

Client: LARQ, 3980 Trust Way, Hayward, CA 94545

Order Number: IN201804033

Sample Number: HR20180490108

Study: Antimicrobial efficacy of the LARQ Bottle against *Escherichia coli*

Method: ASTM E2315

Report Date: 5/30/2018

Certificate of Analysis

Experimental Summary:

The objective of this experiment was to test the efficacy of LARQ's UV-C LED UV technology within the application of the LARQ Bottle against water samples enriched with *E. coli*. The testing procedure was designed after discussions between LARQ and Harrens Lab and based on ASTM E2315 ("Standard Guide for Assessment of Antimicrobial Activity Using a Time-Kill Procedure") testing guidelines and was conducted at Harrens Lab Inc. in Hayward, CA.

Materials and Methods:

LARQ provided 4 stainless steel bottles and one UV-C LED cap for the testing. LARQ provided Sterile Deionized water that was used to spike the samples and treat. *E. coli* (ATCC 25922) was used as the testing organism in this experiment with a starting solution of about 1.00×10^7 CFU/mL. Testing was done in 3 replicates for 2-min tests, and 6 replicates for 1-min and 3-min tests. Inoculated volumes for each run was 500 mL, out of which 50 mL was collected for LARQ internal purposes, and 450 mL was tested in a stainless bottle with UV cap (provided by LARQ) for designated run-times. Pre and post treatment aliquots were plated in serial dilutions ranging from 10^{-1} to 10^{-9} on APC Media using a pour plate technique. Plates were incubated for 48-hr at 35°C.

Figure 1: LARQ Bottle with cap on and off



Results:

Table 1: Experimental results using 1-min light treatment against *E. coli*

Replicate	Initial Population	T-1 min	Log Reduction (T1)	% Reduction (T1)
1	1.60E+07	2.50E+03	3.81	99.9844
2	6.00E+06	6.80E+02	3.95	99.9887
3	6.00E+06	7.20E+02	3.92	99.9880
4	4.00E+06	2.12E+03	3.28	99.9470
5	5.20E+06	8.80E+02	3.77	99.9831
6	6.50E+06	1.68E+03	3.59	99.9742
Average	7.28E+06	1.43E+03	3.72	99.9775

Table 2: Experimental results using 2-min light treatment against *E. coli*

Replicate	Initial Population	T-2 min	Log Reduction (T2)	% Reduction (T2)
1	5.80E+06	1.00E+01	5.76	99.9998
2	2.90E+06	1.00E+01	5.46	99.9997
3	5.60E+06	1.00E+01	5.75	99.9998
Average	4.77E+06	1.00E+01	5.66	99.9998

Table 3: Experimental results using 3-min light treatment against *E. coli*

Replicate	Initial Population	T-3 min	Log Reduction (T3)	% Reduction (T3)
1	1.10E+08	1.00E+01	7.04	99.9999
2	4.70E+06	1.00E+01	5.67	99.9998
3	7.60E+06	1.00E+01	5.88	99.9999
4	1.20E+07	1.00E+01	6.08	99.9999
5	8.40E+06	1.00E+01	5.92	99.9999
6	7.20E+06	1.00E+01	5.86	99.9999
Average	2.50E+07	1.00E+01	6.08	99.9999

Comment: No growth was detected on 3-min treated plates so a value of 10 was used to indicate the detection limit (<10 CFU).

Conclusions:

This purpose of this study was to determine how effective a LARQ Bottle was at killing *E. coli* at 1-min, 2-min, and 3-min treatments. Tables 1, 2, and 3 shows that the LARQ Bottle produced detectable log reductions of *E. coli* at 1-min, 2-min and 3-min treatments. Table 1 shows that at 1-min treatments, the LARQ Bottle yielded a log reduction of 3.72 and killed 99.9775% of *E. coli*. Table 2 shows that at 2-min treatments, the LARQ Bottle

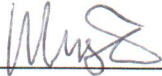
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yielded a log reduction of 5.66 and killed 99.9998% of *E. coli*. Table 3 shows that at 3-min treatments, the LARQ Bottle yielded a log reduction of 6.08 and killed 99.9999% of *E. coli*. The 3-min treatment produced the greatest log reduction and percent reduction against *E. coli*.

Respectfully Submitted,



Ming Li

General Manager

Harrens Lab Inc.

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