Best practice is to use new N95s. Decontamination does not solve the PPE shortage crisis, and is an emergency practice to be considered during the COVID-19 pandemic. Efficacy and safety of N95 decontamination has not been fully characterized.

**COVID N95 DECON & REUSE**

### CORONAVIRUS INACTIVATION

| + | • 70°C dry heat for 60min inactivated*  
• SARS-CoV-2 on N95 under lab conditions |
| ? | • 50–85% humidity enhances inactivation of flu virus (non-CoV) on N95 and metal\(^2\)–\(^4\) |
| - | • Real-world conditions (e.g. saliva, mucus droplets) may require higher temperature, humidity, or longer time.  
• SARS-CoV-2 NOT inactivated by 70°C dry heat for 30min (on N95) and 60min (on metal\(^1\))  
• Method does NOT inactivate all bacterial or mold spores on N95\(^5\) |

\(* \geq 3\)-log inactivation

### N95 MASK INTEGRITY

| + | • Several 3M N95 models (1860, 8210, 8210+) keep fit and filtration for multiple 30min cycles at 70–85°C and >50% humidity\(^6,7\) |
| ? | • Many models (e.g., 3M 8200, 3M 8511) keep fit performance for multiple 30min cycles at 75°C dry heat\(^8,9\) |
| - | • Each N95 model responds differently to heat; many have not been tested with the heating conditions above\(^1,10\)  
• Repeated thermal cycles may damage N95 fit and filtration\(^1,10,11\) |

### RISKS

Heat inactivation is **highly sensitive** to temperature, humidity, time, surface, and co-contaminants.

N95 fit and filtration may be damaged if the temperature is too high or after multiple cycles.

N95 will NOT be sterilized by the heat & humidity treatments listed above.

### IMPLEMENTATION

| + | • CDC released guidance on heat+humidity for N95 decontamination\(^12\)  
• Many devices can maintain 70–80°C, 50–85% humidity (warming cabinets, water baths, autoclaves, ovens) |
| ? | • Method has not been validated in an FDA-approved process |

### CONCLUSION

Heat and humidity for N95 decontamination requires further investigation for inactivation of SARS-CoV-2. Its use should be evaluated by relevant authorities. This is a low-cost technique that could be easy to implement in a wide range of settings. However, excessive heating or multiple thermal cycles may damage N95 fit and filtration. Moreover, this approach will NOT protect against all bacterial and mold co-infection risks. If risks are mitigated, this protocol merits future FDA feasibility studies.

**SUPPORTING RESEARCH**  
\(^{1}+\) Fischer et al., 2020; \(^{2}+\) Bergman et al., 2010; \(^{3}\) Lore et al., 2012; \(^{4}\) McDevitt et al., 2010; \(^{5}\) Rodriguez-Palacios & LeJeune, 2011; \(^{6}\) Anderberg et al., 2020; \(^{7}\) Massey et al., 2020; \(^{8}\) Price et al., 2020; \(^{9}\) Viscusi et al., 2009; \(^{10}\) Viscusi et al., 2011; \(^{11}\) + 3M 2020, \(^{12}\) Bergman et al., 2012; \(^{13}\) CDC, 2020

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COVID N95 DECON & REUSE

UNPROVEN METHODS

Autoclave

- Standard autoclave cycle (121°C steam, 15 min) inactivates SARS-CoV-2 on N95
- Autoclave is an accepted means of sterilization in hospital setting
- Many pleated N95 models (3M 1870, 1804S, 1862+, 9211; Aearo 1054S) pass quantitative fit test for 5 autoclave cycles
- Common molded N95 models (3M 1860, 8210, 8000) known to fail after 1-2 cycles of autoclave treatment
- There are few studies on N95 filtration efficiency after autoclave treatment
- Different N95 models may respond differently to autoclave cycle

Microwave-Generated Steam

- 2 minutes above water reservoir in 1250 W microwave inactivates H1N1 and H5N1 flu (non-coronavirus) on N95
- No data on MGS inactivation of coronaviruses on N95
- Most common N95 models shown to withstand at least one 2-min MGS treatment, several models withstand up to 3 cycles
- Possibility of N95 damage beyond three cycles
- Few studies on N95 durability under more than one repeated decontamination cycle
- Some N95 models destroyed by 2-min microwave without steam
- Metal components of N95 may present sparking hazard

UNSUITABLE METHODS

Home Oven

- Bringing potentially biohazardous materials home is highly dangerous and carries significant contamination risk

SUPPORTING RESEARCH


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