Study Title

# Antibacterial Activity and Efficacy of SARIN Energy's Test Device Item #10999 SES-UVCMOBI-220


Study Sponsor

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Test Facility

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## Purpose

The purpose of this study was to determine the antimicrobial efficacy of SARIN Energy Solution's UVC sterilizing device Mobile UVC Sterilizer Unit XL #10999 SES-UVCMOBI-220.

## Study Timeline - *E. coli*

| Device(s) Received | Culture(s) Initiated | Carriers Inoculated | Carriers Treated | Plates Evaluated | Report Delivered |
|---|---|---|---|---|---|
| 8/27/20 | 9/23/20 | 9/24/20 | 9/24/20 | 9/25/20 | 9/30/20 |

Study Timeline - *S. aureus*

| Device(s) Received | Culture(s) Initiated | Carriers Inoculated | Carriers Treated | Plates Evaluated | Report Delivered |
|---|---|---|---|---|---|
| 8/27/20 | 9/25/20 | 9/26/20 | 9/26/20 | 9/27/20 | 9/30/20 |

## Test Device Information

Name of Test Devices: Mobile UVC Sterilizer Unit XL
Manufacturer: SARIN Energy Solutions
Mode of Action: UVC Light (Germicidal)

Instructions for use were included with the device. The sponsor was consulted for any further questions regarding the operation of the device.
Note: The photo on this page depicts the study setup with the item Mobile UVC Sterilizer Unit XL #10999 SES-UVCMOBI-220. The distance from the unit to the test item was measured with a measuring tape.

## Test Organism Information

The test microorganism(s) selected for this study:
*Escherichia coli* ATCC 25922
*Staphylococcus aureus* ATCC 14458

***Escherichia coli*** is a gram negative, facultative anaerobic, rod-shaped, coliform bacterium commonly found in the environment, foods, and gastrointestinal tract of people and animals. Although most *E. coli* are harmless, some strains can cause severe illnesses such as hemolytic uremic syndrome (HUS), a condition leading to kidney failure.

***Staphylococcus aureus*** is a gram positive, facultative anaerobic, sphere-shaped bacterium commonly residing in the skin and/or nose of healthy individuals. *Staphylococcus aureus* can cause a multitude of diseases including skin infections (cellulitis, abscesses, furuncles etc.) and respiratory diseases such as pneumonia. Methicillin-resistant *Staphylococcus aureus* (MSRA) is a particularly difficult pathogen to treat as it is resistant to some common antibiotics.

## Summary of the test procedure

- The test microorganisms are propagated in the appropriate liquid broth
- Cell suspensions of the test microorganism are prepared to achieve a concentration of 6 $\log_{10}$ CFU/mL
- A known volume of inoculum was used to inoculate plastic coupons to study the surface disinfection efficacy of the UVC unit
- The inoculated surface is exposed to different UVC doses using different time treatments at various distances
- The UVC device is turned on and samples are collected after the treatment
- The survival bacteria were harvested, transferred to neutralizing medium, spread plated on media plates for enumeration and incubated in optimal incubation conditions
- After 24h incubation, the microbial populations are recorded, and log reductions are calculated
- All the experiments were conducted in triplicates

## Testing Parameters

| | | | |
|---|---|---|---|
| **Culture Growth Media** | Tryptic Soy Broth | **Culture Growth Time** | 24 hours $\pm$ 2 hours |
| **Carrier Type** | Plastic coupon | **Inoculum Volume** | 0.050 mL |
| **Contact Times and Distances** | 15 min and 30 min<br>1m, 3m, and 5m | **Contact Temperature** | Ambient (25ºC $\pm$ 2ºC) |
| **Harvest Media (Volume)** | 0.1 % Buffered Peptone Water | **Enumeration Media** | Tryptic Soy Agar |
| **Incubation Temperature** | 35ºC $\pm$ 2ºC | **Incubation Time** | 24 hours $\pm$ 2 hours |

## Study Notes

The two test organisms were tested on two different days using the same treatments. The UVC intensity of the item Mobile UVC Sterilizer Unit XL #10999 SES-UVCMOBI-220 was measured at 1m, 3m, and 5m, using UVC sensor that only measures light intensity at 253.7 nm. All microbial disinfection data reported in this document is preliminary and not peer-reviewed.

## Control Results

The sterility of the media used to grow and enumerate bacterial cells was tested and confirmed sterile. Also, the growth of the bacterial cells was confirmed using the target morphology of the cells grown on the media plates.

## Calculations

To quantify the bacterial disinfection achieved using the UVC device, the following calculations were done to determine the inactivation.

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

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

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

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

Where:
A = Number of viable test microorganisms on the control test surface

B = Number of viable test microorganisms on the test surface after treatment

**<u>Results of the Study</u> - (Mobile UVC Sterilizer Unit XL #10999 SES-UVCMOBI-220)**

| Target Microorganism | Contact Time | Carrier Distance | UV Intensity ($\mu W/cm^2$) at 253.7 nm | $Log_{10}$ Reduction Compared to Control ± Standard Deviation | Reduction Compared to Control |
|---|---|---|---|---|---|
| *E. coli* ATCC 25922 | Time Zero | N/A | N/A | 6.22 ± 0.06 | N/A |
| | 15 min | 1m | 58.84 | 3.81 ± 0.00 | 99.98% |
| | | 3m | 14.72 | 2.98 ± 0.72 | 99.9% |
| | | 5m | 4.34 | 2.15 ± 0.21 | 99% |
| | 30 min | 1m | 58.84 | 3.83 ± 0.0 | 99.98% |
| | | 3m | 14.72 | 3.83 ± 0.0 | 99.98% |
| | | 5m | 4.34 | 3.52 ± 0.36 | 99.9% |
| *S. aureus* ATCC 14458 | Time Zero | N/A | N/A | 6.58 ± 0.06 | N/A |
| | 15 min | 1m | 58.84 | 4.16 ± 0.00 | 99.99% |
| | | 3m | 14.72 | 3.41 ± 0.34 | 99.9% |
| | | 5m | 4.34 | 2.03 ± 0.52 | 99% |
| | 30 min | 1m | 58.84 | 4.19 ± 0.00 | 99.99 % |
| | | 3m | 14.72 | 4.19 ± 0.00 | 99.99 |
| | | 5m | 4.34 | 3.70 ± 0.08 | 99.98% |