FINAL REPORT

Efficacy Study of UVC LED Cap

ORDER Number
152102261

PREPARED FOR:

UBO-Technology, LLC
304 Indian Trace #300
Weston, FL 33327

Jason Dobranic, Ph.D.
EMSL Analytical, Inc.
5950 Fairbanks N. Houston Rd., Houston, TX 77040
Phone: (713) 686-3635 Fax: (713) 686-3645 Web: http://www.emsl.com

Certificate of Analysis

Client: UBO-Technology, LLC

Contact: Rakesh Guduru

Project: Efficacy study of UVC LED Cap against *Shigella flexneri* and *Vibrio cholerae.*

Product: UVC LED Cap

EMSL NO: 152102261

Sample received: 4/1/2021

Report date: 4/21/2021

Challenge Bacteria: *Shigella flexneri* (*S. flexneri*) – ATCC 9199
Vibrio cholerae (*V. cholera)* – ATCC 9459

Experimental Summary:

The testing procedure was designed after discussions between EMSL Analytical, the testing company, and the client, UBO-Technology, LLC. The testing was conducted on a UV light bottle cap, UVC LED, for its ability to kill bacteria in the contained water. The testing was conducted in our Houston Microbiology Laboratory.

Procedure:

Bacterial Inoculum Preparation

Each test bacterium from stock culture was plated separately onto Tryptic Soy Agar with 5% sheep Blood (TSAB) and incubated at 35°C for 24 hours. Well-isolated colonies were then harvested, suspended in phosphate buffered water (PBS) and vortexed for 1 minute to ensure homogenization. This suspension was used to inoculate 450 mL of sterile DI water for each replicate to test in the prototypes.

Efficacy Testing

The 450-mL contaminated test water was placed into the container and capped with the UVC LED cap then treated with UV according to the following protocols:

1) Normal mode once (1 min exposure) and normal mode a second time (2 min exposure).
2) Crazy mode once (2 min exposure) and Crazy mode a second time (4 min exposure). All tests were performed in triplicate.

Following each treatment a small aliquot of water was removed, serially diluted in PBS for plating and plated onto AC Petrifilm plates and incubated at 35°C for 24 hours. After incubation any recovered colonies were counted.

Experimental Results:

Table 1: Quantitative counts for *Shigella flexneri* contaminated water treated with the UVC LED Cap.

Time Point (minutes)	CFU/mL	Log	Log Reduction	%Kill
0 (normal control)	82,000,000	7.91		
Normal mode (1 min)	650,000	5.81	2.10	99.2
Normal mode (2 min)	1,467	3.17	4.75	99.998
0 (Crazy control)	8,200,000	6.92		
Crazy mode (2 min)	1,180	3.07	3.84	99.99
Crazy mode (4 min)	<10	<1.00	>5.92	>99.999

Limit of detection = 10 CFU.
% Kill = Percent difference between starting population and device-treated population.

Table 2: Quantitative counts for *Vibrio cholera* contaminated water treated with the UVC LED Cap.

Time Point (minutes)	CFU/mL	Log	Log Reduction	%Kill
0 (normal control)	267,000	5.43		
Normal mode (1 min)	<10	<10	>5.43	>99.996
Normal mode (2 min)	<10	<10	>5.43	>99.996
0 (Crazy control)	147,000	5.17		
Crazy mode (2 min)	<10	<10	>5.17	>99.993
Crazy mode (4 min)	<10	<10	>5.17	>99.993

Limit of detection = 10 CFU.
% Kill = Percent difference between starting population and device-treated population.

Conclusion:

The UVC LED cap significantly decreased the level of bacteria in the contaminated water after 2 minutes of treatment on the Normal mode and after 2 and 4 minutes on the Crazy mode compared to the starting bacterial populations for both bacteria tested in this study.

Mona Ramadi, Ph.D.
Microbiologist

Jason Dobranic, Ph.D.
Vice President of Microbiology & Life Sciences