BIOLOGICAL CONSULTING SERVICES
OF NORTH FLORIDA, INC.

July 27, 2020

[redacted]

Client ID: Apollo UV-C lamp

BCS ID: 2007063

Project Name: Apollo UV-C Lamp Human Coronavirus Reduction Efficacy Testing

Dear [redacted]

We have completed the disinfection efficacy study on the submitted units/materials as outlined in the report notes. The contaminant species, study conditions, and parameters utilized were based on client's request and adaptation of the guidance documents and protocols listed below:

Validation of virucidal efficacy of supplied system: Performance determination as per laboratory disinfection protocol; BCS SOP-D1 (ISO17025:2017 Accredited) and ASTM E1053

Following, you will find our report of the study conducted on the referenced samples. Should you have any questions, please do not hesitate to contact me.

Sincerely,

George Lukasik, Ph.D.
Laboratory Director

BCS LABORATORIES, INC. – GAINESVILLE
4609 NW 6TH STREET, STE. A, GAINESVILLE, FLORIDA 32609
TEL. (352) 377-9272, FAX. (352) 377-5630
WWW.MICROBIOSERVICES.COM
FL DOH E82924, ISO 17025:2017 L2422 (ANAB/ANSI), EPA FL01147

Analysis: *Human Corona Virus OC43 (ATCC: VR-1558) Reduction Efficacy* Test Carrier: 100mm Glass Petri Dish

Application Method: UV-C Lamp Exposure at 1 Meter Temp.: 20.4 C

Conformance of Study Control Data: Negative Control: Yes Positive Control:Yes Neutralizer Control: Yes

Start Conc.*: 6.35E+04 MPN/Carrier Contact Time: 60 Minutes

Analyst: George Lukasik, Ph.D. Challenge Start Date: 07/09/2020

BCS Sample ID: 2007063 Client ID: Apollo UV-C lamp Rep A Qualifier: U

End Conc.**: <1.80E+01 IU MPN/carrier % Reduct.: >99.997 Log10 Reduct.: >4.5

Sample Analyst: George Lukasik, Ph.D. Sample Analysis Date: 07/09/2020

Sample Notes: Undetected: Analyte was not detected in the sample analyzed; Value represents the method's detection limit for the amount of sample analyzed as per the method's standard reporting units

BCS Sample ID: 2007067 Client ID: Apollo UV-C lamp Rep B Qualifier: U

End Conc.**: <1.80E+01 IU MPN/carrier % Reduct.: >99.997 Log10 Reduct.: >4.5

sample Analyst: George Lukasik, Ph.D. Sample Analysis Date: 07/09/2020

Sample Notes: Undetected: Analyte was not detected in the sample analyzed; Value represents the method's detection limit for the amount of sample analyzed as per the method's standard reporting units

*Start Conc. is the average recovery from 2 control inoculated carriers not subjected to unit's exposure and allowed the indicated contact time (recovery controls). Concentration is reported as Infectious Units Most Probable Number (IU MPN) recovered per carrier.

**End Conc. is the recovery from carrier subjected to treatment and allowed indicated contact time.

BCS LABORATORIES, INC. – GAINESVILLE

4609 NW 6TH STREET, STE. A, GAINESVILLE, FLORIDA 32609

TEL. (352) 377-9272, FAX. (352) 377-5630

WWW.MICROBIOSERVICES.COM

FL DOH E82924, ISO 17025:2017 L2422 (ANAB/ANSI), EPA FL01147

Analysis: *Human Corona Virus OC43 (ATCC: VR-1558) Reduction Efficacy* Test Carrier: 100mm Glass Petri Dish

Application Method: UV-C Lamp Exposure at 4 Meters Temp.: 20.4 C

Conformance of Study Control Data: Negative Control: Yes Positive Control:Yes Neutralizer Control: Yes

Start Conc.*: 6.35E+04 IU MPN/carrier Contact Time: 60 Minutes

Analyst: George Lukasik, Ph.D. Challenge Start Date: 07/09/2020

BCS Sample ID: 2007063 Client ID: Apollo UV-C lamp Rep A Qualifier: NONE

End Conc.**: 3.30E+01 IU MPN/carrier % Reduct.: 99.95 Log10 Reduct.: 3.3

Sample Analyst: George Lukasik, Ph.D. Sample Analysis Date: 07/09/2020

Sample Notes: None to report.

BCS Sample ID: 2007063 Client ID: Apollo UV-C lamp Rep B Qualifier: NONE

End Conc.**: 4.90E+01 IU MPN/carrier % Reduct.: 99.92 Log10 Reduct.: 3.1

Sample Analyst: George Lukasik, Ph.D. Sample Analysis Date: 07/09/2020

Sample Notes: None to report.

*Start Conc. is the average recovery from 2 control inoculated carriers not subjected to unit's exposure and allowed the indicated contact time (recovery controls). Concentration is reported as Infectious Units Most Probable Number (IU MPN) recovered per carrier.

**End Conc. is the recovery from carrier subjected to treatment and allowed indicated contact time.

BCS LABORATORIES, INC. – GAINESVILLE

4609 NW 6TH STREET, STE. A, GAINESVILLE, FLORIDA 32609

TEL. (352) 377-9272, FAX. (352) 377-5630

WWW.MICROBIOSERVICES.COM

FL DOH E82924, ISO 17025:2017 L2422 (ANAB/ANSI), EPA FL01147

Analysis: *Human Corona Virus OC43 (ATCC: VR-1558) Reduction Efficacy* Test Carrier: 100mm Glass Petri Dish

Application Method: UV-C Lamp Exposure at 8 Meters Temp.: 20.4 C

Conformance of Study Control Data: Negative Control: Yes Positive Control:Yes Neutralizer Control:Yes

Start Conc.*: 6.35E+04 IU MPN/carrier Contact Time: 60 Minutes

Analyst: George Lukasik, Ph.D. Challenge Start Date: 07/09/2020

BCS Sample ID: 2007063 Client ID: Apollo UV-C lamp Rep A Qualifier: NONE

End Conc.**: 2.80E+03 IU MPN/carrier % Reduct.: 95.6 Log10 Reduct.: 1.4

Sample Analyst: George Lukasik, Ph.D. Sample Analysis Date: 07/09/2020

Sample Notes: None to report.

BCS Sample ID: 2007063 Client ID: Apollo UV-C lamp Rep B Qualifier: NONE

End Conc.**: 9.20E+03 IU MPN/carrier % Reduct.: 85.5 Log10 Reduct.: 0.8

Sample Analyst: George Lukasik, Ph.D. Sample Analysis Date: 07/09/2020

Sample Notes: None to report.

*Start Conc. is the average recovery from 2 control inoculated carriers not subjected to unit's exposure and allowed the indicated contact time (recovery controls). Concentration is reported as Infectious Units Most Probable Number (IU MPN) recovered per carrier.

**End Conc. is the recovery from carrier subjected to treatment and allowed indicated contact time.

BCS LABORATORIES, INC. – GAINESVILLE

4609 NW 6TH STREET, STE. A, GAINESVILLE, FLORIDA 32609

TEL. (352) 377-9272, FAX. (352) 377-5630

WWW.MICROBIOSERVICES.COM

FL DOH E82924, ISO 17025:2017 L2422 (ANAB/ANSI), EPA FL01147

Project: Apollo UV-C Lamp Human Coronavirus Reduction Efficacy Testing

Date Received: July 07, 2020 11:10

Test Start Date: July 09, 2020 Test End Date: July 24, 2020

Report Notes:

The single counter top mercury lamp UV test unit was received from the study sponsor. The unit was labeled as The Apollo UVC Lamp (product ID MT-UVGL60) and was assigned the referenced BCS identifier number. The study was performed to evaluate the virucidal efficacy of the UVC radiation exposure at various distances from the unit. Human Coronavirus OC43 was used a challenge virus and was inoculated onto glass 100 mm carriers using a protein/mucin soil load. The study protocol was adapted from ASTM 1053: Standard Practice to Assess Virucidal Activity of Chemicals Intended for Disinfection of Inanimate, Nonporous Environmental Surfaces. Briefly, two-hundred microliters of virus suspension (containing soil load) was added to each carrier and allowed to dry. The inoculation was added as a thin layer. Concurrently, the test unit was placed in a room and inoculated carriers were placed at indicated distances from the unit. Two carriers were placed at each distance. Carriers were placed so that the inoculated surface was directly facing the unit. The unit was activated for 1 hour setting and a NIST traceable laboratory timer was started. Additionally two carriers were inoculated but exposed to the unit. These served as recovery controls. Following the 60 minute contact time, the carriers were removed and eluted with 10mL of D/E Neutralizing Broth and homogenized. The samples were analyzed for viable infectious coronavirus on the day of the study at undiluted and at ten-fold dilutions in replicates of five. The average number of microorganisms recovered from the recovery control carriers was used to calculate the starting concentration. Positive, negative and neutralization controls were performed along with test subjects to provide quality control and reference data as per laboratory standard accredited ISO17025:2017 methodology. Viable virus was analyzed using HRT-18G cell infectivity assay. Cell monolayers were monitored for cytopathic effect development over a 14-day period. Viruses were enumerated as Infectious Units (I.U.) using the Most Probably Number (MPN) analysis of the cell culture results. Analysis was conducted as per method EPA/600/R-95/178 and reported as I.U./Carrier section. All equipment and supplies were validated to or were calibrated to NIST traceable standards. All QC were within method acceptance limit. No general environmental conditions are specified in the standard or have been identified that could affect the test results or measurements. End of Report Notes.

BCS LABORATORIES, INC. – GAINESVILLE

4609 NW 6TH STREET, STE. A, GAINESVILLE, FLORIDA 32609

TEL. (352) 377-9272, FAX. (352) 377-5630

WWW.MICROBIOSERVICES.COM

FL DOH E82924, ISO 17025:2017 L2422 (ANAB/ANSI), EPA FL01147

*I certify that I have examined and I am familiar with the information submitted herein. The results pertain only to the sample(s) analyzed and associated identifier #(s). Based on my inquiry of the individuals responsible for the analysis, I believe the data to be true, accurate, and complete. Unit descriptions and names were obtained from the submitted documents. The analysis was authorized and commissioned by the client or client's representative. The resulting data are representative of the analysis conducted on the collected samples and its/their condition at the time of analysis. The data provided is strictly representative of the study conducted under laboratory conditions using the material/samples/articles provided by the client (or client's representative) and its (their) condition at the time of test. The data obtained may not be representative or indicative of a real-life process and/or application. The sample(s) were analyzed in accordance with the appropriate method, however due to the inherent limitations of methods, microorganisms may avoid detection. BCS Laboratories offers no express or implied warranties concerning the quality, safety, and/or purity of any sample, batch, source, or the process they are derived from. Quality assurance controls were performed as outlined in the method and as per Good Laboratory Practices. Analyses were performed in accordance with laboratory practices and procedures set-forth by ISO 17025-2017 and NELAP/TNI accreditation standards unless otherwise noted. BCS makes no express or implied warranty regarding the ownership, merchantability, safety or fitness for a particular purpose of any such property or product.

Signature of Laboratory Director/Authorized Rep. _____ Date: July 27, 2020

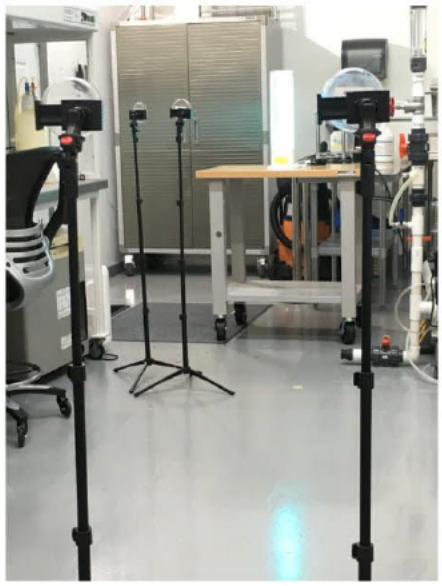
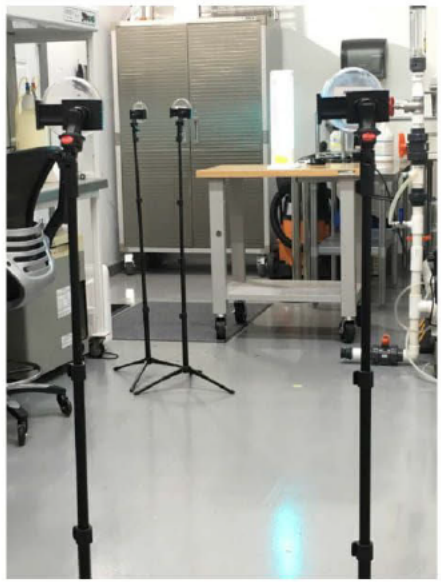
BCS LABORATORIES, INC. – GAINESVILLE
4609 NW 6TH STREET, STE. A, GAINESVILLE, FLORIDA 32609
TEL. (352) 377-9272, FAX. (352) 377-5630
WWW.MICROBIOSERVICES.COM
FL DOH E82924, ISO 17025:2017 L2422 (ANAB/ANSI), EPA FL01147

DATA QUALIFIER CODES	
SYMBOL	MEANING
D	Measurement was made in the field.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J1	The sample matrix interfered with the ability to make any accurate determination.
J2	No Quality Control criteria exist for the component.
^	analysis conducted outside the Laboratory's scope of accreditation
L	Off scale high. Actual value is known to be greater than value given.
O	Sampled, but analysis not performed.
Q	Sample held beyond the accepted holding time.
U	Indicates that the compound was analyzed for but not detected. The reported value is the method detection limit.
V	Analyte was detected in both sample and associated method blank. Data may not be accurate.
Y	The laboratory analysis was from an improperly preserved sample. The data may not be accurate.
Z	Too many colonies present (TNTC); the numeric value given represents the upper end of the value that can be determined based on the volume.
?	Data are rejected and should not be used. QC data did not meet acceptance criteria.
**	Analysis of analyte submitted to an accredited sub-contract laboratory.
!	Data deviate from historically established concentration range.
#	BCS Lab specific qualifier. See laboratory analysis notes.

BCS LABORATORIES, INC. – GAINESVILLE
4609 NW 6TH STREET, STE. A, GAINESVILLE, FLORIDA 32609
TEL. (352) 377-9272, FAX. (352) 377-5630
WWW.MICROBIOSERVICES.COM
FL DOH E82924, ISO 17025:2017 L2422 (ANAB/ANSI), EPA FL01147





Client: [redacted]

BCS LABORATORIES, INC. — GAINESVILLE
4609 NW 6TH STREET, STE. A, GAINESVILLE, FLORIDA 32609
TEL. (352) 377-9272, FAX. (352) 377-5630
WWW.MICROBIOSERVICES.COM
FL DOH E82924, ISO 17025:2017 L2422 (ANAB/ANSI), EPA FL01147