



Validation of the Airdog X8 Air Scrubber to the Liverpool Biovalidation Protocol



INNOVATION AGENCY

Academic Health Science Network
for the North West Coast

Validation of the Airdog X8 Air Scrubber to the Liverpool Biovalidation Protocol



INNOVATION AGENCY

Airdog X8

Ref AS0009

Room Chamber 3 used for real-world evaluation

Room size 129.7 m³

Mean Temp 23.7 °C (estimated)

Mean RH 57.0 % (estimated)

Fan Setting 800 m³/hr

06/09/2022

n = 1

Plate Count 1	Plate Count 2	Time (mins)	Room Count
8.89E+04	9.07E+04	0	58,221,830
5.93E+04	5.26E+04	6.5	36,275,183
3.87E+04	2.08E+04	10	19,288,413
1.86E+04	2.27E+04	15	13,388,428
1.12E+04	1.12E+04	20	7,261,520
6.00E+03	4.72E+03	25	3,475,156
3.20E+03	2.68E+03	30	1,906,149
1.56E+03	2.04E+03	35	1,167,030
1.02E+03	9.60E+02	40	641,867
4.40E+02	5.00E+02	50	304,725

Exponent -0.111

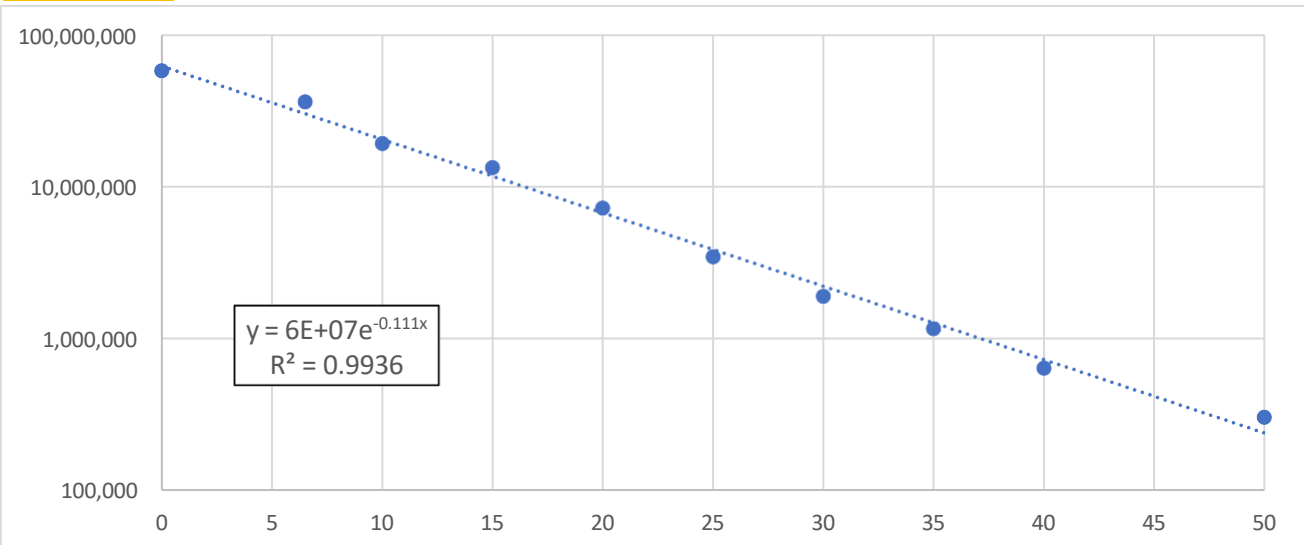
Intercept 6.00E+07

Calculated 60' count 7.69E+04

Log₁₀ Reduction 2.89

minus room -0.264

NET Log₁₀ Reduction 2.63

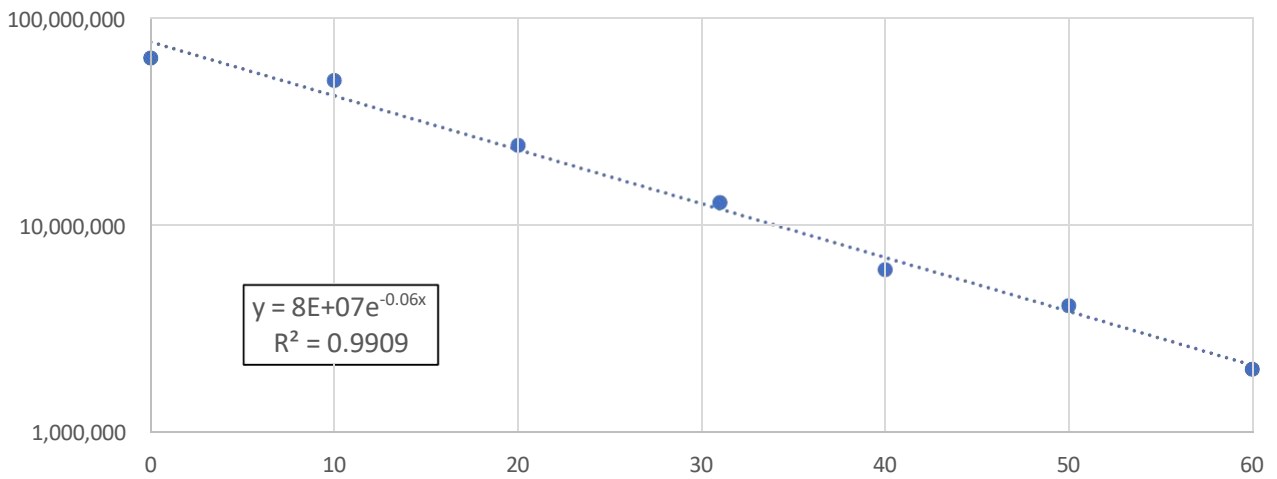


Control (Midtherm 500)

Plate Count 1	Plate Count 2	Time (mins)	Room Count
1.02E+05	9.63E+04	0	64,283,903
8.52E+04	6.93E+04	10	50,085,038
4.45E+04	3.07E+04	20	24,377,960
1.93E+04	2.05E+04	31	12,902,165
9.07E+03	9.85E+03	40	6,133,391
5.87E+03	6.80E+03	50	4,107,297
3.16E+03	3.10E+03	60	2,029,336

Exponent	-0.06
Intercept	8.00E+07
Calculated 60' count	2.19E+06
Log₁₀ Reduction	1.56
minus room	-0.264
NET Log₁₀ Reduction	1.30

1 hour trend



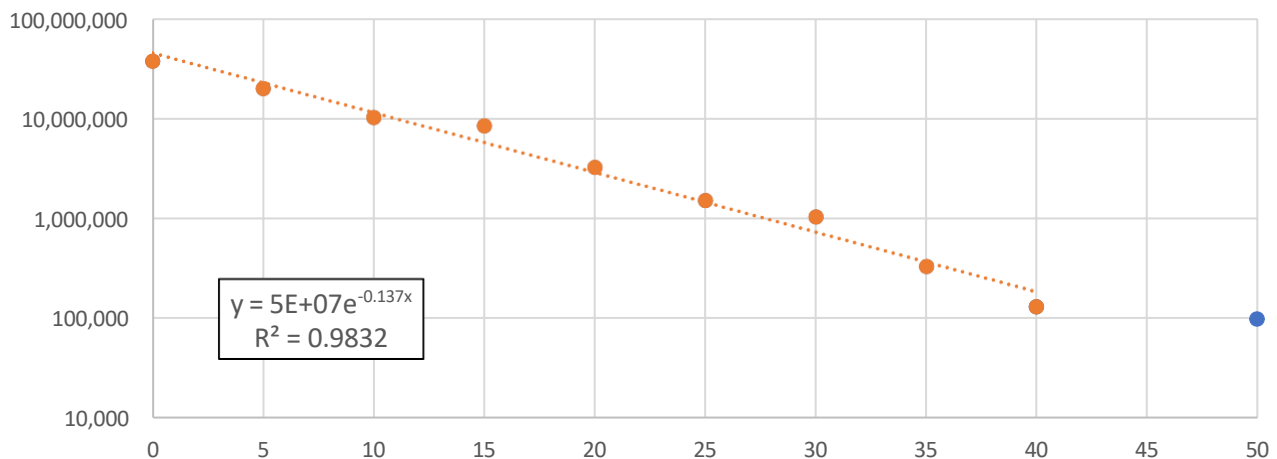
08/09/2022

n = 2

Count 1	Count 2	Time (mins)	Room Count
5.40E+04	6.13E+04	0	37,377,378
2.85E+04	3.28E+04	5	19,871,928
1.70E+04	1.44E+04	10	10,179,095
1.36E+04	1.23E+04	15	8,396,133
5.60E+03	4.40E+03	20	3,241,750
2.62E+03	2.04E+03	25	1,510,656
1.46E+03	1.74E+03	30	1,037,360
5.40E+02	4.80E+02	35	330,659
2.20E+02	1.80E+02	40	129,670
1.80E+02	1.20E+02	50	97,253

Exponent	-0.137
Intercept	5.00E+07
Calculated 60' count	1.35E+04
Log₁₀ Reduction	3.57
minus room	-0.264
NET Log₁₀ Reduction	3.31

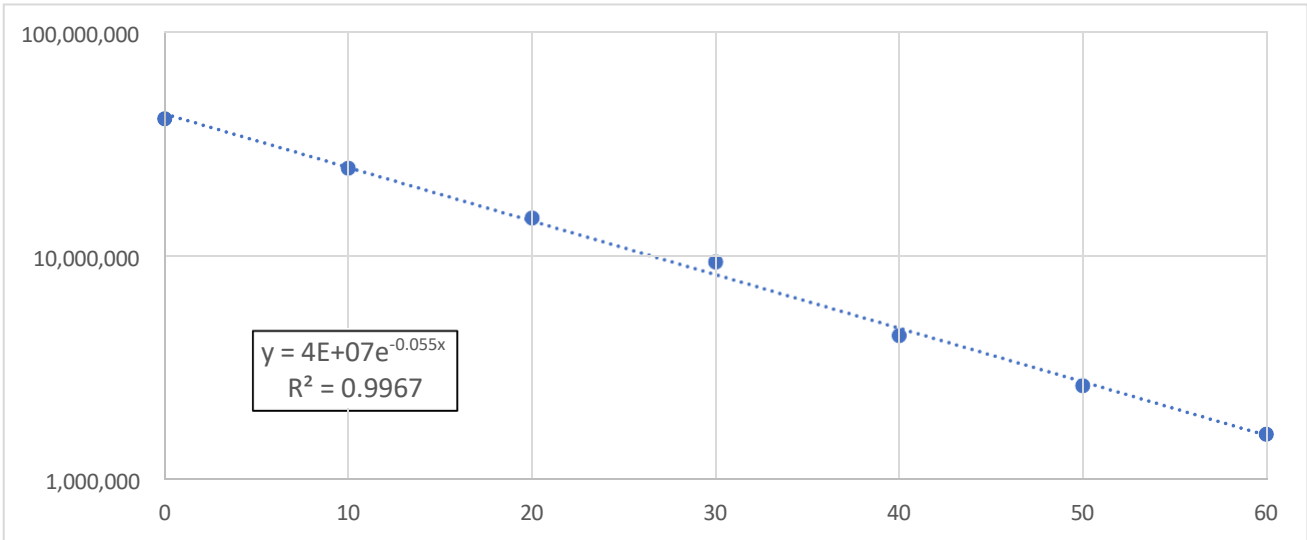
1 hour trend



Control (Midtherm 500)

Plate Count 1	Plate Count 2	Time (mins)	Room Count
6.30E+04	6.42E+04	0	41,235,060
3.36E+04	4.31E+04	10	24,864,223
2.12E+04	2.48E+04	20	14,912,050
1.25E+04	1.67E+04	30	9,465,910
6.53E+03	7.20E+03	40	4,450,923
3.28E+03	4.93E+03	50	2,661,477
2.50E+03	2.48E+03	60	1,614,392

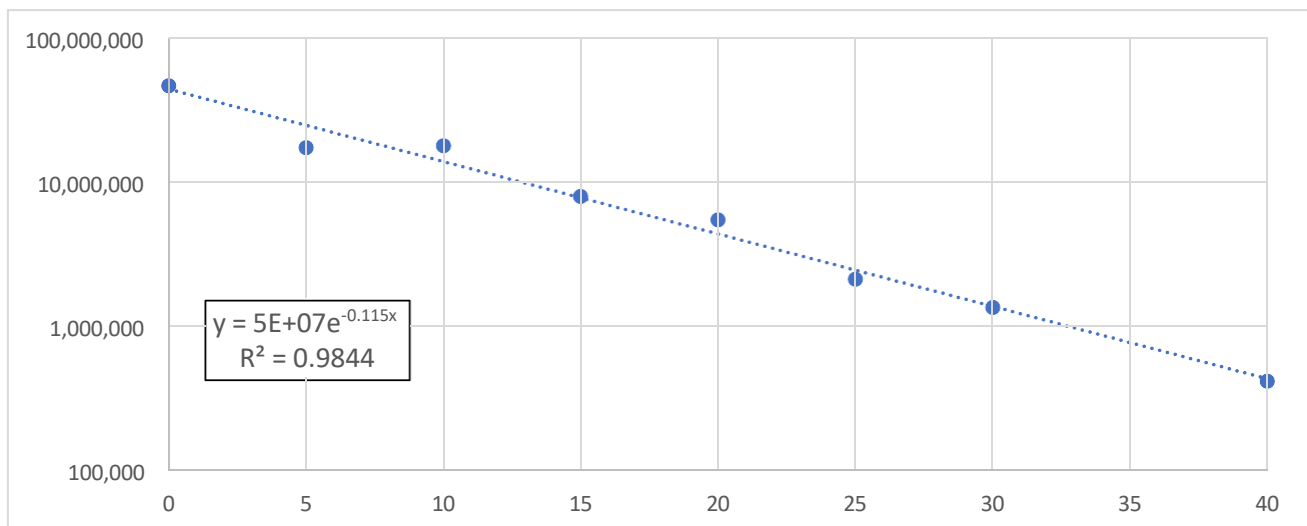
Exponent	-0.055
Intercept	4.00E+07
Calculated 60' count	1.48E+06
Log₁₀ Reduction	1.43
minus room	-0.264
NET Log₁₀ Reduction	1.17



n = 3

Plate Count 1	Plate Count 2	Time (mins)	Room Count
8.33E+04	6.35E+04	0	47,588,890
2.48E+04	2.99E+04	5	17,732,373
2.63E+04	2.99E+04	10	18,218,635
1.03E+04	1.48E+04	15	8,136,793
5.87E+03	1.14E+04	20	5,598,502
3.76E+03	2.96E+03	25	2,178,456
2.02E+03	2.26E+03	30	1,387,469
7.00E+02	6.20E+02	40	427,911

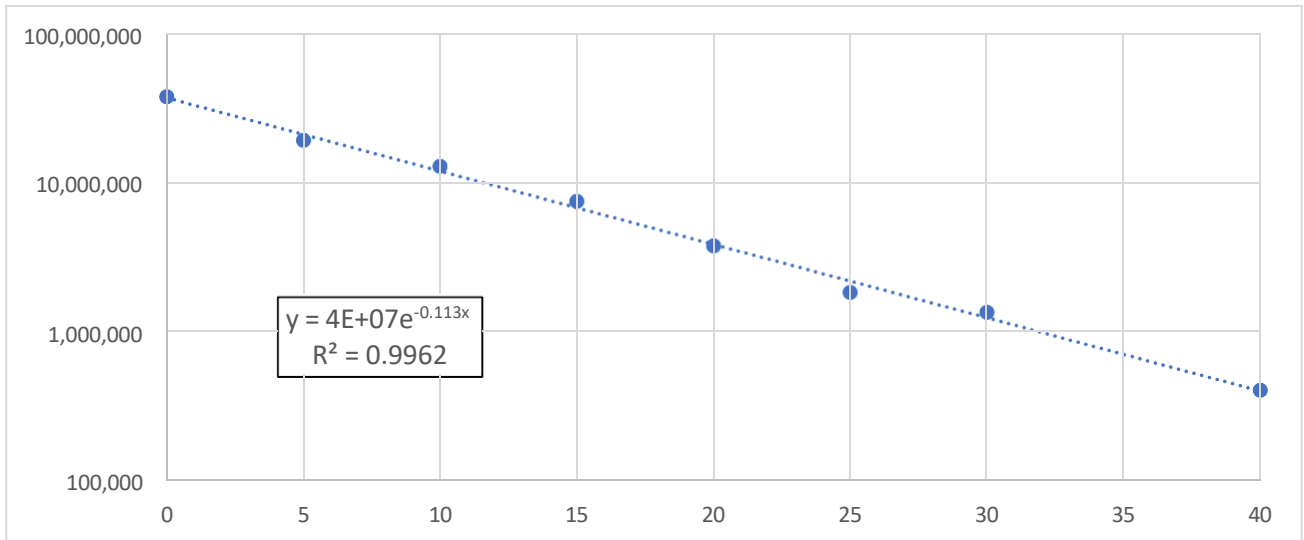
Exponent	-0.115
Intercept	5.00E+07
Calculated 60' count	5.04E+04
Log₁₀ Reduction	3.00
minus room	-0.264
NET Log₁₀ Reduction	2.73



n = 4

Plate Count 1	Plate Count 2	Time (mins)	Room Count
5.04E+04	6.79E+04	0	38,349,903
2.92E+04	3.14E+04	5	19,645,005
1.93E+04	2.12E+04	10	13,129,088
1.33E+04	1.03E+04	15	7,650,530
5.73E+03	6.13E+03	20	3,844,716
2.92E+03	2.88E+03	25	1,880,215
1.94E+03	2.32E+03	30	1,380,986
6.20E+02	6.60E+02	40	414,944

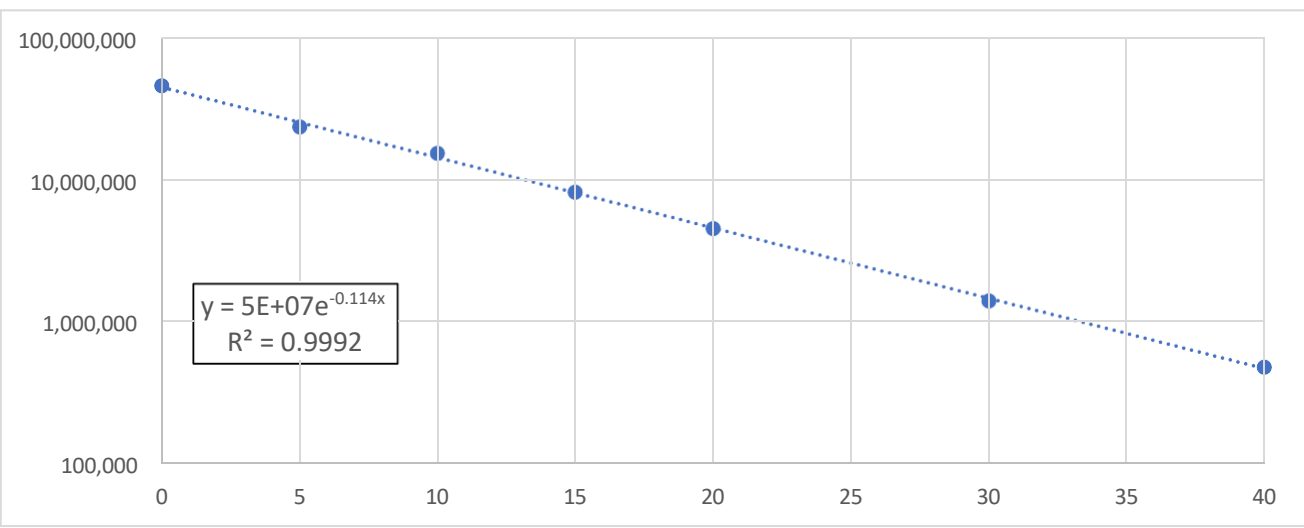
Exponent	-0.113
Intercept	4.00E+07
Calculated 60' count	4.55E+04
Log₁₀ Reduction	2.94
minus room	-0.264
NET Log₁₀ Reduction	2.68



n = 5

Plate Count 1	Plate Count 2	Time (mins)	Room Count
8.15E+04	6.30E+04	0	46,843,288
4.23E+04	3.21E+04	5	24,118,620
2.35E+04	2.50E+04	10	15,722,488
1.14E+04	1.44E+04	15	8,363,715
7.66E+03	6.67E+03	20	4,645,428
2.14E+03	2.30E+03	30	1,439,337
8.40E+02	6.80E+02	40	492,746

Exponent	-0.114
Intercept	5.00E+07
Calculated 60' count	5.35E+04
Log₁₀ Reduction	2.97
minus room	-0.264
NET Log₁₀ Reduction	2.71



Results summary (bacterial inactivation curve)

Log₁₀ reduction over an hour in a 129.7 m³ chamber

Unnormalised results

	X8	Control §
n=1	2.63	1.30
n=2	3.31	1.17
n=3	2.73	
n=4	2.68	
n=5	2.71	
Mean	2.81	
SD	0.28	0.09
Performance	9.9	22.5

* Performance measured as duration in seconds to reduce bacterial count in 1m³ by 1 log₁₀ reduction

§ Expected Control bacterial reduction based on previous results (*n* = 11): 1.07 log₁₀ reductions

Normalised results

	X8	Control ¶
n=1	2.20	1.07
n=2	3.06	1.07
n=3	2.52	
n=4	2.47	
n=5	2.50	
Mean	2.55	
SD	0.31	0.00
Performance	10.9	25.9

* Performance measured as duration in seconds to reduce bacterial count in 1m³ by 1 log₁₀ reduction

¶ X8 results normalised to historical control bacterial reduction values based on previous results (*n* = 11): 1.070 log₁₀ reductions

Notes

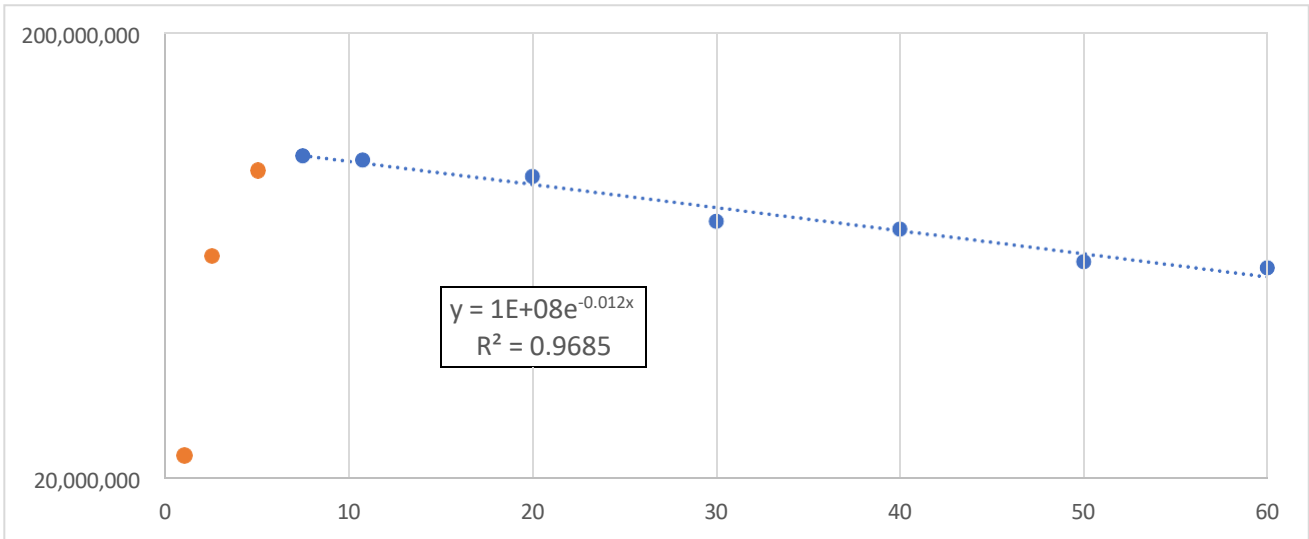
1. The results have been normalised to take into account a lower performance of the standard control for bacterial inactivation for particular measurements. Both unnormalised and normalised results have been included for comparison.
2. Due to methodological reasons, accurate measurement of bacterial numbers at high log reductions was not possible. For this reason, measurements were performed at 5 minute intervals for some measurements to preserve the quality of the data. Calculation of the bacterial CFU reduction curve was conducted on the accurate measurements only.
3. Mean temperature and humidity have been estimated from machine and control values (*n* = 14).
4. A value of 0.264 log₁₀ reductions has been deducted from each result, representing the mean decay in bacterial numbers as measured in the same chamber without any air purification but with air mixing (*SD* = 0.046, *n* = 5).

Room 3 validation: natural decay characteristics

Validation R3
n = 1

Plate Count 1	Plate Count 2	Time (mins)	Room Count
3.07E+04	3.80E+04	1	22,270,823
1.00E+05	9.26E+04	2.5	62,436,105
1.56E+05	1.44E+05	5	97,252,500
1.46E+05	1.83E+05	7.5	106,653,575
1.65E+05	1.57E+05	10.75	104,384,350
1.37E+05	1.59E+05	20	95,955,800
1.31E+05	1.04E+05	30	76,181,125
1.04E+05	1.22E+05	40	73,263,550
1.06E+05	8.52E+04	50	61,982,260
9.26E+04	9.26E+04	60	60,037,210

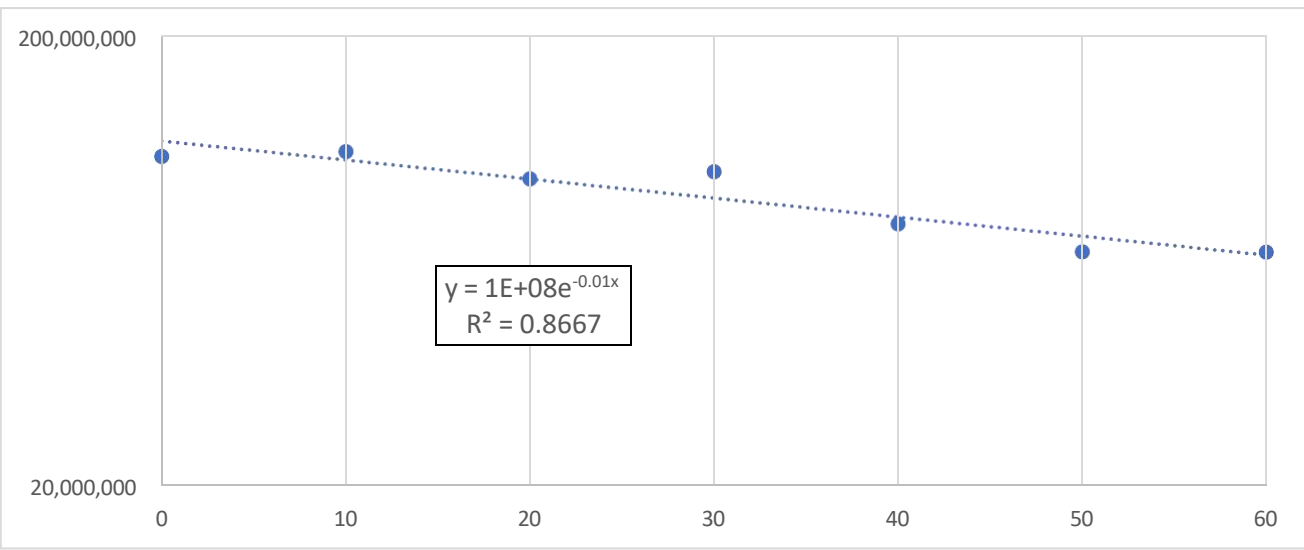
Exponent	-0.012
Intercept	1.00E+08
Calculated 60' count	4.87E+07
Log₁₀ Reduction	0.31



Validation R3
n = 2

Plate Count 1	Plate Count 2	Time (mins)	Room Count
1.65E+05	1.69E+05	0	108,274,450
1.59E+05	1.83E+05	10	110,867,850
1.57E+05	1.41E+05	20	96,604,150
1.76E+05	1.33E+05	30	100,170,075
9.81E+04	1.39E+05	40	76,861,893
1.04E+05	1.02E+05	50	66,780,050
9.07E+04	1.15E+05	60	66,682,798

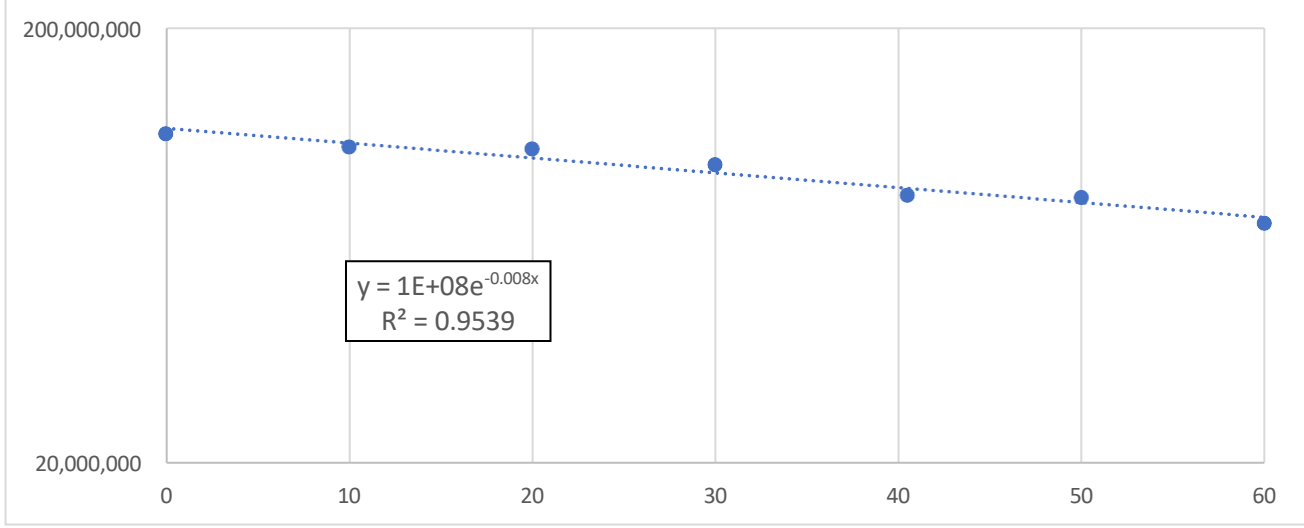
Exponent	-0.010
Intercept	1.00E+08
Calculated 60' count	5.49E+07
Log₁₀ Reduction	0.26



Validation R3
n = 3

Plate Count 1	Plate Count 2	Time (mins)	Room Count
1.96E+05	1.57E+05	0	114,433,775
1.70E+05	1.59E+05	10	106,653,575
1.52E+05	1.74E+05	20	105,681,050
1.52E+05	1.69E+05	30	97,122,830
1.22E+05	1.33E+05	40.5	82,664,625
1.06E+05	1.46E+05	50	81,692,100
1.24E+05	9.63E+04	60	71,415,753

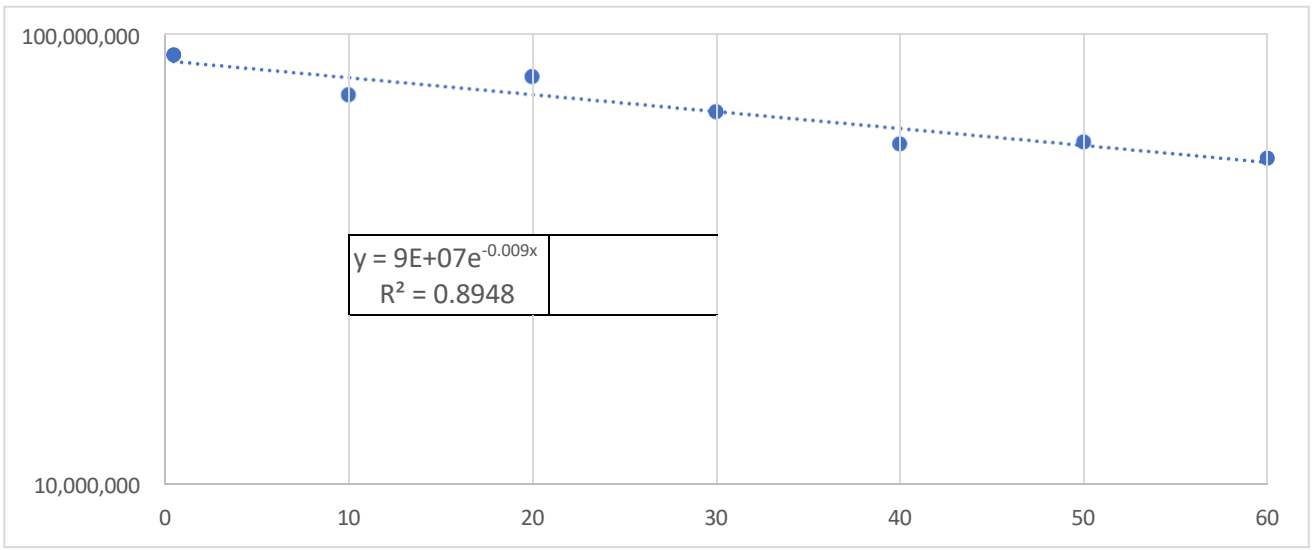
Exponent	-0.008
Intercept	1.00E+08
Calculated 60' count	6.19E+07
Log₁₀ Reduction	0.21



Validation R3
n = 4

Plate Count 1	Plate Count 2	Time (mins)	Room Count
1.33E+05	1.46E+05	0.5	90,444,825
1.11E+05	1.17E+05	10	73,911,900
1.37E+05	1.13E+05	20	81,043,750
8.52E+04	1.24E+05	30	67,817,410
8.89E+04	8.89E+04	40	57,638,315
9.07E+04	8.89E+04	50	58,221,830
7.66E+04	8.89E+04	60	53,650,963

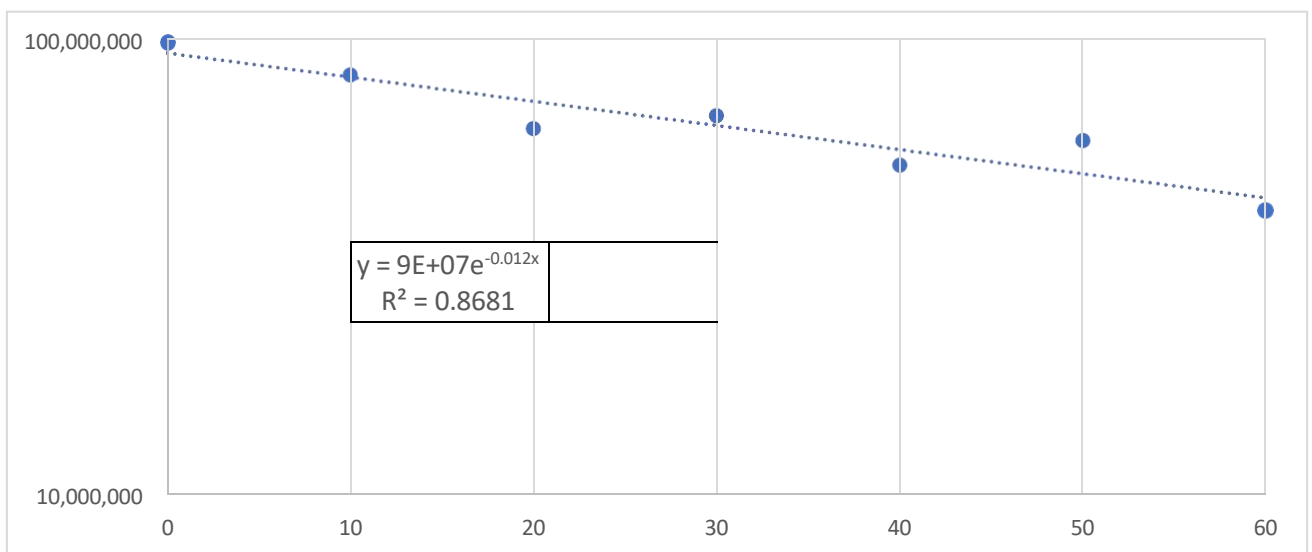
Exponent	-0.009
Intercept	9.00E+07
Calculated 60' count	5.24E+07
Log₁₀ Reduction	0.23



Validation R3
n = 5

Plate Count 1	Plate Count 2	Time (mins)	Room Count
1.65E+05	1.41E+05	0	99,197,550
1.33E+05	1.26E+05	10	83,961,325
1.00E+05	9.81E+04	20	64,219,068
1.13E+05	9.81E+04	30	68,433,343
7.96E+04	8.52E+04	40	53,424,040
1.09E+05	7.74E+04	50	60,426,220
6.86E+04	6.20E+04	60	42,337,255

Exponent	-0.012
Intercept	9.00E+07
Calculated 60' count	4.38E+07
Log₁₀ Reduction	0.31



Results summary (bacterial inactivation curve) - natural decay

Log₁₀ reduction over an hour in a 129.7 m³ chamber

Unnormalised results

n=1	0.31
n=2	0.26
n=3	0.21
n=4	0.23
n=5	0.31
Mean	0.26
SD	0.05