

# Sterilization of non-invasive CPAP ventilator in resource poor areas

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**Introduction:** As per worldometer report of SARS-CoV-2, as of 1st April 2020, there are 875,474 reported confirmed cases of COVID-19 and 43,459 deaths [1]. WHO is working to increase access to life-saving goods, including PPE, diagnostics, medical oxygen, ventilators and more [2].

In this situation we are working on a concept for non-invasive continuous positive airway pressure (CPAP) ventilator that can be made from household parts this to reduce cost an increase availability. Please note this is NOT an FDA approved device and use of this concept in any jurisdiction must follow that jurisdictions rules, guidelines and laws on approved medication devices.

The reader should note without proper sterilization, person-person transmission of SARS-COV2 and other pathogens may occur [3].

In this report we are considering the sterilization methods which can be done in generally poor resource settings of the non-Western world where use of such a home-made CPAP device might be contemplated.

**Methods:** Several studies recommend that using 6% dry mist of hydrogen peroxide for 30 minutes can decontaminate the certain smaller parts of medical device equipment that could not be soaked in liquids (e.g. CPAP mask, air-pump) [4,6]. A gas sealed jar can decontaminate the instrument. The hydrogen peroxide liquid (6%) will be poured earlier in the jar. Then another perforated hanging basket or sack will hold the contaminated items. The items then put in to the jar which will be sealed for 30 minutes (Fig. 1). After that all items will be sterilized.

It should be noted here that the used CPAP masks should be decontaminated to save the health care worker and other relatives who is attending the patient. Also, it is necessary to stop the germs spreading in the environment. There is no published report whether reuse of CPAP masks spared the germs to others. In this situation we recommend **NOT** to reuse the same CPAP mask on different patients. Furthermore CPAP masks with built-in exhaust valve and/or filter must be used.

The solid part of the ventilator equipment which can be soaked (CPAP reservoir, canister, CPAP pump, CPAP piping), can be decontaminated easily with immersing these objects in a 1:50 dilution of 5.25% sodium hypochlorite (household bleach) (for 3 minutes) [4]

Usually hydrogen peroxide is very cheap. A gallon (3.8 liters) of 35% food grade hydrogen peroxide is maybe in the range of \$55 to \$75[4]. To get a 6% solution it can be dilute approximately 1:7 times.

It is important that prior to CPAP ventilator cleaning and prior to COVID patient care healthcare worker must maintain proper personal protective equipment to maintain their personal hygiene as per WHO and CDC guideline [8,9]



Gas sealed jar



Perforated bag



Sieve container

Figure 1. Gas sealed containers and related materials. 6% hydrogen peroxide will be poured in the gas sealed metal jar (A). A porous metal small bucket (B) will be overturned to hold the perforated bag or sieve container. All contaminated materials in a porous sieve container will be put at the bottom of the porous bucket in the gas sealed jar. The lid of the gas sealed jar will be fixed tightly and kept for 30 minutes. After that the materials in the bag will have gone through H<sub>2</sub>O<sub>2</sub> sterilization. All metallic materials shall (e.g. item (A) or item (B)) above shall be boiled and/or autoclaved between subsequent uses. Porous sieve container must follow jurisdiction specific biological material disposal process

**Conclusion:** Knowledge about good hygiene and infection control concerning reusable medical equipment are limited. This situation may be critical for the family, patient, health care workers and the environment [5]. In addition to biological materials like excretions, secretions and residual blood products from the patient, if not cleaned and decontaminated infection may transmit between patient to patient. Proper personal hygiene of healthcare worker and proper sterilization of medical equipment is a must in modern medicine [6].

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