

RESPIRATORY HEALTH EFFECTS OF OCCUPATIONAL EXPOSURE TO BUSHFIRE SMOKE

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 D4 Respiratory Health of Fire Fighters
 Program D Protection of People and Property

Introduction

- Growing concern about the health effects of exposure to bushfire smoke
- 8,387 bushfires in WA in 2003-2004
- A range of toxic compounds identified, including respiratory irritants such as formaldehyde and acrolein
- Limited data:
 - Occupational exposure and related health effects
 - Efficacy of the protective filters on fire fighters' masks



Figure 1: Controlled Bushfire Smoke Exposure in Smoke Chamber

Objectives

- To assess the effectiveness of wearing protective filters under controlled conditions
- To validate the findings in the field during prescribed burns and bushfires



Figure 2: Subject wearing Study Mask and Sampling Equipment

Methods

- Random allocation to to:
 - Particulate filter
 - Particulate/organic vapour filter
 - Particulate/organic vapour/formaldehyde filter
- 15 minute controlled bushfire smoke exposure
- Measurement of respiratory health outcomes:
 - Respiratory Health Questionnaire
 - FEV₁ and SaO₂ measurements
- Air sampling inside the masks



Figure 3: Spirometry Measurement (FEV₁)

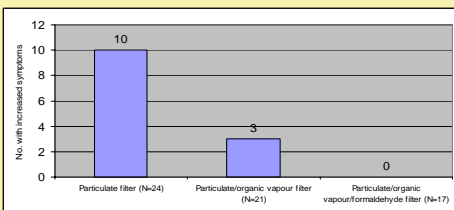


Figure 4: No. of Subjects with increased Respiratory Symptoms following Exposure

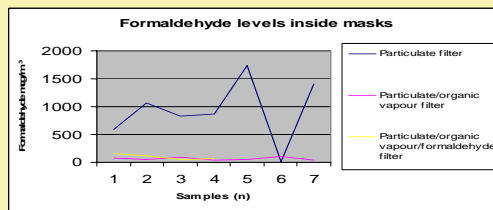


Figure 5: Formaldehyde Levels inside Masks across Three Filter Types

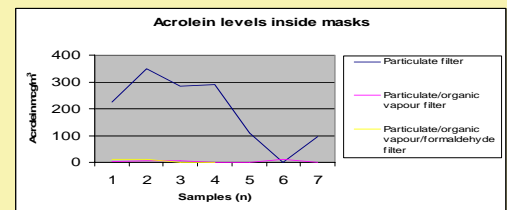


Figure 6: Acrolein Levels inside Masks across Three Filter Types

Results

- Across the three types of filters, significantly higher number of subjects in both the particulate filter group and particulate/organic vapour filter group reported increased respiratory symptoms ($p < 0.05$)
- Significantly higher formaldehyde and acrolein levels were detected inside the masks fitted with particulate filters ($p < 0.05$)

Conclusions

Testing the efficacy of three types of filters under controlled conditions demonstrated that:

- The particulate filter is ineffective in filtering out bushfire smoke components, including respiratory irritants such as formaldehyde and acrolein
- The particulate/organic vapour/formaldehyde filter provides significantly better protection for fire fighters' respiratory health compared to both particulate filters and particulate/organic vapour filters