

1 **Applied and Environmental Microbiology – Supplemental Material**  
 2 **“Airborne disinfection by dry fogging efficiently inactivates SARS-CoV-2,**  
 3 **mycobacteria and bacterial spores and shows the limits of commercial spore carriers**  
 4 **for process control”**

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 6 **Table S1.** Log<sub>10</sub> reduction of infectivity (means with pooled standard deviation) of germ  
 7 carriers coated with microorganisms as 10 µl/cm<sup>2</sup> after aerosolization of variable PAA  
 8 concentrations and 30 min incubation time.

c(PAA) in %	VSIV	SARS- CoV-2	MNV	MS	BS	GS	CSC
<b>0</b>	1.71 ± 0.34	nd	nd	nd	nd	nd	nd
<b>0.0078</b>	3.76 ± 0.47	nd	nd	nd	nd	nd	nd
<b>0.0156</b>	6.34 ± 0.64	3.04 ± 0.44	nd	nd	nd	nd	nd
<b>0.0313</b>	7.19 ± 0.26 <sup>a</sup>	4.60 ± 0.37	3.91 ± 0.28	nd	nd	nd	nd
<b>0.0625</b>	6.61 ± 0.08 <sup>a</sup>	4.68 ± 0.18 <sup>a</sup>	6.09 ± 0.11 <sup>a</sup>	nd	nd	nd	2.01 ± 0.48
<b>0.1250</b>	nd	nd	nd	1.45 ± 1.07	3.03 ± 1.02	2.83 ± 0.90	4.03 ± 0.28
<b>0.2500</b>	nd	nd	nd	1.97 ± 0.33	4.76 ± 0.93	4.65 ± 0.84	5.83 ± 0.13 <sup>a</sup>
<b>0.5000</b>	nd	nd	nd	4.32 ± 0.95	5.50 ± 0.61	4.46 ± 0.75	5.99 ± 0.24 <sup>a</sup>
<b>1.0000</b>	nd	nd	nd	5.98 ± 0.30 <sup>a</sup>	5.46 ± 0.47	5.31 ± 0.60	5.94 ± 0.16 <sup>a</sup>

9 c(PAA), concentration of peroxyacetic acid; VSIV, Indiana vesiculovirus; SARS-CoV-2,  
 10 severe acute respiratory syndrome coronavirus 2; MNV, murine norovirus; MS, *M.*  
 11 *senegalense*; BS, *B. subtilis* spores; GS, *G. stearothermophilus* spores; CSC, commercial  
 12 spore carriers coated with GS spores; <sup>a</sup>, complete inactivation; nd, not done.

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14 **Table S2.** Log<sub>10</sub> reduction of infectivity (means with pooled standard deviation) of germ  
 15 carriers coated with microorganisms as a drop after aerosolization of variable PAA  
 16 concentrations and 30 or 60 min incubation time.

c(PAA) in %	VSIV	SARS- CoV-2	MNV	MS	BS	GS	CSC
<b>0.0625</b>	3.81 ± 0.42	nd	nd	nd	nd	nd	2.01 ± 0.48
<b>0.1250</b>	5.67 ± 0.27	5.05 ± 0.16 <sup>a</sup>	nd	nd	nd	nd	4.03 ± 0.28
<b>0.2500</b>	7.04 ± 0.28 <sup>a</sup>	5.00 ± 0.23 <sup>a</sup>	2.62 ± 0.20	2.62 ± 0.54	3.81 ± 0.77	2.53 ± 0.53	5.83 ± 0.13 <sup>a</sup>
<b>0.5000</b>	7.05 ± 0.25 <sup>a</sup>	nd	4.05 ± 0.30	4.21 ± 0.35	3.52 ± 0.42	3.37 ± 0.36	5.99 ± 0.24 <sup>a</sup>
<b>1.0000</b>	7.42 ± 0.17 <sup>a</sup>	nd	4.57 ± 0.50	4.10 ± 0.63	4.21 ± 0.63	4.42 ± 0.82	5.94 ± 0.16 <sup>a</sup>
<b>2.0000</b>	nd	nd	nd	4.93 ± 0.49	2.73 ± 0.17	3.28 ± 0.35	nd
<b>1.0000<sup>b</sup></b>	nd	nd	nd	nd	5.97 ± 0.64	3.23 ± 0.32	nd
<b>2.0000<sup>b</sup></b>	nd	nd	nd	nd	nd	5.72 ± 0.24	nd

17 c(PAA), concentration peroxyacetic acid; VSIV, Indiana vesiculovirus; SARS-CoV-2, severe  
 18 acute respiratory syndrome coronavirus 2; MNV, murine norovirus; MS, *M. senegalense*; BS,  
 19 *B. subtilis* spores; GS, *G. stearothermophilus* spores; CSC, commercial spore carriers coated  
 20 with GS spores; <sup>a</sup>, complete inactivation; <sup>b</sup>, 60 min incubation time; nd, not done.

21 **Table S3.** Log<sub>10</sub> reduction of infectivity (means with pooled standard deviation) of germ  
 22 carriers coated with microorganisms as a 10 µl/cm<sup>2</sup> smear after aerosolization of 1.223% HP  
 23 or 0.25% PAA and 1.223% HP.

	1.223% HP	0.25% PAA/1.223% HP
<b>VSIV</b>	6.84 ± 0.22 <sup>a</sup>	6.90 ± 0.11 <sup>a</sup>
<b>MNV</b>	4.67 ± 0.48	6.04 ± 0.20 <sup>a</sup>
<b>MS</b>	0.28 ± 0.79	1.97 ± 0.33
<b>BS</b>	-0.03 ± 0.15	4.76 ± 0.93
<b>GS</b>	0.70 ± 0.25	4.65 ± 0.84

24 VSIV, Indiana vesiculovirus; MNV, murine norovirus; MS, *M. senegalense*; BS, *B. subtilis*  
 25 spores; GS, *G. stearothermophilus* spores; <sup>a</sup>, complete inactivation.

26 **Table S4.** Log<sub>10</sub> reduction of infectivity as mean and standard deviation (SD) of germ carriers  
 27 with surface temperature (mean and SD) at distinct locations in an animal and necropsy  
 28 room after aerosolization of 1.20%/5.86% PAA/HP.

GC	VSIV	MNV	MS	BS	T in °C
1	6.33 ± 0.29 <sup>a</sup>	5.39 ± 0.10 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	21.27 ± 0.12
2	6.33 ± 0.29 <sup>a</sup>	5.72 ± 0.54 <sup>a</sup>	5.15 ± 1.41	6.27 ± 0.09 <sup>a</sup>	21.27 ± 0.23
3	6.33 ± 0.29 <sup>a</sup>	5.72 ± 0.54 <sup>a</sup>	6.16 ± 0.54	6.27 ± 0.09 <sup>a</sup>	21.50 ± 0.36
4	7.00 ± 0.29 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	2.26 ± 0.50	6.27 ± 0.09 <sup>a</sup>	33.13 ± 0.31
5	6.33 ± 0.29 <sup>a</sup>	5.72 ± 0.54 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	23.47 ± 0.31
6	6.33 ± 0.29 <sup>a</sup>	5.72 ± 0.54 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	20.97 ± 0.21
7	6.33 ± 0.29 <sup>a</sup>	6.05 ± 0.48 <sup>a</sup>	6.23 ± 0.41	6.27 ± 0.09 <sup>a</sup>	21.30 ± 0.26
8	6.33 ± 0.29 <sup>a</sup>	5.72 ± 0.54 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	21.43 ± 0.21
9	6.33 ± 0.29 <sup>a</sup>	6.05 ± 0.63 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	21.43 ± 0.32
10	7.33 ± 0.29 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	4.56 ± 2.00	6.27 ± 0.09 <sup>a</sup>	33.67 ± 0.61
11	7.00 ± 0.29 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	5.86 ± 0.93	6.27 ± 0.09 <sup>a</sup>	29.30 ± 0.44
12	7.00 ± 0.29 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	22.40 ± 0.20
13	6.66 ± 0.50 <sup>a</sup>	5.72 ± 0.54 <sup>a</sup>	6.26 ± 0.37	6.27 ± 0.09 <sup>a</sup>	22.53 ± 0.12
14	6.66 ± 0.50 <sup>a</sup>	5.72 ± 0.54 <sup>a</sup>	5.45 ± 1.17	6.27 ± 0.09 <sup>a</sup>	21.97 ± 0.15
15	6.66 ± 0.50 <sup>a</sup>	6.05 ± 0.63 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	22.70 ± 0.46
16	6.33 ± 0.29 <sup>a</sup>	5.39 ± 0.10 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	22.57 ± 0.21
17	6.33 ± 0.29 <sup>a</sup>	5.39 ± 0.10 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	22.57 ± 0.35
18	6.33 ± 0.29 <sup>a</sup>	6.05 ± 0.63 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	21.77 ± 0.25
19	6.66 ± 0.50 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	4.47 ± 1.82	6.27 ± 0.09 <sup>a</sup>	29.07 ± 0.51
20	7.00 ± 0.29 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	5.80 ± 1.16	6.27 ± 0.09 <sup>a</sup>	30.00 ± 0.50
21	7.00 ± 0.29 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	30.07 ± 0.61
22	6.33 ± 0.29 <sup>a</sup>	5.72 ± 0.54 <sup>a</sup>	2.06 ± 0.50	6.27 ± 0.09 <sup>a</sup>	22.37 ± 0.15
23	6.66 ± 0.50 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	2.83 ± 1.52	6.27 ± 0.09 <sup>a</sup>	34.77 ± 0.55
24	6.33 ± 0.29 <sup>a</sup>	5.39 ± 0.10 <sup>a</sup>	6.02 ± 0.77	6.27 ± 0.09 <sup>a</sup>	21.10 ± 0.20
25	6.66 ± 0.50 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	6.23 ± 0.41	6.27 ± 0.09 <sup>a</sup>	21.47 ± 0.25
26	7.00 ± 0.29 <sup>a</sup>	6.39 ± 0.10 <sup>a</sup>	6.49 ± 0.09 <sup>a</sup>	6.27 ± 0.09 <sup>a</sup>	21.60 ± 0.20
27	6.66 ± 0.50 <sup>a</sup>	6.05 ± 0.48 <sup>a</sup>	6.19 ± 0.48	5.97 ± 0.43	20.53 ± 0.35
28	6.33 ± 0.29 <sup>a</sup>	6.05 ± 0.48 <sup>a</sup>	6.39 ± 0.15	6.11 ± 0.19	21.93 ± 0.12

29 GC, germ carrier location; VSIV, Indiana vesiculovirus; MNV, murine norovirus; MS,  
 30 *Mycobacterium senegalense*; BS, *Bacillus subtilis*; GS, *Geobacillus stearothermophilus*; T,  
 31 temperature; <sup>a</sup>, complete inactivation (differences within columns resulting from variable  
 32 cytotoxic effects).

33 **Table S5.** Log<sub>10</sub> reduction of infectivity as mean and standard deviation (SD) of exposed germ  
 34 carriers with surface temperature (mean and SD) at distinct locations in a BSL-4 laboratory  
 35 suite after aerosolization of 0.5%/2.44% PAA/HP.

GC	VSIV	MNV	MS	BS	GS	T in °C
1	6.66 ± 0.33 <sup>a</sup>	5.33 ± 0.00 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.24 ± 0.43	23.03 ± 0.74
2	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.27 ± 0.50
3	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.27 ± 0.47
4	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	23.70 ± 0.70
5	6.66 ± 0.34 <sup>a</sup>	5.33 ± 0.00 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	23.90 ± 0.17
6	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	23.70 ± 0.10
7	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.60 ± 0.19	22.67 ± 0.55
8	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.07 ± 0.73	23.93 ± 0.29
9	6.66 ± 0.34 <sup>a</sup>	6.33 ± 0.00 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	5.34 ± 1.26	6.63 ± 0.24 <sup>a</sup>	26.63 ± 1.46
10	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	25.80 ± 0.00
11	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.06 ± 0.45	6.08 ± 0.04 <sup>a</sup>	6.44 ± 0.09	25.77 ± 0.21
12	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	5.72 ± 0.60	6.63 ± 0.24 <sup>a</sup>	26.13 ± 0.35
13	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.97 ± 0.15
14	6.66 ± 0.34 <sup>a</sup>	6.33 ± 0.00 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	5.80 ± 0.46	6.63 ± 0.24 <sup>a</sup>	33.00 ± 0.70
15	6.66 ± 0.34 <sup>a</sup>	5.33 ± 1.00	6.00 ± 0.55	1.65 ± 0.22	4.48 ± 0.23	52.40 ± 3.34
16	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	5.99 ± 1.23	23.80 ± 0.56
17	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.22 ± 0.17	5.05 ± 1.77	6.63 ± 0.24 <sup>a</sup>	22.13 ± 1.33
18	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	5.72 ± 0.60	6.63 ± 0.24 <sup>a</sup>	24.53 ± 0.55
19	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	21.30 ± 0.36
20	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.09 ± 0.40	4.98 ± 1.88	6.63 ± 0.24 <sup>a</sup>	33.40 ± 0.53
21	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.70 ± 0.36
22	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.63 ± 0.21
23	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	5.51 ± 1.43	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.10 ± 0.36
24	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	24.33 ± 0.42
25	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.47 ± 0.42
26	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	20.23 ± 0.75
27	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	5.83 ± 0.85	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	24.67 ± 1.21
28	6.66 ± 0.34 <sup>a</sup>	5.33 ± 0.00 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	20.60 ± 0.20
29	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.07 ± 0.25
30	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	5.58 ± 0.91	6.63 ± 0.24 <sup>a</sup>	22.53 ± 0.25
31	6.66 ± 0.34 <sup>a</sup>	5.66 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.33 ± 0.15
32	6.66 ± 0.34 <sup>a</sup>	6.00 ± 0.58 <sup>a</sup>	6.32 ± 0.02 <sup>a</sup>	6.08 ± 0.04 <sup>a</sup>	6.63 ± 0.24 <sup>a</sup>	22.57 ± 0.31

36 GC, germ carrier location; VSIV, Indiana vesiculovirus; MNV, murine norovirus; MS,  
 37 *Mycobacterium senegalense*; BS, *Bacillus subtilis*; GS, *Geobacillus stearothermophilus*; T,  
 38 temperature; <sup>a</sup>, complete inactivation (differences within columns resulting from variable  
 39 cytotoxic effects).