

# Efficacy of the Defend 1050 Recirculating Air Cleaner Against Three Respirable Microorganisms

Client: Protect ED™

ARE Project#: 11007.10

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# Efficacy of the Defend 1050 Recirculating Air Cleaner Against Three Respirable Microorganisms

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#### Article Info ABSTRACT Article History: *Purpose:* This study was done to characterize the efficacy of the Defend 1050 air purification device, distributed by Protect ED™, against three aerosolized microorganisms. Submitted: 11-Jul-24 Background: This study characterized the Defend 1050 air purifier's efficacy in removing three species of respirable bioaerosols using a sealed 16m<sup>3</sup> testing chamber. Two methods were used: Keywords: 1) the single-pass efficiency was tested to calculate the CADR, and 2) chamber trials were · Defend 1050 performed to prove the device's efficacy in an indoor environment. Protect ED<sup>™</sup> · Bioaerosol Reduction The species tested were Enterobacter cloacae, a gram-negative bacterium; Salmonella enterica, a gram-negative bacterium; and *Listeria innocua*, a gram-positive bacterium. These are typical FDA Compliance: food and airborne pathogens that can be found in public places and cause various illnesses. Consequently, the United States Department of Agriculture (USDA) and the Food and Drug This study was conducted in compliance with FDA Good Administration (FDA) are concerned with controlling their spread. Laboratory Practices (GLP) as defined in 21 CFR, Part 58. Methods: Each microorganism was aerosolized into a sealed 16m3 environmental bioaerosol test chamber containing the test device using a Collison 24-jet nebulizer. For the single-pass Testing Lab: testing, sampling was performed by simultaneously capturing bioaerosols directly at the inlet and outlet of the device and calculating the percent reduction. Three trials were performed for Aerosol Research and Engineering each organism and the results averaged. For the chamber trials, twelve (12) live bioaerosol trials Laboratories, Inc. were performed; three species each were tested in triplicate, including one control trial per Project #: 11007.10 organism. Bioaerosol samples were then taken from the chamber at multiple time points Conflict of Interest: throughout each trial to quantify the reduction rate of the recirculating air cleaner. Chamber control trial data, or natural decay, was subtracted from the device trial data to yield the net log Aerosol Research and Engineering reduction for each bioaerosol challenge. Laboratories, Inc. have no affiliations with, or involvement in All samples were serially diluted, plated, incubated, and enumerated in triplicate to yield viable any capacity, with Protect ED & bioaerosol concentrations before and after passing through the device. Novaerus' financial interests such as; membership, employment, *Results:* The average single-pass reduction measured was 3.97 ± 0.03 log, or 99.989%, resulting stock ownership, or other equity in a CADR of 533 cfm. interest. In chamber trial tests, the device effectively reduced all three bioaerosol challenge organisms by a net log of 4.0 or greater (equivalent to 99.99% or greater) within 15 minutes, exceeding a 6 net log reduction in 20 minutes. *Conclusions:* The device quickly reduced three species of airborne microorganisms in the chamber trials. This is due to the device's high efficiency, which resulted in a 533 cfm CADR.

#### Introduction

This study evaluated the efficacy of the Defend 1050 device, manufactured by Novaerus and distributed by Protect ED<sup>™</sup>, in reducing aerosolized microorganisms. The air filtration device utilizes a three-stage filter and Nanostrike<sup>™</sup> technology for use in schools, medical buildings, and other large spaces. It's designed to purify air continuously while in operation. It filters out and inactivates airborne particles, including bacteria, viruses, and mold spores, with the filters and proprietary technology.

The Defend 1050 device has a 510(k) premarket

notification to the U.S. Food and Drug Administration (FDA). The 510(k) submission provides comprehensive information about the device, its intended use, and data supporting its safety and efficacy. Clearance through the 510(k) process is essential for legally marketing the device in the United States.

The Defend 1050 device is designed to improve indoor air quality in commercial and medical applications. The test plan implemented in this study involved challenging the Defend 1050 device in a controlled environmental chamber. The objective was to determine the reduction rates and extent of three commonly found bacteria. Figure 1 shows a photo of the Defend 1050 device.





Figure 1: The Defend 1050 Recirculating Room Air Purifier.

#### **Study Overview**

The effectiveness of the Defend 1050 device (Figure 1) was evaluated against two Gram-negative and one Gram-positive bacteria. Testing was conducted to characterize the Defend 1050 device unit against three organism types to demonstrate the device's capability, when operating at the highest fan speed (533 CFM), to reduce viable bioaerosol concentrations, theoretically reducing the chances of airborne infection.

#### **Test Device Description**

The Defend 1050 is a free-standing recirculating air cleaner. It is designed to pull air through a pre-filter, and then the airflow is passed through the patented NanoStrike<sup>M</sup> coils before being pushed out of a HEPA 13 filter and granulated carbon post-filter. The device has 5 fan speeds, and all testing was performed at the highest fan speed, which averaged 533 ft<sup>3</sup>/minute (CFM).

#### Flow Rate Measurement

Before testing, the flow rate was measured on the test device when set to Speed 5 by measuring with a handheld digital anemometer (AOPUTTRIVER AP-856A). The average of 6 location linear flow rates and the total area the air passes through were measured. The volumetric flow rate was then calculated by multiplying the linear flow rate by the area of the device vent.

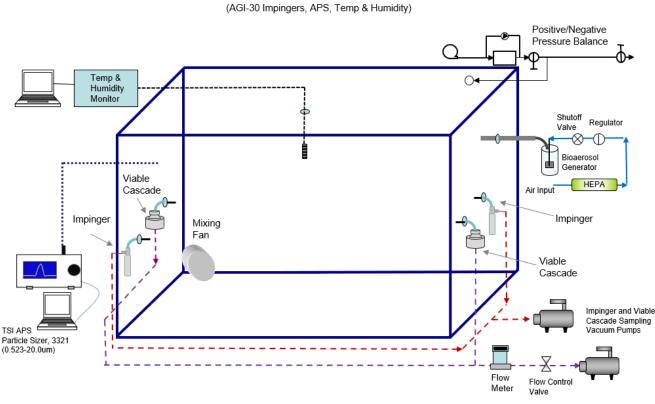
#### **Chamber Use Justification**

The 16m<sup>3</sup> stainless steel chamber was chosen for testing the device as it was tested for the 510k approval. The 16m<sup>3</sup> chamber has often been used to simulate an air cleaner running in a small room such as an office or residential space. The chamber has been used in previous FDA 510K submissions with devices from notable manufacturers such as Aeroclean (K223328) and The Pyure Company, formerly known as HGI Industries (K133800).

Trial	Run	Device	Device Fan Setting	Challenge Species (gram, description)	ATCC Ref #	Chamber Size (m <sup>3</sup> )	Target Particle Size	Challenge Conc. (#/L)	Trial Time (min)	Bioaerosol Sampling Time Points (min)	Sampling Devices	Plating and Enumeration
1	Control										Impingers,	
2	Challenge	Defend 1050	Speed 5	Enterococcus clocae	13047	16	1.0 - 3.0	10 <sup>4</sup> -10 <sup>5</sup>	20	0, 5, 10, 15, 20	Viable	All Samples
3	Challenge	Derena 1050	Speed 5	(gram -)	13047	10	μm	10 - 10	20	0, 3, 10, 13, 20	BioSamplers	in Triplicate
4	Challenge										biosampiers	
1	Control											
2	Challenge	Defend 1050	Speed 5	Salmonella enterica	53648	16	1.0 - 3.0	10 <sup>4</sup> -10 <sup>5</sup>	20	0, 5, 10, 15, 20	TSI 3321 APS,	All Samples
3	Challenge	Defend 1050	speed 5	(gram -)	53048	5 10	μm	10'-10" 2	20	0, 5, 10, 15, 20	Impingers	in Triplicate
4	Challenge											
1	Control											
2	Challenge	D - f	C	(interviewing in a second for a second s	22000	10	1.0 - 3.0	4 5	20	0 5 40 45 20	TSI 3321 APS,	All Samples
3	Challenge	Defend 1050	Speed 5	Listeria innocua (gram +)	33090	16	μm	10 <sup>4</sup> -10 <sup>5</sup>	20	0, 5, 10, 15, 20	Impingers	in Triplicate
4	Challenge											

Table 1: Bioaerosol Challenge Test Matrix. The Defend 1050 was operated at 533 CFM for all trials in this study.





### General Large Chamber Bioaerosol Configuration

**Figure 2 Bio-Aerosol Test Chamber Flow Diagram**. The chamber includes bioaerosol induction, multiple bioaerosol sampling ports, Particle size monitoring, internal mixing fans, and temperature and humidity controls. The HEPA Evacuation System is not pictured.

#### Equipment

#### **Bioaerosol Testing Chamber**

A large, sealed aerosol test chamber was used to simulate a contaminated room environment and to contain any aerosols for lab and technician safety. The aerosol test chamber is constructed of 304 stainless steel and is equipped with three viewing windows and an air-tight lockable chamber door for system setup and general ingress and egress. The test chamber's internal dimensions are 9.1 ft x 9.1 ft x 7 ft, with a displacement volume of 579 cubic feet, or 16,000 liters. Figure 3 shows the bioaerosol chamber used for all testing in this study.

The chamber has filtered HEPA inlets, digital internal temperature and humidity monitors, a heater, a humidifier, a lighting system, multiple sampling ports, aerosol mixing fans, and a HEPA-filtered exhaust system operated with wireless remote control.

For testing, the chamber is equipped with four 3/8-inch diameter stainless steel probes for aerosol sampling and a 1-inch diameter port for bio-aerosol dissemination into the chamber using a Collison 24-jet nebulizer or dry powder

eductor for the aerosolization of the microorganisms and spores, respectively. See Figure 2 for a flow diagram of the testing chamber.



Figure 3: Stainless Steel Bioaerosol Test Chamber used for all Defend 1050 Device Testing. The Chamber has HEPA in/out, multiple bioaerosol sampling ports, decontamination, and pressure balance.

To avoid wall effects, all sample and dissemination ports were inserted approximately 18 inches from the chamber's



interior walls and at a height of approximately 40 inches from the floor. The aerosol sampling and dissemination probes are stainless steel and bulkheaded through the chamber walls to provide external remote access to the aerosol generator and samplers during testing.

The test chamber is equipped with two high-flow HEPA filters for the introduction of filtered, purified air into the test chamber during aerosol evacuation/purging of the system between test trials and a HEPA-filtered exhaust blower with a 500 ft<sup>3</sup>/min rated flow capability for rapid evacuation of remaining bioaerosols. A Magnehelic gauge with a range of -0.5 to 0.5 inches of H<sub>2</sub>O (Dwyer instruments, Michigan City, IN) was used to monitor and balance the system pressure during aerosol generation, aerosol purge, and testing cycles.

#### **Test Chamber Environmental Controls**

For increased stability of bioaerosols, relative humidity inside the chamber is kept at 65% +/- 5% using a PID humidity controller in combination with an ultra-sonic humidifier to nebulize filtered DI water. Temperature controls maintain chamber trial conditions at typical ambient conditions of  $72 \pm 2$  °F ( $22 \pm 1$  °C). These environmental controls ensure that the bioaerosols remain stable within the chamber, limiting the amount of natural decay seen during control tests. This subsequently allows for a better resolution of the reduction provided by the device, especially at lower chamber concentrations.

#### **Bioaerosol Generation System**

All test bioaerosols were disseminated using a Collison 24jet nebulizer (BGI Inc. Waltham MA), similar to the one shown in Figure 4. A HEPA-purified, filtered house air supply drove the aerosolization of bioaerosols. A pressure regulator allowed for controlled dissemination, allowing for better control of particle size and standardizing the use rate and sheer force generated within the Collison nebulizer. Before testing, the Collison nebulizer flow rate and usage rate were characterized using an air supply pressure of approximately 40-60 psi, which produced an output volumetric flow rate of 50-80 L/min with a fluid dissemination rate of approximately 1.25 mL/min. The flow of the Collison nebulizer was characterized by a calibrated TSI model 4040 mass flow meter (TSI Inc., St Paul, MN).

#### **Bioaerosol Sampling and Monitoring System**

Two AGI impingers (Figure 5, Ace Glass Inc. Vineland NJ) were used to collect all biological aerosols, allowing for precise back calculations to determine chamber concentrations. The two AGI Impingers were placed at opposite corners of the chamber, ensuring a better representative sample. The mixing fans inside the chamber provided a homogenous air mixture inside the chamber.

These procedural implementations are essential for consistency and accuracy during the bioaerosol sampling. The AGI-30 impingers were connected to a vacuum source maintained at a negative pressure of 18 inches of Hg during all characterization and test sampling to ensure critical flow conditions. The AGI-30 bio sampler impingers flow was characterized using a calibrated TSI model 4040 mass flow meter. This calibration, coupled with the impingers' critical orifice design, always allows for a consistent chamber airflow through the samplers.



Figure 5: Air samples were taken with an AGI-30 impinger.



Figure 4. 6-Jet Collison nebulizer. Glass and 304 stainless steel construction, BGI Industries. The 24-jet variant was used for testing.

#### TSI Aerodynamic Particle Sizer

A TSI Aerodynamic Particle Sizer (APS) model 3321 (TSI Inc., Shoreview, MN) was used to measure aerosol concentrations and particle size during trials. The APS provided real-time aerodynamic particle characterization with a size range from 0.54 to 20.0  $\mu$ m and 52 size bins of resolution. Sampling is continuous with a data export interval of 1 second. The APS has a continuous flow rate of 5 liters per minute (LPM). A picture of the APS is shown in Figure 6.





**Figure 6.** TSI Aerodynamic Particle Sizer (APS) model 3321 was used to measure the challenge-bioaerosol's total particle concentration and particle size distribution. The range is 0.54-20.0  $\mu$ m aerodynamic diameter, with 1 particle/L detection limits.

#### SKC Viable Bio-Sampler

Sample collections were also obtained using a pair of viable impactors during testing with less resilient organisms or those that fall out of the air more efficiently. A viable cascade impactor (SKC Inc., Valley View, PA) comprises an inlet cone, a precision-drilled 400-hole impactor stage, and a base with a standard-size agar plate (Figure 7). A high-flow pump pulls microorganisms in the air through the holes (jets) at 30 liters per minute, where they are collected directly onto the agar surface. This method is the most sensitive for detecting organisms at low concentrations.



**Figure 7:** SKC Single Stage BioStage Viable Cascade Impactor used for bacterial and spore sampling for select time points during bioaerosol trials. LOD is >0.01 cfu/L.

#### Single-Pass Sampling Configuration

To quantify the Defend 1050's single-pass reduction, stainless steel sample probes were mounted on the device for instantaneous sampling of its inflow and outflow. Figure 8 shows a picture of the probes mounted. A PVC pipe was mounted on the outflow to prevent particles from returning to the sample probe and measure the downstream bioaerosol concentrations. The upstream probe was mounted tangentially to the inflow of air on the front of the device.

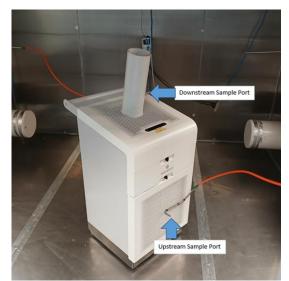


Figure 8: Aerodynamic Single pass sample port placement on the test device. Stainless steel probes were attached to PTE tubing for direct air sampling with AGI 30 impingers.

#### **Species Selection and Justification**

Reducing viable bioaerosols by 4 net log or 99.99% is the minimum requirement for FDA 510k-approved use. The organism species used were explicitly chosen for their natural abundance, particle size differences, and potential to cause infection. Due to safety concerns for bioaerosol testing, organism selection was based on Biological Safety Level 1 (BSL1) species.

Three different organisms with different particle sizes were selected to assess the filtration device fully. Determining the reduction rate by a filtration device with a range of particle sizes was one of the justifications for selecting these organisms and their predominance in commercial settings.

The first bacterium chosen was *Enterobacter cloacae* (ATCC # 13047), a gram-negative rod-shaped, facultatively anaerobic, and bears peritrichous flagella. *E. cloacae* is a bacteria commonly used in various forms of testing as it is a common pathogen found in a multiplicity of places, and it is also known as a simulant for medically significant gram-negative pathogens.

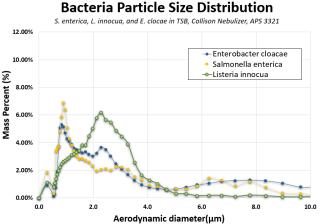
The second bacterium chosen was *Salmonella enterica* (ATCC # 53648), a rod-shaped, flagellate, facultatively anaerobic, Gram-negative bacterium. This is a common foodborne illness pathogen and is predominant in poultry processing factories.

The third bacterium was *Listeria innocua* (ATCC# 33090), a Gram-positive, rod-shaped bacterium. This species is motile, facultatively anaerobic, and non-spore-forming. Pathogenic forms of Listeria can form biofilms in food-processing plants, creating contamination problems.

#### **Challenge Bioaerosol Aerodynamic Diameter**

Bioaerosol particle size distributions were measured with a TSI Aerodynamic Particle Sizer model 3321 (APS) for all challenge species. The particle size distribution was taken shortly after aerosolization for each species via sampling through a sample probe into the test chamber. The APS has a dynamic measurement range of 0.54 to 20.0  $\mu$ m and was programmed to take consecutive real-time one-minute aerosol samples.

Data was logged in real-time to a laptop computer, regressed, and plotted. All challenge bioaerosols' aerodynamic particle size distribution was within the respirable range for regional alveolar tract deposition. It showed a low geometric standard deviation (GSD), indicating that a monodispersed aerosol was generated in the chamber for each challenge species. The bioaerosol particle size distributions for the species tested are shown in Figure 9.



**Figure 9:** Aerodynamic Particle Size Distribution of the three bioaerosol species in the test chamber. MMAD for each species was approximately 1-3 µm.

#### **Challenge Organism Culture & Preparation**

#### Vegetative Cells Culture & Preparation

Pure strain seed stocks were purchased from ATCC (American Type Culture Collection, Manassas, VA). For ATCC reference numbers, see **Table 1** on page 3. Working stock cultures were prepared using aseptic techniques in a class 2 biological safety cabinet and followed standard seed preparation methodologies. Approximately 250mL of each biological stock was prepared in tryptic soy liquid broth media and incubated for 24-48 hours with oxygen infusion (1cc/min)

at 37°C. Biological stock concentrations were around 1 x  $10^{10}$  cfu/ml.

These stock cultures were then centrifuged for 10 minutes at 3000rpm in an LD-3 centrifuge in sterile 50mL conical tubes, growth media was removed, and the cells were resuspended in sterile Tryptic Soy Broth for aerosolization. For viable counts and stock concentration calculation, these suspensions were enumerated on tryptic soy agar plates (Hardy Diagnostics, Cincinnati, OH). For each organism, test working stocks were grown in sufficient volume to satisfy use quantities for all tests conducted using the same culture stock material.

#### Methods Bioaerosol Testing

#### Nebulizer Stock Preparation

The bacterial challenges were centrifuged to remove spent growth media, then resuspended in Tryptic Soy Broth (TSB) and Antifoam A (ThermoScientific). The Collison nebulizer was filled with approximately 50mL of biological stock suspension for all bioaerosol tests. The TSB acted as a soil and stabilizer for the challenge tests, adding sugars, proteins, and other particulate matter to simulate a more real-world scenario for the filter.

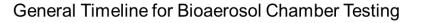
#### **Bioaerosol Single Pass Methods**

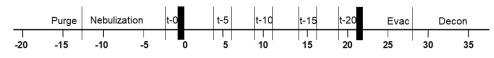
Using the custom sampling configuration described above, each organism was aerosolized individually for 10 minutes, and then simultaneous upstream and downstream impinger samples were taken 3 times with the Defend 1050 in operation. After the sampling, the nebulization was stopped, the device was powered off, and the chamber was evacuated.

#### **Bioaerosol Trial Methods**

To accurately assess the Defend 1050 device unit, test chamber pilot control trials were performed with all six organisms over 60 minutes to characterize the biological challenge of aerosol delivery/collection efficiency and viable concentration over time. Control testing was performed to provide baseline comparative data and verify that viable bioaerosol concentrations persisted above the required concentrations over the entire pilot control test period.

The control data, or natural decay, allowed quantifying the reduction from the Defend 1050 device challenge testing. During control runs, two low-velocity fans located in the corners of the bioaerosol test chamber were turned on for the trial to ensure a homogenous aerosol concentration within the chamber. The mixing fan was used for all control runs and was turned off during Defend 1050 device decontamination trials.





**Figure 10 Bioaerosol Trial Timeline Example.** Impinger samples were taken throughout each trial to determine the reduction rate of bioaerosols in the testing chamber, and trial times varied depending on the fan speed setting of the device. The figure shows the timeline of a 20-minute trial.

The two impingers for bioaerosol collection were pooled and mixed before plating and enumeration. A complete test matrix for the bioaerosol trials can be found at the beginning of the report in Table 1.

AREGLabs

The Collison nebulizer was filled with the appropriate solution described above and then operated at 40 psi for 20 minutes. The TSB acted as a type of soil for the challenge tests. Then, the impingers were filled with 20 mL of sterilized PBS with an addition of 0.005% v/v Tween 80 for bioaerosol collection. The addition of Tween 80 was used to increase the impinger collection efficiency and deagglomeration of all microorganisms. The chamber mixing fans were turned on during bioaerosol dissemination to ensure a homogeneous bioaerosol concentration in the test chamber before taking the first impinger sample (T=0).

Following bioaerosol generation, baseline bioaerosol concentrations were established for each pilot control and Defend 1050 device test by sampling simultaneously with two AGI-30 impingers at opposite corners of the chamber. AGI samples were collected for 2 to 10 minutes at different intervals (Liu, et al., 2013) throughout the test period. Collected impinger chamber samples were pooled and mixed at each sample interval for each test. Aliquots of impingers were rinsed 6x with sterile filtered water between each sampling interval and re-filled with sterile PBS using sterile graduated pipettes for sample collection.

For Defend 1050 device biological testing, the unit was turned on immediately following the T=0 timepoint sample and operated for the entirety of the test. Subsequent impinger samples were taken at various time points throughout the trial. These samples were enumerated for viable concentration to measure the effective viable bioaerosol reduction during the operation of the Defend 1050 device over time.

All samples were plated in triplicate on tryptic soy agar media over a minimum 3 log dilution range. Plates were incubated for 24-48 hours and enumerated for viable plaqueforming units (pfu) or colony-forming units (cfu) to calculate aerosol challenge concentrations in the chamber and reduction of viable microorganisms.

#### **Plating and Enumeration**

Impinger and stock biological cultures were serially diluted

and plated in triplicate. (Multiple serial dilutions) using a standard drop plaque assay technique onto tryptic soy agar plates. Depending on the species, the plated cultures were incubated for 24-48 hours and enumerated and recorded. Viable cascade sampling was used when working with microorganisms at extremely low concentrations. This method samples the chamber by pulling 30 liters per minute through the cascade device directly onto an agar plate.

Enumeration of colonies grown depends on the concentration of the sample. Colony counts totaling 400 can then be adjusted using the positive conversion table. This table is based on the principle that as the number of viable particles impinged on a given plate increases, the probability of the following particle entering an "empty hole" decreases. This can be corrected statistically using the conversion formula of Feller, W (1950). This viable cascade sampling method was not used in this study, given the level of resolution provided by the impingers at the end of these trials.

#### **Post-Testing Decontamination and Prep**

Following each test, the chamber was airflow evacuated/purged for at least twenty minutes between tests and analyzed with the APS for particle concentration decrease to baseline levels between each test. The chamber was decontaminated after the trials with aerosol/vaporous hydrogen peroxide (35%). The Collison nebulizer and impingers were cleaned after each day of testing by soaking in a 5% bleach bath for 20 minutes. The nebulizer and impingers were then submerged in a DI water bath, removed, and spray rinsed 6x with filtered DI water until use.

#### **Data Analysis and Calculations**

Single-pass upstream and downstream bioaerosol concentrations were used to calculate the single-pass reduction by the Defend 1050 device for each of the three organisms. This was done by dividing the downstream concentration by the upstream concentration and subtracting from one to determine the percent reduction after a single pass through the device. Each species was tested in triplicate for statistical significance. Also, once the single pass reduction was measured, the clean air delivery rate was calculated by multiplying the single pass reduction by the volumetric flow rate of the device, which was 533 CFM for all tests.



In addition, results from the control trials were graphed and plotted to show natural viability loss over time in the chamber. These control runs served as the basis to determine the time required for the Defend 1050 device to achieve at least a 4 LOG (99.99%) reduction in viable bioaerosol above the natural losses from the control runs. The control and trial runs are plotted, showing each organism's log reduction in viable bioaerosol. All data are normalized with time-zero enumerated concentrations. Subsequent samples are normalized and plotted to show the loss of viability over time. All raw data and supplemental graphs can be found in the report appendices. Example calculations used in this study can be found in **Appendix C.** 

#### **Single-Pass Reduction Results**

The Defend 1050 device was challenged with three different bacteria species, and a minimum reduction of 99.988% was observed after a single pass through the device.

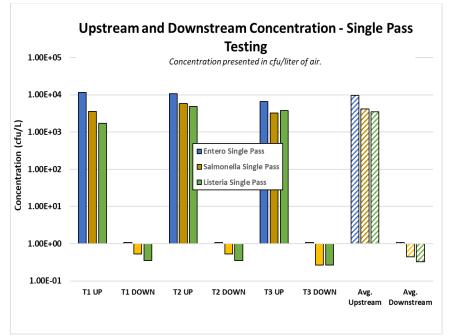
Each species had similar reductions, proving that the device's robust efficacy captures nearly all of the bioaerosol generated. The percent reduction results can be found in Figure 11.

#### Single-Pass Conclusion and CADR

Given the high reduction observed from single-pass testing, the CADR can be calculated for each organism. This is the single pass reduction for each multiplied by the volumetric flow rate of the device, which was 533 CFM. Each of the CADRs averaged 532.9 CFM across the three species tested. The following equation was used to calculate the CADR:

CADR = % Reduction  $\times V$ 

CADR = Clean Air Delivery Rate V = volumetric flow rate ft<sup>3</sup>/min % Reduction = Single-Pass Efficiency



**Figure 11**: Up and downstream bioaerosol concentrations used in the calculations of the single-pass percent reduction results for all three species tested on the highest fan speed of the device (533 CFM).

Test Species	Number of Trials	Volumetric Flow Rate (ft <sup>3</sup> /min)	Data Type	Trial 1	Trial 2	Trial 3	Average
Enterobacter clocae	2	533	CADR	532.95	532.95	532.91	532.94 ± 0.02
Enterobucter clocue	5	222	Single Pass Efficiency	99.991%	99.990%	99.984%	99.988% ± 0.004%
Salmonella enterica	Э	533	CADR	532.92	532.95	532.96	532.94 ± 0.02
Sumonena enterica	5	222	Single Pass Efficiency	99.985%	99.991%	99.992%	99.989% ± 0.004%
,	2	500	CADR	532.89	532.96	532.96	532.94 ± 0.04
Listeria innocua	3	533	Single Pass Efficiency	99.979%	99.993%	99.993%	99.988% ± 0.008%

Figure 12: This table summarizes each trial's single pass reduction results and the group average and standard deviation. The CADR was calculated for each trial by multiplying the single pass efficiency by the volumetric flow rate of 533 CFM.

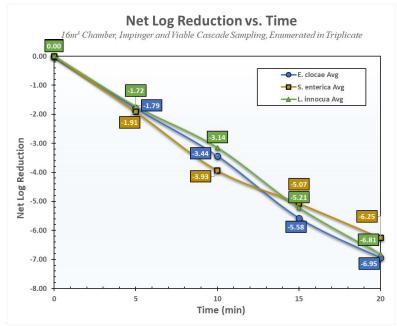


#### **Chamber Trial Reduction Results**

The Defend 1050 device performed quickly and efficiently, reducing all three organisms by over 4 log or 99.99% in under 15 minutes in the testing chamber. Samples were taken every 5 minutes after the device was activated, and no bacteria was detected after 20 minutes of operation. The average total net reduction of *E. cloacae* was  $6.95 \pm 0.14 \log$  or 99.99988% in 20 minutes. The average total reduction of *S. enterica* was  $6.25 \pm$ 

0.22 log or 99.999939% in 20 minutes. The average reduction of L. innocua was  $6.81 \pm 0.23$  log or 99.999983% in 20 minutes.

The reproducibility of the results and consistent performance demonstrate that Defend 1050 is very effective at reducing airborne bacteria. The net log reduction results can be found in Figure 13, and an executive summary detailing the test results can be found in Figure 14. Supplementary graphs and raw data are in Appendixes A and B.



**Figure 13:** Net Log Reduction for the bacterial species challenged against the Defend 1050 device. The device was set to 533 CFM for all trials.

Bioaerosol Type	Species (description)	) Trial Name	Reduction Type		Trial T	ime (minutes)		
Type	(description)			5	10	15	20	
De ete vie	E. clocae	Entero-T1	Net Log Reduction	-1.50	-3.21	-5.51	-7.05	
Bacteria	(gram -)	Entero-11	Net % Reduction	96.8301%	99.9390%	99.9997%	100.0000%	
Bacteria	E. clocae	Entero-T2	Net Log Reduction	-1.82	-3.72	-5.64	-7.01	
Bacteria	(gram -)	Entero-12	Net % Reduction	98.4983%	99.9809%	99.9998%	100.0000%	
Bacteria	E. clocae	Entero-T3	Net Log Reduction	-2.05	-3.38	-5.59	-6.78	
Dacteria	(gram -)	Entero-15	Net % Reduction	99.1019%	99.9580%	99.9997%	100.0000%	
		/ St. Dov	Net Log Reduction	-1.79 ± 0.28	-3.44 ± 0.26	-5.58 ± 0.07	-6.95 ± 0.14	
	All Trial Averages +/- St. Dev.		Net % Reduction	98.143% ± 1.177%	99.959% ± 0.021%	99.9997% ± 0.00004%	99.999988% ± 0.000004%	
Dectoria	acteria S. enterica (gram -)	S. enterica	Salmonella-T1	Net Log Reduction	-1.73	-3.85	-5.14	-6.30
Bacteria		Sumonena-11	Net % Reduction	98.1478%	99.9858%	99.9993%	100.0000%	
De ete vie	S. enterica	Salmonella-T2	Net Log Reduction	-1.99	-3.96	-4.81	-6.02	
Bacteria	(gram -)		Net % Reduction	98.9669%	99.9890%	99.9985%	99.9999%	
Bacteria	S. enterica	Salmonella-T3	Net Log Reduction	-2.02	-3.99	-5.24	-6.45	
Bacteria	(gram -)	Sumonena-13	Net % Reduction	99.0345%	99.9898%	99.9994%	100.0000%	
AU 7.			Net Log Reduction	-1.91 ± 0.16	-3.93 ± 0.08	-5.07 ± 0.23	-6.25 ± 0.22	
All Ir	ial Averages	± St. Dev.	Net % Reduction	98.716% ± 0.494%	99.988% ± 0.002%	99.9991% ± 0.00052%	99.999939% ± 0.000032%	
De ete vie	L. innocua	Listeria-T1	Net Log Reduction	-1.51	-3.32	-5.29	-6.62	
Bacteria	(gram +)	Listeria-11	Net % Reduction	96.9078%	99.9525%	99.9995%	100.0000%	
Bacteria	L. innocua	Listeria-T2	Net Log Reduction	-1.87	-3.07	-5.16	-6.74	
Dacteria	(gram +)	Listeriu-12	Net % Reduction	98.6433%	99.9155%	99.9993%	100.0000%	
Bacteria	L. innocua	Listeria-T3	Net Log Reduction	-1.78	-3.03	-5.19	-7.07	
Datterid	(gram +)	LISLEITU-13	Net % Reduction	98.3561%	99.9074%	99.9993%	100.0000%	
	ial Averages	+ St. Dou	Net Log Reduction	-1.72 ± 0.19	-3.14 ± 0.16	-5.21 ± 0.07	-6.81 ± 0.23	
	Tal Averages	± St. Dev.	Net % Reduction	97.969% ± 0.93%	99.925% ± 0.024%	99.9994% ± 0.00009%	99.999983% ± 0.000008%	

ARE Labs Inc. 2024



#### **Overall Study Summary:**

In conclusion, the Defend 1050 device, with its high efficiency and CADR, achieved greater than a 4 net log reduction of all three bioaerosols within 20 minutes of operation in the 16m3 environmental chamber. The device proved highly effective in reducing the aerosol bioburden of three distinct microbial species. It is anticipated that such a reduction should reduce the likelihood of individuals contracting airborne infectious diseases in an enclosed environment.

#### **Deviations and Data Analysis:**

No deviations from the protocol were noted throughout the trials. All results were ≤0.30 standard deviations from the mean. Following ARE Lab's standard practice and in compliance with GLPs, all data were verified for accuracy. All raw data and supplemental graphs can be found in the appendices following the report.

#### References

Feller, W. (1950). An introduction to probability theory and its applications. Wiley.

T. Reponen, K. Willeke, V. Ulevicius et al. *Techniques of Dispersion of Microorganisms in Air*. Aerosol Science and Technology. 27: 1997. pp. 405-421.

Ding and Wing. *Effects of Sampling Time on the Total Recovery Rate of AGI-30 Impingers for E. coli*. Aerosol and Air Quality Research, Vol. 1, No. 1, 2001, pp. 31-36.

Hinds, W. C. (1999). Aerosol technology: properties, behavior, and measurement of airborne particles. John Wiley & Sons.

Hwang, S. H., et al. (2018). Evaluation of microbial contamination levels of bioaerosols in a healthcare facility using an active air-sampling method. *Environmental Health and Toxicology*, 33(2), e2018009.

Biswas, P., et al. (2018). Factors affecting the collection efficiency of bioaerosol samplers—a review. *Aerosol Science and Technology*, 52(2), 142-160.

Li, C. S., et al. (2002). Collection efficiencies of aerosol samplers in sub-micrometer and ultrafine particle sampling: effect of particle size, sampling flow rate, and sampler design. Aerosol Science and Technology, 36(5), 593-602.

Wang, Z., Reponen, T., Grinshpun, S. A., Górny, R. L., & Willeke, K. (2001). Effect of sampling time and air humidity on the bioefficiency of filter samplers for bioaerosol collection. *Journal of Aerosol Science*, *32*(5), 661-674.



Aerosol Research and Engineering Labs, Inc. 12880 Metcalf Avenue Overland Park, KS 66213

### Project #

11007.10

### **Study Director**

Richard Ludwick Aerosol Research and Engineering Laboratories

#### **GLP Statement**

We, the undersigned, certify that Aerosol Research and Engineering Laboratories conducted the work described herein in compliance with FDA Good Laboratory Practices (GLP) as defined in 21 CFR, Part 58.

#### **Conflict of Interest Statement**

Aerosol Research and Engineering Laboratories, Inc. has no affiliations with, or involvement in any capacity, with Protect ED & Novaerus' financial interests, such as membership, employment, stock ownership, or other equity interests.

**Study Director:** 

Rochard K

Richard Ludwick Study Director ARE Labs, Inc.

7/11/2024 Date

**Principal Investigator:** 

ARE Labs, Inc.

Sean McLeod Principal Investigator

7/11/2024 Date



# Appendix A - Additional Figures: Reduction Graphs by Organism



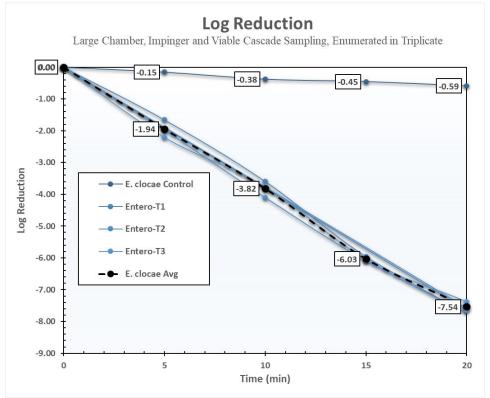
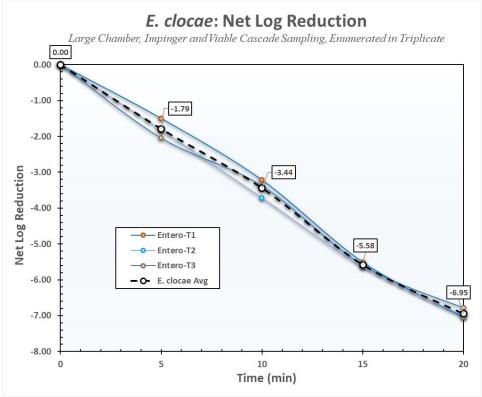
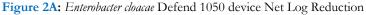


Figure 1A: Enterobacter cloacae Defend 1050 device Log Reduction







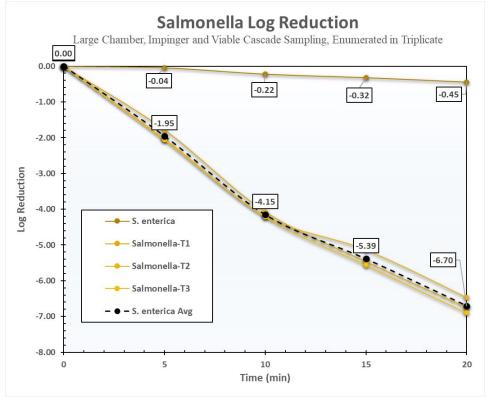


Figure 3A: Salmonella enterica Defend 1050 device Log Reduction

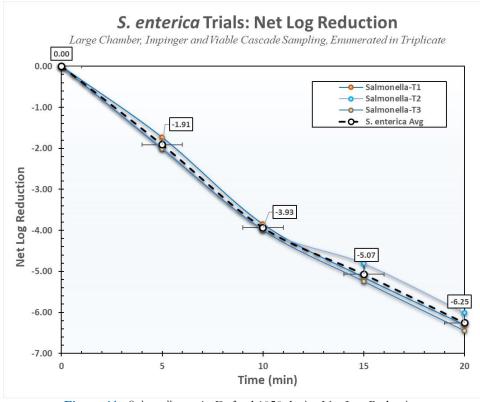


Figure 4A: Salmonella enterica Defend 1050 device Net Log Reduction



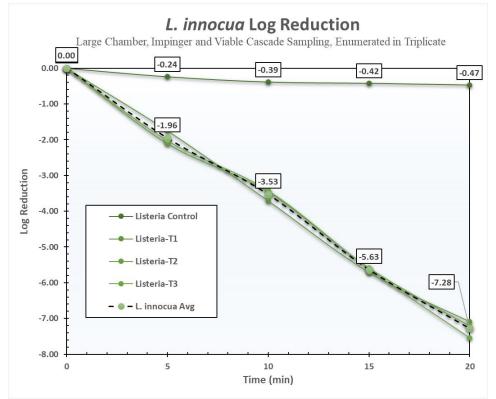
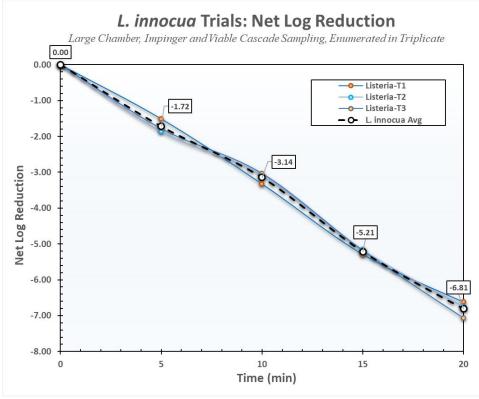
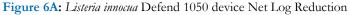


Figure 5A: Listeria innocua Defend 1050 device Log Reduction







# **Appendix B: Raw Data**



[ <b>ria</b> ]	l Information		TRIAL LOC	<b>G</b> REDUCTION	RESULTS	
	TEST DATE: Tuesday, July 2, 2024					
	TRIAL PERFORMED BY: SMM	0.	0	-0.38		
	TRIAL NUMBER: C1				-0.45	-0.59
	TEST ORGANISM: E. clocae					ĕ
TR	IAL NAME ID (GRAPHS/TABLES): Entero C1	-1.	0			
ev	ice Information					
	MANUFACTURER: NA	-2.	0			
	UNIT MODEL: NA	E				
	FAN SPEED (CFM): NA	ctic				
	UNIT SERIAL #: NA	-3.	D			
	FITER ID #: NA	l R			Ente	ro C1
	FILTER LOT #: NA	LOG Reduction			– – LOD	
		-4.			– <b>o</b> – Linea	ar Fit
en	eral Testing Conditions (Can Be User Defined)					
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16 NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb	-5.	0 <mark>-5.82</mark>			
	SAMPLING METHOD: Impinger & Cascade					
	CHAMBER MIXING FAN: yes	-6.				
	TEMP (F): 74					
	RH (%): 57					
	OTHER INSTRUMENTS: NA	-7.				
	TRIAL COMMENTS/NOTES and antifoam		0 5	10	15	20
	RIAL COMMENTS/NOTES and antifoam			Time (min	)	
0/	AEROSOL Sample ID and Summary Data	S1	S2	<b>S</b> 3	S4	<b>S</b> 5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	У	У	У	У	У
	VIABLE CASCADE USED (y / n)	n	n	n	n	n
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	9.422E+0	6.613E+04	3.947E+04	3.307E+04	2.416E+0
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	23.33%	6 45.00%	31.82%	<b>45.00%</b>	9 38.21%
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	9.42E+0	4 66133.33	39466.67	33066.67	2.416E+0
	<b>RELATIVE PERCENT REMAINING FROM T=0 (%)</b>	100.0000	% 70.1887%	41.8868%	35.0943%	25.6415%
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	29.8113%	58.1132%	64.9057%	74.3585%
	LOG REDUCTION FROM T=0 (log10)	0.00	-0.15	-0.38	-0.45	-0.59
m	inger Sampling Conditions					
'P'	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0	20.0
	IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0	5.0
	IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5	12.5
	DILUTION RATIO (10 <sup>x</sup> )	-4	-4	-4	-4	-3
	DROPLET SIZE (µl)	100	100	100	100	100
		1	4	1	2	2
T#2			3	1	1	11
T# after		2				
T # ASTINIT HA	ENUMERATED PLATE COUNTS (# / drop)	2 3	1	1	1	15
		3			-	,
Duuuon Nauge #1	PLATE AVERAGE COUNT (# / drop)	3	2.67	1.00	1.33	9.33
THURSDAY INTERACT	PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml)	3 2.00 200,000	2.67 266,667	1.00 100,000	1.33 133,333	9.33 93,333
Dilution Kange #1	PLATE AVERAGE COUNT (# / drop)	3	2.67 266,667	1.00	1.33	9.33

DROPLET SIZE (µl)

100

100

100

100

100

51

60

62



	I Information TEST DATE: Tuesday, July 2, 2024			REDUCTION		
	TRIAL PERFORMED BY: SMM	2.0				
	TRIAL NUMBER: T1	[				
	TEST ORGANISM: E. clocae	1.0				
TR	IAL NAME ID (GRAPHS/TABLES): Entero T1	0.0				
	to a funda muse of the se	0.0	$\sim$			
vev	ice Information MANUFACTURER: NV	-1.0		1.65		
	UNIT MODEL: Defend 1050	e l		N I		
	FAN SPEED (CFM): 533	-2.0				
	UNIT SERIAL #: NA	-3.0				
	FITER ID #: NA	a la		No.	Enter	o T1
	FILTER LOT #: NA	<u>-4.0</u>				. 514
ien	eral Testing Conditions (Can Be User Defined)	-5.0			-•- Linea	FIT
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16				96	
	NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb	-6.0				
	SAMPLING METHOD: Impinger & Cascade	-7.0				
	CHAMBER MIXING FAN: yes				7.64	
	TEMP (F): 74	-8.0			<b>`</b>	
	RH (%): 57					
	OTHER INSTRUMENTS: NA		0	10	20	30
	TRIAL COMMENTS/NOTES and antifoam			Time (min)		
UNIT SERIAL #: NA FITER ID #: NA         General Testing Conditions (Can Be User Defined)         TEST CHAMBER VOLUME (m <sup>3</sup> ): 16 NEBULIZER CONDITIONS; Collison 24-jet; approx. 20 min neb SAMPLING METHOD: Impinger & Cascade CHAMBER NUNING FAN: yes TEMP (r): 74 RH (%): 57 	Time (timi)					
310/				<u>S3</u>	S4	S5
				10	15	20
	* /			y n	y n	n
				7.467E+01	3.200E-01	У
	· · ·	2.02.12.100	0.007 2100	1.1012.101	0.2002 01	0.007
		26.84%	25.71%	60.00%		
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	2.92E+05	6506.67	74.67	0.32	6.667E-0
				0.0255%	0.0001%	0.0000%
				99.9745%	99.9999%	100.0000
	LOG REDUCTION FROM 1=0 (log <sub>10</sub> )	0.00	-1.00	-3.59	-5.96	-7.64
mpi					45	
	SAMPLE TIME (min)		-			20
				10	15	
	IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0	20.0
	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min)	20.0 3.0	20.0 5.0	20.0 5.0	20.0 5.0	20.0 5.0
	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm)	20.0 3.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5
	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min)	20.0 3.0	20.0 5.0	20.0 5.0	20.0 5.0	20.0 5.0
E#1	IMPINGER FILL VOL (ni) IMPINGER SAMPLING TIME (nin) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> )	20.0 3.0 12.5 -4	20.0 5.0 12.5 -3	20.0 5.0 12.5 -2	20.0 5.0 12.5 <b>0</b>	20.0 5.0 12.5 <b>0</b>
ange #1	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µi)	20.0 3.0 12.5 -4 100	20.0 5.0 12.5 -3 100	20.0 5.0 12.5 -2 100	20.0 5.0 12.5 0 500	20.0 5.0 12.5 <b>0</b>
on Range #1	IMPINGER FILL VOL (ni) IMPINGER SAMPLING TIME (nin) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> )	20.0 3.0 12.5 -4 100 5	20.0 5.0 12.5 -3 100 1	20.0 5.0 12.5 -2 100 1	20.0 5.0 12.5 0 500 1	20.0 5.0 12.5 <b>0</b>
Dilution Range #1	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (bpm) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -4 100 5 8 6	20.0 5.0 12.5 -3 100 1 4 2	20.0 5.0 12.5 -2 100 1 0 0	20.0 5.0 12.5 0 500 1 0	20.0 5.0 12.5 <b>0</b>
Dilution Range #1	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µi) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	20.0 3.0 12.5 -4 100 5 8 6 .33	20.0 5.0 12.5 -3 100 1 4 2 2.33	20.0 5.0 12.5 -2 100 1 0 0	20.0 5.0 12.5 0 500 1 0 0	20.0 5.0 12.5 <b>0</b>
Dilution Range #1	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu'ml)	20.0 3.0 12.5 -4 100 5 8 6 6 33,333	20.0 5.0 12.5 -3 100 1 4 2 2 2,33 23,333	20.0 5.0 12.5 -2 100 1 0 0 0 0 .33 333	20.0 5.0 12.5 0 500 1 0 0 0.50 1	20.0 5.0 12.5 <b>0</b>
Dilution Range #1	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µi) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/m) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/m)	20.0 3.0 12.5 -4 100 5 8 6 6 3 6.33 6.33 6.33 3.38±+05	20.0 5.0 12.5 -3 100 1 4 2 2 2,33 23,333 7.47£+03	20.0 5.0 12.5 -2 100 1 0 0 0 0 0 333 333 1.07E+02	20.0 5.0 12.5 0 500 1 0 0 0.50 1 3.20E-01	20.0 5.0 12.5 0 500
Dilution Range #1	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (bm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µi) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) DILUTION RATIO (10 <sup>8</sup> )	20.0 3.0 12.5 -4 100 5 8 6 -3 -3	20.0 5.0 12.5 3 100 1 4 2 2 2,33 23,333 7.47E-03 -2	20.0 5.0 12.5 -2 100 1 0 0 0 .033 333 1.07E+02 -1	20.0 5.0 12.5 0 500 1 0 0 0 0 0	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µi) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/m) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/m)	20.0 3.0 12.5 -4 100 5 8 6 6 3 6.33 6.33 6.33 3.38±+05	20.0 5.0 12.5 -3 100 1 4 2 2 2,33 23,333 7.47£+03	20.0 5.0 12.5 -2 100 1 0 0 0 0 0 333 333 1.07E+02	20.0 5.0 12.5 0 500 1 0 0 0.50 1 3.20E-01	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ru) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ru) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -4 100 5 8 6 -3 100	20.0 5.0 12.5 -3 100 1 4 2 2 3 3 3 2 3,333 7.47E-03 -2 100	20.0 5.0 12.5 -2 100 1 0 0 0 333 333 1.07F-02 -1 100	20.0 5.0 12.5 0 500 1 0 0 0 0 0	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (þm) DILUTION RATIO (10°) DROPLET SIZE (µi) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi)	20.0 3.0 12.5 -4 100 5 8 6 -3 100 46	20.0 5.0 12.5 -3 100 1 4 2 2 3 3 3 2 3,333 7.47E+03 -2 100 15	20.0 5.0 12.5 -2 100 1 0 0 0 0 0 0 0 0 0 0 0 0 1 00 7 1 100 1 1	20.0 5.0 12.5 0 500 1 0 0 0 0 0	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ru) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ru) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -4 100 5 8 6 -3 100 46 38	20.0 5.0 12.5 -3 100 1 4 2 2 2,33 23,333 7.472+03 -2 100 15 20	20.0 5.0 12.5 -2 100 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	20.0 5.0 12.5 0 500 1 0 0 0 0 0	20.0 5.0 12.5 0 500
Dilution Range #1 Dilution Range #1	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ru) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ru) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -4 100 5 8 6 -3 100 46 38	20.0 5.0 12.5 -3 100 1 4 2 2 2,33 23,333 7.472+03 -2 100 15 20	20.0 5.0 12.5 -2 100 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	20.0 5.0 12.5 0 500 1 0 0 0 0 0	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (dpm) DILUTION RATIO (10 <sup>6</sup> ) DROPLET SIZE (µi) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) CHAMBER SIZE (µi)	20.0 3.0 12.5 -4 100 5 8 6 3 6.33 6.33 3.38±405 -3 100 46 38 55	20.0 5.0 12.5 -3 100 1 4 2 2 33 2,333 7.47E+03 -2 100 15 20 17	20.0 5.0 12.5 -2 100 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	20.0 5.0 12.5 0 500 1 0 0 0 0 0	20.0 5.0 12.5 0 500

Via	ble Cascade Sampling Conditions **Statistical Correction	Applied Autom	natically for co	unts>60		
	SAMPLE TIME (min	0	5	10	15	20
	VIABLE CASCADE SAMPLING TIME (min	0.5	0.5	1.0	2.0	5.0
1#	VIABLE CASCADE FLOW RATE (lpm)	30	30	30	30	30
ascade #	ENUMERATED PLATE COUNTS (# / plate	•				1
Viable Ca	STATISTICALLY CORRECTED PLATE COUNTS (# / plate					1
-	PLATE AVERAGE COUNT (# / plate	)				1.00
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air					0.007
			m · 1	4		

#### Figure 2B: Enterobacter cloacae Trial 1



rial	Information		TRIAL LOG	REDUCTION	RESULTS	
	TEST DATE: Wednesday, July 3, 2024					
	TRIAL PERFORMED BY: SMM	1.0				
	TRIAL NUMBER: T2					
	TEST ORGANISM: E. clocae	0.0				
TRI	IAL NAME ID (GRAPHS/TABLES): Entero T2					
		-1.0	\ <b>\</b>			
evi	ice Information			4.98		
	MANUFACTURER: NV	-2.0		- <b>\</b>		
	UNIT MODEL: Defend 1050	<u>.</u>				
	FAN SPEED (CFM): 533	g -3.0				
	UNIT SERIAL #: NA	-3.0 -3.0 -4.0 -4.0		10		
	FITER ID #: NA	-4.0 U		<u>_</u>	Enter	o T2
	FILTER LOT #: NA					
		-5.0			Linear	· Fit
en	eral Testing Conditions (Can Be User Defined)				09	
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16	-6.0				
	NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb				$\mathbf{N}$	
	SAMPLING METHOD: Impinger & Cascade	-7.0			7.60	
	CHAMBER MIXING FAN: yes				8	
	TEMP (F): 74	-8.0				
	RH (%): 57	-9.0				
	OTHER INSTRUMENTS: NA	-9.0	0	10	20	30
	TRIAL COMMENTS/NOTES					
	and antifoam			Time (min)		
~ ^	AEROSOL Sample ID and Summary Data	S1	S2	<b>S</b> 3	<b>S4</b>	<b>S</b> 5
0,	SAMPLE TIME (min)	0	5	10	15	20
		-	-		-	-
	IMPINGER USED (y / n)	у	У	У	у	n
	VIABLE CASCADE USED (y / n)	n	n	n	n	У
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	2.631E+05	2.773E+03	2.101E+01	2.133E-01	
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					0.007
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	25.88%	<b>7.41%</b>	38.52%		
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	263111.11	2773.33	21.01	0.21	6.667E-03
	RELATIVE PERCENT REMAINING FROM T=0 (%)	100.0000%	1.0541%	0.0080%	0.0001%	0.0000%
						100.0000%
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	98.9459%	99.9920%	99.9999%	
	KELA HVE PERCENT REMOVAL FROM 1=0 (%) LOG REDUCTION FROM T=0 (log <sub>10</sub> )	0.0000% 0.00		99.9920% -4.10	99.9999% -6.09	-7.60
ia	LOG REDUCTION FROM T=0 (log <sub>10</sub> )		98.9459%			-7.60
npi			98.9459%			-7.60 20
npi	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions	0.00	98.9459% -1.98	-4.10	-6.09	
npi	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi)	0.00 0	98.9459% -1.98 5 20.0	-4.10 10 20.0	-6.09 15 20.0	<b>20</b> 20.0
npi	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min)	0.00 0 20.0	98.9459% -1.98 5	-4.10 10	-6.09 15	20
npi	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (hpm)	0.00 0 20.0 3.0 12.5	98.9459% -1.98 5 20.0 5.0 12.5	-4.10 10 20.0 5.0 12.5	-6.09 15 20.0 5.0 12.5	<b>20</b> 20.0 5.0 12.5
pi	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> )	0.00 0 20.0 3.0 12.5 -4	98.9459% -1.98 5 20.0 5.0 12.5 -2	-4.10 10 20.0 5.0 12.5 -1	-6.09 15 20.0 5.0 12.5 0	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (hpm)	0.00 0 20.0 3.0 12.5 -4 100	98.9459% -1.98 5 20.0 5.0 12.5 -2 100	-4.10 10 20.0 5.0 12.5 -1 100	-6.09 15 20.0 5.0 12.5 0 750	<b>20</b> 20.0 5.0 12.5
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> )	0.00 0 20.0 3.0 12.5 -4 100 4	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7	-4.10 10 20.0 5.0 12.5 -1 100 1	-6.09 15 20.0 5.0 12.5 0 750 1	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> )	0.00 0 20.0 3.0 12.5 -4 100 4 7	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9	-4.10 10 20.0 5.0 12.5 -1 100	-6.09 15 20.0 5.0 12.5 0 750	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl)	0.00 0 20.0 3.0 12.5 -4 100 4	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7	-4.10 10 20.0 5.0 12.5 -1 100 1	-6.09 15 20.0 5.0 12.5 0 750 1	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop)	0.00 0 20.0 3.0 12.5 -4 100 4 7 6	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 9 11	-4.10 10 20.0 5.0 12.5 -1 100 1 0	-6.09 15 20.0 5.0 12.5 0 750 1 0	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	0.00 20.0 3.0 12.5 -4 100 4 7 6 5.67	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 11 9.00	-4.10 10 20.0 5.0 12.5 -1 100 1 0 0.50	-6.09 15 20.0 5.0 12.5 0 750 1 0 	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>9</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi)	0.00 0 20.0 3.0 12.5 -4 100 4 7 6 5.67 566,667	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 9.00 9.000	-4.10 10 20.0 5.0 12.5 -1 100 1 0 0.50 50	-6.09 15 20.0 5.0 12.5 0 750 1 0 	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	0.00 20.0 3.0 12.5 -4 100 4 7 6 5.67	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 11 9.00	-4.10 10 20.0 5.0 12.5 -1 100 1 0 0.50	-6.09 15 20.0 5.0 12.5 0 750 1 0 	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>9</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi)	0.00 0 20.0 3.0 12.5 -4 100 4 7 6 5.67 566,667	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 9.00 9.000	-4.10 10 20.0 5.0 12.5 -1 100 1 0 0.50 50	-6.09 15 20.0 5.0 12.5 0 750 1 0 	20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µI) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L wir) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L wir)	0.00 20.0 3.0 12.5 -4 100 4 7 6 5.67 5.66, 667 3.02E+05	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 9.00 9,000 2.88E+03	-4.10 10 20.0 5.0 12.5 -1 100 1 0 0.50 50 1.60E+01	-6.09 15 20.0 5.0 12.5 0 750 1 0 0.50 1 2.13E-01	20. 20.0 5.0 12.5 0 500
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (lo <sup>0</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (lo <sup>0</sup> )	0.00 0 20.0 3.0 12.5 -4 100 4 7 6 5.67 566,667 3.02E+05 -3	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 9.00 9.000 2.88E+03 -1	-4.10 10 20.0 5.0 12.5 -1 100 1 0 .050 50 1.60E+01 0	-6.09 15 20.0 5.0 12.5 0 750 1 0 0 1 2.13E-01 0	20. 20.0 5.0 12.5 0 500
	IDG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl)	0.00 0 20.0 3.0 12.5 -4 100 4 7 6 5.67 5.66,667 3.02E+05 -3 100	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 9.00 9,000 9,000 2.88E+03 -1 100	-4.10 10 20.0 5.0 12.5 -1 100 1 0 50 1.60E+01 0 750	-6.09 15 20.0 5.0 12.5 0 750 1 0 0 1 2.13E-01 0	200 20.0 5.0 12.5 0 500
	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (lo <sup>0</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (lo <sup>0</sup> )	0.00 20.0 3.0 12.5 -4 100 4 7 6 5.67 3.02E+05 -3 100 27	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 11 9.00 9,000 2.88E+03 -1 100 88	-4.10 10 20.0 5.0 12.5 -1 100 1 0 50 1.60E+01 0 750	-6.09 15 20.0 5.0 12.5 0 750 1 0 0 1 2.13E-01 0	200 20.0 5.0 12.5 0 500
DIBUOU AAUGC #1	IDG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl)	0.00 0 20.0 3.0 12.5 -4 100 4 7 6 5.67 5.667 3.02E+05 -3 100 27 43	98.9459% -1.98 20.0 5.0 12.5 -2 100 7 9 11 1 9.00 9.00 2.88E+03 -1 100 88 88 75	-4.10 10 20.0 5.0 12.5 -1 100 1 0 50 1.60E+01 0 750	-6.09 15 20.0 5.0 12.5 0 750 1 0 0 1 2.13E-01 0	20. 20.0 5.0 12.5 0 500
Dinuon Nange #1	IDG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl)	0.00 0 20.0 3.0 12.5 -4 100 4 7 6 5.67 5.667 3.02E+05 -3 100 27 43	98.9459% -1.98 20.0 5.0 12.5 -2 100 7 9 11 1 9.00 9.00 2.88E+03 -1 100 88 88 75	-4.10 10 20.0 5.0 12.5 -1 100 1 0 50 1.60E+01 0 750	-6.09 15 20.0 5.0 12.5 0 750 1 0 0 1 2.13E-01 0	20. 20.0 5.0 12.5 0 500
Dinuon Nange #1	IDG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>9</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfur) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfur) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfur) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfur) DILUTION RATIO (10 <sup>9</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) PLATE AVERAGE COUNT (# / drop)	0.00 20.0 3.0 12.5 -4 100 4 7 6 5.67 5.66, 667 3.022+05 -3 100 27 43 56 6 4 200 4 200 200 200 200 200 20	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 9 11 9.00 9.000 9.000 2.88E+03 -1 100 88 87 5 87 5 87 83.33	-4.10 10 20.0 5.0 12.5 -1 100 1 0 0 50 1.60E+01 0 61 61.00	-6.09 15 20.0 5.0 12.5 0 750 1 0 0 1 2.13E-01 0	20. 20.0 5.0 12.5 0 500
	IDG REDUCTION FROM T=0 (log <sub>10</sub> ) inger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCENTRATION (cfu or pfu/mi))	0.00 20.0 3.0 12.5 -4 100 4 7 6 5.67 566,667 3.02E+05 -3 100 27 43 56	98.9459% -1.98 5 20.0 5.0 12.5 -2 100 7 9 11 9.00 9.000 2.88E+03 -1 100 88 75 87	-4.10 10 20.0 5.0 12.5 -1 100 1 0 0 50 1.60E+01 0 750 61	-6.09 15 20.0 5.0 12.5 0 750 1 0 0 1 2.13E-01 0	20. 20.0 5.0 12.5 0 500

#### SAMPLE TIME (min) 10 15 0 5 20 VIABLE CASCADE SAMPLING TIME (min) 0.5 0.5 1.0 2.0 5.0 30 30 30 30 30 VIABLE CASCADE FLOW RATE (lpm Viable Cascade #1 1 ENUMERATED PLATE COUNTS (# / plate STATISTICALLY CORRECTED PLATE COUNTS (# / plate PLATE AVERAGE COUNT (# / plate) 1.00 CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) Figure 3B: Enterobacter cloacae Trial 2 0.00



	Information		TRIAL LOG	REDUCTION	RESULTS	
	TEST DATE: Wednesday, July 3, 2024					
	TRIAL PERFORMED BY: SMM	1.	.0			
	TRIAL NUMBER: T3					
	TEST ORGANISM: E. clocae	0.	.0			
TRIA	AL NAME ID (GRAPHS/TABLES): Entero T3					
		-1.	.0			
evio	ce Information	_		-2.20		
	MANUFACTURER: NV	-2.	.0	- Revenue - Reve		
	UNIT MODEL: Defend 1050 FAN SPEED (CFM): 533	. <mark></mark>				
		-3		8.75		
	UNIT SERIAL #: NA FITER ID #: NA	<b>.</b> -4,				o T2
	FILTER LOT #: NA	-4- -4-			Enter	013
		-5.	.0		-•- Linea	r Fit
	ral Testing Conditions (Can Be User Defined)	<i>c</i>			05	
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16 NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb	-6.	.0	<b>`</b>		
		-7.			7 20	
	SAMPLING METHOD: Impinger & Cascade	-/.			7.38	
	CHAMBER MIXING FAN: yes	-8	0		°	
	TEMP (F): 74	-0.				
	RH (%): 57 OTHER INSTRUMENTS: NA	-9.	.0			
		-	10 0	10	20	30
	TRIAL COMMENTS/NOTES 100 mL overnight stock centrifuged with soil and antifoam			Time (min)		
	EROSOL Sample ID and Summary Data	<b>S1</b>	S2	<b>S</b> 3	S4	S5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	У	У	У	У	n
	VIABLE CASCADE USED (y / n)	n	n	n	n	У
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.582E+05	9.973E+02	2.784E+01	1.422E-01	
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					0.007
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	18.37%	30.00%	26.00%		
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	158222.22	997.33	27.84	0.14	
	RELATIVE PERCENT REMAINING FROM T=0 (%)				0.14	6.667E-0
		100.0000%	0.6303%	0.0176%	0.0001%	
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	100.0000% 0.0000%	0.6303% 99.3697%			0.0000%
	RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (log <sub>10</sub> )			0.0176%	0.0001%	0.0000%
npir		0.0000%	99.3697%	0.0176% 99.9824%	0.0001% 99.9999%	0.0000% 100.0000
npir	LOG REDUCTION FROM T=0 (log10)	0.0000%	99.3697%	0.0176% 99.9824%	0.0001% 99.9999%	0.0000% 100.0000
npir	LOG REDUCTION FROM T=0 (logia) Iger Sampling Conditions	0.0000% 0.00	99.3697% -2.20	0.0176% 99.9824% -3.75	0.0001% 99.9999% -6.05	0.0000% 100.0000 -7.38
npir	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min)	0.0000% 0.00 0	99.3697% -2.20 5	0.0176% 99.9824% -3.75 10	0.0001% 99.9999% -6.05 15	0.0000% 100.0000 -7.38 20
npir	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi)	0.0000% 0.00 0 20.0	99.3697% -2.20 5 20.0	0.0176% 99.9824% -3.75 10 20.0	0.0001% 99.9999% -6.05 15 20.0	0.0000% 100.0000 -7.38 20 20.0
npir	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min)	0.0000% 0.00 0 20.0 3.0	99.3697% -2.20 5 20.0 5.0	0.0176% 99.9824% -3.75 10 20.0 5.0	0.0001% 99.9999% -6.05 15 20.0 5.0	0.0000% 100.0000 -7.38 20 20.0 5.0
npir	LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm)	0.0000% 0.00 0 20.0 3.0 12.5	99.3697% -2.20 5 20.0 5.0 12.5	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5	0.0001% 99.9999% -6.05 <b>15</b> 20.0 5.0 12.5	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5
	LOG REDUCTION FROM T=0 (log10) Orger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10°)	0.0000% 0.00 0 20.0 3.0 12.5 -4	99.3697% -2.20 5 20.0 5.0 12.5 -2	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5 0
	LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*) DROPLET SIZE (µl)	0.0000% 0.00 0 20.0 3.0 12.5 -4 100	99.3697% -2.20 5 20.0 5.0 12.5 -2 100	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5 0
Kange#1	LOG REDUCTION FROM T=0 (log10) Orger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10°)	0.0000% 0.00 0 20.0 3.0 12.5 -4 100 1	99.3697% -2.20 5 20.0 5.0 12.5 -2 100 2	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1	0.0001% 99.9999% -6.05 20.0 5.0 12.5 0 750 1	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5 0
Kange#1	LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*) DROPLET SIZE (µl)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3	99.3697% -2.20 5 20.0 5.0 12.5 -2 100 2 5	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1	0.0001% 99.9999% -6.05 20.0 5.0 12.5 0 750 1 1 0	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5 0
Kange#1	LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*) DROPLET SIZE (µl)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3	99.3697% -2.20 5 20.0 5.0 12.5 -2 100 2 5	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1	0.0001% 99.9999% -6.05 20.0 5.0 12.5 0 750 1 1 0	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5 0
Kange#1	LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3 4	99.3697% -2.20 5 20.0 5.0 12.5 -2 100 2 5 4	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 750 1 0 0	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5 0
Kange#1	LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3 4 2.67	99.3697% -2.20 5.0 12.5 12.5 20.0 5.0 12.5 100 2 5 4	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1 1	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 0 0 0	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5 0
Kange#1	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/m)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3 4 2.67 266,667	99.3697% -2.20 5.0 12.5 -2 100 2 5 4 3.67 3,667	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1 1 1 0 1.00 100	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 750 1 0 0 0 0	0.0000% 100.0000 -7.38 20 20.0 5.0 12.5 0
Kange#1	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE A VERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ hi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ hi)	0.0000% 0.00 20.0 3.0 125 -4 100 1 3 4 2.67 2.66,667 1.42E+05	99.3697% -2.20 5.0 12.5 -2 100 2 5 4 3.67 3,667 1.17E+03	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1 1 1 00 3.20E+01	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 0 0 0 0 0 0 0 1.42E-01	0.0000% 100.0000 -7.38 200 20.0 5.0 12.5 0 500
Dilution Kange #1	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10*)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3 4 2.67 2.65,657 1.42E+05 -3	99.3697% -2.20 5.0 12.5 -2 100 2 5 4 3.67 3.667 1.17E+03 -1	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1 1 1 1 0 20.0 5.0 12.5 -1 100 100 3.20E+01	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 750 1 0 0 3.33 0 1.42E-01 0	0.0000% 100.0000 -7.38 200 20.0 5.0 12.5 0 500
Dilution Kange #1	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (m) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µ)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3 4 2.67 266,667 1.42E+05 -3 100	99.3697% -2.20 5 20.0 5.0 12.5 -2 100 2 5 4 3.67 3.667 1.17E+03 -1 100	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1 1 1 1 0 0 3.20E+01 0 500	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 750 1 0 0 3.33 0 1.42E-01 0	0.0000% 100.0000 -7.38 200 20.0 5.0 12.5 0 500
Dilution Range #1	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10*)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3 4 2.67 2.66,667 1.42E+05 -3 100 26	99.3697% -2.20 5 20.0 5.0 12.5 -2 100 2 5 4 3.67 3.667 1.17E+03 -1 100 24	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1 1 1 1 0 0 3.20E+01 0 500	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 750 1 0 0 3.33 0 1.42E-01 0	0.0000% 100.0000 -7.38 200 20.0 5.0 12.5 0 500
Diution Kange #1	LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10°) DROPLET SIZE (µI) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfw/1 Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfw/1 Air) DILUTION RATIO (10°) DROPLET SIZE (µI) ENUMERATED PLATE COUNTS (# / drop)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3 4 2.67 266,667 1.42E+05 -3 100 26 36 36	99.3697% -2.20 5 20.0 5.0 12.5 -2 100 2 5 4 3.667 1.17E403 -1 100 24 32 21	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1 1 1 1 0 3.20E+01 37	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 750 1 0 0 3.33 0 1.42E-01 0	0.0000% 100.0000 -7.38 200 20.0 5.0 12.5 0 500
Dilution Range #1 Dilution Range #1 du	LOG REDUCTION FROM T=0 (log <sub>10</sub> ) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (m) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µ)	0.0000% 0.00 20.0 3.0 12.5 -4 100 1 3 4 2.67 2.66,667 1.42E+05 -3 100 26 36	99.3697% -2.20 5 20.0 5.0 12.5 -2 100 2 5 4 3.67 3.667 1.17E+03 -1 100 24 32	0.0176% 99.9824% -3.75 10 20.0 5.0 12.5 -1 100 1 1 1 1 1 1 1 1 0 0 3.20E+01 0 500	0.0001% 99.9999% -6.05 15 20.0 5.0 12.5 0 750 1 0 750 1 0 0 3.33 0 1.42E-01 0	0.0000% 100.0000 -7.38 200 20.0 5.0 12.5 0 500

	SAMPLE TIME (min)	0	5	10	15	20
	VIABLE CASCADE SAMPLING TIME (min)	0.5	0.5	1.0	2.0	5.0
_	VIABLE CASCADE FLOW RATE (lpm)	30	30	30	30	30
Cascade #1	ENUMERATED PLATE COUNTS (# / plate)					1
Viable Ca	STATISTICALLY CORRECTED PLATE COUNTS (# / plate)					1
-	PLATE AVERAGE COUNT (# / plate)					1.00
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)					0.007

#### Figure 4B: Enterobacter cloacae Trial 3





[ <b>rial</b>	Information		TRIAL LOG	REDUCTION	RESULTS	
	TEST DATE: Monday, July 8, 2024		-0.04			
	TRIAL PERFORMED BY: SMM	0.0		-0.22	-0.32	
	TRIAL NUMBER: C1					-0.45
	TEST ORGANISM: S. enterica					
TRI	AL NAME ID (GRAPHS/TABLES): Salmonella Control	-1.0				
i	ce Information					
7 V I	MANUFACTURER: NA	-2.0				
	UNIT MODEL: NA	ç				
	FAN SPEED (CFM): NA	ctio				
	UNIT SERIAL #: NA	-3.0				
	FITER ID #: NA	Re Re				
	FILTER LOT #: NA	-3.0 OG Reduction -4.0			a Coi – – LOD	ntrol
and	eral Testing Conditions (Can Be User Defined)					
2110	TEST CHAMBER VOLUME (m <sup>3</sup> ): <sup>16</sup>	5.0				
	NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb	-5.0	F 00			
	SAMPLING METHOD: Impinger & Cascade		-5.99			
	CHAMBER MIXING FAN: yes	-6.0				
	TEMP (F): 74					
	RH (%): 57					
	OTHER INSTRUMENTS: NA	-7.0	I			
	TRIAL COMMENTS/NOTES 100 mL overnight stock centrifuged with soil		0 5	10	15	20
	and antifoam			Time (min	)	
OA	EROSOL Sample ID and Summary Data	<b>S1</b>	<b>S2</b>	<b>S</b> 3	<b>S4</b>	<b>S</b> 5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	У	У	У	У	У
	VIABLE CASCADE USED (y / n)	n	n	n	n	n
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.378E+05	1.248E+05	8.267E+04	6.560E+04	4.907E+0
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	17.65%		6.25%	4.76%	23.08%
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	137777.78	124800.00	82666.67	65600.00	4.907E+0
	RELATIVE PERCENT REMAINING FROM T=0 (%)	100.0000%	90.5806%	60.0000%	47.6129%	35.6129%
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	9.4194%	40.0000%	52.3871%	64.3871%
	LOG REDUCTION FROM T=0 (log <sub>10</sub> )	0.00	-0.04	-0.22	-0.32	
ia				•	-0.52	-0.45
	nger Sampling Conditions				-0.52	-0.45
<u>r</u>	nger Sampling Conditions SAMPLE TIME (min)	0	5	10	15	-0.45 20
		<b>0</b> 20.0	<b>5</b> 20.0			
<u>.</u>	SAMPLE TIME (min)			10	15	20
	SAMPLE TIME (min) IMPINGER FILL VOL (ml)	20.0	20.0	<b>10</b> 20.0	<b>15</b> 20.0	<b>20</b> 20.0
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min)	20.0 3.0	20.0 5.0	<b>10</b> 20.0 5.0	<b>15</b> 20.0 5.0	<b>20</b> 20.0 5.0
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm)	20.0 3.0 12.5	20.0 5.0 12.5	<b>10</b> 20.0 5.0 12.5	<b>15</b> 20.0 5.0 12.5	<b>20</b> 20.0 5.0 12.5
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> )	20.0 3.0 12.5 -4	20.0 5.0 12.5 -4	10 20.0 5.0 12.5 -4	<b>15</b> 20.0 5.0 12.5 <b>-4</b>	<b>20</b> 20.0 5.0 12.5 <b>-4</b>
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -4 100	20.0 5.0 12.5 -4	10 20.0 5.0 12.5 -4 100	15 20.0 5.0 12.5 -4 100	20 20.0 5.0 12.5 -4 100
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> )	20.0 3.0 12.5 -4 100 3	20.0 5.0 12.5 -4	10 20.0 5.0 12.5 -4 100 3	<b>15</b> 20.0 5.0 12.5 <b>-4</b> <b>100</b> 2	20 20.0 5.0 12.5 -4 100 1
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -4 100 3 2 2	20.0 5.0 12.5 -4	10 20.0 5.0 12.5 -4 100 3 4 1	<b>15</b> 20.0 5.0 12.5 <b>-4</b> <b>100</b> 2 1 3	<b>20</b> 20.0 5.0 12.5 <b>-4</b> <b>100</b> 1 2 1
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	20.0 3.0 12.5 -4 100 3 2 2 2 2.33	20.0 5.0 12.5 -4	10 20.0 5.0 12.5 -4 100 3 4 1 1 2.67	15 20.0 5.0 12.5 -4 100 2 1 3 2.00	<b>20</b> 20.0 5.0 12.5 <b>-4</b> <b>100</b> 1 2 1 1.33
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml)	20.0 3.0 12.5 -4 100 3 2 2 2 2.33 233,333	20.0 5.0 12.5 -4	10 20.0 5.0 12.5 -4 100 3 4 1 2.67 266,667	15 20.0 5.0 12.5 -4 100 2 1 3 2.00 200,000	<b>20</b> 20.0 5.0 12.5 <b>-4</b> <b>100</b> 1 2 1 1.33 133,333
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	20.0 3.0 12.5 -4 100 3 2 2 2 2 33,333 1.24E+05	20.0 5.0 12.5 -4 100	10 20.0 5.0 12.5 -4 100 3 4 1 1 2.67 266,667 8.53E+04	15 20.0 5.0 12.5 -4 100 2 1 3 2.00 200,000 6.40E+04	200 20.0 5.0 12.5 -4 100 1 2 1 1.33 133,333 4.27E+04
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>x</sup> )	20.0 3.0 12.5 -4 100 3 2 2 2 2 2 2 3,333 1.24E+05 -3	20.0 5.0 12.5 -4 100	10 20.0 5.0 12.5 -4 100 3 4 1 1 2.67 266,667 8.53E+04 -3	15 20.0 5.0 12.5 -4 100 2 1 3 2 1 3 2.00 200,000 6.40E+04 -3	20 20.0 5.0 12.5 -4 100 1 2 1 1 3,333 4.27E+04 -3
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	20.0 3.0 12.5 -4 100 3 2 2 2 2 2 2 2 3,333 1.24E+05 -3 100	20.0 5.0 12.5 -4 100 -3 100	10 20.0 5.0 12.5 -4 100 3 4 1 1 2.67 266,667 8.53E+04 -3 100	15 20.0 5.0 12.5 -4 100 2 1 3 2 2.00 200,000 6.40E+04 -3 100	20 20.0 5.0 12.5 -4 100 1 2 1 
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>x</sup> )	20.0 3.0 12.5 -4 100 3 2 2 2 2.33 233,333 1.24E+05 -3 100 30	20.0 5.0 12.5 -4 100 -3 100 44	10 20.0 5.0 12.5 -4 100 3 4 1 1 2.67 266,667 8.53E+04 -3 100 26	15 20.0 5.0 12.5 -4 100 2 1 3 2 2.00 200,000 6.40E+04 -3 100 24	20 20.0 5.0 12.5 -4 100 1 2 1 3.333 4.27E+04 -3 100 16
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>x</sup> )	20.0 3.0 12.5 -4 100 3 2 2 2 2 2.33 233,333 1.24E+05 -3 100 30 26	20.0 5.0 12.5 -4 100 -3 100 44 43	10 20.0 5.0 12.5 -4 100 3 4 1 1 2.67 266,667 8.53E+04 -3 100 26 25	15 20.0 5.0 12.5 -4 100 2 1 3 2 2.00 200,000 6.40E+04 -3 100 24 19	20 20.0 5.0 12.5 -4 100 1 2 1 3.333 4.27E+04 -3 100 16 15
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -4 100 3 2 2 2 2.33 233,333 1.24E+05 -3 100 30	20.0 5.0 12.5 -4 100 -3 100 44	10 20.0 5.0 12.5 -4 100 3 4 1 1 2.67 266,667 8.53E+04 -3 100 26	15 20.0 5.0 12.5 -4 100 2 1 3 2 2.00 200,000 6.40E+04 -3 100 24	20 20.0 5.0 12.5 -4 100 1 2 1 3.333 4.27E+04 -3 100 16
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -4 100 3 2 2 2.33 2.33 2.33 1.24E+05 -3 100 30 26 29	20.0 5.0 12.5 -4 100 -3 100 44 43 30	10 20.0 5.0 12.5 -4 100 3 4 1 2.67 266,667 8.53E+04 -3 100 26 25 24	15 20.0 5.0 12.5 -4 100 2 1 3 2 2.00 200,000 6.40E+04 -3 100 24 19 20	20 20.0 5.0 12.5 -4 100 1 2 1 3.333 4.27E+04 -3 100 16 15 21
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	20.0 3.0 12.5 -4 100 3 2 2 2.33 2.33 2.33 2.33 1.24E+05 -3 100 30 26 29 28.33	20.0 5.0 12.5 -4 100 -3 100 44 43 30 39.00	10 20.0 5.0 12.5 -4 100 3 4 1 1 2.67 266,667 8.53E+04 -3 100 26 25 24 25.00	15 20.0 5.0 12.5 -4 100 2 1 3 2 20,000 6.40E+04 -3 100 24 19 20 20,001	20 20.0 5.0 12.5 4 100 1 2 1 2 1 3,333 4.27E+04 100 16 15 21 17.33
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -4 100 3 2 2 2.33 2.33 2.33 1.24E+05 -3 100 30 26 29	20.0 5.0 12.5 -4 100 -3 100 44 43 30	10 20.0 5.0 12.5 -4 100 3 4 1 2.67 266,667 8.53E+04 -3 100 26 25 24	15 20.0 5.0 12.5 -4 100 2 1 3 2 2.00 200,000 6.40E+04 -3 100 24 19 20	20 20.0 5.0 12.5 -4 100 1 2 1 3.333 4.27E+04 -3 100 16 15 21

 CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)
 1.51E+05
 1.25E+05

 Figure 5B: Salmonella enterica Control



	TEST DATE: Tuesday, July 2, 2024			REDUCTION		
	TRIAL PERFORMED BY: SMM	1.0	<b>.</b>			
	TRIAL NUMBER: T1	1.	<b>,</b>			
	TEST ORGANISM: S. enterica	0.0				
TR	IAL NAME ID (GRAPHS/TABLES): Salmonella T1	U.	, V			
	· · · · · · · · · · · · · · · · · · ·	-1.0				
ev	ice Information	-1.	,,	1.78		
	MANUFACTURER: NV			N. I		
	UNIT MODEL: Defend 1050	-2.0	)	1		
	FAN SPEED (CFM): 533	-2.1 -3.1 -3.1				
	UNIT SERIAL #: NA	-3.0	)		-o Salmo	moll
	FITER ID #: NA	5			a T1	men
	FILTER LOT #: NA	<mark>-4.</mark>	<b>)</b>		-O- Linear	r Fit
en	eral Testing Conditions (Can Be User Defined)	-5.	<b>)</b>		47	
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16 NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb			1		
		-6.	<b>)</b>		$\mathbf{i}$	
	SAMPLING METHOD: Impinger & Cascade				6.75	
	CHAMBER MIXING FAN: yes	-7.	<b>b</b>			
	TEMP (F): 74					
	RH (%): 57	-8.0	,			
	OTHER INSTRUMENTS: NA	-1		10	20	30
	TRIAL COMMENTS/NOTES 100 mL overnight stock centrifuged with soil and antifoam			Time (min)		
				Time (min)		
io/	AEROSOL Sample ID and Summary Data	<b>S1</b>	<b>S2</b>	<b>S</b> 3	<b>S4</b>	<b>S</b> 5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	у	у	у	у	n
	VIABLE CASCADE USED (y / n)	n	n	n	n	у
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.876E+05	3.147E+03	1.600E+01	6.400E-01	
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					0.033
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	24.17%	52.50%			
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	187555.56	3146.67	16.00	0.64	3.333E-0
	RELATIVE PERCENT REMAINING FROM T=0 (%)	100.0000%	1.6777%	0.0085%	0.0003%	0.0000%
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	98.3223%	99.9915%	99.9997%	100.0000
	LOG REDUCTION FROM T=0 (log10)	0.00	-1.78	-4.07	-5.47	-6.75
	in von Compling Conditions					
np	inger Sampling Conditions SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0	20.0
	IMPINGER VILL VOL (III) IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0	5.0
	IMPINGER SAMPLING HAVE (http: IMPINGER FLOW RATE (http: )	3.0 12.5	5.0	5.0	5.0	5.0 12.5
_	IMPINGER FLOW RATE (IPM)					
	DILUTION RATIO (10 <sup>x</sup> )	-4	-3	-1	0	0
	DROPLET SIZE (µl)	100	100	100	500	500
1		5	0	1	1	
ţe ⋕	ENUMERATED PLATE COUNTS (# / drop)	4	1	0		
tange ∄						
ion Range #		3	3			
lution			-	•	-	
lution	PLATE AVERAGE COUNT (# / drop)	4.00	1.33	0.50	1.00	-
lution	IMPINGER CONCENTRATION (cfu or pfu/ml)	4.00	1.33 13,333	50	2	-
lution		4.00	1.33			•
lution	IMPINGER CONCENTRATION (cfu or pfu/ml)	4.00	1.33 13,333	50	2	0
lution	IMPINGER CONCENTRATION (cfu or pfu/rul) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	4.00 400,000 <b>2.13E+05</b>	1.33 13,333 <b>4.27E+03</b>	50 <b>1.60E+01</b>	2 6.40E-01	0 500
fl Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>8</sup> )	4.00 400,000 2.13E+05 -3	1.33 13,333 4.27E+03 -2	50 1.60E+01 -1	2 6.40E-01 0	
fl Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (μl)	4.00 400,000 2.13E+05 -3 100	1.33 13,333 4.27E+03 -2 100	50 1.60E+01 -1	2 6.40E-01 0	
Range #1 Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>8</sup> )	4.00 400,000 2.13E+05 -3 100 32	1.33 13,333 4.27E+03 -2 100 6	50 1.60E+01 -1	2 6.40E-01 0	
Range #1 Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (μl)	4.00 400,000 2.13E+05 -3 100 32 27	1.33 13,333 4.27E+03 -2 100 6 7	50 1.60E+01 -1	2 6.40E-01 0	
Range #1 Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (μl)	4.00 400,000 2.13E+05 -3 100 32 27	1.33 13,333 4.27E+03 -2 100 6 7	50 1.60E+01 -1	2 6.40E-01 0	
Range #1 Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	4.00 400,000 <b>2.13E+05</b> -3 100 32 27 32	1.33 13,333 4.27E+03 -2 100 6 7 6	50 1.60E+01 -1	2 6.40E-01 0	
Range #1 Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml)	4.00 400,000 2.13E+05 -3 100 32 27 32 30.33	1.33 13,333 4.27t+03 -2 100 6 7 6 6 .33	50 1.60E+01 -1	2 6.40E-01 0	
Range #1 Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	4.00 400,000 <b>2.13E+05</b> <b>-3</b> <b>100</b> 32 27 32 30,33 303,333	1.33 13,333 4.27E+03 -2 100 6 7 6 7 6 6 3 6,33 6,333	50 1.60E+01 -1	2 6.40E-01 0	
Dilution Range #1 Dilution	IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml)	4.00 400,000 <b>2.13E+05</b> -3 100 32 27 32 30.33 30.333 1.62E+05	1.33 13,333 4.27E+03 -2 100 6 7 6 6 7 6 6 3 3 6,333 6,333 2.03E+03	50 <u>1.60E+01</u> -1 100	2 6.40E-01 0	
Dilution Range #1 Dilution	IMPINGER CONCENTRATION (cfu or pfu/rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>9</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	4.00 400,000 <b>2.13E+05</b> -3 100 32 27 32 30.33 30.333 1.62E+05	1.33 13,333 4.27E+03 -2 100 6 7 6 6 7 6 6 3 3 6,333 6,333 2.03E+03	50 <u>1.60E+01</u> -1 100	2 6.40E-01 0	
Dilution Range #1 Dilution Range #1 Dilution Range #1	IMPINGER CONCENTRATION (cfu or pfu/rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>4</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/rai) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/rai)	4.00 400,000 2.13E+05 -3 100 32 27 32 30.33 30.333 1.62E+05 spplied Autor	1.33 13,333 4.27E+03 -2 100 6 7 6 6 6 3 3 6,333 2.03E+03 matically for co	50 <u>1.60E+01</u> -1 100	2 6.40E-01 0 500	500

	SAMPLE TIME (min)	U	5	10	15	20
	VIABLE CASCADE SAMPLING TIME (min)	0.5	0.5	1.0	2.0	5.0
#1	VIABLE CASCADE FLOW RATE (lpm)	30	30	30	30	30
ascade #	ENUMERATED PLATE COUNTS (# / plate)					5
Viable C:	STATISTICALLY CORRECTED PLATE COUNTS (# / plate)					5
-	PLATE AVERAGE COUNT (# / plate)					5.00
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)					0.033
	Figure 6B: Sala	monella ente	<i>rica</i> Trial 1	l		



ı rial	Information		TRIAL LOG	REDUCTION	RESULTS	
	TEST DATE: Wednesday, July 3, 2024					
	TRIAL PERFORMED BY: SMM	1.0				
	TRIAL NUMBER: T2					
	TEST ORGANISM: S. enterica	0.0				
TR	IAL NAME ID (GRAPHS/TABLES): Salmonella T2	0.0				
		-1.0	. 🛛 🔪			
ev	ice Information	-1.0				
	MANUFACTURER: NV			-1.03		
	UNIT MODEL: Defend 1050	.5 -2.0		1		
	FAN SPEED (CFM): 533	et l				
	UNIT SERIAL #: NA	-3.0			-o Salmo	nell
	FITER ID #: NA	u -2.0 -3.0 -3.0 -4.0		$\backslash 2$	a T2	men
	FILTER LOT #: NA	-4.0			– • Linear	Fit
ien	eral Testing Conditions (Can Be User Defined)				13	
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16	-5.0		6		
	NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb					
	SAMPLING METHOD: Impinger & Cascade	-6.0			6.46	
	CHAMBER MIXING FAN: yes				8	
	TEMP (F): 74	-7.0			<b>`</b>	
	RH (%): 57					
	OTHER INSTRUMENTS: NA	-8.0				
	TRIAL COMMENTS/NOTES and antifacem	-1	0 0	10	20	30
	and antifoam			Time (min)		
IOA	AEROSOL Sample ID and Summary Data	S1	S2	<b>S</b> 3	S4	<b>S</b> 5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	У	У	У	У	n
	VIABLE CASCADE USED (y / n)	n	n	n	n	У
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.938E+04	1.813E+02	1.280E+00	1.422E-01	
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					0.007
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	<b>42.03%</b>	30.00%			
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	19377.78	181.33	1.28	0.14	6.667E-0
	RELATIVE PERCENT REMAINING FROM T=0 (%)	100.0000%	0.9358%	0.0066%	0.0007%	0.0000%
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	99.0642%	99.9934%	99.9993%	100.0000
	LOG REDUCTION FROM T=0 (log10)	0.00	-2.03	-4.18	-5.13	-6.46
nni	inger Sampling Conditions					
npi	SAMPLE TIME (min)	0				
		U	5	10	15	20
	IMPINGER FILL VOL (ml)	20.0	<b>5</b> 20.0	<b>10</b> 20.0	<b>15</b> 20.0	<b>20</b> 20.0
		-	-		-	
	IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0	20.0
	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (þm)	20.0 3.0	20.0 5.0	20.0 5.0	20.0 5.0	20.0 5.0
	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min)	20.0 3.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5
#1	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (þm) DILUTION RATIO (10 <sup>°</sup> )	20.0 3.0 12.5 -3	20.0 5.0 12.5 -2	20.0 5.0 12.5 0	20.0 5.0 12.5 0	20.0 5.0 12.5 <b>0</b>
nge #1	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>s</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -3 100 3	20.0 5.0 12.5 -2 100 1	20.0 5.0 12.5 0 500	20.0 5.0 12.5 0 750 1	20.0 5.0 12.5 <b>0</b>
	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (þm) DILUTION RATIO (10 <sup>°</sup> )	20.0 3.0 12.5 -3 100	20.0 5.0 12.5 -2 100	20.0 5.0 12.5 0 500	20.0 5.0 12.5 0 750	20.0 5.0 12.5 <b>0</b>
	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>s</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -3 100 3 3 3	20.0 5.0 12.5 -2 100 1 1	20.0 5.0 12.5 0 500	20.0 5.0 12.5 0 750 1 0	20.0 5.0 12.5 <b>0</b>
	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>s</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -3 100 3 3 3	20.0 5.0 12.5 -2 100 1 1	20.0 5.0 12.5 0 500	20.0 5.0 12.5 0 750 1 0	20.0 5.0 12.5 <b>0</b>
	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (þm) DILUTION RATIO (10 <sup>6</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -3 100 3 3 3 2	20.0 5.0 12.5 -2 100 1 1 1 0	20.0 5.0 12.5 0 500 2	20.0 5.0 12.5 0 750 1 0 0	20.0 5.0 12.5 <b>0</b>
	IMPINGER FILL VOL (m) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>6</sup> ) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	20.0 3.0 12.5 -3 100 3 3 3 2 2.67	20.0 5.0 12.5 -2 100 1 1 1 0 0.67	20.0 5.0 12.5 0 500 2 2	20.0 5.0 12.5 0 750 1 0 0 0	20.0 5.0 12.5 <b>0</b>
	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (μm) DILUTION RATIO (10 <sup>6</sup> ) DROPLET SIZE (μl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml)	20.0 3.0 12.5 -3 100 3 3 2 2.67 2.6,667	20.0 5.0 12.5 -2 100 1 1 1 0 0.67 667	20.0 5.0 12.5 0 500 2 2 2.00 4	20.0 5.0 12.5 0 750 1 0 0 0 0.33 0	20.0 5.0 12.5 <b>0</b>
	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>4</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ml)	20.0 3.0 12.5 -3 100 3 3 3 2 2.67 26.667 1.42E+04	20.0 5.0 12.5 -2 100 1 1 1 0 0.67 667 2.13E+02	20.0 5.0 12.5 0 500 2 2 2.00 4 1.28E+00	20.0 5.0 12.5 0 750 1 0 0 0 0.33 0 1.42E-01	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (bpm) DILUTION RATIO (10 <sup>4</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ml)	20.0 3.0 12.5 -3 100 3 3 3 2 2.67 26.667 1.42E+04 -2	20.0 5.0 12.5 -2 100 1 1 1 0 0.67 667 2.13E+02 -1	20.0 5.0 12.5 0 500 2 2 2.00 4 1.28E+00 -1	20.0 5.0 12.5 0 750 1 0 0 0.33 0 1.42E-01 0	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) DILUTION RATIO (10°) DILUTION RATIO (10°)	20.0 3.0 12.5 -3 100 3 3 2 2 .67 26,667 1.42E+04 -2 100 47	20.0 5.0 12.5 -2 100 1 1 1 1 0 0 0.67 667 2.13E+02 -1 100 2	20.0 5.0 12.5 0 500 2 2 2.00 4 1.28E+00 -1	20.0 5.0 12.5 0 750 1 0 0 0.33 0 1.42E-01 0	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (bpm) DILUTION RATIO (10 <sup>4</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ml)	20.0 3.0 12.5 -3 100 3 3 2 2 2.67 26,667 1.42E-04 -2 100	20.0 5.0 12.5 -2 100 1 1 1 0 0 .67 667 2.13E+02 -1 100	20.0 5.0 12.5 0 500 2 2 2.00 4 1.28E+00 -1	20.0 5.0 12.5 0 750 1 0 0 0.33 0 1.42E-01 0	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>4</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/rai) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/rai) DILUTION RATIO (10 <sup>4</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -3 100 3 3 2 2.67 2.667 1.42E+04 -2 100 47 38 53	20.0 5.0 12.5 -2 100 1 1 1 0 0.67 667 2.135+02 -1 100 2 6 6 6	20.0 5.0 12.5 0 500 2 2 2.00 4 1.28E+00 -1	20.0 5.0 12.5 0 750 1 0 0 0.33 0 1.42E-01 0	20.0 5.0 12.5 0 500
Dilution	IMPINGER FILL VOL (m) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/m) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/m) DILUTION RATIO (10°) DILUTION RATIO (10°) DILUTION RATIO (10°) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	20.0 3.0 12.5 -3 100 3 3 2 2.67 26,667 1.42E+04 -2 100 47 38 53 46.00	20.0 5.0 12.5 -2 100 1 1 1 0 0.67 667 2.13E+02 -1 100 2 6 6 6 6	20.0 5.0 12.5 0 500 2 2 2.00 4 1.28E+00 -1	20.0 5.0 12.5 0 750 1 0 0 0.33 0 1.42E-01 0	20.0 5.0 12.5 0 500
Dilution Range #1 Dilution Range #1	IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>4</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/rai) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/rai) DILUTION RATIO (10 <sup>4</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -3 100 3 3 2 2.67 2.667 1.42E+04 -2 100 47 38 53	20.0 5.0 12.5 -2 100 1 1 1 0 0.67 667 2.135+02 -1 100 2 6 6 6	20.0 5.0 12.5 0 500 2 2 2.00 4 1.28E+00 -1	20.0 5.0 12.5 0 750 1 0 0 0.33 0 1.42E-01 0	20.0 5.0 12.5 0 500

SAMPLE TIME (min)	0	5	10	15	20
VIABLE CASCADE SAMPLING TIME (min)	0.5	0.5	1.0	2.0	5.0
VIABLE CASCADE FLOW RATE (lpm)	30	30	30	30	30
ENUMERATED PLATE COUNTS (# / plate)					1
STATISTICALLY CORRECTED PLATE COUNTS (# / plate)					1
PLATE AVERAGE COUNT (# / plate)					1.00
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)					0.007

#### Figure 7B: Salmonella enterica Trial 2



TIGLI, PERFORMED IY: SMM         THEST, NUMMERT 3         THEST, NUMMERT 3         SPICe Information         VICE INFORMATION INFORMATI		TEST DATE: Wednesday, July 3, 2024			REDUCTION	1230213		
THAL NUMER 13           THAL NUMER 10 (REATISTICABLES): Selence of a 320           THE RD #14 (REATISTICABLES): Selence of a 320           THE RD #14 (REATISTICABLES): Selence of a 320           THE RD #14 (REATISTICABLES): Selence of a 320           THAT CHAINER 24 (REATISTICABLES): SELENCE ON 10 (REATISTICABLES): S								
THE ORGANEST STREETS: Selence and SD           Note in Organization SD (C)			1.0					
TEAL NAME DUGGENESS Seminaria 13           EVICE INFORMATIONE VIEW           MINIMPACTURE: W           NUME INFORMATION: VIEW OF ADDITION CONTRIPTION VIEW OF ADDITION VIEW OF ADDIT								
wire information         MANUFACTURE: wire           MANUFACTURE: wire         MANUFACTURE: wire           PAN STEDIC. Chief 303         PAN STEDIC. Chief 303           PAN STEDIC. Filt wire         PAN STEDIC. Filt wire           PETTRICUTE: Wire         PAN STEDIC. Filt wire           MEMOLEXCOMMENTS: Constant Aret: spece. 20 min meb         SAMPLETMELTERE: wire           SAMPLETMELTERE: Wire         D         5         10         15         20           MARKER MENTSCHER: Spece. 20 min meb         SAMPLETMELTMEL (wire)         V         Y         Y         N         N           CHAMBER MENTSCHER: Spece. 20 min meb         SAMPLETMEL (wire)         0         5         10         15         20           CHAMBER MENTSCHER MERTSCHER MER	тр		0.0	<u> </u>				
Device information           MINUTE MORE, INVERTINGE, INVERTING INFORMATION (Solution (Can Be User Defined)           State of the User Defined)           Tast channes (Conditions (Can Be User Defined)           Tast channes (Conditions (Can Defined With Sell)           Tast channes (Conditions (Can Defined With Sell)           Tast channes (Conditions (Can Defined With Sell)           Tast (Conditions (Can Defined With Sell)           Samuel East (Conditions (Can Defined With Sell)           Tast (Conditions (Can Defined With Sell)           Can Defined With Sell           <	IK	AL NAME ID (ORAFIIS/TABLES): Saimonena 15						
MANNEARCHNER IM UNT MODEL, Condensition PAN SPEED, COME SIG UNT SPEED, EVAN ESS UNT	<u>.</u>	ice Information	-1.0	·				
120         20 <th colspa="&lt;/td"><td>ev</td><td></td><td></td><td></td><td></td><td></td><td></td></th>	<td>ev</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	ev						
Chandles Woldwich: 16           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SECONTONS: (SIGNED >24:5; spaces. 20 min mb           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SECONTONS: (SIGNED >24:5; spaces. 20 min mb           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SIGNED >20: min mb           SAMPLE TIME (min)           DAGEROSOL Sample ID and Summary Data         SI         SZ         SZ         SZ         SZ         SZ         SZ         SZ           MITTIGE MONDEROSOL CONCENTRATION (difted pLAP)           SAMPLE TIME (min)         SZ			<mark>_</mark> -2.0		- <u>``</u>			
Chandles Woldwich: 16           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SECONTONS: (SIGNED >24:5; spaces. 20 min mb           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SECONTONS: (SIGNED >24:5; spaces. 20 min mb           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SIGNED >20: min mb           SAMPLE TIME (min)           DAGEROSOL Sample ID and Summary Data         SI         SZ         SZ         SZ         SZ         SZ         SZ         SZ           MITTIGE MONDEROSOL CONCENTRATION (difted pLAP)           SAMPLE TIME (min)         SZ			읊					
Chandles Woldwich: 16           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SECONTONS: (SIGNED >24:5; spaces. 20 min mb           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SECONTONS: (SIGNED >24:5; spaces. 20 min mb           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SIGNED >20: min mb           SAMPLE TIME (min)           DAGEROSOL Sample ID and Summary Data         SI         SZ         SZ         SZ         SZ         SZ         SZ         SZ           MITTIGE MONDEROSOL CONCENTRATION (difted pLAP)           SAMPLE TIME (min)         SZ			-3.0					
Chandles Woldwich: 16           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SECONTONS: (SIGNED >24:5; spaces. 20 min mb           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SECONTONS: (SIGNED >24:5; spaces. 20 min mb           SAMPLING MITTIGE: Impirger & Cascade           CHANDER WOLDWICH: SIGNED >20: min mb           SAMPLE TIME (min)           DAGEROSOL Sample ID and Summary Data         SI         SZ         SZ         SZ         SZ         SZ         SZ         SZ           MITTIGE MONDEROSOL CONCENTRATION (difted pLAP)           SAMPLE TIME (min)         SZ			8			Salmo	onell	
Chandles Woldwindten Steller Berlined J.           District Chandles Woldwindten Steller Berlined Stampinger & Cascade           SAMPLING MITTIGD: Impinger & Cascade           Chandles Woldwindten Steller Berlined Stampinger & Cascade           Chandles Woldwindten Steller Berlined Stampinger & Cascade           District Contentions (Cascade Stampinger Valle Soft)           Cascade Stampinger Data           Stample ID and Summary Data         Stample ID and Summary			8		<u>V9.</u>			
The TLANSER WOLK METHOD: Impinger & Cascade           CHAMBER WILLING impinger & Cascade           CHAMBER MUTRIC NAY by:           THE PLET: 12           CHAMBER VICLAMERTS NOTES           SAMPLE TIME (cm)         0         5           CHAMBER VICLAMERTS NOTES         SAMPLE TIME (cm)         0         5           CHAMBER VICLAMERTS NOTES NO		TILLER LOT #. IN	-4.0		٨	-o- Linear	r Fit	
This CLAMBER WOLKING: 15           NEEULER: CONTRONS, CONTROL,	en	eral Testing Conditions (Can Be User Defined)						
NERULIZER CONTINUES Collino 24 (4), sports. 20 min neb SAMPLION METHOD, impiger & Gascade Clauber MINNOFAN (vs) BEP(F) 7: 0 THER INSTRUMENTS: NA BR (6); 57 0 THER INSTRUMENTS: NA BR (6); 50 0 C 5 0 10 0 C 5 0 14 6687E-0 0.0007 0 2.00 0	•		-5.0	·		57		
SAMPLING METHOD: implager & Cascade CHAMBER MENNOPAN: yes BERP (1); 7 BERP (2);					1	< ∣		
CHAMBER MININGAN, per Half (F) 7 HI (K) 57 OTHER INSTRUMENTS, NA TRUAL COMMINISTORS 2000 control to too control to too control to too and antifoam         50 0         0         10         20         30           OLEROSOL Sample ID and Summary Data and antifoam         S1         S2         S3         S4         S5           OLEROSOL Sample ID and Summary Data and antifoam         S1         S2         S3         S4         S5           OLEROSOL Sample ID and Summary Data SAMPLE TIME (rain) MININGER USED (r) VAMER CASCADE USED (r) VAMER CASCADE USED (r) VAMER CASCADE USED (r) VAMER CONSTRUCT CHECKS (% agreement)         0         5         10         15         20           VAMER INFORMATION (ch or phL Abr VAMER CONSTRUCT CHECKS (% agreement)         33.3%         2.800%         0.0007%         0.3246.44.44         4.587E+02         3.200 E+00         1.422E+01           VAMER INFORMATION (ch or phL Abr VAMER CONSTRUCT CHECKS (% agreement)         00.0007%         0.8746%         0.0001%         0.0007%         0.0007%         0.0007%         0.0007%         0.0007%         0.0007%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.0001%         0.			-6.0			$\mathbf{i}$		
TEMP (P) 74 BIT (P) 73 OTHER INSTRUMENTS IM TRUL COMMENTS NOTS: MOM covering in stock centrifuged with out and artition         7.0 .00         7.0 .00         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.007           OAEROSOL Sample ID and Summary Data         S1         S2         S3         S4         S5           MEMONO AEROSOL CONCENTRATION (sing plat.Ar CHAMBER MEMOROAEROSOL CONCENTRATION (sing plat.Ar CHAMBER MEMOROAEROSOL CONCENTRATION (sing plat.Ar CHAMBER MEMOROAEROSOL CONCENTRATION (sing plat.Ar MEMORER SIMPLING (sing plat.Ar MEMORER SIMPLING (sing plat.Ar MELATIVE PERCENT REMAINING FROM T=0 (S)         3.33%         2.200         0.0007           MEMONO AEROSOL CONCENTRATION (sing plat.Ar MELATIVE PERCENT REMAINING FROM T=0 (S)         0.00051%         0.00007%           MELATIVE PERCENT REMAINING FROM T=0 (S)         0.0007         0.0007%           MELATIVE PERCENT REMAINING FROM T=0 (S)         0.00051%         0.000051%         0.00005%						6.90		
Bit (%) 57 OTHER INSTRUMENTIS: M TRUL COMMENTISTING Mail autifiam           OTHER INSTRUMENTISTING TRUL COMMENTISTING and autifiam           OAEROSOL Sample ID and Summary Data         S1         S2         S3         S4         S2           OAEROSOL Sample ID and Summary Data         S1         S2         S3         S4         S2           OAEROSOL CONCENTRATION (clop or plat. Arrow Colspan="2">SAMPLE TIME (min)         O         Total Colspan="2">Total Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">SAMPLE TIME (min)         O         S2			-7.0			- Y		
3.0						<u>`</u>		
ISO mt eveninget took centrifuged with soll and attificum         100         0         100         20         30           TRUAL COMMENTISMOTE and attificum           SAMPLE TIME (mit) NERROSOL Sample ID and Summary Data         S1         S2         S3         S4         S5           SAMPLE TIME (mit) NERROSCACADE USED (y/m) VABLE COSCADE USED (y/m) VABLE COSCADE USED (y/m) VABLE COSCADE USED (y/m) VABLE COSCENTRATION (dur pfil. Arr)         0         5         100         1.422E-01         0007           CHAMBER MERIORER MORISCHARCHOR CONSENTRATO (CHECKS (% agreement) VABLE CONSISTENCY CHECKS (% agreement) LMP & VABLE CONSISTENCY CHECKS (% agree			-8.0					
OACENOME           OAEROSOL Sample ID and Summary Data         SI         S2         S3         SKAPPLE TIME (min)           OAEROSOL Sample ID and Summary Data         SI         S2         S3         S           MEMORE NUMPLY Data         SI         S2         SI         S2         SI         S2         SI         S2           CHAMBER MINPLORE RIGIOLARENOSOL CONCENTRATION (cha or plat L Ar)         SAMPLE TIME (min)         n         n         0.007           VAIABLE EDDBIOAEROSOL CONCENTRATION (cha or plat L Ar)         SAMPLE CONSISTENCY CHECKS (% agreement)           VIABLE EDDBIOAEROSOL CONCENTRATION (cha or plat L Ar)         S2444.44         458.67         3.200 + 00         0.007           VIABLE EDDBIOAEROSOL CONCENTRATION (cha or plat L Ar)         S2444.44         458.67         3.200 + 00         0.007           VIABLE EDDBIOAEROSOL CONCENTRATION (cha or plat L Ar)         0         0         0         0         0         0 <th cols<="" td=""><td></td><td></td><td>-1</td><td>o o</td><td>10</td><td>20</td><td>30</td></th>	<td></td> <td></td> <td>-1</td> <td>o o</td> <td>10</td> <td>20</td> <td>30</td>			-1	o o	10	20	30
OAEROSOL Sample ID and Summary Data         SI S2 S3 S4 S5           SAMPLE TIME (min)         0         SI S2 S3 S4 S5           SAMPLE TIME (min)         0         S S4         S5         10         S           VIABLE CASCADE USED (y / m)         n<		TRIAL COMMENTS/NOTES			The state			
SAMPLE TIME (min)         0         5         10         15         20           IMPINGER USED (7/n)         y         y         y         y         y         y         n					Time (min)			
SAMPLE TIME (min)         0         5         10         15         20           IMPINGER USED (7/n)         y         y         y         y         y         y         n	0/	AFROSOL Sample ID and Summary Data	<b>S1</b>	<b>S</b> 2	\$3	<b>S4</b>	85	
IMPINGER USED (y / n) VIABLE CASCADE USED (y / n) CHAMBER MPINGER RIDRIOARDSOL CONCENTRATION (clir op ful. Ar)         y         y         n         n         n         n         y           CHAMBER MPINGER RIDRIOARDSOL CONCENTRATION (clir op ful. Ar)         52444.44         4.557E+02         3.200E+00         1.422E-01         0.007           IMPINGER RIDRIOARDSOL CONCENTRATION (clir op ful. Ar)         533%         28.00%         28.00%         0.001%         0.0003%         0.0003%         0.0003%         0.0003%         0.0003%         0.0003%         0.0003%         0.0003%         0.0003%         0.0000%         0.931264%         99.9339%         99.9939%         99.9939%         99.9937%         100.0000%         0.02166%         0.0001%         0.0003%								
VIABLE CASCADE USED (y/n) CHAMBER MPINCER BIOBIOAREROSOL CONCENTRATION (clin plin LAY)         n			-	-	-		-	
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfiu or pful. Ar)         5.244E+04         4.597E+02         3.200E+00         1.422E-01           IMPINGER DIDBIOAEROSOL CONCENTRATION (cfiu or pful. Ar)         3.33%         © 28.00%         0.007           IMPINGER DIDBIOAEROSOL CONCENTRATION (cfiu or pful. Ar)         3.33%         © 28.00%         0.0005%           VIABLE CONSISTENCY CHECKS (% agreement)         3.33%         © 28.00%         0.0001%         0.0003%         0.0003%         0.0003%         0.0000%         0.8746%         0.0001%         0.0003%         0.0003%         0.0000%         0.8746%         0.0001%         0.0003%         0.0000%         0.8746%         0.0001%         0.0003%         0.0000%         0.8746%         0.0001%         0.0003%         0.0000%         0.8746%         0.0001%         0.0003%         0.0000%         0.8746%         0.0001%         0.0003%         0.0000%         0.8746%         0.0000%         0.0000%         0.8746%         0.0000%         0.891264%         99.9939%         99.9939%         99.9939%         99.9939%         99.9939%         99.9939%         99.9939%         100.0000%         100.0000%         100.0000%         100.000%         100.000%         100.0000%         100.0000%         100.0000%         100.0000%         100.0000%         100.000%         1								
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pful. A): VIABLE CONSISTENCY CHECKS (% agreement)         3.33%         28.00%           VIABLE CONSISTENCY CHECKS (% agreement)         3.33%         28.00%         0.014         6.667E-0.00007%           CHAMBER BIOBIOAEROSOL CONCENTRATION (d/u or pful. A): RELATIVE PERCENT REMOVAL REOK (% agreement)         0.0000%         0.91254%         9.99393%         99.9937%         0.00003%         0.00007%         9.1254%         9.99393%         100.00007%         0.200         4.21         -5.57         -6.90           pinger Sampling Conditions         5.0007%         9.1254%         9.9939%         100.00007%         9.1254%         9.99393%         100.00007%         9.1254%         9.99397%         100.00007%         -2.06         4.21         -5.57         -6.90           appinger Sampling Conditions         1         2.0         2.00							у	
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement) IMP & VIABLE CONSISTENCY CHECKS (% agreement) IMP & VIABLE CONSISTENCY CHECKS (% agreement) IMP & VIABLE CONSISTENCY CHECKS (% agreement)         3.33%         28.00%           CHAMBER BIOBIOACROSOL CONCENTRATION (dw or plu). Air RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (%) LOG REDUCTION FROM T=0 (%) DO00         52.444.44         458.67         3.20         0.14         6.667E-07           spinger Sampling Conditions         52.444.44         458.67         3.20         0.14         6.667E-07           spinger Sampling Conditions         0.000%         99.1254%         99.99.93%         99.99.97%         100.0000%           spinger Sampling Conditions         5.04         15         20         20.0			5.244E+04	4.567E+02	3.200E+00	1.422E-01	0.007	
VIABLE CONSISTENCY CHECK (% agreement)           IMP & VIABLE COOSS CHECK (% agreement)           CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or ph/L Air)         S2444.4         458.67         3.20         0.14         6.667E-0           CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or ph/L Air)         52444.44         458.67         3.20         0.14         6.667E-0           RELATIVE PERCENT REMAINING FROM T=0 (%)         0.0000%         99.9333%         99.9939%         99.9939%         99.9939%         0.00003%         0.00003%         0.0001%         0.0001%         0.14         6.667E-0           DIG Conditions           IMPINGER RELL VOL (mi)         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0         20.0 <th 2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2<="" colspa="2" td=""><td>_</td><td></td><td>2 2 2 2 0 /</td><td>. 20.00%</td><td></td><td></td><td>0.007</td></th>	<td>_</td> <td></td> <td>2 2 2 2 0 /</td> <td>. 20.00%</td> <td></td> <td></td> <td>0.007</td>	_		2 2 2 2 0 /	. 20.00%			0.007
IMP & VIABLE CROSS CHECK (% agreement)           CHAMBER BIOBIOAEROSOL CONCENTRATION (chor pfwL4) (s) RELATIVE PERCENT REMAINING FROM T=0 (s) D0.0000%         52444.44         458.67         3.20         0.14         6.667E-00 0.0003%           RELATIVE PERCENT REMAINING FROM T=0 (s) DLOG REDUCTION FROM T=0 (bg) DLOG REDUCTION FROM T=0 (bg) DLOG REDUCTION FROM T=0 (bg) 0.00         0.0000%         99.1254%         99.9937%         99.9937%         100.0000%           OUTON TO CONCENTRATION (chor pfwL4m)           SAMPLE TIME (min) IMPINGER AMPLEN TIME (min)         0         5         10         15         20           IMPINEER FLOW NETC (min)         2.00         20.0<		. – .	3.33%	28.00%				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfor L Air)         52444.44         458.67         3.20         0.14         6.6677E-0.           RELATIVE PERCENT REMAINING ROM T=0 (%)         100.0000%         9.91254%         99.9939%         99.9939%         99.9939%         100.0000%         99.1254%         99.9939%         99.9939%         100.0000%         0.0000%         99.1254%         99.9939%         99.9939%         100.0000%         0.0000%         99.1254%         99.9939%         99.9939%         100.0000%         0.0000%         92.00         4.21         -5.57         -6.90           Indegrad to the four the		. – .						
RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL ROM T=0 (%) LOG REDUCTION FROM T=0 (%) LOG REDUCTION FROM T=0 (%) LOG REDUCTION FROM T=0 (%) D.000 *2.06         0.0001% 99.1254%         0.0001% 99.9939%         99.9939% 99.9997%         00.0000% 100.0000%           typinger Sampling Conditions         SAMPLE TIME (min)         0         5         10         15         200           typinger Sampling Conditions         SAMPLE TIME (min)         20.0								
Relative percent Removal FROM T=0 (%) LOG REDUCTION FROM T=0 (%) O.00         0.000% -2.06         99.993% -4.21         99.993% -5.57         99.00000 -6.00           pinger Sampling Conditions         SAMPLE TIME (min)         0         5         10         15         20           SAMPLE TIME (min)         0         5         10         15         20           IMPINGER FILL VOL (n0)         20.0         <								
LOG REDUCTION FROM T=0 (log <sub>10</sub> )         0.00         -2.06         -4.21         -5.57         -6.90           ADDREDUCTION FROM T=0 (log <sub>11</sub> )           SAMPLE TIME (min)         0         5         10         15         20           SAMPLE TIME (min)         20.0								
Dipinger Sampling Conditions           SAMPLE TIME (min)         0         5         10         15         20           IMPINGER FILL VOL (mi)         20.0 </td <td></td> <td>RELATIVE PERCENT REMOVAL FROM T=0 (%)</td> <td>0.0000%</td> <td>99.1254%</td> <td>99.9939%</td> <td>99.9997%</td> <td>100.0000</td>		RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	99.1254%	99.9939%	99.9997%	100.0000	
SAMPLE TIME (min)         0         5         10         15         20           IMPINGER FILL VOL (m)         20.0 </th <th></th> <th>LOG REDUCTION FROM T=0 (log<sub>10</sub>)</th> <th>0.00</th> <th>-2.06</th> <th>-4.21</th> <th>-5.57</th> <th>-6.90</th>		LOG REDUCTION FROM T=0 (log <sub>10</sub> )	0.00	-2.06	-4.21	-5.57	-6.90	
SAMPLE TIME (min)         0         5         10         15         20           IMPINGER FILL VOL (m)         20.0 </td <td>'n</td> <td>inger Sampling Conditions</td> <td></td> <td></td> <td></td> <td></td> <td></td>	'n	inger Sampling Conditions						
IMPINGER FILL VOL (m) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm)         20.0	ipi		0	5	10	15	20	
IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm)         3.0         5.0         5.0         5.0         5.0           IMPINGER FLOW RATE (pm)         12.5 </td <td>_</td> <td></td> <td></td> <td></td> <td>-</td> <td>-</td> <td></td>	_				-	-		
IMPINGER FLOW RATE (µm)         12.5         10.5         10								
DILUTION RATIO (10 <sup>1</sup> )         -4         -2         0         0         0           DROPLET SIZE (µ)         100         100         500         750         500           1         2         5         1         1         0         1         2         0         500         750         500           1         1         2         5         1         1         1         0         1         2         0         1         1         1         0         1         2         0         1         1         1         0         1         1         1         0         1         1         1         0         1         1         0         1         1         1         0         1         1         1         0         1         1         1         0         1         1         1         0         1								
DROPLET SIZE (µl)         100         100         500         750         500           DROPLET SIZE (µl)         1         2         5         1         1         0           ENUMERATED PLATE COUNTS (# / drop)         1         1         1         0         1         2         0           PLATE AVERAGE COUNTS (# / drop)         100         1.67         5.00         0.33         -           PLATE AVERAGE COUNT (# / drop)         100         1.667         10         0         -           CHAMBER BIOAEROSOL CONCENTRATION (cfu or pfu/L Åip)         5.38E+04         5.38E+02         3.20E+00         1.42E+01           DILUTION RATIO (10°)         -3         -1         -1         0         0           DROPLET SIZE (µl)         100         100         100         500         500           PLATE AVERAGE COUNT (# / drop)         -7         12         - <td></td> <td>IMPINGER FLOW RATE (lpm)</td> <td>12.5</td> <td>12.5</td> <td>12.5</td> <td>12.5</td> <td>12.5</td>		IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5	12.5	
Image: constraint of the second sec		DILUTION RATIO (10 <sup>x</sup> )	-4	-2	0	0	0	
Image: https://www.setup.com/setu						750	500	
Image: head of the second se		DROPLET SIZE (µl)	100	100	500	750		
PLATE AVERAGE COUNT (# / drop)         1.00         1.67         5.00         0.33           IMPINGER CONCENTRATION (cfu or pfu/mit)         100,000         1,667         10         0           CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mit)         5.33E+04         5.33E+02         3.20E+00         1.42E+01           DILUTION RATIO (10 <sup>0</sup> )         -3         -1         -1         0         0           DROPLET SIZE (µt)         100         100         100         500         500           ENUMERATED PLATE COUNTS (# / drop)         7         12         8         12         14         12           PLATE AVERAGE COUNT (# / drop)         96,67         1,200	1.4	DROPLET SIZE (µl)						
Description         PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/hai)         1.00         1.67         5.00         0.33	nge #1		1	2		1		
S         PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air)         1.00         1.67         5.00         0.33           IMPINGER CONCENTRATION (cfu or pfu/L Air)         100,000         1,667         10         0         0           CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)         5.38E+04         5.38E+02         3.20E+00         1.42E+01           DILUTION RATIO (10 <sup>1</sup> )         -3         -1         0         0           DROPLET SIZE (µ)         100         100         100         500         500           F         PLATE AVERAGE COUNT (# / drop)         -7         12         5         5         5           PLATE AVERAGE COUNT (# / drop)         9.67         12.00         5         5         5         5           PLATE AVERAGE COUNT (# / drop)         9.67         1,200         5         5         5         5           CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)         5         1.6E+04         3.84E+02         5         5         5	kange		1	2		1 0		
IMPINGER CONCENTRATION (cfu or pfu/ha)         100,000         1,667         10         0           CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)         5.33E+04         5.33E+02         3.20E+00         1.42E+01           DILUTION RATIO (10°)         -3         -1         -1         0         0           BOOPLET SIZE (µ)         100         100         100         500         500           FINAL RATED PLATE COUNTS (# / drop)         -7         12         -         0         1         1         1         1         1         1         1         1         1	range		1	2		1 0		
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)         5.33E+04         5.33E+02         3.20E+00         1.42E-01           DILUTION RATIO (10°) DROPLET SIZE (µ)         -3         -1         0         0         0         500	uuron Kange	ENUMERATED PLATE COUNTS (# / drop)	1 1 1	2 1 2	5	1 0 0	,	
DILUTION RATIO (10°)         -3         -1         -1         0         0           DROPLET SIZE (µl)         100         100         100         500         500           A         7         12         8         12         14         12           PLATE AVERAGE COUNTS (# / drop)         9.67         12.00	uuron Kange	ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	1 1 1 1.00	2 1 2 1.67	5	1 0 0	r	
DROPLET SIZE (µ)         100         100         100         500         500           PLATE AVERAGE COUNTS (# / drop)         7         12         8         12         14         12           PLATE AVERAGE COUNT (# / drop)         9.67         12.00         14         12         14         12           PLATE AVERAGE COUNT (# / drop)         9.67         12.00         14         12         14         14         12         14         12         14         12         14         12         14         12         14         12         14         12         14         12         14         12         14         12         14         14         14	uuron Kange	ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml)	1 1 1 1.00 100,000	2 1 2 1.67 1,667	5 5.00 10	1 0 0 0.33 0	<i>γ</i>	
7         12           8         12           14         12           PLATE AVERAGE COUNT (# / drop)         9.67           IMPINGER CONCENTRATION (cfu or pfu/ml)         96,667           CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)         5.16£+04	uuron Kange	ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu'/ di CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu'/ Air)	1 1 1.00 100,000 5.33E+04	2 1 2 1.67 1,667 <b>5.33E+02</b>	5 5.00 10 3.20E+00	1 0 0 0.33 0 1.42E-01	۶ 	
8         12           14         12           PLATE AVERAGE COUNT (# / drop)         9.67           IMPINGER CONCENTRATION (cfu or pfu/L)         96,667           CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)         5.16€+04	uuron Kange	ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>5</sup> )	1 1 1 100,000 5.33E+04	2 1 2 1,667 5,33E+02 -1	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
IMPINGER CONCENTRATION (cfu or pfu/L Air)     5.16E+04     3.84E+02	uuron Kange	ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>5</sup> )	1 1 1 100 100,000 5.33E+04 -3 100	2 1 2 1.67 1,667 5.33E+02 -1 100	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
IMPINGER CONCENTRATION (cfu or pfu/L Air)     5.16E+04     3.84E+02		ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10 <sup>5</sup> )	1 1 1 100 100,000 5.33E+04 -3 100	2 1 2 1.67 1,667 5.33E+02 -1 100	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
IMPINGER CONCENTRATION (cfu or pfu/L Air)     5.16E+04     3.84E+02		ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ Air) DILUTION RATIO (10°) DROPLET SIZE (µl)	1 1 1 100 100,000 5.33E+04 -3 100 7	2 1 2 1.67 <u>1.667</u> <u>5.334-02</u> -1 100 12	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
IMPINGER CONCENTRATION (cfu or pfu/L Air)     5.16E+04     3.84E+02		ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ Air) DILUTION RATIO (10°) DROPLET SIZE (µl)	1 1 1 100 100,000 5.33E+04 -3 100 7 8	2 1 2 1.67 1.667 5.33E+02 -1 100 12 12 12	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
IMPINGER CONCENTRATION (cfu or pfi/ml)         96,667         1,200           CHAMBER BIOAEROSOL CONCETRATION (cfu or pfi/L Air)         5.16E+04         3.84E+02		ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ Air) DILUTION RATIO (10°) DROPLET SIZE (µl)	1 1 1 100 100,000 5.33E+04 -3 100 7 8	2 1 2 1.67 1.667 5.33E+02 -1 100 12 12 12	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) 5.16E+04 3.84E+02	Dilution Kange #1 Dilution Kange #1	ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/nai) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Aii) DILUTION RATIO (10°) DROPLET SIZE (µI) ENUMERATED PLATE COUNTS (# / drop)	1 1 1 1 100,000 5.33E+04 -3 100 7 8 14	2 1 2 1.667 5.332+02 -1 100 12 12 12 12	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
		ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/rd) DILUTION RATIO (10°) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	1 1 1 1 1 00,000 5.33E+04 -3 100 7 8 14 9.67	2 1 2 1.67 1.667 5.332+02 -1 100 12 12 12 12 12 12 0	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
		ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/t Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/t Air) DILUTION RATIO (10°) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi)	1 1 1 1 1 00,000 5.33E+04 -3 100 7 8 14 9,67 96,667	2 1 2 1.67 1.667 <u>5.33E+02</u> -1 100 12 12 12 12 12 12 12 00 1,200	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		
		ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/t Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/t Air) DILUTION RATIO (10°) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi)	1 1 1 1 1 00,000 5.33E+04 -3 100 7 8 14 9,67 96,667	2 1 2 1.67 1.667 <u>5.33E+02</u> -1 100 12 12 12 12 12 12 12 00 1,200	5 5.00 10 3.20E+00 -1	1 0 0 0.33 0 1.42E-01 0		

Viab	e Cascade Sampling Conditions **Statistical Correction /	Applied Autom	natically for co	unts>60		
	SAMPLE TIME (min)	0	5	10	15	20
	VIABLE CASCADE SAMPLING TIME (min)	0.5	0.5	1.0	2.0	5.0
_	VIABLE CASCADE FLOW RATE (lpm)	30	30	30	30	30
Cascade #1	ENUMERATED PLATE COUNTS (# / plate)					• 1
Viable C	STATISTICALLY CORRECTED PLATE COUNTS (# / plate)					1
-	PLATE AVERAGE COUNT (# / plate)					1.00
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)					0.007
				•		

#### Figure 8B: Salmonella enterica Trial 3



'rial	Information		TRIAL LOG	<b>REDUCTION</b>	RESULTS	
	TEST DATE: Thursday, July 4, 2024					
	TRIAL PERFORMED BY: SMM	0.0	-0.24	-0.39	-0.42	
	TRIAL NUMBER: C1					-0.47
	TEST ORGANISM: L. innocua					
TR	IAL NAME ID (GRAPHS/TABLES): Listeria Control	-1.0				
ev	ice Information					
	MANUFACTURER: NA	2.0				
	UNIT MODEL: NA	tion				
	FAN SPEED (CFM): NA	Inc				
	UNIT SERIAL #: NA	See See				ia
	FITER ID #: NA	-3.0 -3.0			Conti	ol
	FILTER LOT #: NA	Ц Ц			– – LOD	
en	eral Testing Conditions (Can Be User Defined)	-4.0				_
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16					
	NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb		-4.97			
	SAMPLING METHOD: Impinger & Cascade					
	CHAMBER MIXING FAN: yes	-5.0				
	TEMP (F): 74					
	RH (%): 57					
	OTHER INSTRUMENTS: NA	-6.0				
	TRIAL COMMENTS/NOTES 100 mL overnight stock centrifuged with soil	C	5	10	15	20
	and antifoam			Time (min	)	
0/	EROSOL Sample ID and Summary Data	S1	S2	<b>S</b> 3	<b>S4</b>	<b>S</b> 5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	У	У	У	У	У
	VIABLE CASCADE USED (y / n)	n	n	n	n	n
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.333E+04	7.733E+03	5.493E+03	5.067E+03	4.533E+0
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	<b>50.00%</b>	18.75%	28.33%	27.27%	6 45.45%
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	13333.33	7733.33	5493.33	5066.67	4.533E+0
	RELATIVE PERCENT REMAINING FROM T=0 (%)	100.0000%	58.0000%	41.2000%	38.0000%	34.0000
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	42.0000%	58.8000%	62.0000%	66.0000
	LOG REDUCTION FROM T=0 (log <sub>10</sub> )	0.00	-0.24	-0.39	-0.42	-0.47
_						
p	nger Sampling Conditions SAMPLE TIME (min)	0	5	10	15	20
	STAVE LE TIVIE (IIII)		5	10	IJ	
	IMDINGER EILL VOL (wh		20.0	20.0	20.0	20 0
	IMPINGER FILL VOL (m)	20.0	20.0	20.0	20.0	20.0
	IMPINGER SAMPLING TIME (min)	20.0 3.0	5.0	5.0	5.0	5.0
	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm)	20.0 3.0 12.5	5.0 12.5	5.0 12.5	5.0 12.5	5.0 12.5
	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*)	20.0 3.0 12.5 -3	5.0 12.5 <b>-3</b>	5.0 12.5 <b>-3</b>	5.0 12.5 <b>-3</b>	5.0 12.5 <b>-3</b>
	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm)	20.0 3.0 12.5	5.0 12.5	5.0 12.5	5.0 12.5	5.0 12.5
	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*)	20.0 3.0 12.5 -3	5.0 12.5 <b>-3</b>	5.0 12.5 <b>-3</b>	5.0 12.5 <b>-3</b>	5.0 12.5 <b>-3</b>
T a sime	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>x</sup> ) DROPLET SIZE (μl)	20.0 3.0 12.5 -3 100	5.0 12.5 -3 100	5.0 12.5 -3 100	5.0 12.5 -3 100	5.0 12.5 -3 100
	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*)	20.0 3.0 12.5 -3 100 5	5.0 12.5 -3 100 3	5.0 12.5 -3 100 2	5.0 12.5 -3 100 1	5.0 12.5 -3 100 1
	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -3 100 5 4 1	5.0 12.5 -3 100 3 2 3	5.0 12.5 -3 100 2 2 2 2	5.0 12.5 <b>-3</b> 100 1 1 2	5.0 12.5 <b>-3</b> 100 1 1 1
Duuuon Kange #1	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	20.0 3.0 12.5 -3 100 5 4 1 3.33	5.0 12.5 -3 100 3 2 3 3 2.67	5.0 12.5 -3 2 2 2 2 2	5.0 12.5 <b>-3</b> 100 1 1 2 1.33	5.0 12.5 -3 100 1 1 1 1 .00
	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -3 100 5 4 1	5.0 12.5 -3 100 3 2 3	5.0 12.5 -3 100 2 2 2 2	5.0 12.5 <b>-3</b> 100 1 1 2	5.0 12.5 100 1 1 1 1 1 1.00 10,000
	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>3</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	20.0 3.0 12.5 -3 100 5 4 1 3.33	5.0 12.5 -3 100 3 2 3 3 2.67	5.0 12.5 -3 2 2 2 2 2	5.0 12.5 <b>-3</b> 100 1 1 2 1.33	5.0 12.5 100 1 1 1 1 1 0,000
Duuuon Kange #1	IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10 <sup>8</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml)	20.0 3.0 12.5 -3 100 5 4 1 1 3.33 33,333	5.0 12.5 -3 100 3 2 3 2 3 2.67 26,667	5.0 12.5 -3 100 2 2 2 2 2 2 2 2 0 2,00 20,000	5.0 12.5 <b>-3</b> 100 1 1 2 1.33 13,333	5.0 12.5 <b>-3</b> 100 1 1 1 1 1 .00



	TEST DATE: Tuesday, July 2, 2024			REDUCTION		
	TRIAL PERFORMED BY: SMM	1.0-				
	TRIAL NUMBER: T1	1.0				
	TEST ORGANISM: L. innocua	0.0				
TR	IAL NAME ID (GRAPHS/TABLES): Listeria T1		N			
		-1.0-				
evi	ice Information			1.75		
	MANUFACTURER: NV	<del>-</del> -2.0		<u>\</u>		
	UNIT MODEL: Defend 1050 FAN SPEED (CFM): 533	- E				
	UNIT SERIAL #: NA	-3.0				
	FITER ID #: NA	Re		71	-o- Lister	ia
	FILTER LOT #: NA	-2.0 -3.0 -3.0 -4.0		<u>\</u>	T1 –•– Linea	r Fit
<u></u>	eral Testing Conditions (Can Be User Defined)					
CII	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16	-5.0			71	
	NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb			1		
	SAMPLING METHOD: Impinger & Cascade	-6.0			$\backslash$	
	CHAMBER MIXING FAN: yes				7.09	
	TEMP (F): 74	-7.0			V	
	RH (%): 57				١	
	OTHER INSTRUMENTS: NA	-8.0 -10	O	10	20	30
	TRIAL COMMENTS/NOTES 100 mL overnight stock centrifuged with soil	-10	0	10	20	30
	and antifoam			Time (min)		
IO/	EROSOL Sample ID and Summary Data	S1	S2	<u>83</u>	<u>S4</u>	<b>S</b> 5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	У	У	У	У	n
	VIABLE CASCADE USED $(y / n)$	n 1.0005-05	n 0.0005.00	n	n a ana T at	У
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air) CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	1.636E+05	2.933E+03	3.200E+01	3.200E-01	0.013
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	4.26%	16.67%			0.013
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					
		163555.56	2933.33	32.00	0.32	1.333E-02
	RELATIVE PERCENT REMAINING FROM T=0 (%)	163555.56 100.0000%	2933.33 1.7935%	32.00 0.0196%	0.32 0.0002%	1.333E-02 0.0000%
						0.0000%
	RELATIVE PERCENT REMAINING FROM T=0 (%)	100.0000%	1.7935%	0.0196%	0.0002%	0.0000%
iar	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (log <sub>10</sub> )	100.0000% 0.0000%	1.7935% 98.2065%	0.0196% 99.9804%	0.0002% 99.9998%	0.0000% 100.0000%
npi	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%)	100.0000% 0.0000%	1.7935% 98.2065%	0.0196% 99.9804%	0.0002% 99.9998%	0.0000% 100.0000%
npi	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mil)	100.0000% 0.0000% 0.00	1.7935% 98.2065% -1.75	0.0196% 99.9804% -3.71	0.0002% 99.9998% -5.71	0.0000% 100.0000% -7.09
npi	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (bg10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min)	100.0000% 0.0000% 0.00 20.0 3.0	1.7935% 98.2065% -1.75 5 20.0 5.0	0.0196% 99.9804% -3.71 10 20.0 5.0	0.0002% 99.9998% -5.71 15 20.0 5.0	0.0000% 100.0000% -7.09 20 20.0 5.0
npi	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mil)	100.0000% 0.0000% 0.00 0.00	1.7935% 98.2065% -1.75 5 20.0	0.0196% 99.9804% -3.71 10 20.0	0.0002% 99.9998% -5.71 15 20.0	0.0000% 100.0000 -7.09 20 20.0
npi	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (bg10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER FILL VOL (ml) IMPINGER FLOW RATE (pm) DILUTION RATIO (10*)	100.0000% 0.0000% 0.00 20.0 3.0 12.5 -4	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3	0.0196% 99.9804% -3.71 10 20.0 5.0 12.5 -2	0.0002% 99.9998% -5.71 15 20.0 5.0 12.5 0	0.0000% 100.0000 -7.09 20.0 5.0 12.5 0
	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (bg10) INPERCENT REMOVAL FROM T=0 (bg10) MPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (hmi)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100	1.7935% 98.2065% -1.75 20.0 5.0 12.5 -3 100	0.0196% 99.9804% -3.71 10 20.0 5.0 12.5	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500	0.0000% 100.0000 -7.09 20.0 5.0 12.5
#1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (bg10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER FILL VOL (ml) IMPINGER FLOW RATE (pm) DILUTION RATIO (10*)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100 2	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3 100 1	0.0196% 99.9804% -3.71 10 20.0 5.0 12.5 -2	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1	0.0000% 100.0000 -7.09 20.0 5.0 12.5 0
Kange #1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (bg10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER FILL VOL (ml) IMPINGER FLOW RATE (pm) DILUTION RATIO (10*)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100	1.7935% 98.2065% -1.75 20.0 5.0 12.5 -3 100 1 1 1	0.0196% 99.9804% -3.71 10 20.0 5.0 12.5 -2	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500	0.0000% 100.0000 -7.09 20.0 5.0 12.5 0
n Kange#1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (%) INGREDUCTION FROM	100.0000% 0.0000% 0.00 20.0 3.0 12.5 -4 100 2 3	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3 100 1	0.0196% 99.9804% -3.71 10 20.0 5.0 12.5 -2	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1	0.0000% 100.0000 -7.09 20.0 5.0 12.5 0
n Kange#1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (%) INGREDUCTION FROM	100.0000% 0.0000% 0.00 20.0 3.0 12.5 -4 100 2 3	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3 100 1 1 1 1	0.0196% 99.9804% -3.71 10 20.0 5.0 12.5 -2	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1	0.0000% 100.0000 -7.09 20.0 5.0 12.5 0
n Kange#1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (log10) mger Sampling Conditions SAMPLE TIME (min) IMPINGER FILL VOL (mil) IMPINGER FILL VOL (mil) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	100.0000% 0.0000% 0.00 20.0 3.0 12.5 -4 100 2 3 4	1.7935% 98.2065% -1.75 20.0 5.0 12.5 -3 100 1 1 1	0.0196% 99.9804% -3.71 10 20.0 5.0 12.5 -2	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1 0	0.0000% 100.0000 -7.09 20.0 5.0 12.5 0
n Kange#1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (0g10) INGER SAMPLING TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (pmi) DILUTION RATIO (10*) DILUTION RATIO (10*) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/m)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100 2 3 3 4	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3 100 1 1 1 1 1 1	0.0196% 99.9804% -3.71 10 20.0 5.0 12.5 -2	0.0002% 99.9998% -5.71 15 20.0 5.0 12.5 0 500 1 0 0	0.0000% 100.0000 -7.09 20.0 5.0 12.5 0
n Kange#1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER SAMPLENT VOL (mil) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10°) DIROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cflu or pfu'nd) CHAMBER BIOAEROSOL CONCETRATION (cflu or pfu'nd)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100 2 3 4 3 4 3.00 300,000 1.60E+05	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3 100 1 1 1 1 1 1 1 00 10,000 3.20E+03	0.0196% 99.9804% -3.71 20.0 5.0 12.5 -2 100	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1 0 500 1 0 500 1 0 500 1 3.20E-01	0.0000% 100.0000% -7.09 200 5.0 12.5 0 500
n Kange#1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (%) IDG REDUCTION FROM T=0 (%) IMPINGER SAMPLING TIME (min) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (pm) DILUTION RATIO (10*) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10*)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100 2 3 4 3 4 3.00 300,000 1.606+05 -3	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3 100 1 1 1 1 1 1 1 1 0 0 10,000 3.20£403 -2	0.0196% 99.9804% -3.71 20.0 5.0 12.5 -2 100	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1 0 500 1 0 500 1 3.20E-01 0	0.0000% 100.0009 -7.09 20.0 5.0 12.5 0 500
Duution Kange #1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (log10) nger Sampling Conditions SAMPLE TIME (min) IMPINGER SAMPLENT VOL (mil) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10°) DIROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cflu or pfu'nd) CHAMBER BIOAEROSOL CONCETRATION (cflu or pfu'nd)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100 2 3 4 3.0 3.00 300,000 1.60E+05 -3 100	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3 100 1 1 1 1 1 1 1 1 0 1,000 10,000 3.20E+03 -2 100	0.0196% 99.9804% -3.71 20.0 5.0 12.5 -2 100 -1 100	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1 0 500 1 0 500 1 0 500 1 3.20E-01	0.0000% 100.0009 -7.09 200 20.0 5.0 12.5 0 500
Duution Kange #1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (%) LOG REDUCTION FROM T=0 (%) IMPINGER SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (hmi) DILUTION RATIO (10°) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfurt Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfurt Air) DILUTION RATIO (10°) DROPLET SIZE (µ)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100 2 3 4 3.00 300,000 1.60E+05 -3 100 35	1.7935% 98.2065% -1.75 20.0 5.0 12.5 -3 100 1 1 1 1 1 1 1 1 1 1 1 2 2 0 0 2 2 5 0 3 2 2 5 3 100 1 2 5 5 -3 100 1 2 5 5 -3 100 1 2 5 5 -3 100 5 5 -3 100 5 5 -3 100 5 5 -3 100 5 5 -3 100 5 5 -3 100 5 5 -3 100 5 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 -3 100 5 	0.0196% 99.9804% -3.71 20.0 5.0 12.5 -2 100 -1 100 1	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1 0 500 1 0 500 1 3.20E-01 0	0.0000% 100.0009 -7.09 20.0 5.0 12.5 0 500
Dilution Range #1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (%) IDG REDUCTION FROM T=0 (%) IMPINGER SAMPLING TIME (min) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (pm) DILUTION RATIO (10*) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/L Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air) DILUTION RATIO (10*)	100.0000% 0.000 0.00 20.0 3.0 12.5 -4 100 2 3 4 3.0 3.00 300,000 1.60E+05 -3 100	1.7935% 98.2065% -1.75 5 20.0 5.0 12.5 -3 100 1 1 1 1 1 1 1 1 0 1,000 10,000 3.20E+03 -2 100	0.0196% 99.9804% -3.71 20.0 5.0 12.5 -2 100 -1 100	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1 0 500 1 0 500 1 3.20E-01 0	0.0000% 100.0000% -7.09 20.0 5.0 12.5 0 500
Dilution Kange #1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (bg10) INPINGER SAMPLING TIME (min) IMPINGER FILL VOL (ml) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (bpn) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/min) CHAMBER BIO AEROSOL CONCETRATION (cfu or pfu/min) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	100.000% 0.000% 0.00 20.0 3.0 12.5 -4 100 2 3 4 3 4 3.00 300,000 1.60£+05 -3 100 35 27 32	1.7935% 98.2065% -1.75 20.0 5.0 12.5 -3 100 1 1 1 1 1 1 1 1 1 1 0 0 0,000 3.20E+03 -2 100 6 8 11	0.0196% 99.9804% -3.71 20.0 5.0 12.5 -2 100 -1 100 1 1 1 1 1	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1 0 500 1 0 500 1 3.20E-01 0	0.0000% 100.0000% -7.09 20.0 5.0 12.5 0 500
n Kange#1	RELATIVE PERCENT REMAINING FROM T=0 (%) RELATIVE PERCENT REMOVAL FROM T=0 (%) LOG REDUCTION FROM T=0 (%) LOG REDUCTION FROM T=0 (%) IMPINGER SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (hmi) DILUTION RATIO (10°) DROPLET SIZE (µ) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfurt Air) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfurt Air) DILUTION RATIO (10°) DROPLET SIZE (µ)	100.000% 0.000% 0.00 20.0 3.0 12.5 -4 100 2 3 4 3.0 3.00 3.00 3.00 3.00 0.000 1.60E+05 -3 100 3.5 27	1.7935% 98.2065% -1.75 20.0 5.0 12.5 -3 100 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2	0.0196% 99.9804% -3.71 20.0 5.0 12.5 -2 100 -1 100 1 1 1 1	0.0002% 99.9998% -5.71 20.0 5.0 12.5 0 500 1 0 500 1 0 500 1 3.20E-01 0	100.000% -7.09 20.0 5.0 12.5 0 500

SAMPLE TIME (min)	0	5	10	15	20
VIABLE CASCADE SAMPLING TIME (min)	0.5	0.5	1.0	2.0	5.0
VIABLE CASCADE FLOW RATE (lpm)	30	30	30	30	30
ENUMERATED PLATE COUNTS (# / plate)					2
STATISTICALLY CORRECTED PLATE COUNTS (# / plate)					2
PLATE AVERAGE COUNT (# / plate)					2.00
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)					0.013

#### Figure 10B: Listeria innocua Trial 1



	Information		TRIAL LOG	REDUCTION	RESULTS	
	TEST DATE: Wednesday, July 3, 2024					
	TRIAL PERFORMED BY: SMM	1	.0			
	TRIAL NUMBER: T2					
	TEST ORGANISM: L. innocua	0	.0			
TR	IAL NAME ID (GRAPHS/TABLES): Listeria T2	, i i i	." 			
_						
ev	ice Information	-1	· · · · · · · · · · · · · · · · · · ·			
	MANUFACTURER: NV			-240		
	UNIT MODEL: Defend 1050	.5 -2	.0	N I		
	FAN SPEED (CFM): 533	ti i				
	UNIT SERIAL #: NA	-3	.0	3.46	-o- Lister	ia
	FITER ID #: NA	LOG Reduction		8	T2	14
	FILTER LOT #: NA	9 -4	.0		–●– Linea	r Fit
ien	eral Testing Conditions (Can Be User Defined)	-	.0			_
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16	-3	.0		58	
	NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb				$\mathbf{i}$	
	SAMPLING METHOD: Impinger & Cascade	-6	.0			
	CHAMBER MIXING FAN: yes					
	TEMP (F): 74	-7	.00		<b>7</b> ,21	
	RH (%): 57				``	
	OTHER INSTRUMENTS: NA	-	.0			
	TRIAL COMMENTS/NOTES and antiform	-	10 0	10	20	30
	and antifoam			Time (min)		
IOA	AEROSOL Sample ID and Summary Data	S1	S2	<b>S</b> 3	<b>S4</b>	<b>S</b> 5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	у	у	У	У	n
	VIABLE CASCADE USED (y / n)	n	n	n	n	у
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.084E+05	8.533E+02	3.776E+01	2.844E-01	
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					0.007
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	30.56%	22.22%			
	VIABLE CONSISTENCY CHECKS (% agreement)	- -	-			
	IMP & VIABLE CROSS CHECK (% agreement)					
	CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	108444.44	853.33	37.76	0.28	6.667E-0
	RELATIVE PERCENT REMAINING FROM T=0 (%)	100.0000%	0.7869%	0.0348%	0.0003%	0.0000%
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	99.2131%	99.9652%	99.9997%	100.0000
	LOG REDUCTION FROM T=0 (log10)	0.00	-2.10	-3.46	-5.58	-7.21
npi	inger Sampling Conditions SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0	20.0
	IMPINGER SAMPLING TIME (min)	3.0		5.0	5.0	5.0
			5.0	5.0		
			5.0 12.5	5.0 12.5		12.5
	IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5	12.5
	IMPINGER FLOW RATE (bm) DILUTION RATIO (10*)	12.5 -4	12.5 -2	12.5 <b>-1</b>	12.5 0	0
	IMPINGER FLOW RATE (lpm)	12.5 -4 100	12.5 -2 100	12.5	12.5 0 750	
ge #1	IMPINGER FLOW RATE (bm) DILUTION RATIO (10*)	12.5 -4 100 2	12.5 -2 100 2	12.5 <b>-1</b>	12.5 0 750 1	0
Range #1	IMPINGER FLOW RATE (bm) DILUTION RATIO (10*)	12.5 -4 100 2 2 2	12.5 -2 100 2 2 2	12.5 <b>-1</b>	12.5 0 750 1 1	0
Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>*</sup> ) DROPLET SIZE (µ)	12.5 -4 100 2	12.5 -2 100 2	12.5 <b>-1</b>	12.5 0 750 1	0
Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (μl) ENUMERATED PLATE COUNTS (# / drop)	12.5 -4 100 2 2 1	12.5 -2 100 2 2 5	12.5 <b>-1</b>	12.5 0 750 1 1 0	0
Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µ1) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	12.5 -4 100 2 2 1 1.67	12.5 -2 100 2 2 5 5 3.00	12.5 <b>-1</b>	12.5 0 750 1 1 0 0	0
Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µ1) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/m)	12.5 -4 100 2 2 1 1.67 166,667	12.5 -2 100 2 2 5 3.00 3,000	12.5 <b>-1</b>	12.5 0 750 1 1 0 0.67 1	0
Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu'rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu'rd)	12.5 -4 100 2 2 1 1.67 1.66,667 8.89E+04	12.5 -2 100 2 2 5 5 3.00 3,000 9.60E+02	12.5 -1 100	12.5 0 750 1 1 0 0.67 1 2.84E-01	0 500
Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ral) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ral) DILUTION RATIO (10°)	12.5 -4 100 2 2 1 1.67 1.66,667 8.89E+04 -3	12.5 -2 100 2 2 5 5 3.00 3,000 9.60E+02 -1	12.5 -1 100	12.5 0 750 1 1 0.67 1 2.84E-01 0	0 500 7
Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu'rd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu'rd)	12.5 -4 100 2 2 1 1.67 1.66,667 8.89E+04	12.5 -2 100 2 2 5 5 3.00 3,000 9.60E+02	12.5 -1 100	12.5 0 750 1 1 0 0.67 1 2.84E-01	0 500
Dilution Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ral) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ral) DILUTION RATIO (10°)	12.5 -4 100 2 2 1 1.67 1.66,667 8.89E+04 -3	12.5 -2 100 2 2 5 5 3.00 3,000 9.60E+02 -1	12.5 -1 100	12.5 0 750 1 1 0.67 1 2.84E-01 0	0 500 7
Dilution Range	IMPINGER FLOW RATE (þm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/r di CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/r di DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl)	12.5 -4 100 2 2 1 1.67 1.66,667 8.89£+04 -3 100	12.5 -2 100 2 2 5 5 3.00 3,000 9.60E+02 -1 100	12.5 -1 100 	12.5 0 750 1 1 0.67 1 2.84E-01 0	0 500 7
Dilution Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ral) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/ral) DILUTION RATIO (10°)	12.5 -4 100 2 2 1 1.67 1.66,667 8.89E+04 -3 100 20	12.5 -2 100 2 2 5 3.00 3.000 9.60E+02 -1 100 28	12.5 -1 100 	12.5 0 750 1 1 0.67 1 2.84E-01 0	0 500 7
Dilution Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>2</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/na) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/na) DILUTION RATIO (10 <sup>2</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	12.5 -4 100 2 2 1 1.67 1.66,667 8.895+04 -3 100 20 26 26	12.5 -2 100 2 2 5 3.00 3.000 9.60E+02 -1 100 28 19 23	12.5 -1 100 	12.5 0 750 1 1 0.67 1 2.84E-01 0	0 500 7
Dilution Range	IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/nd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/nd) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/nd) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	12.5 -4 100 2 2 1 1.67 1.667 8.895+04 -3 100 20 26 26 26 24.00	12.5 -2 100 2 2 5 3.00 3,000 9.60E+02 -1 100 28 19 23 23.33	12.5 -1 100 0 500 59 59.00	12.5 0 750 1 1 0.67 1 2.84E-01 0	0 500 7
Dilution Range #1 Dilution Range #1	IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>2</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/na) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/na) DILUTION RATIO (10 <sup>2</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	12.5 -4 100 2 2 1 1.67 1.66,667 8.895+04 -3 100 20 26 26	12.5 -2 100 2 2 5 3.00 3.000 9.60E+02 -1 100 28 19 23	12.5 -1 100 	12.5 0 750 1 1 0.67 1 2.84E-01 0	0 500 7

SAMPLE TIME (min)	0	5	10	15	20
VIABLE CASCADE SAMPLING TIME (min)	0.5	0.5	1.0	2.0	5.0
VIABLE CASCADE FLOW RATE (lpm)	30	30	30	30	30
ENUMERATED PLATE COUNTS (# / plate)					1
STATISTICALLY CORRECTED PLATE COUNTS (# / plate)					1
PLATE AVERAGE COUNT (# / plate)					1.00
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)					0.007

#### Figure 11B: Listeria innocua Trial 2



	Information		TRIAL LOG	REDUCTION	RESULTS	
	TEST DATE: Wednesday, July 3, 2024					
	TRIAL PERFORMED BY: SMM	1.0				
	TRIAL NUMBER: T3					
	TEST ORGANISM: L. innocua	0.0				
TR	AL NAME ID (GRAPHS/TABLES): Listeria T3					
	ing Information	-1.0				
ev	CE Information MANUFACTURER: NV			<b>N</b> 02		
	UNIT MODEL: Defend 1050	<b>_</b> -2.0		- <u> </u>		
	FAN SPEED (CFM): 533	ctie				
	UNIT SERIAL #: NA	-3.0		8.42		
	FITER ID #: NA	R R		<u>N</u>	Listeri	а
	FILTER LOT #: NA	-2.0 -3.0 -4.0		N	T3 –•– Linear	Fit
ien	eral Testing Conditions (Can Be User Defined)					
	TEST CHAMBER VOLUME (m <sup>3</sup> ): 16	-5.0		<i>},</i>	61	
	NEBULIZER CONDITIONS: Collison 24-Jet; approx. 20 min neb			· · · · · · · · · · · · · · · · · · ·	<b>ر</b>	
	SAMPLING METHOD: Impinger & Cascade	-6.0				
	CHAMBER MIXING FAN: yes					
	TEMP (F): 74	-7.0			-1.54	
	RH (%): 57				<u>۲</u>	
	OTHER INSTRUMENTS: NA	-8.0 -10		10	20	30
	TRIAL COMMENTS/NOTES	-1	, <b>v</b>		20	50
	and antifoam			Time (min)		
10/	EROSOL Sample ID and Summary Data	<u>S1</u>	S2	<b>S</b> 3	S4	S5
	SAMPLE TIME (min)	0	5	10	15	20
	IMPINGER USED (y / n)	У	У	У	У	n
	VIABLE CASCADE USED (y / n)	n	n	n	n	У
	CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	4.587E+05	4.373E+03	1.749E+02	1.138E+00	
	CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)		<b>A A A A A A A A A A</b>	<b>50 04</b> %		0.013
	IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)		42.31%	50.91%		
	VIABLE CONSISTENCY CHECKS (% agreement)					
	IMP & VIABLE CROSS CHECK (% agreement) CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	450000.07	1070.00	474.00		4 000 5 0
	RELATIVE PERCENT REMAINING FROM T=0 (%)	458666.67 100.0000%	4373.33 0.9535%	174.93 0.0381%	1.14 0.0002%	1.333E-0 0.0000%
	RELATIVE PERCENT REMOVAL FROM T=0 (%)	0.0000%	99.0465%	99.9619%	99.9998%	100.0000
	LOG REDUCTION FROM T=0 (log <sub>10</sub> )	0.00	-2.02	-3.42	-5.61	-7.54
прі	nger Sampling Conditions	0	5	10	15	20
прі	SAMPLE TIME (min)	0	<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>
Πρι	SAMPLE TIME (min) IMPINGER FILL VOL (mi)	<b>0</b> 20.0 3.0	<b>5</b> 20.0 5.0	20.0	20.0	20.0
	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min)	20.0	20.0	-	-	-
	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (hm)	20.0 3.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5	20.0 5.0 12.5
	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min)	20.0 3.0	20.0 5.0	20.0 5.0	20.0 5.0	20.0 5.0
	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*)	20.0 3.0 12.5 -4	20.0 5.0 12.5 -3	20.0 5.0 12.5 <b>-1</b>	20.0 5.0 12.5 0	20.0 5.0 12.5 0
	SAMPLE TIME (min) IMPINGER FILL VOL (ml) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (hm) DILUTION RATIO (10 <sup>*</sup> ) DROPLET SIZE (µl)	20.0 3.0 12.5 -4	20.0 5.0 12.5 -3 100	20.0 5.0 12.5 -1 100	20.0 5.0 12.5 0 750	20.0 5.0 12.5 0
Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10*)	20.0 3.0 12.5 -4	20.0 5.0 12.5 -3 100 1	20.0 5.0 12.5 -1 100 8	20.0 5.0 12.5 0 750 3	20.0 5.0 12.5 0
Range #1	SAMPLE TIME (nim) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (lpm) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -4	20.0 5.0 12.5 -3 100 1 2 0	20.0 5.0 12.5 -1 100 8 8 8 6	20.0 5.0 12.5 0 750 3 3 3 2	20.0 5.0 12.5 0
Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop)	20.0 3.0 12.5 -4	20.0 5.0 12.5 -3 100 1 2 0	20.0 5.0 12.5 -1 100 8 8 8 6 7.33	20.0 5.0 12.5 0 750 3 3 3 2 2.67	20.0 5.0 12.5 0
Dilution Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/ml)	20.0 3.0 12.5 -4	20.0 5.0 12.5 -3 100 1 2 0 1.00 10,000	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4	20.0 5.0 12.5 0
Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (hmi) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/t.hi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/t.hi)	20.0 3.0 12.5 -4 100	20.0 5.0 12.5 -3 100 1 2 0 1.00 1.000 3.20E+03	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733 2.35±+02	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4 1.14E+00	20.0 5.0 12.5 0 500
Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi)	20.0 3.0 12.5 -4 100 -3	20.0 5.0 12.5 -3 100 1 2 0 1.00 10,000 3.20E+03	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733 2.35E+02 0	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4 1.14E+00 0	20.0 5.0 12.5 0 500
Dilution Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (hmi) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) PLATE AVERAGE COUNT (# / drop) IMPINGER CONCENTRATION (cfu or pfu/t.hi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/t.hi)	20.0 3.0 12.5 -4 100 -3 100	20.0 5.0 12.5 -3 100 1 2 0 1.00 1.000 1.000 3.20E-03 -2 100	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733 2.35±402 0 500	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4 1.14E+00	20.0 5.0 12.5 0 500
Dilution Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi)	20.0 3.0 12.5 -4 100 -3 100 69	20.0 5.0 12.5 100 1 2 0 1 0 1.00 10,000 3.20E+03 -2 100 20	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733 2.35E+02 0	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4 1.14E+00 0	20.0 5.0 12.5 0 500
Dilution Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>°</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi)	20.0 3.0 12.5 -4 100 -3 100 69 80	20.0 5.0 12.5 100 1 2 0 1 2 0 1.00 10,000 3.20E+03 20 20 17	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733 2.35±402 0 500	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4 1.14E+00 0	20.0 5.0 12.5 0 500
Dilution Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (min) IMPINGER FLOW RATE (pmi) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) DILUTION RATIO (10°) DROPLET SIZE (µl)	20.0 3.0 12.5 -4 100 -3 100 69	20.0 5.0 12.5 100 1 2 0 1 0 1.00 10,000 3.20E+03 -2 100 20	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733 2.35±402 0 500	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4 1.14E+00 0	20.0 5.0 12.5 0 500
Dilution Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER SAMPLING TIME (min) IMPINGER FLOW RATE (pm) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) DILUTION RATIO (10 <sup>5</sup> ) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop)	20.0 3.0 12.5 -4 100 -3 100 69 80 109	20.0 5.0 12.5 -3 100 1 2 0 1.00 1.000 3.20E+03 -2 100 20 17 15	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733 2.35±+02 0 500 180	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4 1.14E+00 0	20.0 5.0 12.5 0 500
Range #1	SAMPLE TIME (min) IMPINGER FILL VOL (mi) IMPINGER FILL VOL (mi) IMPINGER FLOW RATE (min) IMPINGER FLOW RATE (pmi) DILUTION RATIO (10°) DROPLET SIZE (µl) ENUMERATED PLATE COUNTS (# / drop) IMPINGER CONCENTRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/mi) DILUTION RATIO (10°) DROPLET SIZE (µl)	20.0 3.0 12.5 -4 100 -3 100 69 80	20.0 5.0 12.5 100 1 2 0 1 2 0 1.00 10,000 3.20E+03 20 20 17	20.0 5.0 12.5 -1 100 8 8 8 6 7.33 733 2.35±402 0 500	20.0 5.0 12.5 0 750 3 3 3 2 2.67 4 1.14E+00 0	20.0 5.0 12.5 0 500

	SAMPLE TIME (min)	0	5	10	15	20
	VIABLE CASCADE SAMPLING TIME (min)	0.5	0.5	1.0	2.0	5.0
_	VIABLE CASCADE FLOW RATE (lpm)	30	30	30	30	30
Cascade #1	ENUMERATED PLATE COUNTS (# / plate)					2
Viable Ca	STATISTICALLY CORRECTED PLATE COUNTS (# / plate)					2
-	PLATE AVERAGE COUNT (# / plate)					2.00
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)					0.013

#### Figure 12B: Listeria innocua Trial 3



# **Appendix C: Calculations**

To evaluate the viable aerosol delivery efficiency and define the operation parameters of the system, calculations based on (theoretical) 100% efficacy of aerosol dissemination were derived using the following steps:

- Plating and enumerating the biological to derive the stock suspension concentration (Cs) in pfu/mL, cfu/mL, or cfu/g for dry powder.
- Collison 24 jet nebulizer use rate  $(R_{neb})$  (volume of liquid generated by the nebulizer/time) at 28 psi air supply pressure = 1.0 mL/min.
- Collison 24 jet Generation time (t) = 20 or 30 minutes, test dependent.
- Chamber volume  $(V_c) = 15,993$  Liters

Assuming 100% efficiency, the quantity of aerosolized viable particles ( $V_P$ ) per liter of air in the chamber for a given nebulizer stock concentration ( $C_s$ ) is calculated as:

Nebulizer: 
$$V_P = \frac{C_s \cdot R_{neb}}{V_c} t$$

AGI – 30 impinger or 47mm filter collection calculation:

- Viable aerosol concentration collection  $(C_a) = cfu$  or pfu/L of chamber air.
- Viable Impinger concentration collection  $(C_{Imp}) = cfu$  or pfu/mL from the impinger or filter sample enumeration.
- Impinger sample collection volume  $(I_{vol}) = 20$  mL collection fluid/impinger or extraction fluid for the filter.
- AGI-30 impingers or filter sample flow rate  $(Q_{imp}) = 12.5$  L/min.
- AGI-30 impinger or filter sample time (t) = 5 or 10 minutes, test dependent.

For viable impinger or filter aerosol concentration collection ( $C_a$ ) = cfu or pfu/L of chamber air:

$$C_a = \frac{\mathbf{C}_{\mathrm{Imp}} \cdot \mathbf{I}_{\mathrm{vol}}}{\mathbf{Q}_{\mathrm{imp}}} \mathbf{t}$$

The aerosol system viable delivery efficiency (expressed as %) is:

$$Efficiency = \frac{C_a}{V_p} \cdot 100$$