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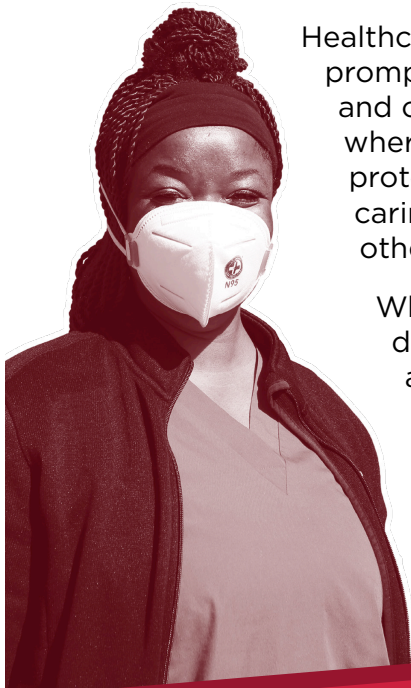
N95 Respirator Decontamination and Reuse is Unsafe

National Nurses United, the largest labor union for registered nurses in the United States, has examined the available evidence and warns that decontaminating and reusing N95 filtering facepiece respirators is unsafe.

Given reports of shortages of personal protective equipment (PPE), many hospitals and other healthcare employers have turned to reusing disposable N95 filtering facepiece respirators, including implementing decontamination methods to reuse respirators multiple times.

NNU has evaluated the available evidence on decontamination methods and determined that NO METHOD IS BOTH SAFE AND EFFECTIVE. For an N95 decontamination method to be safe and effective, it must meet three criteria, (1) it must effectively inactivate the pathogen, (2) it must not degrade the performance of the respirator including filtration, structural integrity, and face seal, and (3) it must not introduce an additional hazard to the worker wearing the respirator.

Employers are legally and morally obligated to provide a safe and healthful workplace to employees. To prevent exposure to and transmission of COVID-19, healthcare employers must implement comprehensive precautions, based on the precautionary principle that states that we do not wait for scientific proof of harm before taking action to protect people's health.



Healthcare employers must implement engineering controls, including prompt screening and isolation procedures, designated COVID-19 units, and converting rooms, units, floors, or entire facilities to negative pressure, where possible. A minimum of N95 filtering face piece respiratory protection must be provided to nurses and other healthcare workers caring for patients with suspected or confirmed COVID-19, in addition to other necessary PPE.¹

Where N95 respirators are not available, employers should turn to PPE designed to be reusable and decontaminated safely, including powered air-purifying respirators (PAPRs) and elastomeric respirators.²

Below is a summary of NNU's research on decontamination methods for N95 filtering facepiece respirators. No decontamination method is both safe and effective.

#ProtectNurses #COVID19



Ultraviolet germicidal irradiation (UVGI or UV):

- UVGI may not effectively inactivate pathogens because UV radiation does not penetrate the filter media and only decontaminates the surface of the respirator.
- Studies show that UVGI treatment can degrade the filtration ability and structural integrity of N95 respirators, degradation of straps.^{3,4}
- Therefore, this method is unsafe.

Microwave oven:

- Studies have found that microwave ovens can melt materials on respirators including straps, delaminating nose foams.^{5,6}
- Therefore, this method is unsafe.

Bleach:

- Chlorine gas was found to off-gas from bleach-decontaminated respirators when rehydrated with deionized water.⁷ Breathing chlorine gas can result in irritation, changes in breathing rate and coughing, and damage to the lungs.⁸
- Therefore, this method is unsafe.

Ethylene oxide:

- Ethylene oxide is a known carcinogen.⁹ Studies cannot rule out the potential for off-gassing, which would be extremely hazardous.
- Therefore, this method is unsafe.

Vaporized hydrogen peroxide:

- Breathing in hydrogen peroxide can cause upper airway irritation, hoarseness, shortness of breath, and a sensation of burning or tightness in the chest. Exposure to high concentrations can cause severe mucosal congestion of the trachea and bronchi and delayed accumulation of fluid in the lungs. Prolonged dermal exposure can cause irritation and temporary bleaching of skin and hair.¹⁰ Studies cannot rule out the potential for off-gassing, which would be extremely hazardous.
- Therefore, this method is unsafe.

Moist heat/steam:

- One study found that moist heat/steam resulted in nose clips and staples melting surrounding plastic, delaminated nose foams, and degradation of strap elasticity.¹¹

- Therefore, this method is unsafe.

Ionizing radiation:

- Studies have found that ionizing radiation can significantly damage filter media.¹²
- Therefore, this method is unsafe.

NNU found consistent issues in the available evidence on decontamination methods for N95 filtering facepiece respirators:

- Many studies did not evaluate the ability of the decontamination method to inactivate pathogens.
- Many studies did not evaluate the effectiveness of the decontamination method on all surfaces (e.g., examined impact on filter only and not straps and nose piece). Many studies examined impact on outside of respirator only.
- Many studies did not evaluate the impact of the decontamination method on all aspects important to respirator function- filtration, structural integrity, AND face seal.

Endnotes

- 1 For more information, please see "What Your Employers Should Provide: Protections at Work for COVID-19," National Nurses United, online at <https://www.nationalnursesunited.org/california-nurses-know-your-rights-protections-work-covid-19-0>.
- 2 The U.S. Occupational Safety and Health Administration wrote in their guidance document that "when disposable N95 filtering facepiece respirators are not available, consider using other respirators that provide greater protection and improve worker comfort," including "a R/P95, N/R/P99, or N/R/P100 filtering facepiece respirator; an air-purifying elastomeric (e.g., half-face or full-face) respirator with appropriate filters or cartridges; powered air purifying respirator (PAPR) with high-efficiency particulate arrestance (HEPA) filter; or supplied air respirator (SAR)." U.S. Occupational Safety and Health Administration (2020), "Guidance on Preparing Workplaces for COVID-19," online at <https://www.osha.gov/Publications/OSHA3990.pdf>.
- 3 Lindsley, William G. et al (2015), "Effects of Ultraviolet Germicidal Irradiation (UVGI) on N95 Respirator Filtration Performance and Structural Integrity," *J Occup Environ Hyg*, 12(8): 509-17. Online at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4699414/>.
- 4 Results from 3M study, reported in 3M Technical Bulletin (March 2020), "Disinfection of Filtering Facepiece Respirators," online at <https://multimedia.3m.com/mws/media/18165760/disinfection-of-disposable-respirators-technical-bulletin.pdf>.
- 5 Viscusi, DJ et al (2009), "Evaluation of five decontamination methods for filtering facepiece respirators," *Ann Occup Hyg*, 53(8): 815-27. Online at <https://www.ncbi.nlm.nih.gov/pubmed/19805391>.
- 6 3M Technical Bulletin (March 2020).
- 7 Viscusi, DJ et al (2009).
- 8 U.S. Agency for Toxic Substances & Disease Registry (Nov 2010), "Toxic Substances Portal- Chlorine," online at <https://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=200&tid=36>.
- 9 U.S. Agency for Toxic Substances & Disease Registry (March 3, 2011), "Toxic Substances Portal- Ethylene Oxide," online at <https://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=133>.
- 10 U.S. Agency for Toxic Substances & Disease Registry (Oct 21, 2014), "Toxic Substances Portal- Hydrogen Peroxide," online at <https://www.atsdr.cdc.gov/MMG/MMG.asp?id=304&tid=55>.
- 11 3M Technical Bulletin (March 2020).
- 12 3M Technical Bulletin (March 2020).