Electronic Supplementary Material (ESI) for Environmental Science: Water Research & Technology.

Supplementary Material

Table S1. Irradiance measured at various distances between the UV light source and disinfection surface.

Distance Between Light Source and Disinfection Surface (cm)	**Irradiance ($W\ m^{-2}$)**
78	26.34
68	32.24
58	34.45
48	42.48
38	54.59
28	66.49

Table S2. Results of the first round of experiments for validation of the UV reactor using *E. coli* at a lamp distance of 78 cm from the samples.

Sample type	Respirator layer	Replicate	UV cycle	UV Fluence (mJ cm^{-2})	Dilution used	Colonies counted	CFU mL^{-1}
UV treated	L1	1	90 sec	412	Neat	0	< 100
UV treated	L1	2	90 sec	412	Neat	0	< 100
UV treated	L2	1	90 sec	412	Neat	0	< 100
UV treated	L2	2	90 sec	412	Neat	0	< 100
UV treated	L3	1	90 sec	412	Neat	0	< 100
UV treated	L3	2	90 sec	412	Neat	0	< 100
Positive control	L3	1	90 sec	0	10^1	164	1.6×10^5
Positive control	L1	2	90 sec	0	10^2	43	4.3×10^5
UV treated	L1	1	180 sec	824	Neat	0	< 100
UV treated	L1	2	180 sec	824	Neat	0	< 100
UV treated	L2	1	180 sec	824	Neat	0	< 100
UV treated	L2	2	180 sec	824	Neat	0	< 100
UV treated	L3	1	180 sec	824	Neat	0	< 100
UV treated	L3	2	180 sec	824	Neat	0	< 100
Positive control	L1	1	180 sec	0	10^2	44	4.4×10^5
Positive control	L3	2	180 sec	0	10^2	66	6.6×10^5
UV treated	L1	1	300 sec	1373	Neat	0	< 100
UV treated	L1	2	300 sec	1373	Neat	0	< 100
UV treated	L2	1	300 sec	1373	Neat	0	< 100
UV treated	L2	2	300 sec	1373	Neat	0	< 100
UV treated	L3	1	300 sec	1373	Neat	0	< 100
UV treated	L3	2	300 sec	1373	Neat	0	< 100
Positive control	L3	1	300 sec	0	10^2	36	3.6×10^5
Positive control	L2	2	300 sec	0	10^2	28	2.8×10^5
Negative control	L2	1	0	0	Neat	0	< 100
Negative control	L3	2	0	0	Neat	0	< 100
Negative control	L1	3	0	0	Neat	0	< 100

Table S3. Results of the first round of experiments for validation of the UV reactor using *S. aureus* at a lamp distance of 78 cm from the samples.

Sample type	Respirator layer arrangement	Replicate	UV cycle (s)	UV fluence (mJ cm^{-2})	Dilution	Colonies counted	CFU mL^{-1}
UV treated	Type A	1	600	2746	Neat	0	< 100
UV treated	Type A	2	600	2746	Neat	0	< 100
UV treated	Type B	2	600	2746	Neat	11	1.1×10^3
UV treated	Type C	1	600	2746	Neat	42	4.2×10^3
UV treated	Type C	2	600	2746	Neat	62	6.2×10^3
UV treated	Type D	1	600	2746	10^2	86	8.6×10^5
UV treated	Type D	2	600	2746	10^2	71	7.1×10^5
Positive control	Type A	1	600	0	10^2	111	1.1×10^6
Positive control	Type A	2	600	0	10^3	22	2.2×10^6
UV treated	Type A	1	180	824	10^2	39	3.9×10^4
UV treated	Type A	2	180	824	10^2	77	7.7×10^4
UV treated	Type B	2	180	824	10^2	73	7.3×10^4
UV treated	Type C	1	180	824	10^2	70	7.0×10^4
UV treated	Type C	2	180	824	10^2	72	7.2×10^4
UV treated	Type D	1	180	824	10^3	82	8.2×10^6
UV treated	Type D	2	180	824	10^4	30	3.0×10^7
Positive control	Type D	1	180	0	10^4	14	1.4×10^7
Positive control	Type D	2	180	0	10^4	13	1.3×10^7
Negative control	Type C	1	0	0	Neat	0	< 100

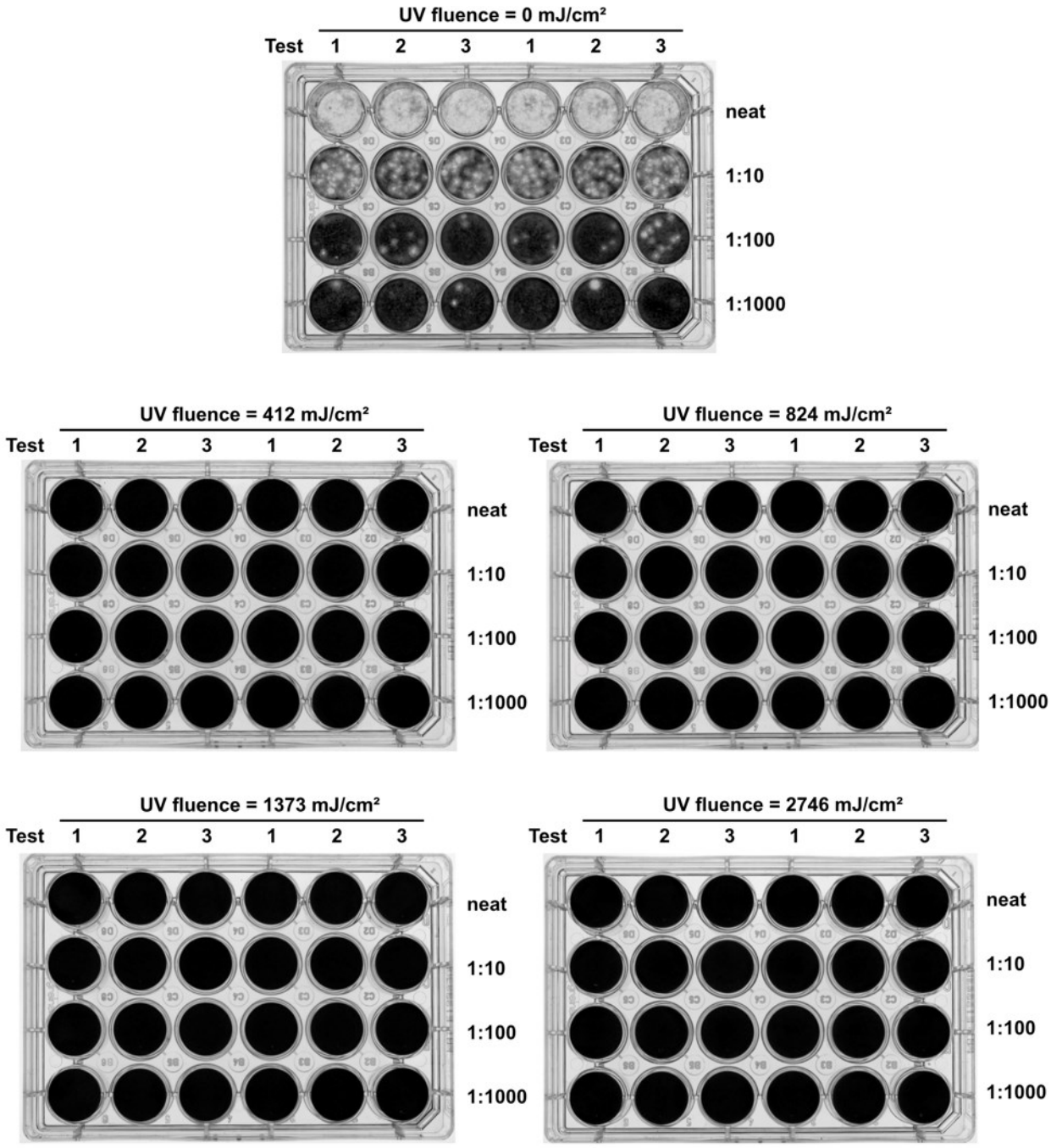


Figure S1. Influenza A virus plaque assays, complete with biological triplicates and technical duplicates. "Neat" means direct infection of MDCK cell monolayers with 120 μL of the 5 mL of media that the N95 respirator coupons were soaked in (picture rendered in greyscale to boost contrast).

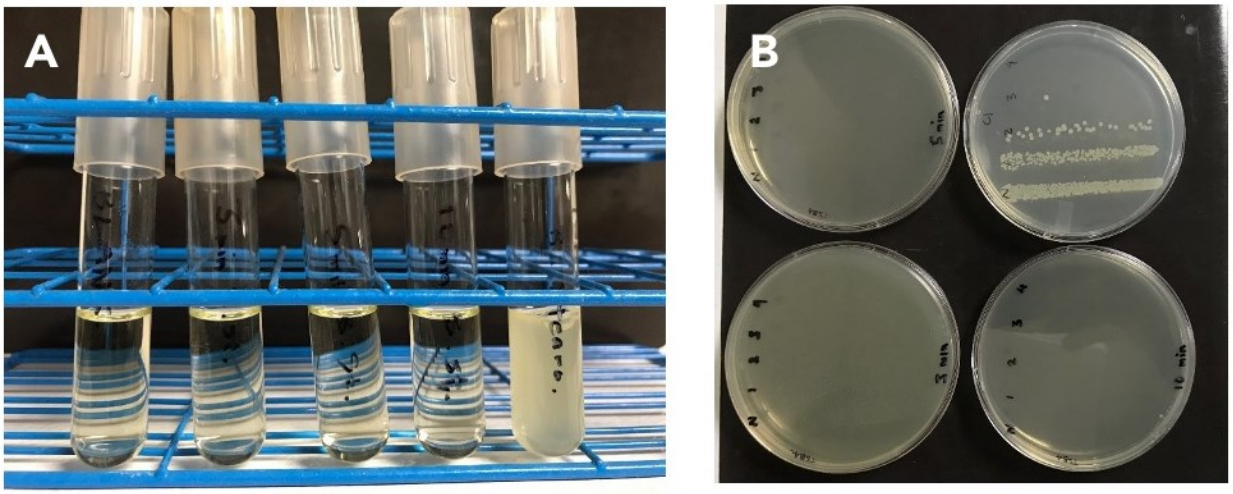
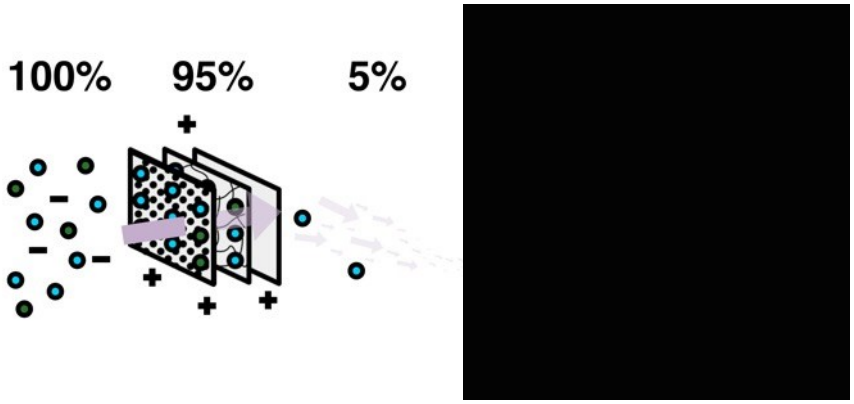


Figure S2. A) G. *stearothermophilus* in liquid broth cultured at 55°C. The tube on the far right is the control sample; its cloudiness indicates bacterial growth. The three middle tubes are the UV-treated samples and the tube on the far left is the blank, all of which are clear, indicating no bacterial growth. B) *G. stearothermophilus* in plates. The plate in the top right corner represents the control sample, which clearly shows bacterial growth. The remaining three plates are UV-treated samples and show no bacterial growth.

Scenario #1: New N95 Mask

- The hydrophobic and electrostatically-charged layers of an N95 respirator successfully prevent penetration of **95%** of ambient particles (**5%** of particles potentially inhaled)



Scenario #2: UV-Disinfected N95 Respirator

- Following UV treatment (3-log reduction), **95%** of particles trapped in respirator material is reduced to ≈**0.095%**
- Due to the nature of electrostatically-charged respirator layers, ***additional*** risk of inhaling particles embedded in respirator layers following UV disinfection is virtually **zero**
- The risk of wearing a UV-treated respirator is comparable to that of wearing a new N95 respirator

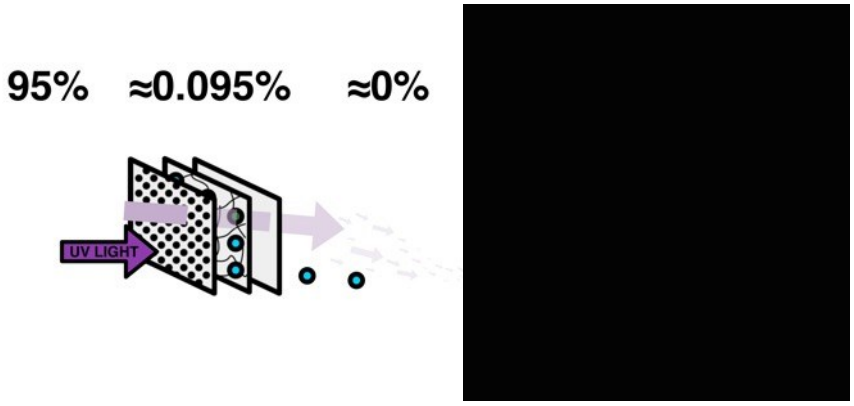


Figure S3. Conceptualization of assessing risk for donning a UV-disinfected N95 respirator.