

## Restore™ FAQs

### What is ozone?

Ozone is an inorganic tri-atomic molecule with a chemical formula of  $O_3$ . It differs slightly from the normal oxygen we breathe in, which is diatomic in nature and has the formula  $O_2$ . What sets ozone ( $O_3$ ) apart from regular oxygen ( $O_2$ ) is the addition of the third oxygen atom. Oxygen is extremely stable in its natural state, but the addition of an extra oxygen atom causes the molecule to transform into a particularly reactive and unstable form. During this reactive state, the molecule is rapidly searching for a quick and easy way to dispel the extra oxygen atom. This normally occurs via physical interactions with other airborne molecules such as viruses, bacteria, mold, pet dander, dust, etc.

### Where does natural ozone come from?

Ozone is a naturally occurring molecule that is created in the upper levels of our atmosphere when ultraviolet radiation interacts with  $O_2$ . A similar process occurs which creates ozone when lightning passes through the lower levels of our upper atmosphere, generating intense heat and creating ozone.

### Where does the ozone for the Restore process come from?

Resolution uses portable, man-made ozone generators, which take advantage of UV light to create ozone. Airborne oxygen ( $O_2$ ) is drawn into the rear of the unit and bombarded with UV light, causing the  $O_2$  molecules to split into two separate oxygen (O) atoms. These monatomic atoms quickly join with nearby  $O_2$  molecules to form ozone ( $O_3$ ).

### How much ozone is normally in the air we breathe?

According to the EPA, some areas of the United States can have ground level ozone in concentrations approaching 0.07 parts per million (ppm).

### How does ozone work to kill bacteria?

When contact occurs on a molecular level it initiates a process known as "oxidation," which rapidly alters the structure of the ambient compound, rendering it disabled or modified into a different compound altogether. Ozone can destroy bacteria by oxidizing the cell wall, eventually rendering the membrane neutralized and thus destroying the bacteria. As these interactions continue to take place, the ozone molecules eventually interact with virtually everything in the area, both airborne and concrete (such as physical surfaces in the room). After a certain period of time, the unreacted ozone molecules eventually revert back to oxygen on their own and the room is left with a clear background concentration of ozone.

### How does ozone work to kill viruses?

When contact occurs with enveloped viruses on a molecular level it initiates a process known as "oxidation," which rapidly alters the structure of the ambient compound, rendering it disabled or modified into a different compound altogether. Since viruses do not have cell walls, the ozone diffuses through the protein coat into the nucleic acid core, resulting in damage of the viral RNA. At higher concentrations, ozone has been proven to destroy the capsid or exterior protein shell by oxidation. As these interactions continue to take place the ozone molecules eventually interact with virtually everything in the area, both airborne and concrete (such as physical surfaces in the room). After a certain period of time, the unreacted ozone molecules eventually revert back to oxygen on their own and the room is left with a clear background concentration of ozone. Ozone has also proven effective against non-enveloped viruses by interacting with external proteins forming oxidants and thus rendering the virus ineffective.

### **How does ozone work to kill mold?**

When contact occurs on a molecular level it initiates a process known as "oxidation," which rapidly alters the structure of the ambient compound, rendering it disabled or modified into a different compound altogether. As these interactions continue to take place, the ozone molecules eventually interact with virtually everything in the area, both airborne and concrete (such as physical surfaces in the room). After a certain period of time, the unreacted ozone molecules eventually revert back to oxygen on their own and the room is left with a clear background concentration of ozone. It should be noted that ozone does not penetrate walls, floors, or other surfaces, nor does it remove inactivated/dead bioaerosols. Ozone treatments should only be used after correcting the issue that is causing mold in the facility/residence. Once the source of moisture has been removed and the growth potential for the mold eliminated, ozone treatment should be considered an effective means of disabling the bioaerosols.

### **How long do Restore treatments typically last from start to finish?**

Our specialists will first need to evaluate the size and layout of your residence/facility in order to calculate the minimum run time needed to fill the room with ozone. Once this is complete, we will require everyone to evacuate the facility until an "all-clear" is given. There are many factors that determine the total length of the treatment, including the air-quality (how "dirty" the air is) and the temperature of the area (ozone decays slightly faster at higher temperature and humidity). Typically a run time of 30 minutes may require a decay period of anywhere between 1-3 hours.

### **How effective is the Restore treatment?**

Studies show the ozone "shock-treatment," meaning elevated concentrations of ozone for a short period of time, can be up to 2,500x more effective than bleach, and at least 10x stronger than chlorine as a disinfectant. Many families of viruses, including Poliovirus I, Poliovirus II, human rotavirus, Norwalk virus, Parvoviruses, and Hepatitis A and B are susceptible to the virucidal oxidation tendencies of ozone.

### **Will the Restore treatment kill the 2019-nCoV (COVID-19) coronavirus?**

Well-regarded scientific studies show ozone gas destroys the 2003-identified SARS coronavirus or "SARS-CoV." Ozone gas, in proper concentration, has been proven to kill the SARS coronavirus, and the structure of the new SARS-CoV-2 or COVID-19 is almost identical to that of the SARS coronavirus. Studies specifically related to ozone effectiveness on SARS-CoV-2 are not yet complete. The National Ozone Association expects these emerging studies will show that Ozone will have an antipathogenic effect on SARS-CoV-2, as well.

### **Why should I opt for the Restore method as opposed to hand-cleaning with liquid disinfectants?**

Ozone is a more effective virucidal, bactericidal, and anti-microbial compound when compared to the effective concentrations required to kill these microorganisms. Since ozone is a gas, we are able to implement the use of HVAC systems to assist in more uniform and quicker dispersion throughout a room, allowing the ozone to fill up virtually every single crack and crevice. Hand-cleaning (or even mist/spraying) services are only effective in the areas where solutions are applied. Also, these treatments use harsh chemicals that must be manually removed afterwards or there is risk for human exposure. The Restore method, on the other hand, uses no chemicals and only leaves you with a clean environment afterwards.

### **Can exposure to ozone be harmful?**

Yes, absolutely. Various governing bodies such as OSHA and the EPA have established safe exposure levels for ozone. The Restore treatment implements concentrations that exceed these safe limits in order to expedite the effectiveness and decrease the treatment time for your facility. This is why we require the facility to be vacated before treatment can begin and not to be reoccupied until a Resolution specialist has performed area testing for ozone to ensure ambient air quality is back to a normal and safe level.