

D4 Respiratory Health of Fire Fighters

Phase 2 - Field Validation

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Aims

To determine respiratory health risk in fire fighters after exposure to bushfire smoke
To conduct controlled exposure trials in the field during prescribed burns in Western Australia

Methodology

Random allocation of 67 career fire fighters to:

1. Particulate (P) filter
2. Particulate/organic vapour (P/OV) filter
3. Particulate/organic vapour/formaldehyde (P/OV/F) filter

Exposure to bushfire smoke for 2 periods of 60 minutes

Repeated measurements of respiratory health outcomes by:

- Respiratory Symptom Questionnaire
- Oxymetry measurement (SaO₂)
- Spirometry measurement (FEV₁)

Air sampling inside the masks



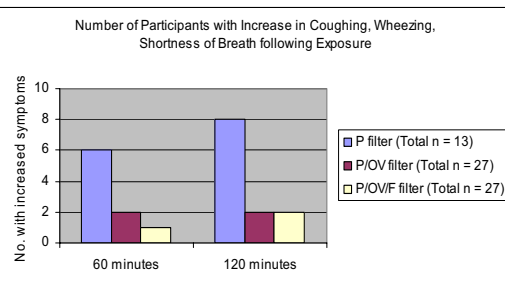
Fire Fighters in the Field during the Exposure Trials



Odds Ratios for Increases in Respiratory Symptoms across the Three Types of Filters

Filters	Adj. OR*	p	95% CI
0-60 Minutes			
P filter vs. P/OV filter	0.050	0.02	0.004 – 0.597
P filter vs. P/OV/F filter	0.234	0.02	0.068 – 0.797
P/OV filter vs. P/OV/F filter	0.484	ns	0.034 – 6.802
0-120 Minutes			
P filter vs. P/OV filter	0.048	0.00	0.006 – 0.358
P filter vs. P/OV/F filter	0.237	0.00	0.092 – 0.613
P/OV filter vs. P/OV/F filter	1.300	ns	0.149 – 11.359

*OR adjusted for FESA years, age group, pack years
ns = Difference statistically not significant



Conclusions

- The commonly used particulate filter is ineffective in filtering out bushfire components such as formaldehyde.
- The particulate/organic vapour and the particulate/organic vapour formaldehyde filter provide statistically better protection for fire fighters' respiratory health in bushfire smoke conditions.

Results

- Significantly higher proportion of fire fighters with increase in coughing, wheezing, shortness of breath following exposure were allocated the P filter ($p < 0.05$).
- After adjusting for service years, age, and smoking:
 - 4-fold reduction in the number of participants with increased respiratory symptoms in the P/OV/F filter group compared to the P filter group.
 - 20-fold reduction in the number of participants- with increased respiratory symptoms in the P/OV filter group compared to the P filter group
- Formaldehyde levels inside the masks significantly higher in the P filter group - both after 60 and 120 minutes.