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## Articles

### Effect of ultraviolet germicidal lights installed in office ventilation systems on workers' health and wellbeing: double-blind multiple crossover trial

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## Summary

### Background

Workers in modern office buildings frequently have unexplained work-related symptoms or combinations of symptoms. We assessed whether ultraviolet germicidal irradiation (UVGI) of drip pans and cooling coils within ventilation systems of office buildings would reduce microbial contamination, and thus occupants' work-related symptoms.

### Methods

We undertook a double blind, multiple crossover trial of 771 participants. In office buildings in Montreal, Canada, UVGI was alternately off for 12 weeks, then turned on for 4 weeks. We did this three times with UVGI on and three times with it off, for 48 consecutive weeks. Primary outcomes of self-reported work-related symptoms, and secondary outcomes of endotoxin and viable microbial concentrations in air and on surfaces, and other environmental covariates were measured six times.

### Findings


Operation of UVGI resulted in 99% (95% CI 67–100) reduction of microbial and endotoxin concentrations on irradiated surfaces within the ventilation systems. 771 participants appeared to remain masked, and reported no adverse effects. On the basis of within-person estimates, use of UVGI was associated with significantly fewer work-related symptoms overall (adjusted odds ratio 0.8 [95% CI 0.7–0.99]), as well as respiratory (0.6 [0.4–0.9]) and mucosal (0.7 [0.6–0.9]) symptoms than was non-use. Reduction of work-related mucosal symptoms was greatest among atopic workers (0.6 [0.5–0.8]), and never-smokers (0.7 [0.5–0.9]). With UVGI on, never-smokers also had large reduction of work-related respiratory (0.4 [0.2–0.9]), and musculoskeletal symptoms (0.5 [0.3–0.9]).

### Interpretation

Installation of UVGI in most North American offices could resolve work-related symptoms in about 4 million employees, caused by microbial contamination of heating, ventilation, and air-conditioning systems. The cost of UVGI installation could in the long run prove cost-effective compared with the yearly losses from absence because of building-related illness.

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