MICROCHEM LABORATORY

STUDY REPORT

Study Title

Antibacterial Activity and Efficacy of 3B Medical Lumin CPAP UV Sanitizer Device

Test Method

Custom Device Study Based on: ASTM E1153 Method

Study Identification Number

NG14813-V2

Test Microorganism

S. enterica ATCC 10708

Study Sponsor

Alex Lucio
3B Medical, Inc.
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Test Facility

Microchem Laboratory
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Report Author: Brady Ryan, B.S.

Purpose of the Study

The purpose of this study was to determine the antimicrobial efficacy of a UV CPAP Sanitizer device supplied by 3B Medical, Inc.

Brief History of the Performing Laboratory

Microchem Laboratory is located in the greater Austin, Texas area. It is owned and operated by microbiologist Dr. Benjamin Tanner. The core of the company was founded by Dr. Tanner as Antimicrobial Test Laboratories in 2006. Antimicrobial Test Laboratories was later combined with a niche cosmetic testing lab and Microchem Laboratory, founded in 1988 by Dr. Norman Miner. The combined labs have operated under one roof as Microchem Laboratory since 2016. Microchem Laboratory is ISO 17025 accredited and offers testing in compliance with current Good Laboratory Practice (GLP) regulations as stipulated by EPA and FDA. Clients are always welcome to tour the lab, observe studies, and audit the lab's quality systems.

Study Timeline

S. enterica ATCC 10708

Devices Received	Cultures Initiated	Carriers Inoculated	Carriers Treated	Enumeration Plates Evaluated	Report Delivered
05FEB2020	16MAR2020	17MAR2020	17MAR2020	18MAR2020	26MAR2020

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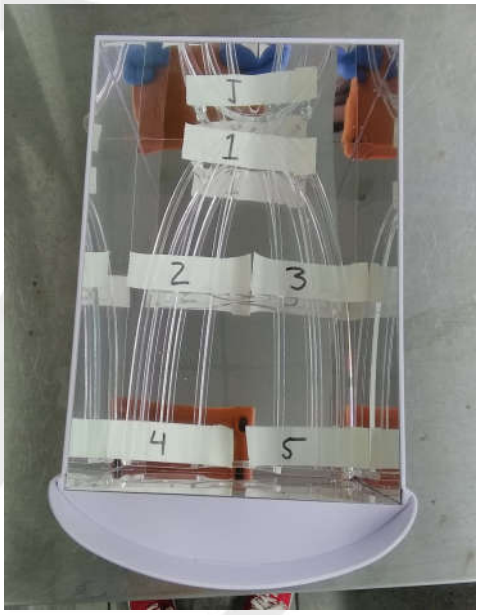
Test Device Information

Name of Test Device: Lumin UV CPAP Sanitizer
Manufacturer: 3B Medical, Inc.
Mode of Active: UV Light (Germicidal)

The following pictures were taken prior to testing.



Note: The numbers in the right hand picture indicate the approximate position of the carriers during testing. Additionally, the device and carrier locations are identical to those used in study NG14592.

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Test Microorganism Information

The test microorganism(s) selected for this test:

Salmonella enterica

This bacteria is Gram-negative, rod-shaped, facultative anaerobe. Like the closely related *Escherichia* genus, *Salmonella* are common to all parts of the world and share habitats in the digestive systems of cold and warm-blooded animals. *S. enterica* is one of the most common bacteria associated with zoonotic and foodbourne illness. Because of it's regular occurrence and pathogenicity, *S. enterica* is a common bacteria for measuring disinfectant efficacy.

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Summary of the Procedure

- Test microorganism was prepared in appropriate liquid broth.
- Test microorganism was harvested and the resulting suspension was diluted to achieve $\geq 1x10^6$ CFU/mL.
- Test and control carriers were inoculated and allowed to dry in optimal conditions for test microorganism.
- Test carriers were placed in test device for the Sponsor-determined contact time.
- Test carriers were harvested into liquid media and plated in optimal incubation conditions and time for the test microorganism.
- After incubation, microbial concentrations were determined and reductions relative to pre-treatment controls were calculated.

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Criteria for Scientific Defensibility of a Custom Device Study

For Microchem Laboratory to consider a Device Study study to be scientifically defensible, the following criteria must be met:

1. The initial and final concentration of microorganisms must be significantly high enough to observe the passing criteria/log reduction.
2. The media used for testing must be sterile.
3. The target microorganism must be pure colony morphology.

Passing Criteria

Due to the modified nature of the study, passing criteria may be determined by the Study Sponsor prior to test initiation. If no passing criteria is established, a conclusion about the data is not provided by Microchem Laboratory, but the Study Sponsor may determine significance based on statistical interpretation or other means.

Testing Parameters

Culture Growth Media:	Tryptic Soy Broth	**Culture Growth Time:**	24 hours ± 4 hours
Culture Dilution Media	Tryptic Soy Broth	**Culture Supplement**	N/A
Carrier Type	1″ x 3″ Glass Slides	**Inoculum Volume**	0.020 ml
Carrier Dry Time	15 to 30 minutes	**Carrier Dry Temp.**	Ambient (Biological Safety Hood)
Contact Time	5 minutes ± 5 seconds	**Contact Temperature**	Ambient
Harvest Media (Volume)	Phosphate Buffered Solution (20ml)	**Enumeration Media**	Tryptic Soy Agar
Incubation Temp.	36°C	**Incubation Time**	24-48 hours

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Study Notes

Due to low control concentrations, the testing for both *E. coli* and *S. enterica* was repeated. The retest procedure was changed in the following ways: decreased the carrier drying time, used the raw culture as the inoculum, changed drying location from incubator to biological safety cabinet.

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Control Results

Neutralization Method: N/A
Growth Confirmation: Pure and Viable
Media Sterility: No Growth

Calculations

CFU/ml = (Average plate count) x 1:10 serial dilution factor

CFU/carrier = (Average plate count) x 1:10 serial dilution factor x media dilution factor

CFU/carrier = CFU/ml x total harvest media volume

$$\text{Percent Reduction} = \frac{(B - A)}{B} \times 100\%$$

$$\text{Log}_{10}\ \text{Reduction} = \text{Log}(B/A)$$

Where:
B = Number of viable test microorganisms on the control carriers immediately after inoculation
A = Number of viable test microorganisms on the test carriers after the contact time

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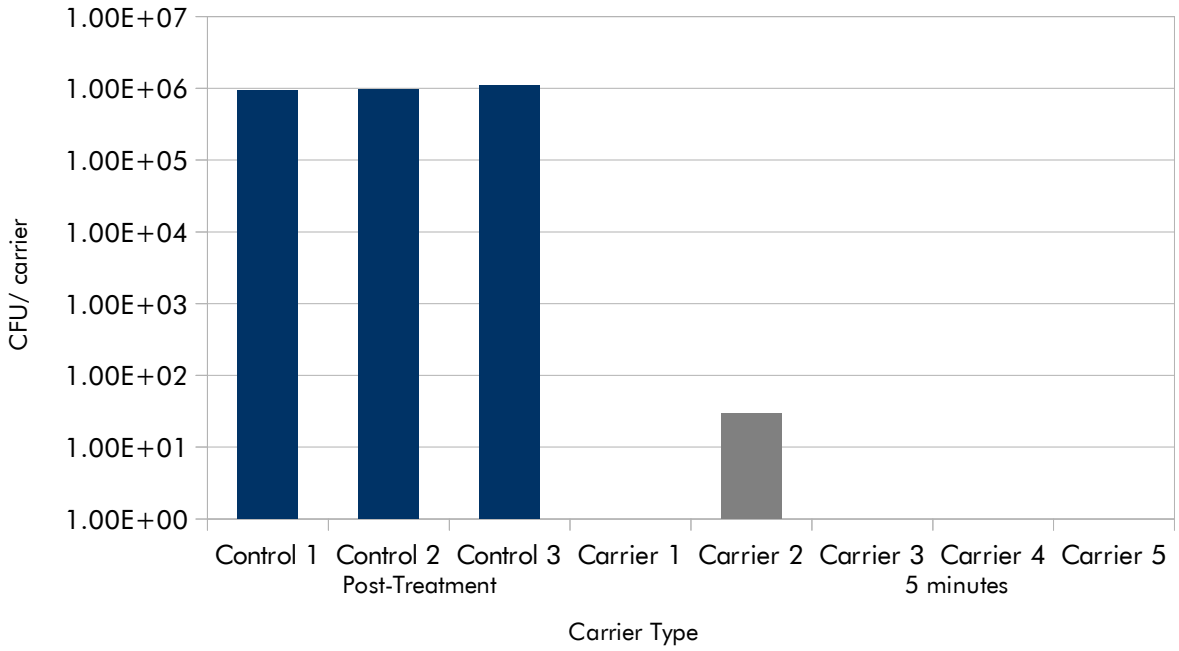
Results of the Study – *S. enterica* ATCC 10708

Test Microorganism	Contact Time	Carrier	CFU/Carrier	Average CFU/Carrier	Average Percent Reduction Compared to Controls	Average Log_{10} Reduction Compared to Controls
S. enterica ATCC 10708	N/A	Inoculum	2.27E+09	2.27E+09	N/A	
	Post-Treatment	Control 1	9.50E+05	1.00E+06		
		Control 2	9.60E+05			
		Control 3	1.10E+06			
	5 minutes	Carrier 1	<1.00E+01	<1.20E+01	>99.9988%	>4.92
		Carrier 2	3.00E+01			
		Carrier 3	<1.00E+01			
		Carrier 4	<1.00E+01			
		Carrier 5	<1.00E+01			

Note: Inoculum is reported as CFU/ml. All other values are CFU/Carrier. The lower limit of detection for this study was 1.00E+01 CFU/Carrier. Values observed below the limit of detection are reported as <1.00E+01 in the results table and as zero in the graph.



The results of this study apply to the tested substances(s) only. Extrapolation of findings to related materials is the responsibility of the Sponsor.