

# ReMASK

An evidence-based method to decontaminate and  
re-use N95 face masks using  
Ultraviolet Germicidal Irradiation

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# Peer-reviewed evidences of UVGI

## UVGI quenches viruses on surfaces of N95 masks

Mills D et al "Ultraviolet germicidal irradiation of influenza-contaminated N95 filtering facepiece respirators."

American Journal of Infection Control 46, no. 7 (2018): e49-e55.

Heimbuch BK et al "A Pandemic Influenza Preparedness Study: Use of Energetic Methods to Decontaminate Filtering Facepiece Respirators Contaminated with H1N1 Aerosols and Droplets", American Journal of Infection Control , 2010;38(1):3–8

## UVGI does not alter usability of N95 masks after many cycles of decon

Viscusi AJ et al. "Impact of Three Biological Decontamination Methods on Filtering Facepiece Respirator Fit, Smell, Comfort, and Donning Ease." Journal of Occupational and Environmental Hygiene, Jan 2011;8(7):426–36.

William G. Lindsley et al "Effects of Ultraviolet Germicidal Irradiation (UVGI) on N95 Respirator Filtration Performance and Structural Integrity", Journal of Occupational and Environmental Hygiene, 12:8, 509-517.

EFFECTIVELY USED AT NEBRASKA UNIVERSITY , USA



# ReMASK - The UV decontamination box



Threshold value

$1 \text{ J/cm}^2$

**Topography of Top Tray with 8 UV-C lamps**  
**UV Intensity (mW/cm<sup>2</sup>)**

Quadrant A				Quadrant B			
A1	A2	A3	A4	B1	B2	B3	B4
0.203	0.266	0.309	0.354	0.347	0.330	0.313	0.279
A5	A6	A7	A8	B5	B6	B7	B8
0.278	0.388	0.481	0.535	0.554	0.496	0.466	0.400
A9	A10	A11	A12	B9	B10	B11	B12
0.355	0.515	0.647	0.721	0.727	0.710	0.679	0.570
A13	A14	A15	A16	B13	B14	B15	B16
0.387	0.595	0.740	0.811	0.836	0.842	0.812	0.703
←----- 310 mm ----->				←----- 310 mm ----->			
Quadrant C				Quadrant D			
C1	C2	C3	C4	D1	D2	D3	D4
0.340	0.507	0.680	0.765	0.773	0.805	0.797	0.719
C5	C6	C7	C8	D5	D6	D7	D8
0.240	0.387	0.546	0.616	0.622	0.675	0.675	0.622
C9	C10	C11	C12	D9	D10	D11	D12
0.183	0.382	0.380	0.419	0.436	0.485	0.482	0.447
C13	C14	C15	C16	D13	D14	D15	D16
0.099	0.148	0.200	0.222	0.348	0.281	0.288	0.271

# UVGI Heat Map

Spearman-Kärber formula

$$\text{UV dose (J/cm}^2\text{)} = \text{Irradiance (W/cm}^2\text{)} \times \text{Time (s)}$$



# Microbiological tests

- Evaluated at NABL Laboratory –
- Anderson Lab, & CMC Vellore



**Certificate of Inactivation of Microorganisms  
Using Ultraviolet Germicidal Irradiation (UVGI)**  
30-May-2020

<b>Name of the Organisation</b>	Sree Renga Hospital
<b>Address</b>	12 Varada Reddy Street, Vedachala Nagar, Chengalpattu, Tamilnadu 603001.
<b>Date of testing</b>	30-May-2020
<b>Test(s) conducted</b>	Inactivation of microorganisms using Ultraviolet Germicidal Irradiation (UVGI).
<b>Samples tested</b>	<ul style="list-style-type: none"> <li>a) E.Coli ATCC 25922 on plate</li> <li>b) Pseudomonas aeruginosa ATCC 27853 on plate</li> <li>c) Spores (Bacillus stearothermophilus) on tube</li> <li>d) E.Coli ATCC 25922 smeared and injected on to the inner and outer surface of an N95 mask – four unique test conditions</li> <li>e) Pseudomonas aeruginosa smeared and injected on to the inner and outer surface of an N95 mask – four unique test conditions.</li> </ul>
<b>Method(s) used</b>	Open plate, Colony count by spread plate technique
<b>Site of testing</b>	Anderson Diagnostic Laboratories, Chennai.
<b>Description of Instrument</b>	The Ultraviolet Decontamination Box, delivering 11/cm <sup>2</sup> of Ultraviolet Germicidal Irradiation (UVGI), custom-designed by Sree Renga Hospital.
<b>Observations</b>	<ul style="list-style-type: none"> <li>a) A 5 log reduction in all the microorganisms tested was recorded.</li> <li>b) The Ultraviolet Germicidal Irradiation (UVGI) process achieved 99.999% reduction in the destruction of the pathogens.</li> <li>c) The Ultraviolet Germicidal Irradiation (UVGI) energy generated by the UV Box is sufficient to destroy 99.999% of the infectious microorganism load.</li> </ul>

  
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 Date : 30.05.2020





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# Process flow to decontaminate and re-use an N95 mask



MSB MASH STERILIZATION REGISTER

Date	Total Mask	Checked	No. of Disinfectant mark	Decont. surface	Start Time	End Time	Total duration
20/10/20	18	✓	1	Outer	07:30:00	08:15:00	45
				Inner	08:15:00	08:30:00	15
20/10/20	14	✓	1	Outer	08:30:00	09:15:00	45
				Inner	09:15:00	09:30:00	15
20/10/20	8	✓	1	Outer	09:30:00	10:15:00	45
				Inner	10:15:00	10:30:00	15
20/10/20	18	✓	1	Outer	09:30:00	10:15:00	45
				Inner	10:15:00	10:30:00	15
20/10/20	13	✓	1	Outer	10:30:00	11:15:00	45
				Inner	11:15:00	11:30:00	15
20/10/20	8	✓	1	Outer	11:30:00	12:15:00	45
				Inner	12:15:00	12:30:00	15
20/10/20	10	✓	1	Outer	12:30:00	01:15:00	45
				Inner	01:15:00	01:30:00	15
20/10/20	7	✓	1	Outer	01:30:00	02:15:00	45
				Inner	02:15:00	02:30:00	15
20/10/20	8	✓	1	Outer	02:30:00	03:15:00	45
				Inner	03:15:00	03:30:00	15
20/10/20	10	✓	1	Outer	03:30:00	04:15:00	45
				Inner	04:15:00	04:30:00	15
20/10/20	10	✓	1	Outer	04:30:00	05:15:00	45
				Inner	05:15:00	05:30:00	15
20/10/20	10	✓	1	Outer	05:30:00	06:15:00	45
				Inner	06:15:00	06:30:00	15
20/10/20	10	✓	1	Outer	06:30:00	07:15:00	45
				Inner	07:15:00	07:30:00	15
20/10/20	10	✓	1	Outer	07:30:00	08:15:00	45
				Inner	08:15:00	08:30:00	15
20/10/20	10	✓	1	Outer	08:30:00	09:15:00	45
				Inner	09:15:00	09:30:00	15



## Efficiency

- Compact
- Non-toxic
- Easy to use, maintain
- Point of Care use, small & large hospitals
- Extensively studied and reported
- Proven decontamination of different microorganisms

## Tangible and intangible results

- Cost savings Rs.1,75,000/- per month
- Cost savings on BMW disposal
- HCW morale ↑
- HCW Absenteeism ↓



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