LIMITED INDOOR AIR ASSESSMENT REPORT

Saint Mary Hospital
500 West Court Street
Kankakee, Illinois 60901

Prepared For:

VentorLux, LLC
1210 43rd Street
Phenix City, Alabama 36867

Prepared by:

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7972 Hampton Cove Drive
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September 24, 2023

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SECTION 1.0 – LIMITED INDOOR AIR ASSESSMENT

1.1 INTRODUCTION

ERRM, LLC was contracted by VentorLux, LLC to collect indoor air samples for the purpose of determining the effectiveness of its Soulis air cleaner. The Soulis air cleaner is a proprietary unit developed with quiet operation and using ultra-violet radiation that kills bacteria (including virus causing agents), pathogens, and mold. The Indoor Air Assessment (IAA) was limited to an operating room following a patient surgery (room chosen by Saint Mary surgery unit staff). The facility is located at Saint Mary Hospital 500 West Court Street Kankakee, Illinois 60901. The sample locations and description are as follows:

1. Operating Room Number W-1340 O.R. 3 (O.R. 3) – at the time of the IAA the room had just previously been utilized in patient surgery. The room was left untouched, and no cleaning had been conducted by hospital staff in order to determine if the Soulis Unit could clean surfaces as well as air. The air sampling units were placed approximately six feet from the operating table which was approximately three (3) feet outside the laminar flow footprint. Five areas were selected for surface testing sample name and location as follows:
    - S-1 - located behind a supply storage unit.
    - S-2 located behind the nursing support staff storage and computer station.
    - S-3 located on top of the movable surgery light.
    - S-4 located on the handhold of the surgery light.
    - S-5 located on a small rolling computer keyboard specifically on the return key.

The IAA parameters included in the testing conducted at this facility included the following:

- Culturable Air Fungi - The method employs an Anderson impinger that directs air flow onto a petri dish (Malt Extract Agar plate) that is cultured at the lab. This media allows isolation of pathogenic fungi that are “viable”. It will grow a wide variety of fungi that can then be identified at the laboratory. This report and lab data will refer to this as “MEA”.
- Culturable Air Bacteria - The method employs an Anderson impinger that directs air flow onto a petri dish (Tryptic Soy Agar with blood plate) that is cultivated to determine hemolytic activity of bacteria for identification and/or grouping. This method of analysis can identify differing types of infectious bacteria groups i.e., Gram-Negative, Gram-Positive, etc. This report and lab data will refer to this as “TSA”.

1.2 FIELD ACTIVITIES

ERRM, LLC performed the following field activities specifically to determine the effectiveness of the Soulis unit. The surgical operating room used for the testing was determined by Surgery Staff and agreed to by VentorLux, LLC, and ERRM, LLC. O.R. 3 had just previously been in use for a patient surgery and left as is and not cleaned by hospital staff in order to determine the effectiveness of the Soulis unit in the cleaning of air and surfaces. The hospital procedures required hand sanitizing, wearing disposable gloves, mask, and a protective gown and shoe coverings prior to entry. The safety procedures were administered by surgery staff. ERRM, LLC entered the O.R. 3 without Ventorlux representatives, setup the testing equipment and three (3) Soulis Units. Ventorlux representatives did not enter this room prior to, during, or after the testing.

Air Flow Testing

- On September 9, 2023, ERRM, LLC (Mr. Michael Kendall) was on-site to set up air flow instrumentation to determine if the Soulis units may impact the operating laminar air flow system. Per the "Certified Test, Adjust and Balance (CTAB) Report dated March 27, 2023, conducted by Mechanical Test & Balance, Inc.

- Three (3) Omega air speed meters (Model HHEM-SD1) were setup next to the operating table (see attached photos Appendix A. As published in the CTAB report the room size is 5139 ft^3 with a 10-foot ceiling height. The laminar flow system (verified by the hospital HVAC staff) was producing 1376 CFM of supply and the returns flow at 888 CFM provide positive pressure of 0.0402 inches w.c.

- The air flow readings were also collected at the mouth of the Soulis Units then at a distance of 1.5 feet and 3 feet. The flow rates measured were 4.0, 1.0 and 0.0 m/s.

- The laminar flow system surrounds the operating table and lighting system utilized by the surgeon during operations. Therefore, two (2) surface samples were included on the light system (described below).

- NOTE: The hospital Laminar flow system and HVAC systems were not altered. The systems were left in operation as they were during surgery that had just taken place within the room, verified by the HVAC manager and staff.

IAA Sampling

- On September 9, 2023, ERRM, LLC (Mr. Michael Kendall) was on-site to perform the IAA. The equipment was setup (two rotary vane pumps field calibrated to 28.1 liters per minute (LPM) for MEA Agar and TSA Agar plates. Five (5) samples were collected over a one-hour period at the testing location as follows:

    1. One (1) Background air sample, using the MEA and TSA was performed to collect the air-borne species prior to turning on the Soulis unit. The samples were collected over a 5-minute interval to provide the volume needed for each

analytical method. Also, the five surface locations described above were swabbed and placed in agar media to determine the species on surfaces.

2. Four (4) samples (sample pumps turned on while the Soulis Unit was running) and using the MEA, and TSA media to collect the air-borne species. The samples were collected over a 5-minute interval to provide the volume needed for each analytical method. Note: The Soulis unit once turned on continued to run throughout the entire sampling period for these four (4) samples (time 10 minutes, 25 minutes, 40 minutes and 60 minutes). Also surface swabs in agar media were collected to determine species on surfaces at 30 minutes and subsequent to the last 60-minute air sample.

- Best practices were taken by personnel to ensure quality of the project. Since this was an efficacy test procedure building occupants were allowed to conduct their work without change or interruption during the testing procedure and the HVAC units were left in operating mode. The occurrence and movement of people were recorded to provide an understanding of the results and new species introduction, the impact on the results, and the effectiveness of the Soulis Unit under normal operating conditions.

2.0 RESULTS

Air Samples

The laboratory data for the air samples collected at the time of this report are limited to culturable species using the TSA with blood agar. The results identified 105 colony forming units (28 gram negative rod and 77 gram positive rod) in the background sample collected prior to turning on the Soulis units. The remaining samples did not identify any further occurrences of gram negative rod. Gram positive rod were detected throughout the remainder of the air samples. During the air sampling the blood-soaked gauzes and used surgical =instruments remained throughout the entire testing procedure.

Surface Samples

S-1

The laboratory data for the surface samples collected at the time of this report are also limited to culturable bacteria using the TSA with blood agar. The results identified 130,000 colony forming units (60,000 gram positive rod and 70,000 unidentifiable bacteria) in the background sample collected prior to turning on the Soulis units. The remaining samples did not identify any further occurrences of bacteria.

S-2

The laboratory data for the surface samples collected at the time of this report are also limited to culturable bacteria using the TSA with blood agar. The results identified 140,000 colony forming units of gram positive rod in the background sample collected prior to turning on the Soulis units. The next sample midway through dropped to 40,000 colony forming units of gram positive rod and the last sample did not identify any further occurrences of bacteria.

S-3

The laboratory data for the surface samples collected at the time of this report are also limited to culturable bacteria using the TSA with blood agar. This sample location was well within the laminar flow systems protective area. The results did not identify bacteria in the background sample collected. The next sample midway through identified 20,000 colony forming units of gram-positive rod and the last sample did not identify any further occurrences of bacteria. These results indicate that a Laminar flow system on its own has limitations and Soulis Units provide real immediate benefit.

S-4

The laboratory data for the surface samples collected at the time of this report are also limited to culturable bacteria using the TSA with blood agar. This sample location was well within the laminar flow systems protective area. The results identified 10,000 colony forming units of gram-positive rod in the background sample collected prior to turning on the Soulis units. The next sample midway through remained at 10,000 colony forming units of gram-positive rod and the last sample did not identify any further occurrences of bacteria. These results indicate that a Laminar flow system on its own has limitations and Soulis Units provide real immediate benefit.

S-5

The laboratory data for the surface samples collected at the time of this report are also limited to culturable bacteria using the TSA with blood agar. The results did not identify any bacteria in any of the samples.

The analytical data is attached and reveals that the Soulis Unit is effective at cleaning the air and killing viable species. This data reveals that the Soulis unit effectively killed 100% of the majority species. Surfaces, using a swab and TSA auger is shown to kill 100% within 30 minutes.

3.0 CONCLUSIONS

Based upon the results presented above, ERRM, LLC concludes that the Soulis Unit is effective in removing and killing bacteria encountered at an overall rate of 93% within 10 minutes. The surface samples indicate gram positive rod was being added into the air by the movement of air (cleaning of surfaces) and/or the surgical instruments, blood-soaked gauzes and other items used

during surgery. The data provide proof that employing Soulis units with current technology provides improvement that is highly advantageous and can add a high level of safety during surgical procedure.

The study was conducted during an active work day by design as to represent conditions after surgery and prior to staff cleaning operations. The data supports the continued use of Soulis units to kill bacteria thereby providing a safer work place and also improving patient care by killing opportunistic bacteria. Opportunistic bacteria are defined by the World Health Organization. The following table from the U.S. National Institute of Health provides a sample of common sources of the airborne infectious diseases.

Droplet or airborne microorganisms released from various activities for infectious bacteria		
Activity	**Approximate particle count**	**Units**
Sneezing	40,000	Per sneeze
Bowel evacuation	20,000	Per event
Vomiting	1,000	Per event
Coughing	710	Per cough
Talking	36	Per 100 words

The following is an interpretation/extrapolation of these results for COVID-19 (SARS-CoV-2)

The International Ultra-Violet Association states the following:

"Because the COVID-19 virus (SARS-CoV-2) is so new, the scientific community doesn't yet have a specific deactivation dosage. However, we know the dosage values for comparable viruses in the same SARS virus family are 10-20 mJ/cm^2 using direct UV-C light at a wavelength of 254nm; this dosage will achieve 99.9% disinfection (i.e., inactivation) under controlled lab conditions."

Also, Boston University has published results validating that UV-C will deactivate coronavirus.

"The university's National Emerging Infectious Diseases Laboratories (NEIDL) exposed materials containing the virus to a UV-C tube lamp from Signify. It found that a dose of 5 mJ/cm^2 resulted in a reduction of the SARS-CoV-2 virus of 99% in 6 seconds (SARS-CoV-2 is the more scientific name for the novel coronavirus)." The NEIDL team extrapolated that a stronger dose of 22 mJ/cm^2 would result in a reduction of 99.9999% in 25 seconds.

Soulis Conclusion

The Soulis unit provides 1,300,000 mJ/cm^2; with that dose being over 59,000 times(for 99.9999% kill rate) more powerful than the NEIDL dose needed. Concluding that the Soulis unit is effective against the COVID-19/SARS virus and variants as well as opportunistic bacteria.

APPENDIX A

Photo Log

Operating Room – Study Area

O.R. 3 interior

Soulis Unit (lower left facing left of left side of surgical table)

Miscellaneous spent surgical supplies

Surgical table airflow meters on stands next to table surface sample on light handhold and top side (left light)

Support equipment – shadow sample behind on wall

Surgical instruments left after surgery for study including spent gauze pads

Soulis unit facing surgical table (angled to side, not direct) keyboard return key used for surface smaple

View from entry door side of room (shadow sample behind tall cabinet rear in photo)

View of medical equipment in support of surgery operations from entry (door to right is surgical support entry)

APPENDIX B

RAW LABORATORY DATA

EMSL Analytical, Inc.
2500 Gateway Centre Blvd., Suite 600, Morrisville, NC 27560
Phone/Fax: (919) 465-3900 / (919) 465-3950
http://www.EMSL.com raleighlab@emsl.com

EMSL Order:	292306997
CustomerID:	ERRM75
CustomerPO:	231258
ProjectID:	

Attn: **Michael Kendall, P.G.**
Environmental Risk & Resource Management
7972 Hampton Cove Dr
Ooltewah, TN 37363

Phone:	(615) 428-1316
Fax:	
Received:	9/13/2023 10:00 AM
Analysis Date:	9/19/2023
Collected:	9/9/2023

Project: **St. Mary Hospital / 231258**

Test Report: Identification and Enumeration of Culturable Bacteria by Swab (Gram Stain (EMSL Method MICRO-SOP-132))

Sample Description	Location	Media	Temp (C)	Sample Measure (mL)	Analytical Sensitivity (CFU/mL)	Dilution	Bacteria Identification	Colony Count	CFUs (CFU/mL)
S-1	RM W-1239 O.R.3	TSA	35	1	10,000	10,000	*Gram positive rod*	6	60,000
					10,000	10,000	*Unidentifiable bacteria*	7	70,000
							Total	**13**	**130,000**
292306997-0001									
S-2	RM W-1239 O.R.3	TSA	35	1	10,000	10,000	*Gram positive rod*	14	140,000
							Total	**14**	**140,000**
292306997-0002									
S-3	RM W-1239 O.R.3	TSA	35	1	100	100	**None Detected**		
292306997-0003									
S-4	RM W-1239 O.R.3	TSA	35	1	10,000	10,000	*Gram positive rod*	1	10,000
							Total	**1**	**10,000**
292306997-0004									
S-5	RM W-1239 O.R.3	TSA	35	1	100	100	**None Detected**		
292306997-0005									
S-1.2	RM W-1239 O.R.3	TSA	35	1	100	100	**None Detected**		
292306997-0006									
S-2.2	RM W-1239 O.R.3	TSA	35	1	10,000	10,000	*Gram positive rod*	4	40,000
							Total	**4**	**40,000**
292306997-0007									

Analyst(s)

Rebecca Stewart (14)

Billy Barnes, Laboratory Manager
or other approved signatory

Initial report from 09/19/2023 15:44:53

For information on the bacteria lisited in this report please visit the Resources section at www.emsl.com

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Project: **St. Mary Hospital / 231258**

Test Report: Identification and Enumeration of Culturable Bacteria by Swab (Gram Stain (EMSL Method MICRO-SOP-132))

Sample Description	Location	Media	Temp (C)	Sample Measure (mL)	Analytical Sensitivity (CFU/mL)	Dilution	Bacteria Identification	Colony Count	CFUs (CFU/mL)
S-32	RM W-1239 O.R.3	TSA	35	1	10,000	10,000	*Gram positive rod*	2	20,000
							Total	**2**	**20,000**
292306997-0008									
S-4.2	RM W-1239 O.R.3	TSA	35	1	10,000	10,000	*Gram positive rod*	1	10,000
							Total	**1**	**10,000**
292306997-0009									
S-5.2	RM W-1239 O.R.3	TSA	35	1	100	100	**None Detected**		
292306997-0010									
S-1.3	RM W-1239 O.R.3	TSA	35	1	100	100	**None Detected**		
292306997-0011									
S-2.3	RM W-1239 O.R.3	TSA	35	1	100	100	**None Detected**		
292306997-0012									
S-3.3	RM W-1239 O.R.3	TSA	35	1	100	100	**None Detected**		
292306997-0013									
S-4.3	RM W-1239 O.R.3	TSA	35	1	100	100	**None Detected**		
292306997-0014									

No discernable blank was submitted with this group of samples

Analyst(s)

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Collected:	9/9/2023

Project: **St. Mary Hospital / 231258**

Test Report: Identification and Enumeration of Culturable Bacteria by Air (Gram Stain (EMSL Method MICRO-SOP-132))

Sample Description	Location	Volume (L)	Media	Incubation Temp (C)	Sensitivity (CFU/m³)	Bacteria Identification	Colony Count	CFU/m³
T-0	RM W-1239 O.R.3	141.5	TSAB	35	7	*Gram negative rod*	4	28
292306997-0015						*Gram positive rod*	11	77
						Total	**15**	**105**
T-10	RM W-1239 O.R.3	141.5	TSAB	35	7	*Gram positive rod*	1	7
292306997-0016						**Total**	**1**	**7**
T-25	RM W-1239 O.R.3	141.5	TSAB	35	7	*Gram positive rod*	1	7
292306997-0017						**Total**	**1**	**7**
T-40	RM W-1239 O.R.3	141.5	TSAB	35	7	*Gram positive rod*	1	7
292306997-0018						**Total**	**1**	**7**
T-60	RM W-1239 O.R.3	141.5	TSAB	35	7	*Gram positive rod*	3	21
292306997-0019						**Total**	**3**	**21**
Fungi present.								

No discernable blank was submitted with this group of samples.

Analyst(s)

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