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

UV-C

Use appropriate UV-C source

Validate 1.0 J/cm^2 dose with sensor

Expose both sides of N95 mask

CORONAVIRUS INACTIVATION

Peer-reviewed data not available for SARS-CoV-2

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- ≥1.0 J/cm^2 of UV-C inactivates* viruses similar to SARS-CoV-2 on N95 FFRs[1,2**,3]
- ≥1.0 J/cm^2 of UV-C yields 2-log reduction of viable *B. subtilis* spores on N95 FFRs[4]

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- UV-C light may not reach inner N95 layers for all N95 models[5]
- Elastic straps require additional chemical disinfection[1]
- Shadows can block UV-C rays & can leave parts of N95 contaminated

** ≥ 3-log inactivation*

N95 INTEGRITY

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- N95 keeps fit and filter performance after 10-20 cycles of 1.0–1.2 J/cm^2 UV-C[2**]

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- Each don/doff can reduce N95 fit; some models fit unacceptably after 5 don/doff cycles[9]
- Some damage to N95 seen at high UV-C doses (≥120 J/cm^2)[6]
- Strap and facepiece damage seen on some N95 models after UV-C[7**]

KEY CONSIDERATIONS

Ensure accurate UV-C dose on all surfaces of N95

Measure dose at N95 surface with UV-C specific sensor

Return N95s to original users and ensure handling minimizes cross-contamination

Perform user seal check before each reuse

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

RISKS

UV light is harmful to eyes and skin; proper training, engineering controls, and PPE are required before use

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

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

Cosmetics and sunscreen on N95 may reduce decontamination efficacy

Non-uniform irradiance can affect dose, and subsequently, decontamination efficacy

IMPLEMENTATION

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- Reference documents from University of Nebraska Medical Center[8] for 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 ≥1.0 J/cm^2 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

[1] Mills et al., 2018; [2] Heimbuch & Harnish, 2019**; [3] Lore et al., 2012; [4] Lin et al., 2018; [5] Fisher and Shaffer, 2010; [6] Lindsley et al., 2015; [7] Personal Safety Division, 3M, 2020**; [8] Lowe et al., 2020; [9] Bergman et al., 2012

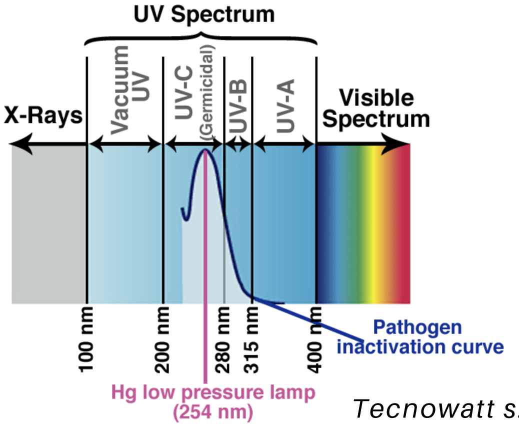
*** = not peer-reviewed*

N95DECON

COVID N95 DECON & REUSE

UV-C RELATED CONCERNS

UNSUITABLE METHODS



Tecnowatt s.r.l.

Only **UV-C light with a peak wavelength of 254 nm** has demonstrated substantial germicidal effects on N95 FFRs.[1]** UV-A (320-400 nm) is not germicidal. UV-B (280-320 nm) has lower germicidal efficiency and has not been validated for N95 FFR decontamination.[2] **Only use UV-C light sources with a peak wavelength of 254 nm.**

✗	Sunlight	Sunlight reaching the Earth's surface does not contain UV-C light;[3] there is no evidence in the peer-reviewed literature to support sunlight-assisted decontamination of N95 FFRs.
✗	Consumer UV Products	Many consumer UV products do not emit UV-C with sufficient irradiance, and have **peak emission in the UV-A range** (e.g., nail polish curing lamps,[4] tanning bed lamps,[5] etc.), which is ineffective for decontamination. Other consumer products may additionally have uniformity or shadowing concerns.
✗	< 200 nm UV Sources	UV sources emitting < 240 nm light can produce ozone, which is hazardous to human health.[6]** Sufficient ventilation is necessary to reduce ozone concentration.[7]
✗	Measuring dose from lamp power	UV-C irradiance should not be calculated from rated lamp power, as bulbs do not have 100% efficiency in converting electrical energy to optical power.[8] Use a **UV-C specific sensor** to measure irradiance at the N95 surface.
✗	Doses for air or surface decon	Viral inactivation protocols designed for surfaces or air are insufficient/not effective for N95 decontamination.[9] Use a substantially higher UV-C dose of 1.0 J/cm^2 at the N95 surface. [1]**
?	Biosafety Cabinets	Many UV-C sources used in research laboratories (e.g., biosafety cabinets) have unacceptable non-uniformity and low power;[10]** thorough characterization of the UV-C dose at the N95 surface is required for sufficient decontamination.

SUPPORTING RESEARCH

[1] Heimbuch & Harnish, 2019**; [2] Kowalski, 2009; [3] Sagripanti and Lytle, 2005; [4] Dowdy & Sayre, 2013; [5] Spencer & Amonette, 1995
[6] Oxidation Technologies LLC, 2017;** [7] McClurkin et al., 2013; [8] Lawal et al., 2017; [9] Walker & Ko, 2007; [10] Card et al., 2020**
** = *not peer-reviewed*

N95DECON