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Report on the Efficiency of the Cleancare air purification system in the removal of Microbial Contamination from contaminated atmospheres

Introduction ;

The Cleancare Air purification system is a device designed to process the atmosphere of room environments. The nature of this process involves the delivery of Uvc doses and the generation of positively charged ions. Uvc dosing occurs internally within the device while the ions are released into the atmosphere. Uvc doses are capable of killing micro-organisms by alteration of there genetic structure. Positively charged ions can act to precipitate micro-organisms from atmospheric suspension.

In the experiments described below we have estimated and report on the efficiency of the device in the removal of a range of micro-organisms from a contaminated atmospheric environment.

The experiments were conducted in a microbiologically contained space (Volume 100m^3) and the measurement of microbes was conducted by analysis of aspirated volumes of atmosphere over a 120 minute period. Numeric estimates were obtained by conducting colony counts on appropriate agars. All numeric estimates are expressed as Log reduction per cubic Litre of atmosphere .

RESULTS

Table 1
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Aspergillus niger

TIME	Uvc on	Cumulative Log reduction
0	3.9E+07	0.0
10	3.8E+07	0.0
20	7.2E+06	0.7
30	1.1E+05	2.5
40	8.7E+04	2.6
50	4.1E+03	4.0
60	2.8E+03	4.1
70	9.6E+02	4.6
80	4.0E+02	5.0
90	3.7E+02	5.0
100	1.9E+02	5.3
110	1.8E+02	5.3
120	2.1E+02	5.2

Fig 1

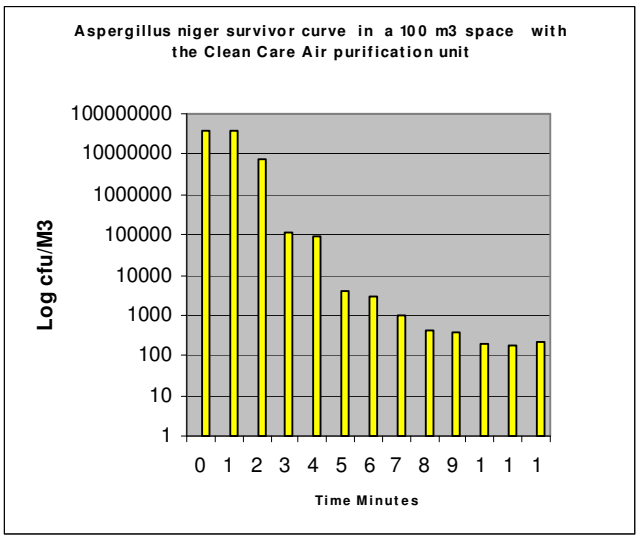

Table 2
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Staphylococcus aureus (MRSA)

TIME	Uvc on	Cumulative Log reduction
0	3.8E+07	0.0
10	1.4E+07	0.4
20	9.2E+06	0.6
30	3.1E+06	1.1
40	7.1E+05	1.7
50	1.9E+05	2.3
60	7.2E+04	2.7
70	3.0E+04	3.1
80	5.5E+03	3.8
90	1.9E+03	4.3
100	4.2E+02	5.0
110	3.0E+02	5.1
120	1.7E+02	5.3

Fig 2

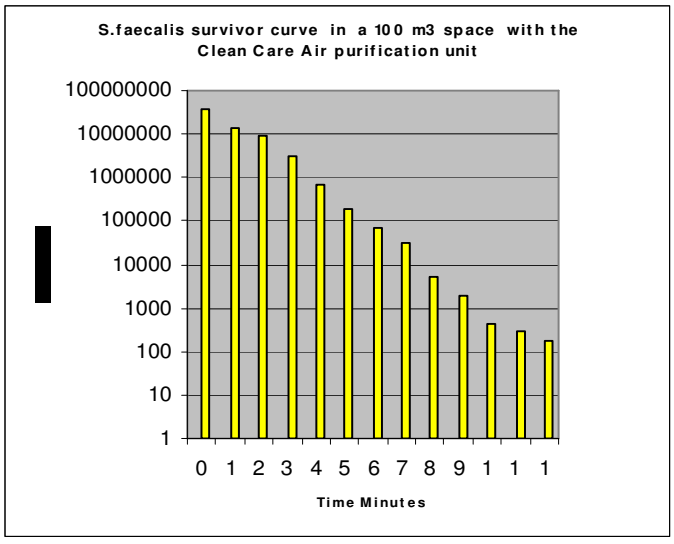

Table 3
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Listeria monocytogenes

TIME	Uvc on	Cumulative Log reduction
0	6.2E+07	0.0
10	5.9E+07	0.0
20	1.4E+07	0.6
30	9.9E+06	0.8
40	7.2E+06	0.9
50	4.2E+04	3.2
60	1.9E+05	2.5
70	5.7E+04	3.0
80	3.2E+04	3.3
90	3.3E+03	4.3
100	6.0E+02	5.0
110	3.4E+02	5.3
120	8.0E+01	5.9

Fig 3

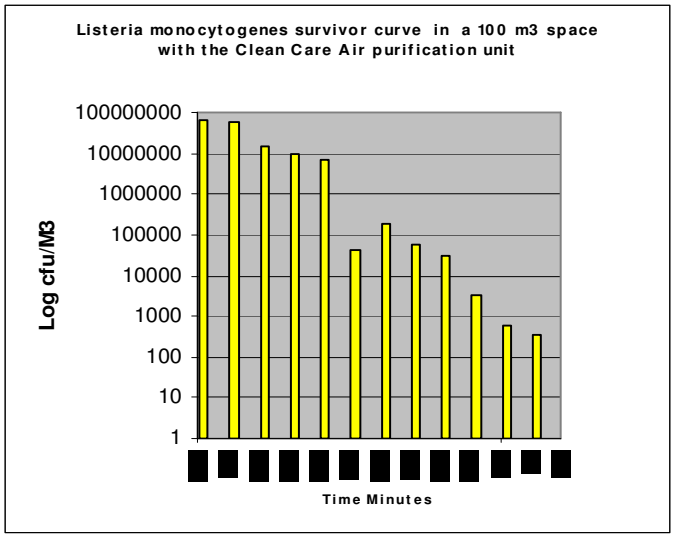

Table 4
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Bacillus cereus

TIME	Uvc on	Cumulative Log reduction
0	3.1E+07	0.0
10	2.8E+07	0.0
20	9.1E+06	0.5
30	3.4E+06	1.0
40	7.2E+05	1.6
50	3.0E+05	2.0
60	9.0E+04	2.5
70	6.2E+04	2.7
80	1.7E+04	3.3
90	8.0E+03	3.6
100	2.0E+03	4.2
110	6.9E+02	4.7
120	4.0E+02	4.9

Fig 4

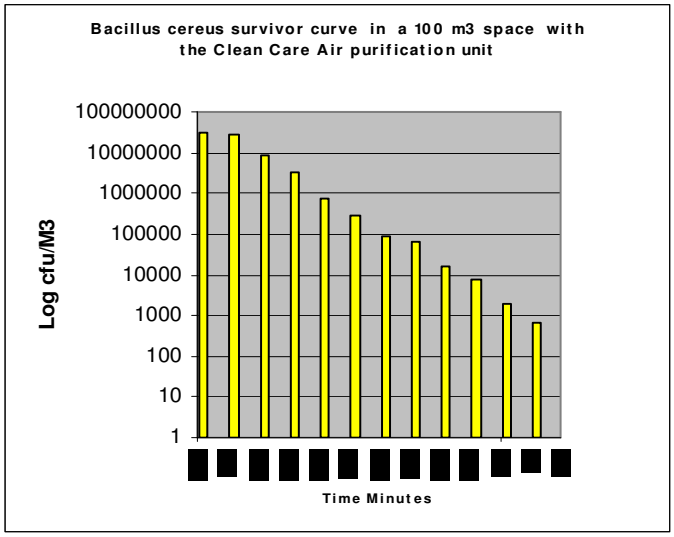

Table 5
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Clostridium difficile spores

TIME	Uvc on	Cumulative Log reduction
0	8.3E+07	0.0
10	7.1E+07	0.1
20	4.2E+07	0.3
30	8.4E+06	1.0
40	5.3E+06	1.2
50	8.9E+05	2.0
60	7.1E+05	2.1
70	1.5E+05	2.7
80	7.2E+04	3.1
90	1.6E+04	3.7
100	8.1E+03	4.0
110	4.7E+03	4.2
120	1.2E+03	4.8

Fig 5

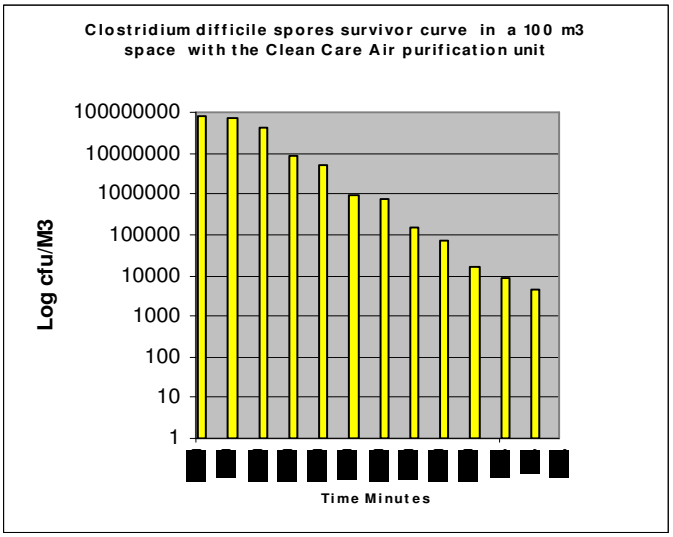

Table 6
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Salmonella Phage type 4

TIME	Uvc on	Cumulative Log reduction
0	5.2E+07	0.0
10	4.6E+07	0.1
20	8.1E+06	0.8
30	4.1E+06	1.1
40	5.1E+05	2.0
50	2.8E+05	2.3
60	6.2E+04	2.9
70	2.7E+04	3.3
80	6.8E+03	3.9
90	1.0E+03	4.7
100	3.0E+02	5.2
110	1.1E+02	5.7
120	3.0E+01	6.2

Fig 6

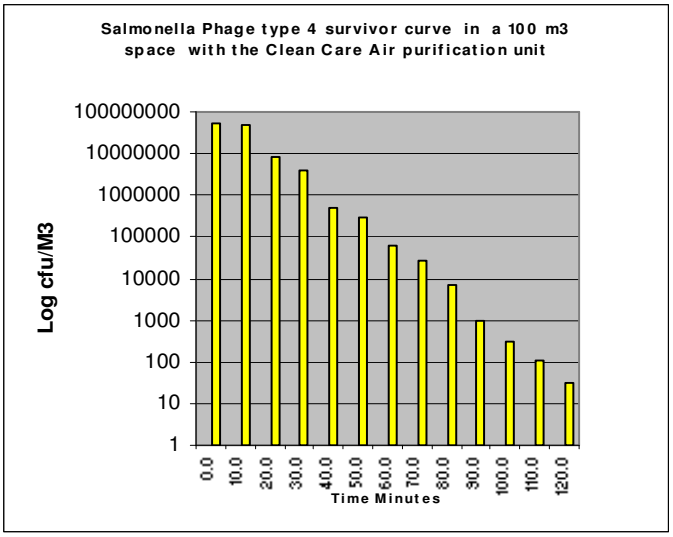

Table 7
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Streptococcus faecalis

TIME	Uvc on	Cumulative Log reduction
0	4.0E+07	0.0
10	3.7E+07	0.0
20	2.2E+07	0.3
30	7.3E+06	0.7
40	4.1E+06	1.0
50	5.3E+05	1.9
60	2.0E+05	2.3
70	6.2E+04	2.8
80	1.3E+04	3.5
90	6.3E+03	3.8
100	7.8E+02	4.7
110	4.4E+02	5.0
120	9.0E+01	5.6

Fig 7

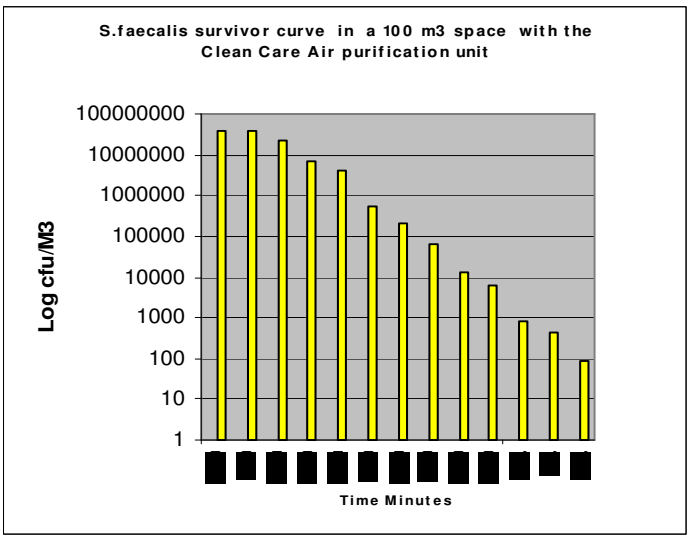

Table 8
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Neurospera sitophila

TIME	Uvc on	Cumulative Log reduction
0	5.3E+07	0.0
10	2.6E+07	0.3
20	2.1E+07	0.3
30	8.4E+06	0.7
40	3.0E+06	1.2
50	5.1E+05	1.9
60	9.2E+04	2.7
70	8.3E+04	2.7
80	1.2E+04	3.6
90	8.2E+03	3.7
100	1.7E+03	4.4
110	7.0E+02	4.8
120	2.3E+02	5.3

Fig 8

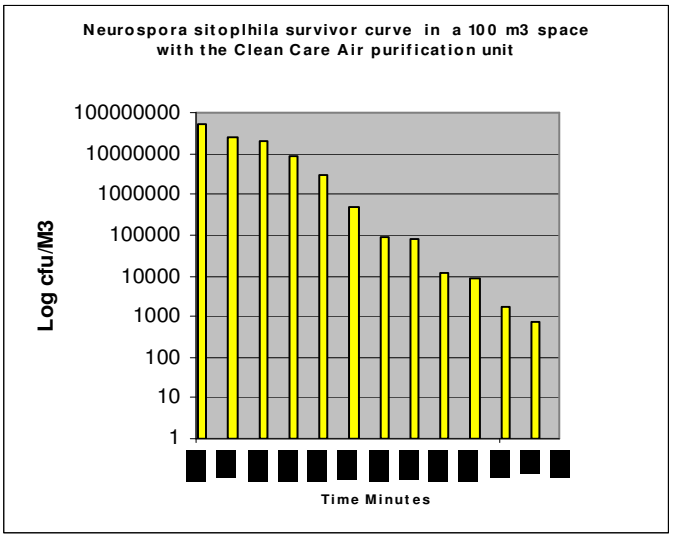

Table 9
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Acinetobacter baumannii

TIME	Uvc on	Cumulative Log reduction
0	3.9E+07	0.0
10	3.8E+07	0.0
20	7.2E+06	0.7
30	1.1E+05	2.5
40	8.7E+04	2.7
50	4.1E+03	4.0
60	2.8E+03	4.1
70	9.6E+02	4.6
80	4.0E+02	5.0
90	3.7E+02	5.0
100	1.9E+02	5.3
110	1.8E+02	5.3
120	8.0E+01	5.7

Fig 9

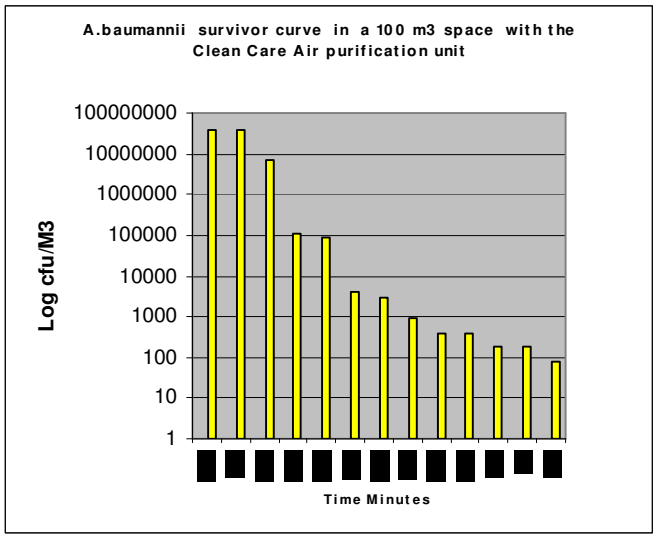

Table 10
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Pesuomonas aeruginosa

TIME	Uvc on	Cumulative Log reduction
0	5.2E+07	0.0
10	5.0E+07	0.0
20	1.3E+07	0.5
30	4.5E+07	0.0
40	2.1E+06	1.3
50	7.3E+05	1.8
60	1.9E+05	2.4
70	7.8E+04	2.8
80	1.0E+04	3.7
90	3.1E+03	4.2
100	8.2E+02	4.7
110	5.1E+02	4.9
120	2.8E+02	5.2

Fig 10

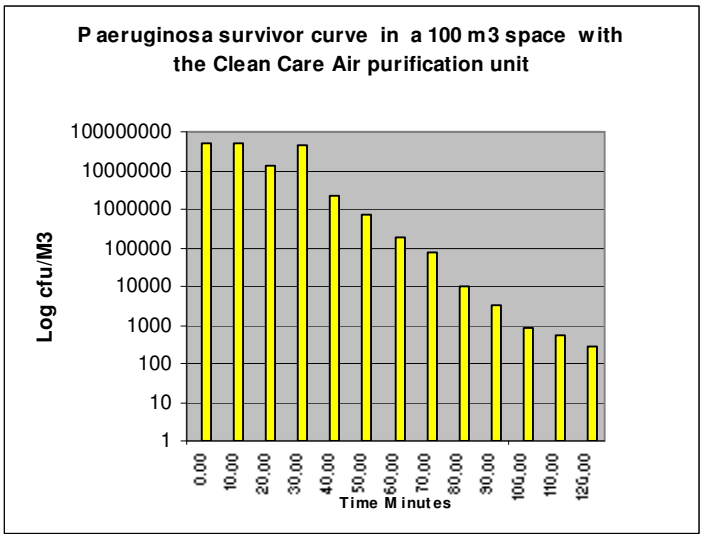

Table 11
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with E.coli 0157

TIME	Uvc on	Cumulative Log reduction
0	6.2E+07	0.0
10	2.9E+07	0.3
20	1.3E+07	0.7
30	4.2E+06	1.2
40	1.3E+06	1.7
50	8.2E+05	1.9
60	1.1E+05	2.8
70	7.2E+04	2.9
80	6.2E+03	4.0
90	2.1E+03	4.5
100	7.4E+02	4.9
110	2.9E+02	5.3
120	1.3E+02	5.7

Fig 11

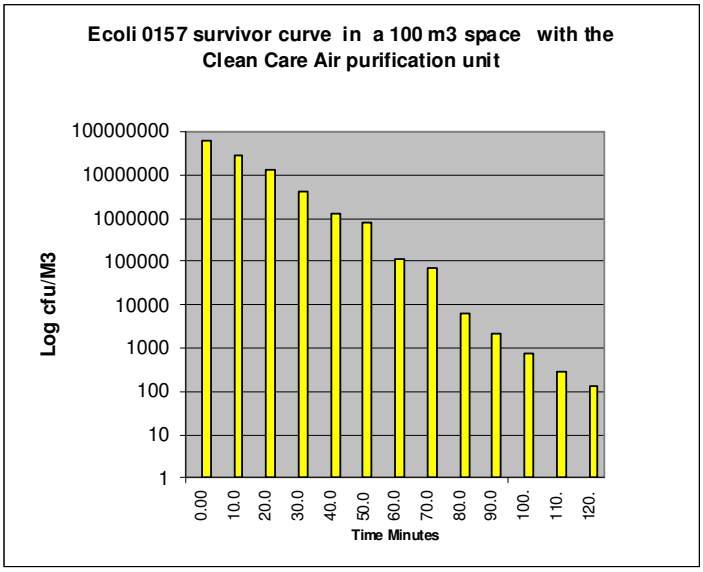

Table 12
Performance of the Clean Care unit in the treatment of 100 m3 space contaminated with Candida albicans

TIME	Uvc on	Cumulative Log reduction
0	3.9E+07	0.0
10	3.1E+07	0.1
20	8.3E+06	0.7
30	1.9E+05	2.3
40	7.7E+04	2.7
50	6.2E+03	3.8
60	2.8E+03	4.1
70	1.2E+03	4.5
80	8.2E+03	3.7
90	8.2E+02	4.7
100	4.3E+02	5.0
110	2.3E+02	5.2
120	1.1E+02	5.5

Fig 12

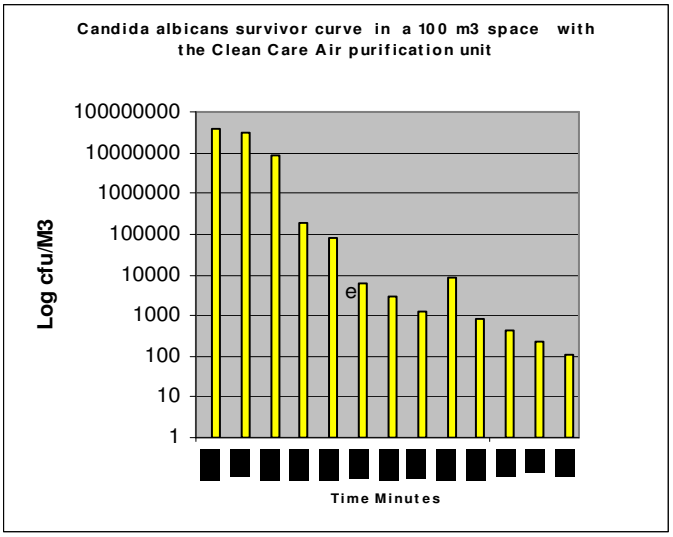

Table 13

Summary performance for the Log reduction Microbiological contamination in an atmosphere by the Clean Care device

Organism	Log reduction/L^2 room volume/120mins
Aspergillus niger	5.2
Staphylococcus aureus (MRSA)	5.3
Listeria monocytogenes	5.9
Bacillus cereus	4.9
Clostridium difficile spores	4.8
Salmonella Phage type 4	6.2
Streptococcus faecalis	5.6
Neurospera sitophila	5.3
Acinetobacter baumannii	5.7
Pesuomonas aeruginosa	5.2
E.coli 0157	5.7
Candida albicans	5.5

CONCLUSIONS

Our data shows that ,after having taken into account the atmospheric depletion of microbial colony forming units by physical means and forces , the effect of treating a contaminated atmosphere (100 m^3) with the Cleancare device produced between a Log 4.8 – 6.2 reduction of recoverable micro-organisms over a 120 minute period.

Room change capacity per hour should be calculated for environments where the device is to be deployed but on the basis of the results obtained I consider the device to be an effective means of improving the microbiological quality of room atmospheres .

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