

Wildland Firefighter Health Hazards: Key Insights and Future Directions

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Topics

Past, current and future research

- NHRA PhD research
- DFES undergarment research
- UoW literature review
- KRIA bushfire smoke & respirators
- Future directions



Exposures of Wildland Firefighters

NHRA Postgraduate Research (PhD)

1. Firefighters are exposed to high concentrations of Particulate and chemicals ([including carcinogens](#)) for short periods of time.
2. Prescribed burns are a good representation of bushfires for research purposes
3. The tunic adsorbs chemicals emitted from bushfires and [off-gasses](#) them for a period of time after exposure
4. Firefighters lack [education and support](#) to deal with these exposure issues. More research and aid is needed, particularly in rural locations.



Undergarment contamination

Department of Fire and Emergency Services WA

Bushfire smoke penetrates the PPE of firefighters onto their **undergarments**

These undergarments were laundered alongside personal items (bedding, gym clothing etc.)

Concern about cross contamination to non-fire related clothing.

N=60 contaminated shirts tested across various laundering protocol to reduce potential cross contamination

Important to closely follow dosage instructions. Drum-clean cycle **effectively removes 99%*** of cross contamination potential (hot wash)



Bushfire smoke harms- our national understanding

Maximilien Desservettaz- Environmental Futures, University of Wollongong

1. Bushfire smoke is a **toxic** and variable mixture influenced by vegetation, fire behaviour, and weather.
2. Protective equipment and practices remain **inconsistent**, with current respiratory and dermal protections offering limited and often incomplete exposure mitigation **in real-world conditions**
3. Real-time exposure monitoring tools sensors are promising, but their impact on **reducing actual exposures or changing behaviour** is not yet demonstrated.
4. Gear contamination and dermal absorption are under-addressed risks, worsened by inadequate decontamination practices and a **lack of national standards**.
5. **Critical evidence gaps remain**, including the long-term effects of low-dose exposure, effectiveness of PPE materials.



Biological effects of smoke exposure

Katherine Landwehr – The Kids Research Institute

Patrick Lim – Curtin University

Methods

Grow lung cell models using donated human airway cells.

These lung models are exposed to smoke from a controlled burn, either [with or without firefighter-issued filters](#).

We then test how the smoke affects cell health, lung barrier strength, and immune responses.

Outcomes

We aim to see how well current respirators [protect lung cells](#) from bushfire smoke.

The study will reveal early signs of lung stress or damage linked to smoke exposure.

Findings could help improve PPE design and safety practices for firefighters.



More work is needed

Exposure monitoring **can be streamlined**. We can create a system akin to mining to alert firefighters to their potential situation

The **health of the volunteers** across the country is largely unknown. Many slip through the cracks. Health monitoring/research is needed.

Effective **implementation of procedures** to minimise risk is key, how do we do this?

Training volunteers is a unique problem, how do we **best deliver effective training** to this unique cohort?



Get in touch

