

## Study Finds UV Works To Treat 'Sick Buildings'

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Ultraviolet lamps can kill bacteria, mold, fungi and other germs in the ventilation systems of big office buildings, preventing headaches, coughs, congestion and other symptoms of "sick building syndrome" among workers, researchers reported yesterday.

The new research represents the first time that sterilizing air-conditioning systems with UV light has been clearly demonstrated to help fight sick building syndrome, which affects millions of workers each year, experts said.

"Sick building syndrome is a composite of many problems. This tackles one component that may be present in a lot of buildings," said Dick Menzies, an associate professor of medicine at the Montreal Chest Institute at McGill University in Canada.

Sick building syndrome is a broad term that refers to workplaces in which employees become ill from exposure to something indoors, such as chemicals used for work; glue and other substances being emitted by furnishings; and bacteria, mold and other microbes. The organisms often thrive in moist, dark ventilation systems. The problem tends to be especially bad in buildings that are sealed tightly to make them energy efficient.

UV light has long been used in hospitals and other settings to kill microorganisms, and a small pilot study suggested that using it in building ventilation systems might help fight sick building syndrome. But the new study represents the first large-scale attempt to test its effectiveness in the real world.

Menzies and his colleagues installed ultraviolet germicidal irradiation (UVGI) systems -- large arrays of light bulbs that emit UV light -- in the air-conditioning systems of three large office buildings in Montreal, irradiating the cooling coils and drip pans where mold and microbes tend to grow in the water that condenses. One of the buildings had separate ventilation systems for the lower and upper halves, allowing the researchers to test the approach on four distinct systems.

The researchers sampled the cooling coils for microbes and conducted detailed surveys of the health of 771 workers in the buildings for a year as the UV systems were repeatedly turned on for a month, off for three months and then on again for a month.

The UV light killed microbes growing in the cooling systems, causing a 99 percent reduction in the concentrations of bacteria, fungi and endotoxins, which are irritants produced by mold, the researchers found.

More important, the workers reported an overall reduction of 20 percent in a wide array of symptoms when the UV lights were on, the researchers reported in a paper to be published in Saturday's issue of *The Lancet*, a British medical journal.

"There was a significant reduction in overall symptoms," Menzies said in a telephone interview.

The biggest reductions were a 40 percent drop in respiratory complaints and a 30 percent cut in "mucosal" symptoms, which included problems with workers' eyes, noses and throats.

Workers with allergies, and those who never smoked, seemed to benefit the most.

The lights caused no adverse reactions. "They are perfectly safe. It's as natural as sunlight. It's not a chemical being sprayed on or something like that that can cause problems of its own," Menzies said.

He stressed that the approach would not solve all the problems associated with sick buildings, such as allergic reactions to chemicals.

But based on the findings, the researchers concluded that if UV systems were installed in most office buildings in North America, work-related health problems would be avoided in about 4 million workers.

"It's not a big industry at the moment. As far as I'm aware, this is the first big study," Menzies said.

A UV system would cost about \$52,000 for an office building with 1,000 occupants and would cost about \$14,000 a year to operate, the researchers estimated. But that cost would easily be offset by the savings from fewer sick days, the researchers said.

"Sick building syndrome is clearly associated with sickness and absences, and absenteeism is a huge cost," Menzies said. "If you can prevent one sick day per worker, you've more than paid for the lights."

Other experts said they were impressed by the carefully designed study and the clear-cut results.

"I think the results provide some pretty powerful evidence about the causal role of microorganisms in contributing to symptoms in office workers, and points to a potential reasonable control strategy," said Jonathan Samet, professor and chairman in the department of epidemiology at the Johns Hopkins Bloomberg School of Public Health in Baltimore.

"It's a very exciting development," said Edward Nardell, an associate professor of medicine and public health at the Harvard School of Public Health in Boston.

Nardell said that UV light systems would have other benefits, as well.

"If you put UV in the ducts, you can cut down on anything that's circulating, from rhinoviruses, which cause the common cold, to influenza and potentially bioterror agents," Nardell said. "There's a lot to be gained here aside from this very important sick building problem."

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