Throughout the COVID-19 pandemic, there has been a persistent shortage of personal protective equipment (PPE). As a result, physician practices, hospitals and health systems have been forced to get creative with how to preserve their PPE, including methods of decontaminating and sterilizing N95 respirator masks.

While the supply continues to be a problem in health care, a recently published literature review examines five types of decontaminating processes for sterilizing N95s. Four were considered effective options while one—ethylene oxide—was found to be less effective as it can leave toxic residues on respirators and is not easily implemented.

Published in *JAMA*, "Filtering Facepiece Respirator (N95 Respirator) Reprocessing," is a systematic review that evaluates the evidence on effectiveness and feasibility of different processes used for decontaminating N95 respirator masks. Researchers assessed 42 studies that examined 65 total types of masks.

The Centers for Disease Control and Prevention (CDC) offers strategies for optimizing the supply of N95 respirator masks during the pandemic and in other scenarios. But it is important to note that once PPE supplies and availability return to normal, physician practices, hospitals and health systems should resume conventional practices, says the CDC.

When supplies are low, here are four decontaminating processes that effectively sterilize most pathogens on N95 respirator masks.

**Ultraviolet germicidal irradiation**

Using ultraviolet germicidal irradiation (UVGI) depends on the total power of UV energy that is delivered from specialized bulbs or lamps. These are used to illuminate a confined space such as a
The effectiveness of UVGI to sterilize N95s impregnated with infectious pathogens was examined in 17 of the 27 studies. To decontaminate masks exposed to SARS-CoV-2, higher doses of UVGI were needed compared with other viruses such as influenza. But this may be one of the most practical methods for reprocessing N95s because UV light boxes and laboratory hoods are readily accessible and used in health systems.

Read about how the University of Nebraska Medical Center tackled the N95 shortage with UVGI decontamination.

**Moist-heat incubation**

“Heat inactivates viruses by denaturing the proteins involved in attachment and replication within a host cell,” the review says. “However, concerns exist regarding the deleterious effects dry heat may have on certain materials, including those that comprise N95 respirators. Moist heat, on the other hand, is more effective at killing microorganisms, it distributes homogeneously across the surface being sterilized, and the lower temperature is less likely to degrade materials."

Nine studies evaluated infectious and mask integrity outcomes after moist-heat incubation on 15 contaminated N95s. These studies found that moist-heat incubation effectively reduced SARS-CoV-2 after 60-minute incubation periods.

**Microwave-generated steam processing**

The use of steam treatment is another known method for inactivating viruses on surfaces. An alternative is microwave-generated steam processing. Energy formed from microwave radiofrequency can be absorbed by water, reducing the potential of damaging N95 respirator mask materials.

While 10 studies evaluated decontamination and filter performance for different pathogens with microwave-generated steam processing, none looked at SARS-CoV-2. But it was shown to be “effective even when proteins such as those found in saliva or skin oil were present that tend to protect pathogens from decontamination,” says the review.

**Vaporized hydrogen peroxide**

URL: https://www.ama-assn.org/delivering-care/public-health/4-decontaminating-processes-effectively-sterilize-n95-masks

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A sterilant for heat-sensitive medical devices and equipment is vaporized hydrogen peroxide, which is used as a gaseous disinfectant circulated in an enclosed space or open room. This process is safe given its low toxicity and residual gas vapor decomposition into water vapor and oxygen.

Nineteen studies assessed outcomes of 30 different N95 respirator masks, looking at vaporized hydrogen peroxide “generators that converted liquid hydrogen peroxide into vapor and, following hydrogen peroxide vapor treatment, required an aeration phase to safely eliminate toxic residual chemicals,” says the review.

The Food and Drug Administration approved the use of vaporized hydrogen peroxide decontamination used in sterilization or aeration chambers or by mobile generators placed in large rooms. The integrity of N95 respirator masks was maintained for up to 20 to 30 cycles of open-room processing.

However, while vaporized hydrogen peroxide is a suitable alternative with longer decontamination periods, it is also more expensive than other options.

Discover how a member of the AMA Health System Program, University of Iowa Hospitals and Clinics, addressed PPE shortages with ionized hydrogen peroxide.

Stay current on the AMA’s COVID-19 advocacy efforts and track the pandemic with the AMA’s COVID-19 resource center, which offers resources from JAMA Network™, the Centers for Disease Control and Prevention, and the World Health Organization.