



Company Name: Purelight Europe

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Introduction

Purelight approached Leatherhead Food Research to carry out some validation testing on their Original UV Hand Wand Germinator.

Method

Experiment 1

E. coli NCTC 9001 was cultured overnight in Nutrient Broth (NB, Oxoid Ltd.) at 37°C. Cultures were centrifuged at 5,000 rpm for 10 minutes, and then washed three times in 10 ml of Maximum Recovery Diluent (MRD, Oxoid Ltd). The final pellet was resuspended in 10 ml of MRD.

Seven metal tools were autoclaved to ensure they were sterile and free from any background micro flora. These were then individually swabbed with the resuspended *E. coli* culture. A swab was taken from each tool to determine the initial level of *E. coli* on the item. This was then re-suspended in 10 ml of MRD, from which a series of dilutions were made. Appropriate dilutions were plated using 1ml spread plates on TBX agar (Oxoid Ltd) and 1ml pour plates using Plate Count Agar (Oxoid Ltd). The items were then exposed to the Original UV Hand Wand Germinator. Using a calibrated timer and after 20, 30, 40 and 50 seconds swabs were taken from different areas and plated as previously stated.

TBX plates were incubated at 44°C for 24 hours and Plate Count Agar plates were incubated at 30°C for 48 hours.

All work was carried out in accordance with our UKAS accreditation.

Experiment 2

Overnight cultures of *Listeria monocytogenes*, *Bacillus cereus*, *Salmonella carmel*, *Escherichia coli* and *Staphylococcus aureus* were grown up in appropriate broths. 0.5ml spread plates were prepared on Nutrient Agar (Oxoid Ltd) in duplicate from serial dilutions of the overnight cultures. One set of the plates were treated using the Original UV Hand Wand Germinator for twenty seconds. The other set were left untreated to act as controls. Both sets of plates were incubated at appropriate temperatures for 24 hours.

Results

A summary of the results is shown in the tables below.

Table 1 Microanalysis results from Experiment 1 (cfu/swab)

Item Tested	Time Exposed to UV light									
	0 seconds		20 Seconds		30 Seconds		40 Seconds		50 Seconds	
	TBX	PCA	TBX	PCA	TBX	PCA	TBX	PCA	TBX	PCA
Key 1	2.10E+05	4.20E+05	8.60E+04	8.40E+04	3.50E+04	3.80E+04	2.90E+03	6.30E+03	7.00E+02	1.20E+03
Key 2	7.10E+04	2.20E+05	6.20E+02	9.10E+02	<10	1.00E+01	<10	2.00E+01	<10	1.00E+01
Gridded Tool	1.70E+05	4.60E+05	5.20E+04	8.00E+04	6.00E+03	1.40E+04	5.00E+03	1.50E+04	1.40E+05	3.80E+05
Screw Driver	6.30E+05	1.10E+06	6.70E+03	1.50E+04	9.50E+03	1.50E+04	7.10E+03	8.30E+03	1.40E+02	4.00E+02
Spanner	3.70E+06	3.80E+06	7.00E+01	3.90E+02	1.10E+02	1.40E+02	1.00E+02	1.40E+02	3.00E+01	1.20E+02
Allen Key 1	9.10E+05	8.40E+05	1.60E+02	2.30E+02	<10	1.00E+02	1.70E+02	8.70E+02	<10	1.00E+01
Allen Key 2	2.90E+05	3.80E+05	2.60E+02	7.70E+02	1.50E+03	3.20E+03	3.00E+02	8.00E+01	3.00E+01	1.00E+02

Table 2 Microanalysis results from Experiment 2: UV Treated Plates (colonies/plate)

Organisms	Dilutions							
	Neat	-1	-2	-3	-4	-5	-6	-7
<i>L. monocytogenes</i>	>300	10	0	0	0	0	0	0
<i>B. cereus</i>	>300	0	1	0	0	0	0	0
<i>S. carmel</i>	>300	13	6	0	0	0	0	0
<i>E. coli</i>	>300	2	0	0	0	0	0	0
<i>S. aureus</i>	>300	45	20	0	0	0	0	0

Table 3 Microanalysis results from Experiment 2: Non-UV Treated Plates (colonies/plate)

Organisms	Dilutions							
	Neat	-1	-2	-3	-4	-5	-6	-7
<i>L. monocytogenes</i>	>300	>300	>300	>300	>300	31	1	0
<i>B. cereus</i>	>300	>300	>300	>300	>300	56	4	0
<i>S. carmel</i>	>300	>300	>300	>300	>300	>300	154	8
<i>E. coli</i>	>300	>300	>300	>300	>300	192	7	0
<i>S. aureus</i>	>300	>300	>300	>300	>300	304	48	3

Sterilizing activity was expressed as a percentage according to the following equation (Table 4):

$$\text{Sterilizing ability (\%)} =$$

$$\frac{[(\text{Number of viable bacteria of control} - \text{Number of viable bacteria of trial}) / \text{Number of viable bacteria of control}] \times 100}{}$$

Table 4 Sterilizing ability (%)

Test Micro-organisms	Groups	No of bacteria (CFU/plate)	Sterilizing ability (%)
<i>L. monocytogenes</i>	Control	6.2×10^6	-
	UV-treated	2.0×10^2	99.99
<i>B. cereus</i>	Control	1.12×10^7	-
	UV-treated	2.0×10^2	99.99
<i>S. carmel</i>	Control	1.6×10^8	-
	UV-treated	2.6×10^2	99.99
<i>E. coli</i>	Control	1.4×10^7	-
	UV-treated	4.0×10^1	99.99
<i>S. aureus</i>	Control	9.6×10^7	-
	UV-treated	4.0×10^3	99.99

Conclusion

From the results of the first experiment it can be seen that overall the counts are higher on the Plate Count Agar (PCA) than they are on the TBX. This can be attributed to the fact that the cells are stressed or damaged and so find it harder to grow on the very selective TBX agar.

Overall, the results from Experiment 1 indicate that the technology can afford a 2-4 log reduction in numbers of *E. coli* present on the surfaces of the different tools, with the exception of the Gridded Tool after 50 seconds.

The results from the second experiment indicated a sterilizing ability of 99.99% against all five micro-organisms.