

# Ultraviolet device gets new look in virus fight

Backers say it zaps germs as part of ventilation systems

By **Kay Lazar** | GLOBE STAFF

Discussions about building ventilation, if they occur at all, tend to revolve around stuffy offices or frigid conference rooms. But as workers tentatively head back to their offices and communities debate whether and how to reopen schools, a new concern has arisen: Could ventilation systems harbor and spread lethal coronavirus?

In Massachusetts, with its abundance of historic buildings and aging schools with decrepit heating and cooling systems, the quality of indoor air is suddenly a hot topic. Fueling the interest is a recent letter from 239 scientists to the World Health Organization saying evidence indicates that when people talk and cough, the virus is released in microdroplets small enough to remain aloft and pose a risk to someone farther away than 6 feet from an infected person.

Among their evidence was a study from China that suggested one person with COVID-19 infected 9 others sitting at nearby tables underneath air conditioning vents in a restaurant.

One approach to battling such airborne spread of coronavirus that's capturing attention now is a century-old technology, known as germicidal ultraviolet air disinfection, or GUV, that zaps harmful airborne germs. In modern use, the lights are tucked inside air conditioning systems or mounted high above people's heads near ceiling fans that draw the air up so the lights can disarm the germs.

Interest in ultraviolet light to fight disease dates to the 1800s, when researchers discovered that sunlight could kill bacteria. By the 1930s, researchers were experimenting with ultraviolet lights beamed into the upper air of some Pennsylvania classrooms. They found use of the lights significantly reduced cases of measles, one of the most contagious airborne diseases, compared with classrooms where the lights were not installed.

The popularity of ultraviolet light to kill germs in hospitals and schools took off, and bread box-sized devices with the lights inside were installed near ceiling fans in many buildings. Unlike UV-A and UV-B ( the ultraviolet burning rays of the sun), the UV-C in germicidal light is a shorter wavelength. Still, it can harm eyes and skin, hence its installation near room ceilings and aimed up and away from people.

UV-C's popularity waned decades ago with the rise of antibiotics and their ability to kill harmful bugs by popping a pill. Now, with few medications available to fight COVID-19, and a possible vaccine still months away, the technology is making a comeback.

“Six months ago, we weren't even thinking of [ultraviolet light] for an office building,” said Eric Edman, a senior associate at BR+A Consulting Engineers, a Boston engineering firm. Before the pandemic, Edman's designs for heating and cooling systems in Boston area hospitals and research labs often included ultraviolet lighting tubes installed in the buildings' air handling systems to kill fungus on their cooling coils.

Those pre-pandemic installations were not usually designed to disarm airborne germs but could typically handle up to 40 percent of such threats as air moved through the system. Now, clients are asking for beefed-up systems with more lights to quickly zap more bacteria and viruses.

Edman said he's working on a UV addition to the air handling system at his own company's offices in the WGBH-owned building in Brighton, for an estimated cost of about \$60,000. Exactly how many other offices in Greater Boston already have installed UV-C, or are considering it, is an open question.

Dan Harris of APA HVAC Technologies, a Canton company that works with engineers and contractors, said many of his customers are hesitant to speak publicly about their company's plans in any way that references COVID-19.

But school leaders are starting to discuss the approach. Tom Scott, executive director of the Massachusetts Association of School Superintendents, said a specialist from the state education department suggested UV-C lights for school heating and ventilation systems during a conference call Thursday with superintendents.

“It's the first I'd heard of it,” Scott said.

For older buildings without central air conditioning, the lights could be mounted in boxes far above people's heads and rely on ceiling fans to pull

the air up to the UV devices. That approach would cost about \$4 per square foot, said Dean Saputa, a vice president at UV Resources in California, which makes ultraviolet products.

But building design and public health experts say UV light is just one weapon in an arsenal that should also include upgraded air filters, increasing the rate of fresh air circulating in rooms, frequent disinfection of common areas, and the use of masks and social distancing. The UV lights, for instance, won't help if someone touches an infected surface, then rubs their eyes.

Another important tool: humidity. The humidity in a typical office and school building in New England in winter is about 20 percent to 30 percent — roughly half what it should be, said Harris of APA HVAC Technologies.

Research shows that dry environments are associated with higher incidence of some viral infections, such as the flu.

“While positive impacts of humidification on COVID-19 have not been determined, avoiding dry conditions in buildings is generally thought to be effective as a risk reduction strategy,” Harvard researchers concluded in a recent report that offers guidance to administrators for reopening schools.

The report also suggested ultraviolet light as a potential strategy but said its costs, maintenance, and “potential health concerns of inadvertent UV exposures” should be considered.

There may soon be another approach.

A Columbia University scientist is working on newer UV technology, called far-UVC, that he said is more efficient and safe. It harnesses even shorter UV wavelengths, which his studies suggest are not harmful to skin and eyes. His work indicates the light can quickly disarm the flu virus and coronaviruses that cause common colds, and his latest research suggests it would work on the new coronavirus responsible for COVID-19.

“UV is like hitting the virus with a hammer,” said David Brenner, professor of radiation biophysics and director of Columbia University’s Center for Radiological Research. That UV hammer has been used for decades, without germs developing a resistance as they do with many antibiotics, Brenner said.

His team estimates that far-UVC light, used continuously in a room at the current regulatory limit, would zap about 90 percent of coronavirus activity

in 8 minutes, 95 percent in 11 minutes and 99.9 percent in about 25 minutes.

“We can put these in ceiling lights that are already there, and we can directly shine it onto the air in the room, but also the surfaces in the room as well,” Brenner said. Unlike current UV-C products, far-UVC doesn’t need ceiling fans or air handling systems to work. He envisions such lights readily used in school buses, restaurants, trains, offices, and more.

Some companies are starting to ramp up production of far-UVC products, but they aren’t yet widely used.

Dr. Edward Nardell, a professor of environmental health and infectious diseases at Harvard’s T.H. Chan School of Public Health, said far-UVC would be well-suited for use in places where it’s hard to maintain social distancing.

“I could see this technology in a nail salon,” Nardell said. “There will be more and more uses of this germicidal UV-C.”

Eventually, there will likely be a vaccine for COVID-19, but far-UVC’s role will outlast that, Brenner predicts.

“It will apply to influenza next year,” he said. “And if we have another pandemic, it will apply to that, too.”

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