained and equipped.
- Establish policies for proper storage of PPE.
- Establish and use personnel injury reporting.
- Advocate for the establishment of, and participation in, cancer surveillance.

TRAINING AND TACTICS

- Treat every fire as a hazardous materials call.
- Include smoke hazards at planning and briefing.
- If possible, conduct overhaul 45 minutes after fire is extinguished to ensure all crew perform SCBA.

MODEL GUIDELINE

Purpose:
Numerous studies have proven that firefighters are at greater risk of contracting many cancers as a result of their assigned duties. These studies have shown that proper use of the PPE, SCBA and a gross decontamination process are beneficial in reducing the duration of the firefighter's exposure to toxic carcinogens. The (Smart Fire Department) is committed to the overall health of employees; the (Smart Fire Department) recognizes the increased risk of cancer associated with the firefighting occupation. In an effort to provide a safe and healthy work environment, the (Smart Fire Department) has created the following guidelines to reduce the cancer risk to its employees.

Scope:
This guideline applies to all (Smart Fire Department) employees.

References:
NIH, Jurisdiction Policy, WAG, RCM, FCBM and IAFF.

Definitions:
See Appendix B.

Statement of Intent:
It is the intent of (Smart Fire Department) to take proactive and reasonable steps to limit employee exposure to carcinogens.

Healthy firefighters
– the Skellefteå Model improves the work environment

Clean work environment
A clean guideline for firefighters after fire

Authors Core group work safety
Version 1.0
Date October 28, 2015
Status Final draft



Training – select suitable training methods

- Apply cleaner training methods, e.g. gas-fuel systems
- Only use wood-fueled systems if the training goal cannot be achieved otherwise
- Treat contaminated material with care and limit exposure to it



Clean but realistic training allows to reduce the exposure to harmful substances to trainees and trainers



Incident – select suitable equipment and follow SOPs

- Select equipment that will minimize dirt traps, reduce uptake by repellant or low absorption materials and will facilitate service tasks
- Wear PPE and breathing protection for as long as possible
- Transport contaminated equipment in closed bags or boxes
- Perform pre-decontamination and personnel hygiene on site



Avoid as much decontamination to teams and equipment as possible during incident, pre-decontamination, and monitoring/entering “cold” fire sites

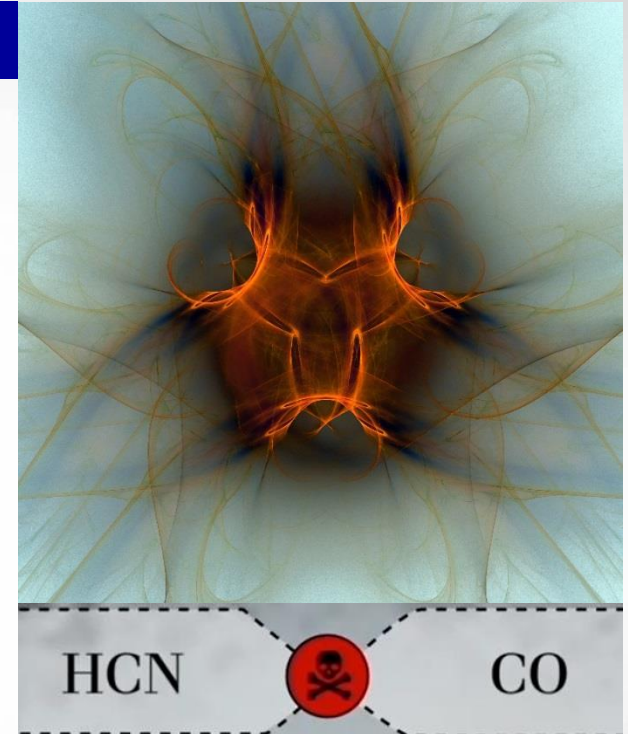
CO + HCN: Toxic Twins

Research⁽¹⁾ shows that the combination of CO and HCN is more harmful than exposure to either one individually, due to synergistic effects

CO prevents oxygen from reaching vital organs

HCN attacks the central nervous system and the cardiovascular system, causing fire fighters to become disoriented and confused.

(1) „Effects of exposure to single or multiple combination of the predominant toxic gases and low oxygen atmospheres produced in fires” from Barbara Levin, Maya Paabo, Joshua Gurman and Steven Harris, 1987



If both gases are present, the alarm threshold for each gas needs to be lower!
State of the art – combination alarm calculating the combined threshold level



Readiness – carefully evaluate your cleaning and inspection process

- Clean PPE routinely after use at any incident
- Treat contaminated material with care and limit exposure to it
- Use suitable PPE when working with contaminated equipment



Don't forget to protect the people cleaning and handling contaminated equipment and clothing

Health Risks for First Responders

Best Practice

Best Practice: Rio Tinto – BARRIO system

- **Best practice, Air borne contaminants, Risk, Reduction, Initiative and Operation**
- Evaluation tools and operating procedures as well as modernized equipment
- 2018 Systems and People Award by the Department of Mines, Industry Regulation and Safety in Western Australia



On scene Decontamination



Doff SCBA and don P2 mask

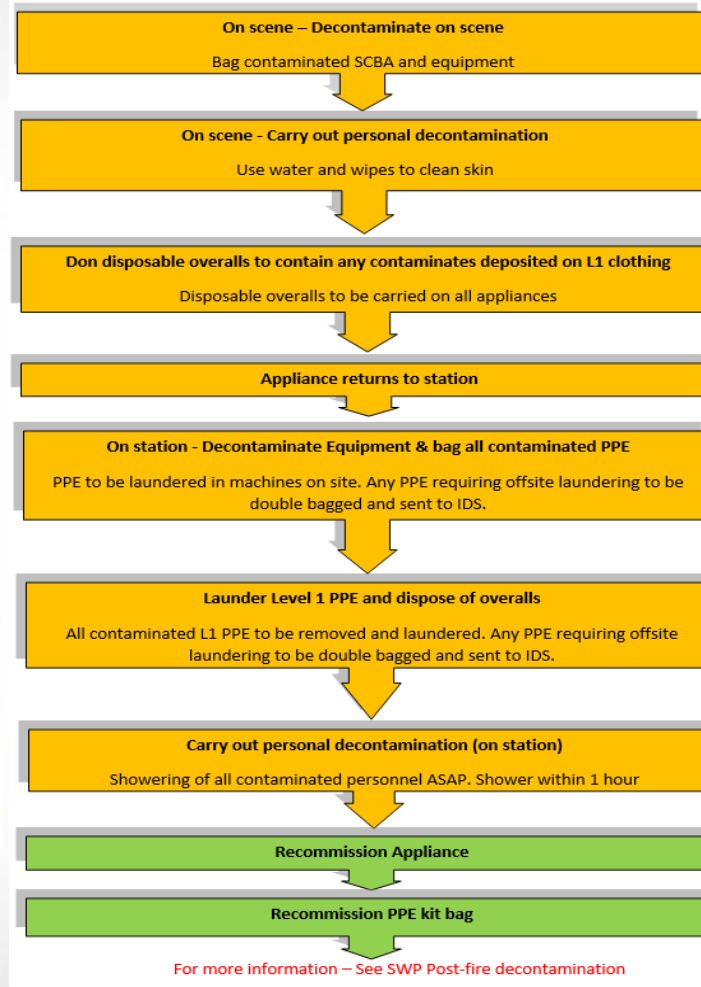


Don nitrile gloves



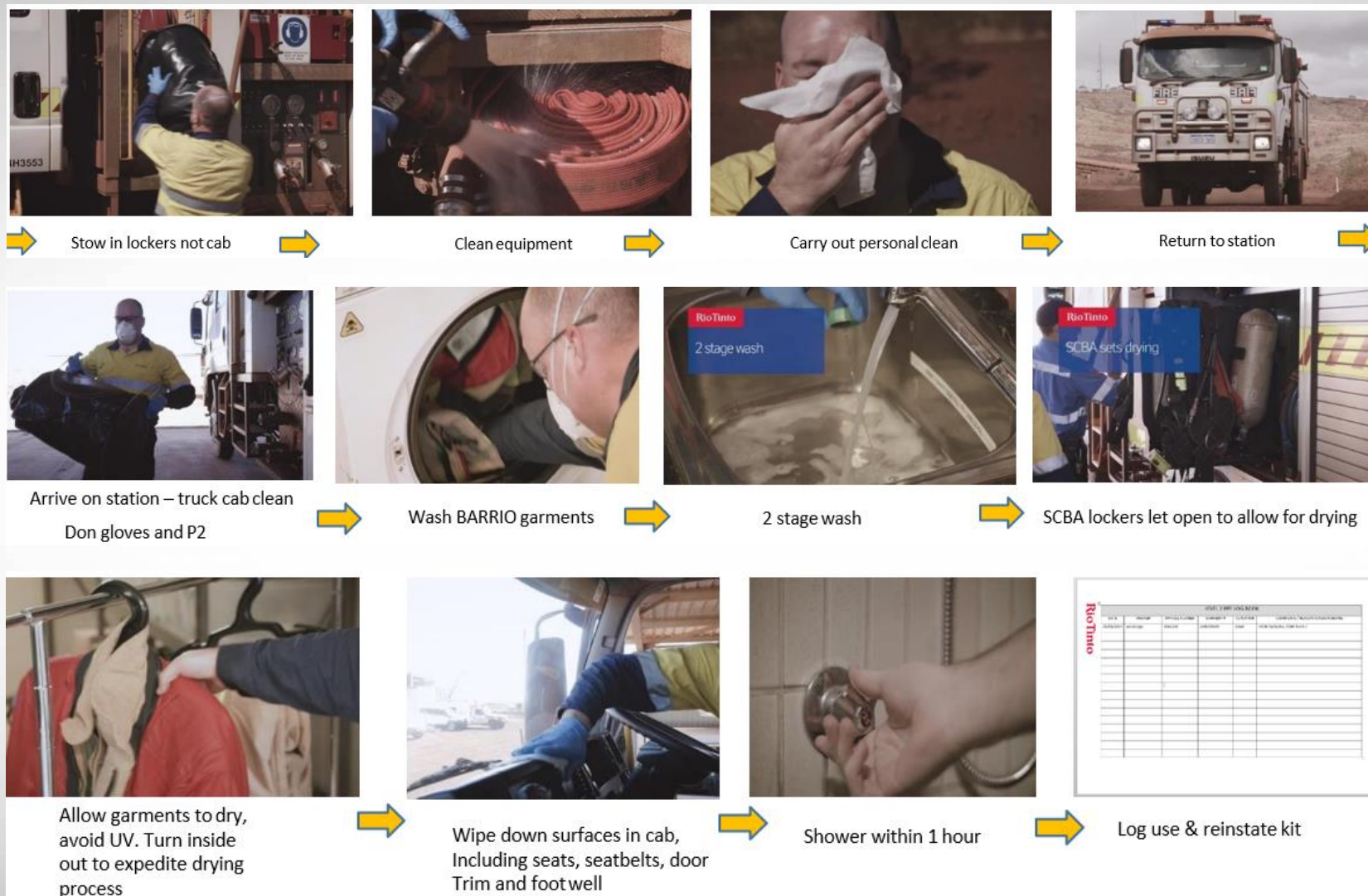
Bag PPE and contaminated gear

Post Fire Decontamination Process



Source: Screenshots courtesy of Rio Tinto Iron Ore

Health Risks for First Responders Best Practice



Conclusion

- Studies show an increased risk of cancer for first responders due to increased exposure to air borne contaminants
- SOPs and guidelines exist to significantly reduce the exposure during and after the incident, but also during training and the logistic chain
- A lot of measures can already be implemented by changing processes and with a limited budget that can be extended to a complete system
- Implementing a culture to support it is key!

Everyone home safe...and healthy!

Skelleftea Model - <https://www.msb.se/siteassets/dokument/publikationer/english-publications/healthy-firefighters-the-skelleftea-model-improves-the-work-environment.pdf>

Research Project: Electric mobility and road tunnel safety

Dräger Hot Topic website on cancer awareness, workshop design, Toxic Twins and more - https://www.draeger.com/en_uk/Fire-Services/Hot-Topics

Rio Tinto Barrio System – [Presentation](#) + [Video](#)

**Thank you for
your attention.**

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