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14

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EDITORIAL

Ozone Disinfectants Like SoClean CPAP Sanitizer can be used to Sterilize Cloth and n95 Masks in the Protection against COVID-19

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With the shortage of n95 protective masks, there has been an interest in reusing existing masks. Indeed, many local hospitals are doing so. However, masks get dirty, moisture-saturated, and potentially infected with bacteria, mold, or with the villainous COVID-19 virus. Therefore, the question of sterilization of used masks has arisen.

Sterilization is the process in which all forms of life such as fungi, bacteria, viruses, and spores are eliminated, killed, removed, or deactivated off a specific object, surface, or fluid. There are several ways to achieve such results depending on the item needing sterilization including boiling, incineration, filtration, dry heat, high pressure, microwave, chemicals, and ionizing irradiation,

In the case of sterilizing protective masks, a person cannot use excessive heat, therefore he would be sterilizing using chemicals and using them in a way that maximizes safety and sterilization. Moreover, these sterilizing agents would be based on the chemistry that oxidative processes with low molecular weight molecules, when used under tested methodologies, kill all bacteria, mold, and viruses.

Vaporized hydrogen peroxide is one method of sterilizing masks. Liquid hydrogen peroxide is converted to vapor form. The vapor is then inserted into a chamber vacuum. The decontamination results in minimal toxin byproducts as the peroxide is broken down into water. Equipment for such sterilization is available to some hospitals already. It is noted that water would also be necessary for the system to avoid potential explosions with hydrogen peroxide radicals.

Ethylene oxide is another method for sterilization that also is available in some settings. Ethylene oxide is a cyclic ether and is flammable and potential explosive. Although an effective method, it has a long cycle time, is relatively expensive and associated with side effects to exposed humans.

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Activated oxygen (often referred to as O_3 or ozone) is another method for sterilization for objects that cannot withstand high temperatures or extreme heat. It is also called ozone sterilization. Ozone is a naturally occurring gas in which three atoms of oxygen are united, instead of the usual two. This chemical can also be made from normal air by ozone generators. These machines are often used as room disinfectants and food (vegetable) sanitizer. They are also used as a disinfectant in many municipal water supply systems.

Ozone has been proven to kill bacteria, fungi, viruses, and protozoa. In the case of viruses, activated oxygen diffuses through their protein coat, into the nucleic acid, damaging and killing the organism. Ozone destroys the unsaturated lipid envelope of the virus by damaging existing multiple bond configuration. The nuclear content of the virus cannot survive without an intact lipid envelope.1 COVID-19 virus is an enveloped virus. At even higher concentrations of oxidation, the capsid (exterior protein shell of the virus) is also destroyed. Viruses that have been susceptible to activated oxygen include poliovirus 1 and 2, human rotavirus, Norwalk virus, Parvoviruses, and Hepatitis A, B, and non-A non-B.1.

As an aside, non-enveloped viruses are also killed by ozone by interacting with amino acids in the form of capsid proteins, protein hydroxides, and protein hydroxides, and protein hydroperoxides. Ozone also has been shown to interfere with carbohydrates and nucleic acids. In short, viruses have no protection against oxidative stress.

The sterilization process with the SoClean system is with activated oxygen. SoClean are sold in conjunction with Continuous Positive Airway Pressure (CPAP) machines, and therefore are readily available to much of the population. The machine is a self-contained device which can easily accommodate several surgical masks at a time. It generates activated oxygen which then moves through the CPAP hose and through all chambers of the unit. The air hose needs to be inserted prior to starting the machine so that the space is closed off to the environment. There is a filter to ensure that no

activated oxygen escapes until it is all converted to normal oxygen. Of note, one never opens the machine prior to 20 minutes after the cleansing process because the toxic activated oxygen is released into the environment, which would prove to be toxic.

I have tested the SoClean machine to see if it would sterilize without damaging used n95 masks or cloth masks. By all clinical criteria, the process is functional. The contaminated mask was cleansed and when removed it definitely had the pungent chlorine smell with a metallic twist that is associated with ozone and sterilized products. Additionally, it also caused no damage to the functional usage of the mask.

Ozone gas has been shown to kill the SARS coronavirus in at least seventeen separate studies [1, 2]. Since the structure of the SARS coronavirus is almost identical to COVID-19; it is logical to assume that it will also kill COVID-19. A study being performed at the Institute of Virology in Hubei is working to confirm that activated oxygen also destroys COVID-19.

In short, the SoClean CPAP Sanitizer is a viable method for sterilizing against coronavirus, and therefore, reusing n95 masks or any cloth mask can be achieved with this method.

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