

ACUTE EFFECTS STUDY OF EXPOSURE TO ROAD TUNNEL VENTILATION STACK EMISSIONS

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Background & Aims: To study the association between exposure to emissions from a road tunnel ventilation stack and short term respiratory and irritant effects in a group of volunteers.

Methods: We recruited 36 volunteers in Sydney, Australia, to a randomised cross-over study over three years. 2006 represented the baseline year where the tunnel was not operational, and 2007 and 2008 post-intervention years when the tunnel was active (58,318 vpd, November 2008). Each group underwent three types of exposures each year: downwind of the road tunnel ventilation stack; upwind of the stack; and at a positive control site (remote, heavily trafficked site). Each exposure consisted of two consecutive mornings of two hours exposure each. Three repeated measurements for spirometry, exhaled nitric oxide (FeNO) and irritant and respiratory symptom scores were collected each morning. We collected data on PM₁₀, PM_{2.5} & PM₁, NO₂ and VOCs during each of the exposure sessions. Data were analysed by mixed effects regression.

Results: 25% of subjects reported a diagnosis of asthma and 72% were atopic at baseline. 26 (72%) subjects participated in 2007 and 20 (56%) in 2008. Exposure downwind of the ventilation stack was associated with some increase in "dry nose" scores, but there was no effect on FEV₁, FVC, FeNO or other symptoms. Over the three year period as a whole, exposure at the heavily trafficked control site was associated with higher FeNO (ratio=1.09; p<0.001), higher scores for eye symptoms (p=0.03), chest symptoms (p<0.001), and throat symptoms (p=0.06).

Conclusion: There was little evidence of any short-term adverse effect of exposure downwind of the road tunnel ventilation stack. The findings of increased symptoms and inflammation at the control site overall validates the study design for detecting effects of short-term traffic exposures.