APHC U.S. ARMY PUBLIC HEALTH CENTER

USE OF OZONE GENERATORS AGAINST COVID-19

TIP NO. 98-115-0420

PURPOSE

To provide information on the usefulness and limitations of ozone generators used for air and surface disinfection and to provide guidance on the safe use of these devices.

BACKGROUND

Coronavirus Disease 2019 (COVID-19) is a respiratory disease caused by the Severe Acute Respiratory Syndrome [SARS]-CoV-2 virus that spreads from person-to-person through respiratory tract expulsion (e.g., sneezing, coughing) of droplets from an infected person to an uninfected person. A secondary risk exists for infection when people touch contaminated surfaces and then touch their mouths, noses, and/or eyes. Effective surface disinfection helps to reduce the risk of disease transmission by removing the virus from the environment.

USING OZONE GENERATORS TO DISINFECT

With caution, ozone generators can be used to disinfect areas such as rooms, vehicles, and buildings for coronaviruses. Ozone poses a significant health exposure risk to humans and animals and can damage materials such as rubber, electrical wire coating, fabrics, and artwork.

Surface cleaning must still be done prior to the disinfection process to allow the gas to make contact with surfaces. Additionally, chemical disinfection of high-touch surfaces (such as doorknobs, light switches, handles, tabletops, chairs, rails, sink faucets, light switches, soap dispensing levers, and so forth) should be conducted in conjunction with the surface cleaning. The ozone generators will significantly reduce the amount of manual effort required to disinfect all surfaces. Conditions should be sufficiently controlled to ensure that no person or pet becomes exposed.

CONSIDERATIONS

The areas treated with an ozone generator (including adjoined spaces that share ventilation) must be vacated during the treatment and for a recovery period after the ozone treatment ends to allow oxygen to reenter the space. Using 2.5 parts of ozone per million parts of air (parts per million (ppm)) to 5 ppm will effectively disinfect and limit damage. The Occupational, Safety, and Health Administration (OSHA) regulates permissible exposure limits (PEL) to ozone. Use an ozone meter to monitor the room and prevent reentry until the ozone level dissipates below an acceptable level. The OSHA PEL for ozone is listed as an 8-hour, time-weighted average value of 0.1 ppm. Therefore, a conservative level to reach before reentry into a room after ozone disinfection is 0.08 ppm. An average of 2 hours wait time after disinfection will allow the ozone to dissipate to safe levels, however, checking with a meter is advised.

The heating, ventilation, and air-conditioning [HVAC] system must be shut off and air-exchange spaces/vents must be sealed prior to activating the ozone generator. The ozone generator, or multiple smaller generators, must achieve a target concentration of at least 2.5 ppm in the entire area of concern. Application time is 30 minutes to 2 hours depending on the size of the area. Ventilation of a treated area is recommended to bring in fresh air prior to reoccupying the space.

TRAINING

Emergency personnel, such as firefighters, are trained to operate these devices and are equipped with sensors to detect ozone and/or oxygen levels during and after treating a room. If this technology is incorporated in areas outside of Emergency Service personnel oversight, safety procedures, training, and monitoring should be incorporated to prevent harmful health effects.

TESTING

Previous test results indicate the room/area to be treated must be completely sealed off to ensure contact with all surfaces in the room; even then, some porous surfaces such as wood floors with cracks may not receive the full disinfectant efficacy. A test on the SARS virus is documented at:
https://scholar.google.com/scholar?q=ozone+disinfection+of+SARs+contaminated+areas&hl=en&as_sdt=0&as_vis=1&oi=scholart.

A second test on multiple viruses is documented at:
https://www.tandfonline.com/doi/full/10.1080/01919510902747969?src=recsys&.

U.S. Environmental (EPA) REQUIREMENTS

The EPA does not post a list of disinfection devices but does register companies that produce them and provides a company device registration number. This can be verified on the EPA Website: https://www.epa.gov/sites/production/files/2016-02/activeestablishmentlist.csv.

No claims of treatment efficacy are required for registering the devices, but misrepresentation is regulated by the Federal Insecticide, Fungicide, and Rodenticide Act [FIFRA].

The EPA addresses why ozone generators are not on List N (Disinfectants for Use Against SARS-CoV-2): It doesn't list devices that kill viruses, including ozone generators and ultraviolet (UV) lights because they are registered pesticide devices, not surface disinfectants. These devices must be registered, and the company must receive an EPA Registrant Number for the device.
https://www.epa.gov/coronavirus/why-arent-ozone-generators-uv-lights-or-air-purifiers-list-n-can-i-use-them-kill-covid

BACKGROUND INFORMATION

OSHA provides the ozone PELS and guidance at:
- https://www.osha.gov/laws-regs/standardinterpretations/1994-09-29-0
- https://www.cdc.gov/niosh/pel88/10028-15.html

The EPA discusses use of ozone generators for indoor air treatment at:
- https://www.epa.gov/indoor-air-quality-iaq/ozone-generators-are-sold-air-cleaners

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An extract from the EPA Website:

Can Ozone be Used in Unoccupied Spaces?

Ozone has been extensively used for water purification, but ozone chemistry in water is not the same as ozone chemistry in air. High concentrations of ozone in air, when people are not present, are sometimes used to help decontaminate an unoccupied space from certain chemical or biological contaminants or odors (e.g., fire restoration). However, little is known about the chemical by-products left behind by these processes (Dunston and Spivak 1997). While high concentrations of ozone in air may sometimes be appropriate in these circumstances, conditions should be sufficiently controlled to ensure that no person or pet becomes exposed. Ozone can adversely affect indoor plants, and damage materials such as rubber, electrical wire coatings and fabrics and art work containing susceptible dyes and pigments (U.S. EPA, 1996a).

How is Ozone Harmful?

The same chemical properties that allow high concentrations of ozone to react with organic material outside the body give it the ability to react with similar organic material that makes up the body, and potentially cause harmful health consequences. When inhaled, ozone can damage the lungs. Relatively low amounts can cause chest pain, coughing, shortness of breath and throat irritation. Ozone may also worsen chronic respiratory diseases such as asthma and compromise the ability of the body to fight respiratory infections. People vary widely in their susceptibility to ozone. Healthy people, as well as those with respiratory difficulty, can experience breathing problems when exposed to ozone. Exercise during exposure to ozone causes a greater amount of ozone to be inhaled and increases the risk of harmful respiratory effects. Recovery from the harmful effects can occur following short-term exposure to low levels of ozone, but health effects may become more damaging and recovery less certain at higher levels or from longer exposures (U.S. EPA 1996a, 1996b).

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