

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



HEAT & HUMIDITY

CORONAVIRUS INACTIVATION

Data not available for COVID-19 on N95s



- 60°C-75°C for 30min inactivates related coronaviruses in solution¹-5
- 70°C at 85% humidity for 30min inactivates H1N1 and H5N1 flu (non-coronavirus) on N95^{6,7}



 Method does NOT inactivate all bacterial or mold spores on N95



No data on heat inactivation of coronaviruses on N95s

N95 MASK INTEGRITY



- N95 keeps filter performance at 5 cycles of 60°C heat, 80% humidity⁸
- N95 shown to keep proper seal after 1 cycle at 65°C, 85% humidity⁶



 Repeated thermal cycles may damage N95 fit and filtration^{8,9}



 Different N95 makes and models may respond differently to heat⁹

KEY CONSIDERATIONS

Data from tests on specific N95 models may not apply to other models

N95s should be isolated and returned to original user

N95 user seal check should be performed before each reuse

RISKS

Untested protocol - virus may survive if temperature, humidity, or duration is too low

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

N95 will NOT be sterilized by low heat and humidity

IMPLEMENTATION



- CDC has released guidance on heat and humidity for decontaminating N95s¹⁰
- Many devices can maintain 65-80°C, 50-85% humidity (warming cabinets, water baths, autoclaves, ovens)

CONCLUSION



· Method has not been validated in an FDA-approved process

Heat and humidity for N95 decontamination is currently unproven 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 thermal cycling 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] Darnell et al., 2006; [2] Darnell & Taylor, 2004; [3] Rabenau et al., 2005; [4] Duan et al., 2003; [5] Pagat et al., 2007; [6] Helmbuch et al., 2011; [7] Lore et al., 2012; [8] 3M, 2020; [9] Viscusi et al., 2009; [10] CDC, 2020

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COVID N95 DECON & REUSE



uv-c

Use appropriate UV-C source
Use sensor to validate 1 J/cm² dose
Expose both sides of N95 mask

CORONAVIRUS INACTIVATION

Data not available for COVID-19



- ≥1 J/cm² of UV-C inactivates viruses similar to SARS-CoV-2 on N95s^{1,2,3}
- ≥1J/cm² of UV-C kills Bacillus subtilis spores on N95s⁴
- UV-C light may not reach inner N95 layers for all N95 models⁵
- Straps may not be fully decontaminated by UV-C alone
- Shadowing blocks UV-C rays & can leave parts of N95 contaminated

N95 MASK INTEGRITY



- N95 keeps fit and filter performance after 10-20 cycles of 1-1.2 J/cm² UV-C²
- _
- Some damage to N95 seen at high UV-C doses (≥120 J/cm²)⁶
- Strap and facepiece damage seen on some N95 models after UV-C⁷

KEY CONSIDERATIONS

Ensure accurate UV-C dose on front and back of N95

Measure dose at N95 surface with calibrated sensor

Keep N95s separate and return to original users

Perform user seal check before each reuse

Be aware that data from tests on specific N95 models may not apply to other models

RISKS

Residual contamination may remain on N95 straps and may need to be separately wiped with disinfectant

Consumer UV products are not recommended for N95 decontamination

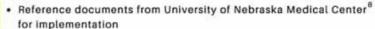
If UV-C source is underpowered, decontamination timescales may be infeasible

UV-C may not decontaminate N95 straps or eliminate risk of bacterial co-infection

Makeup and sunscreen on N95 may reduce decontamination efficacy

IMPLEMENTATION







 Validate each UV-C source and protocol with a UV-C sensor to ensure adequate dose for decontamination at the N95 surface

CONCLUSION

if implemented properly using sensors to ensure ≥1J/cm² UV·C dose to the N95, this method likely inactivates SARS-CoV-2; however, this has not yet been confirmed directly with SARS-CoV-2. This method may protect against some bacterial co-infection risks but not all.

SUPPORTING RESEARCH

Mills et al., 2018; (2) Helmbuch & Harnish, 2019; (3) Lore et al., 2012; (4) Lin et al., 2018; (5) Fisher and Shaffer, 2010;
 Lindsley et al., 2015; (8) Personal Safety Division, 3M, 2020; (9) Lowe et al., 2020

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