Study Summary Article

Efficacy of the M40 Air Purifier against a Broad Range of Respirable Microorganisms: *High Speed Broad Range Efficacy and Low Speed Select Species Efficacy*

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Aerosol Research and Engineering Laboratories, Inc. have no affiliations with, or involvement in any capacity, with Medify's financial interests such as; membership, employment, stock ownership, or other equity interest.

ABSTRACT

Background: Due to the high rate of infectious disease transmission through aerosol exposure to pathogenic microorganisms, systems designed to reduce the levels of airborne pathogens, and other bio particulates in room air, have been attracting significant attention. This in-vitro study characterized the efficacy of the M40 air purification device to reduce respirable bioaerosol levels for six broad-ranged species of microorganisms from room air. The species selected are recognized surrogates for more dangerous pathogenic organisms. In this study, the species tested were: MS2, a non-enveloped ssRNA virus that is a common surrogate for influenza viruses and is a tentative surrogate for SARS-CoV-2; Phi X 174, a non-enveloped DNA virus that is a surrogate for herpes and smallpox viruses; Methicillin Resistant *Staphylococcus epidermidis* (MRSE), a gram-positive bacterium that serves as a surrogate for many pathogenic gram-positive bacteria, including Methicillin Resistant *Staphylococcus aureus* (MRSA); *Escherichia coli*, a gram-negative bacterium that is a well-known pathogen itself; *Bacillus subtilis* endospores, which serve as a model for the many bacterial species that produce highly resistant endospores; and the spores from *Aspergillus brasiliensis*, one of the most common sources of toxic black mold.

This is a two part study designed to demonstrate the efficacy of the M40 and M50 air purifiers. In this part, the M40 was tested in its intended final commercial form. The results of that study are presented in this report. The M40 study was further divided into two phases;

Phase I: The highest level fan speed (Speed 3), which is anticipated to be the speed most used in routine use, was used for this phase of the testing. Additionally, a full contingent of six microorganisms were used to test the system. It consisted of a total of twenty-four (24) live bioaerosol trials; six species with three test trials and one control trial each. In addition to the microorganism tests an inert particles trial and control was performed to determine the reduction of PSL's (polystyrene latex microspheres) by the device in a sealed chamber.

Phase II: The lowest fan speed available on the unit (Speed 1), which is the setting with the lowest room turnover rate, was used for this phase of testing to assess two species, the MS2 bacteriophage (virus) and the endospores from *Bacillus subtilis.* These represented the most difficult to remove microbes. All bioaerosol trials were run in triplicate. In addition to the microorganism test at the lowest fan speed an inert particles trial was also performed to determine the reduction of PSL's (polystyrene latex microspheres) by the device in a sealed chamber.

Methods: Each microorganism was aerosolized into a sealed environmental bioaerosol chamber, containing the M40 air purifier, using a Collison 24-Jet Nebulizer or dry powder feeder. All the bioaerosols had a mass median aerodynamic diameter (MMAD) ranging from 0.7-4.0 µm (species dependent). Bioaerosol samples were taken at multiple time points throughout each trial, in order to quantify the reduction rate capability of the air purification device. Impinger samples were serially diluted, plated, incubated, and enumerated in triplicate to yield viable bioaerosol concentrations for each sampling point. Chamber control trial data, or natural decay, was subtracted from the device trial data to yield the net LOG reduction for each of the bioaerosol challenges.

Results: Phase I – The M40 unit, set to 'Speed 3', was effective at reducing all six organisms by a net log of 4.09 or greater (equivalent to 99.99% or greater) within 30 minutes.
Results: Phase II – The M40 unit, set to 'Speed 1', was effective at reducing both organisms by a net log of 4.0 or greater (equivalent to 99.99% or greater) within 90 minutes.

Conclusions: Based on the results of Phase I and Phase II testing, all fan speeds are effective in reducing airborne microorganisms within a short period of time. However, the higher fan speed achieved a >4.0 net log reduction in 30 minutes vs the lower fan speed which took 90 minutes.

Introduction

This study was conducted to evaluate the efficacy of the M40 room air purifier, manufactured by Medify, at reducing aerosolized bio organisms. The M40 device is an air filtration device, equipped with ozone free ionizer and a true HEPA filter. It is designed to reduce a broad range of gram-positive and gram-negative bacteria, RNA and DNA viruses including SARS-CoV-2, bacterial and mold fungal spores, and airborne particles in room air. The M40 device is designed for commercial and residential applications. The test plan incorporated challenging the M40 device, in a closed environmental chamber, to determine the reduction rate and extent of two separate aerosolized viruses, two separate aerosolized bacteria, and two types of spores. A picture of the M40 device is shown in **Figure 1**.

Figure 1: M40 Air System Device: Portable HEPA filtration with ozone free ionizer. Integrated pre-filter and carbon filter for further polishing of treated air. Multi-speed capable.

Study Overview

The effectiveness of the M40 device was evaluated against an RNA virus, a DNA virus, a gram negative bacteria, a gram positive bacteria, a spore forming bacteria, and a mold spore.

Testing was conducted to characterize a single M40 unit against six organism types to demonstrate the capability of the M40 device, when operating at its highest fan speed, to reduce viable bioaerosol concentrations, therefore theoretically reducing the chances of airborne infection. Two of these organisms, MS2 and *Bacillus subtilis* endospores, were tested at one additional fan speed, Speed 1, to demonstrate efficacy at multiple fan speeds.

Phase I: Speed 3, Broad Range Efficacy Testing:

The Phase I component consisted of testing all six species in the Speed 3 of the M40 device which is intended to be the most commonly used setting. A single trial and control were also performed to characterize the reduction of PSL's in a sealed room. This demonstrated the broad efficacy of the device.

Phase II: Speed 1 Efficacy Testing

Phase II of the testing consisted of running two selected species, MS2 and *B. subtilis* endospores, run with the device at Speed 1. These two organisms were chosen because of their hardiness and particle size. In addition, a single inert particle reduction trial was performed to characterize the device efficacy at removing non-living aerosolized particulates. Testing the efficacy of the device at different air flow rates demonstrated the device's overall capability.

Test Device Description

The M40 device is equipped with multi-step filtration including a pre-filter, carbon filter, HEPA filter, and an ionizer that increases kill efficiency. The pre-filter is used to captures large dust particles and other debris followed by an activated carbon filter intended to remove volatile organic compounds (VOC's). An integrated High Efficiency Particulate Air (HEPA) filter removes respirable particles (>0.1 µm). The ionizer kills any microorganisms the get by the filter system. The device is equipped with four blower speeds: Speed 1, 2, and 3.

Figure 2: Stainless Steel Bioaerosol Test Chamber used for all M40 Testing. Chamber is equipped with HEPA in/out, multiple bioaerosol sampling ports, decontamination and pressure balance. Exterior picture.

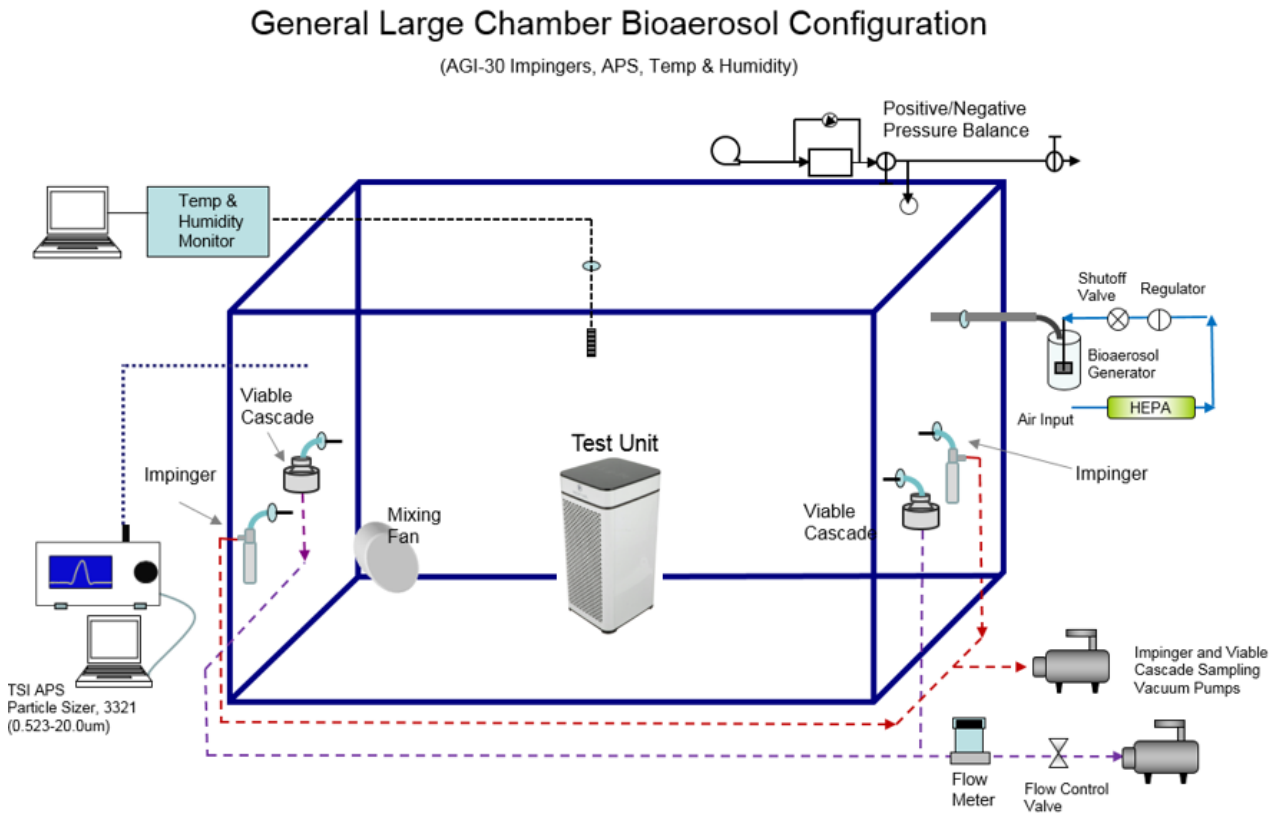


Figure 3: Bio-Aerosol Test Chamber Flow Diagram. Chamber includes bioaerosol induction, multiple bioaerosol sampling ports, Particle size monitoring, internal mixing fans, temperature and humidity controls. Main system HEPA Evacuation System not pictured.

Bioaerosol Testing Chamber

A large sealed aerosol test chamber was used to replicate a potentially contaminated room environment and to contain any potential release of aerosols into the surrounding environment. 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 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 2** shows the bioaerosol chamber used for all testing in this study.

The chamber is equipped with filtered HEPA inlets, digital internal temperature and humidity monitors, heaters and humidifiers, lighting system, multiple sampling ports, aerosol mixing fans, and a HEPA filtered exhaust system that are 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.

In order to avoid wall effects, all sample and dissemination ports were inserted approximately 18 inches in from the interior walls of the chamber and at a height of approximately 40 inches from the floor to avoid wall effects. The aerosol sampling and aerosol dissemination probes are stainless steel and bulk headed 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^3/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_2O (Dwyer instruments, Michigan City IN) was used to monitor and balance the system pressure during aerosol generation, aerosol purge and testing cycles.

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 74°F +/- 2°F.

Bioaerosol Generation System

All test bioaerosols were disseminated using a Collison 24-jet nebulizer (BGI Inc. Waltham MA), similar to the one shown in **Figure 4,** with the exception of the *A. brasiliensis* spores which were aerosolized using a dry powder eductor. The aerosolization of bioaerosols were driven by purified, filtered house air supply. A pressure regulator allowed for control of disseminated particle size, use rate and sheer force generated within the Collison nebulizer. Prior to testing, the Collison nebulizer flow rate and use 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 flow characterized by using a calibrated TSI model 4040 mass flow meter (TSI Inc., St Paul MN).

Figure 4. 6-Jet Collison nebulizer. Glass and 304 stainless steel construction, BGI Industries.

Bioaerosol Sampling and Monitoring System

Two AGI impingers (Ace Glass Inc. Vineland NJ) were used for bioaerosol collection of all biological aerosols to determine chamber concentrations. The two AGI Impingers were placed at opposite corners of the chamber in order to represent an entire room sample. The mixing fans inside the chamber worked to ensure a homogenous air mixture inside the chamber.

Figure 5: 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.

The AGI-30 impinger vacuum source was maintained at a negative pressure of 18 inches of Hg during all characterization and test sampling to assure critical flow conditions. The AGI-30 sample impingers flows were characterized using a calibrated TSI model 4040 mass flow meter. A general flow diagram of the aerosol test system is shown above in **Figure 3**.

During testing with less resilient organisms or those which fall out of the air more easily, sample collections were also obtained using a pair of viable cascade impactors. A viable cascade impactor (SKC Inc., Valley View, PA) is comprised of an inlet cone, a precision-drilled 400-hole impactor stage, and a base that holds a standard-size agar plate (**Figure 5**). 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 the detection of organisms at low concentrations.

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 0.54-20.0 µm with 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 used to measure total particle concentration and particle size distribution of the challenge bioaerosol. Range 0.54-20.0 µm aerodynamic diameter, with 1 particle/L detection limits.

Species Selection

Due to safety concerns for bioaerosol testing, organism selection was based on Biological Safety Level 1 (BSL1) species which served as surrogates for more dangerous pathogenic (BSL2 & BSL3) organisms.

Viral Challenges:

Virus MS2 is a viral single-stranded, non-enveloped RNA bacteriophage that has been used historically as a surrogate for influenza viruses. MS2 has also recently been used as a tentative surrogate for SARS-CoV-2 in numerous published bioaerosol studies. Phi-X174 (Φ-X174) is a viral, single-stranded, non-enveloped, DNA bacteriophage traditionally used as a surrogate for viral species such as herpes simplex and smallpox.

The US FDA guidance document, *Enforcement Policy for Sterilizers, Disinfectant Devices, and Air Purifiers During the Coronavirus Disease 2019 (COVID-19) Public Health Emergency*, states that lipid enveloped viruses, such as coronaviruses, are the least resistant microorganisms to disinfectants. It is presumed that this susceptibility is similar for other chemical, physical and catalytic methods of destruction.

MS2 and Phi X 174 are non-enveloped viruses, which makes them more resistant to disinfection than lipid viruses, and therefore, should represent a "worst case scenario" when compared to actual lipid-enveloped RNA viruses like SARS-CoV-2. **Figure 7** is a graphic from the FDA document, *COVID Sterilizers, Disinfectant Devices, and Air Purifiers Guidance*, demonstrating resistance to disinfection.

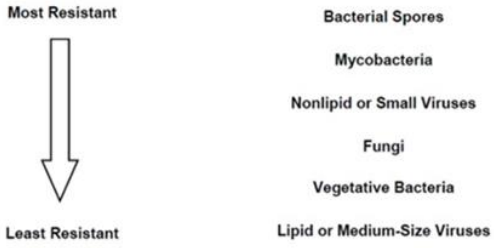


Figure 7: FDA graphic demonstrating general resistance to disinfection for various microorganisms. FDA, Guidance Enforcement Policy for Sterilizers, Disinfectant Devices, and Air Purifiers during the Coronavirus Disease 2019 (COVID-19). Pg. 7. March 2009. SARS-CoV-2 (lipid or medium-Sized Virus), MS2 (non-lipid small virus).

Vegetative Bacteria Challenges:

The vegetative bacteria organisms used for this study included Methicillin Resistant *Staphylococcus epidermidis* (MRSE) (ATCC 12228). *Staphylococcus epidermidis* is a gram-positive bacterium and BSL1 simulant for a wider range of medically significant pathogens including Methicillin Resistant *Staphylococcus aureus* (MRSA).

Escherichia coli was selected as the gram-negative vegetative bacterium for this study. (ATCC 15597). *E. coli* is a bacterium commonly used in various forms of testing as it is a common pathogen found in a multiplicity of places, and it can survive on many surfaces, and it may cause serious illness (potentially lethal) itself.

Mold Spores and Bacterial Endospore Challenges:

Aspergillus brasiliensis (ATCC 16404), formerly known as *A. niger,* is one of the most common species of the genus *Aspergillus*. *A. brasiliensis* is routinely defined as a surrogate for various toxic black mold species such as *Stachybotrys chartarum.* Many respiratory problems found in infants, the elderly and immunocompromised individuals are attributed to mold. Purified *A. brasiliensis* spores were used in bulk, dry powder form with an approximate concentration of 1 x 10^9 cfu/gram.

Bacillus subtilis (ATCC 49760), endospores were used as a surrogate for *Bacillus anthracis* (Anthrax), a biological agent used for bioterrorism/biowarfare research. It also serves as a surrogate for other pathogenic endospore forming species such as *Clostridioides difficile*, a common and difficult to eliminate hospital pathogen. *Bacillus subtilis*, a sub-species of *Bacillus atrophaeus,* is a gram-positive bacterium found in soil and in the gastrointestinal tract of ruminants and humans. B. *subtilis* is rod-shaped, and forms a tough, highly resistant endospore, which allows it to tolerate extreme environmental conditions.

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 µm and was programmed to take consecutive real-time one-minute aerosol samples. Data were logged in real-time to an Acer laptop computer, regressed, and plotted.

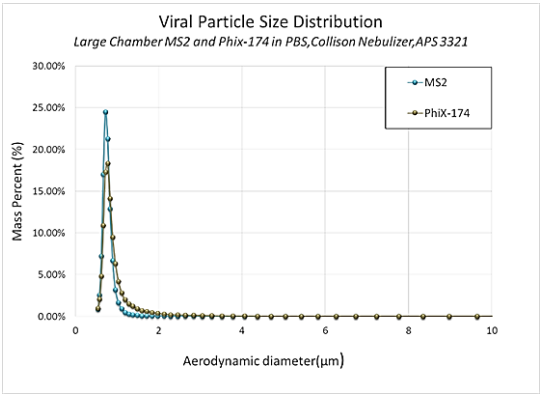


Figure 8: Aerodynamic Particle Size Distribution of RNA virus MS2 and DNA virus PhiX-174 in the test chamber. MMAD for both viral species averaged approximately 0.7 µm.

The aerodynamic particle size distribution for all challenge bioaerosols are shown to be within the respirable range for regional alveolar tract deposition and show a low geometric standard deviation (GSD), indicating that a monodispersed aerosol was generated in the chamber for each of the challenge species. The aerodynamic particle size distributions for MS2 and Phi X174 can be found in **Figure 8,** shown above.

The bioaerosol particle size distributions for *S.epidermidis* and *E.coli* are shown in **Figure 9**. The particle size distribution for *A.brasiliensis* and *B.subtilis* are found in **Figure 10**.

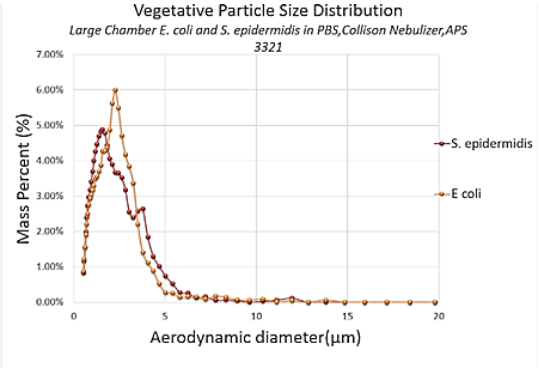


Figure 9: Aerodynamic Particle Size Distribution of *S. epidermidis* and *E. coli* in the test chamber. MMAD for each species was approximately 2.4-2.6 µm.

The particle size distribution of the spore species are noticeably larger than that of the vegetative bacteria. This makes these species easier to filter out of the air, however they are much more resilient when it comes to physical destruction.

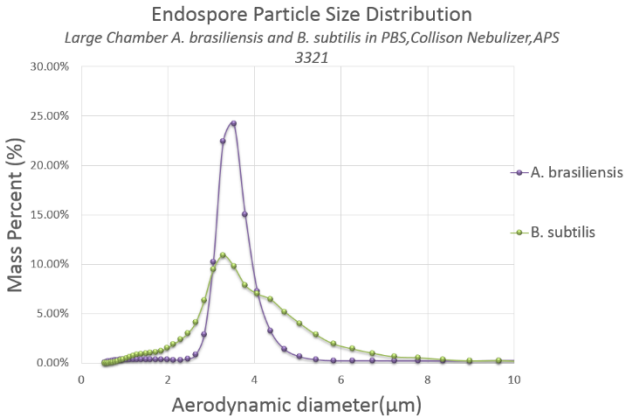


Figure 10: Aerodynamic Particle Size Distribution of *A. brasiliensis* and *B. subtilis* in the test chamber. MMAD for *B. subtilis* is approximately 2.4 µm with *A. brasiliensis* having a MMAD of approximately 4.0 µm.

Viral Culture & Preparation

Pure strain viral seed stock and host bacterium were obtained from ATCC. Host bacterium was grown in a similar fashion to the vegetative cells in an appropriate liquid media. The liquid media was infected during the logarithmic growth cycle with the specific bacteriophage. After an appropriate incubation time, the cells were lysed and the cellular debris separated by centrifugation. MS2 stock yields were greater than 1 x 10^{11} plaque forming units per milliliter (pfu/mL) with a single amplification procedure. This stock MS2 viral solution was then diluted with PBS to approximately 1 x 10^{10} plaque forming units per milliliter (pfu/mL) for use in the Collision nebulizer. The Phi-X174 stock was prepared in the same manner however, in order to achieve a high enough concentration the Phi-X174 underwent a double amplification procedure.

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** below on page 8. Working stock cultures were prepared using aseptic techniques in a class 2 biological safety cabinet and followed standard 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.

Stock cultures were centrifuged for 10 minutes at 3000rpm in an LD-3 centrifuge in sterile 15mL conical tubes, growth media was removed, and the cells re-suspended in sterile PBS buffer for aerosolization. Aliquots of these suspensions were enumerated on tryptic soy agar plates (Hardy Diagnostics, Cincinnati OH) for viable counts and stock concentration calculation. 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.

Fungal Spore Culture & Preparation

A. brasiliensis fungal spores were obtained in purified bulk powder form at a concentration of 1 x 10^{9} cfu/g. To verify the bulk powder spore concentration, an aliquot of weighed dry powder was prepared in suspension in PBS + 0.005% Tween 80 at a mass: volume ratio to obtain a concentration of 1 x 10^{9} cfu/ml. This aliquoted spore suspension was plated prior to testing to verify concentration.

Bacillus subtilis freeze-dried spores were purchased from ATCC with a stock concentration of 1 x 10^{11} cfu/gram. One gram of dry spores was suspended in a 250mL solution of 50/50 91% Isopropyl alcohol and PBS + 5% Tween to assist in deagglomeration. This suspension was sonicated for 40 minutes in order to bring all powder into solution. This aliquoted spore suspension was plated prior to testing to verify concentration.

Plating and Enumeration

Impinger and stock biological cultures were serially diluted and plated in triplicate. (Multiple serial dilutions) using a standard spread plate assay technique onto tryptic soy agar plates. The plated cultures were incubated for 24-48 hours depending on the species and enumerated and recorded.

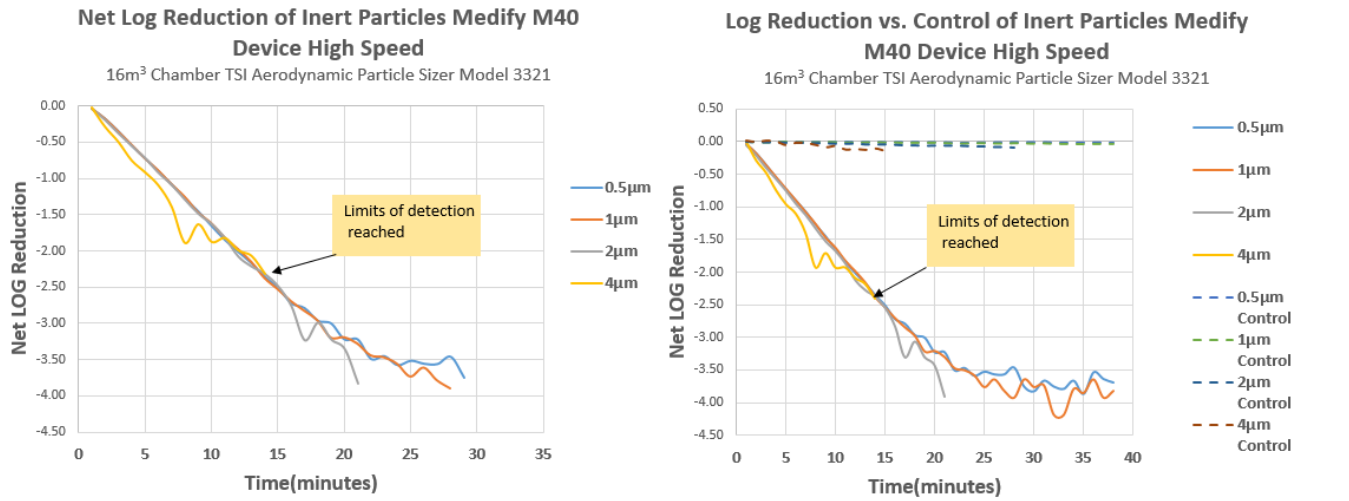


Figure 11: PSL Microspheres Chamber Trials for the Control and M40 Device at High Speed. First figure (Left) shows the net log reduction of four different inert particles normalized to 100% for T=0 sample for both control and M40 trials. Second figure (Right) show the log reduction of inert particles by the M40 unit.

When working with microorganisms at extremely low concentrations the viable cascade sampling was used. 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 up to 400 can then be adjusted using the positive conversion table. This table is based on the principle that, as the number of viable particles being impinged on a given plate increases, the probability of the next particle going into an "empty hole" decreases. This can be corrected statistically using the conversion formula of Feller, W (1950).

Post-Testing Decontamination and Prep

Following each test, the chamber was air flow evacuated/purged for a minimum of twenty minutes between tests and analyzed with the APS for particle concentration decrease to baseline levels between each test. The chamber was decontaminated at the conclusion of the trials with aerosol/vaporous hydrogen peroxide (35%). The Collison nebulizer and impingers were cleaned at the conclusion of 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

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 M40 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 log reduction in viable bioaerosol for each organism. All data are normalized with time zero enumerated concentrations. Subsequent samples are normalized and plotted to show the loss of viability over time.

Result: Inert Particle Characterization

PSL microsphere trial data were used to estimate nebulization efficiencies, particle stability, determine sample collection times, and aerosol persistence prior to bioaerosol testing. In order to estimate total bioaerosol trial times, sampling frequency and sample duration for the bioaerosol challenges testing with the M40 device was conducted using PSL microspheres. The removal efficacy of polystyrene latex microspheres (PSL microspheres) were used to characterize simple particle capture efficiency.

Polydispersed PSL microspheres with aerodynamic diameters of 0.5 - 4.0 µm were nebulized in PBS and chamber concentrations were recorded using the APS over time. The APS recorded individual particle count from 0.54 to 20.0 µm in size with 52 separate size bins of resolution. Two pre-trials were conducted: a negative control with the test unit "off" and a single positive control with the test unit turned "on" after aerosolization. All trials were performed with chamber mixing fans "on" during the entirety of the trial. Results show a sharp drop in the particle number concentration with the M40 in operation (note the log scale of the y-axis). **Figure 11 (left)** shows the net log reduction for the unit and control trial, while **Figure 11 (right)** shows the LOG reduction for 0.5, 1.0, 2.0 and 4.0 µm PSL microspheres.

Biological Test Matrix

Trial	Run	Pathogenic Organism	Surrogate Species (gram, description)	ATCC Ref	Target Monodispersed Particle Size	Challenge Conc. (#/L)	Trial Time (min)	Sample Time (min)	Sampling	Plating and Enumeration
1 2 3 4	Control Challenge Challenge Challenge	*Pathogenic E. coli sp.*	*Eschericia Coli (-, vegetative)*	15597	2.5-3.0um	10^4-10^6	30	0, 10, 20, 30	APS, Impingers, Viable Cascade	all samples in triplicate
5 6 7 8	Control Challenge Challenge Challenge	*Methicillin resistant staphylococcus aureus*	*Staphylococcus Epidermidis (+, vegetative)*	12228	2.5-3.0um	10^4-10^6	30	0, 10, 20, 30	APS, Impingers, Viable Cascade	all samples in triplicate
9 10 11 12	Control Challenge Challenge Challenge	*Influenza*, (tentative surrogate for *Sars-cov2*)	*MS2 bacteriophage (E. coli phage)*	15597-B1	<1.0um	10^4-10^6	30	0, 10, 20, 30	APS, Impingers	all samples in triplicate
13 14 15 16	Control Challenge Challenge Challenge	*Herpes simplex* and *Smallpox*	*Phi X 174 (E. coli phage)*	13706-B1	<1.0um	10^4-10^6	30	0, 10, 20, 30	APS, Impingers	all samples in triplicate
17 18 19 20	Control Challenge Challenge Challenge	Toxic Black Molds (spore)	*Aspergillus brasiliensis (mold, spore forming)*	16404	<5.0um	10^4-10^6	30	0, 10, 20, 30	APS, Impingers, Viable Cascade	all samples in triplicate
21 22 23 24	Control Challenge Challenge Challenge	*C. difficile* & *Bacillus anthracis* (spore)	*Bacillus subtilis endospore (Bacillus Spores)*	49760	<3.5 um	10^4-10^6	30	0, 10, 20, 30	APS, Impingers	all samples in triplicate

Table 1: Phase I Test Matrix for the M40 air purification system.

Phase I Methods: Bioaerosol Efficacy Testing

Method Controls:

To accurately assess the M40 unit, test chamber pilot control trials were performed with all organisms over a 60-minute time period to characterize the biological challenge aerosol delivery/collection efficiency, and viable concentration over time. Control testing was performed to provide baseline comparative data in order to assess the actual reduction from the M40 challenge testing and verify that viable bioaerosol concentrations persisted above the required concentrations over the entire pilot control test period. During control runs, two low velocity fans located in the corners of the bioaerosol test chamber was turned on for the duration of trial to ensure a homogenous aerosol concentration within the aerosol chamber. The mixing fan was used for all control runs and was turned off during M40 decontamination trials. The two impingers used for bioaerosol collection were pooled and mixed prior to plating and enumeration. A complete test matrix for Phase I bioaerosol trials can be found in **Table I** above.

Methods: M40 Testing

For each control and challenge test, the Collison nebulizer was filled with approximately 40 mL of biological stock and operated at 40 psi for a period of 20 minutes. 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 in order to increase the impinger collection efficiency and de-agglomeration of all microorganisms. The chamber mixing fan was turned on during bioaerosol dissemination to assure a homogeneous bioaerosol concentration in the test chamber prior to taking the first impinger sample (T=0).

Following bioaerosol generation, baseline bioaerosol concentrations were established for each pilot control and M40 test by sampling simultaneously with two AGI-30 impingers located at opposite corners of the chamber. AGI samples were collected for 2 to 10 minutes at intervals of 10 or 30 minutes throughout the entire test period.

Collected impinger chamber samples were pooled and mixed at each sample interval for each test. Aliquots of impinger samples were collected and then used for plating. 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 M40 biological testing, the unit was turned on immediately following a time 0 baseline 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 operation of the M40 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 plaque forming units (pfu) or colony forming units (cfu) to calculate aerosol challenge concentrations in the chamber and reduction of viable microorganisms.

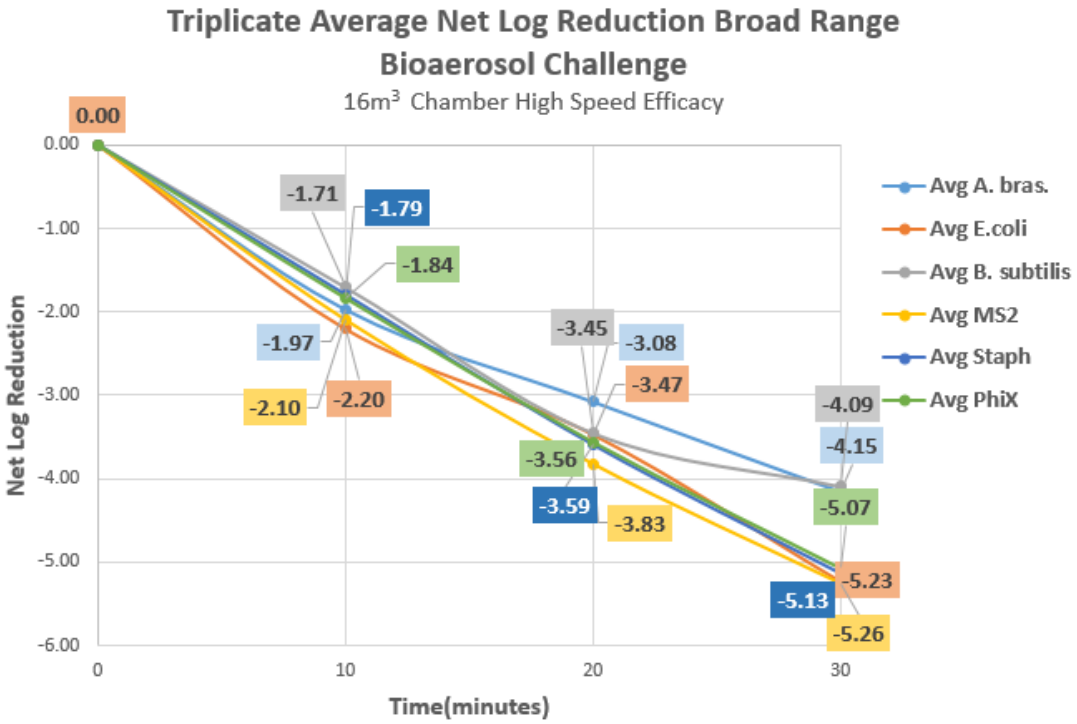


Figure 12: **Phase I** Net LOG Reduction for the M40.

Phase I Results – High Speed

Phase I of this study was performed to evaluate the M40 device efficacy at reduction of bioaerosols in a controlled room. Reduction of viable bioaerosols by a net 4 logs or 99.99% is the minimum requirement for FDA approved use. The species of organisms used were chosen specifically for their ability at gauging device efficacy against the most common encountered organisms.

When tested against the MS2 bacteriophage, the device showed a net log reduction of 5.26 +/- 0.22 in 30 minutes. When tested against Phi X 174 the device achieved a net log reduction of 5.07 +/- 0.27 in 30 minutes. When tested against *Staphylococcus epidermidis* the device reached a net log reduction of 5.13 +/- 0.11 in 30 minutes. The other bacterial species tested *Escherichia coli* reached 5.23 +/- 0.16 in 30 minutes. The *Aspergillus brasiliensis* spores showed an average net reduction of 4.15 +/- 0.04 net logs in 30 minutes. The bacterial endospore from *Bacillus subtilis* reached a net log reduction of 4.15 +/- 0.13 net log in 30 minutes. Net log reduction data can be found above in Figure 12 and Table 2.

Phase I Conclusion

Overall, the Speed 3 yielded consistent reduction throughout, reaching a net 4 log reduction for all species. The duration of time needed to reach a net 4 log reduction was 30 minutes for all species.

Average % NET Reduction and NET LOG Reduction of Viable BioAerosols

Bioaerosol Type	Species (gram, description)	Number of Trials	Total Trial Time(minutes)	Data Type	Trial 1	Trial 2	Trial 3	Average
Virus	*MS2 bacteriophage* (RNA E. coli phage **Sars-CoV2** surrogate)	3	30	*Net Log Reduction* *Net % Reduction*	-5.30 99.9995%	-5.46 99.9997%	-5.02 99.9991%	-5.26+/-0.22 99.9994% +/- 0.0003%
Virus	*Phi X 174 bacteriophage* (DNA E. coli phage)	3	30	*Net Log Reduction* *Net % Reduction*	-5.19 99.9994%	-5.26 99.9994%	-4.77 99.9983%	-5.07+/-0.27 99.999% +/- 0.0006%
Bacterial	*Staphylococcus Epidermidis* (+, vegetative)	3	30	*Net Log Reduction* *Net % Reduction*	-5.23 99.9994%	-5.14 99.9993%	-5.02 99.9990%	-5.13+/-0.11 99.9992% +/- 0.0002%
Bacterial	*Escherichia coli* (-, vegetative)	3	30	*Net Log Reduction* *Net % Reduction*	-5.41 99.9996%	-5.18 99.9993%	-5.09 99.9992%	-5.23+/-0.16 99.9994% +/- 0.0002%
Bacterial	*Bacillus subtilis* (vegetative, spore forming)	3	30	*Net Log Reduction* *Net % Reduction*	-4.08 99.9917%	-4.05 99.9912%	-4.14 99.9928%	-4.09+/-0.04 99.9919% +/- 0.0008%
Mold	*Aspergillus brasiliensis* (mold, spore forming)	3	30	*Net Log Reduction* *Net % Reduction*	-4.29 99.9949%	-4.13 99.9926%	-4.04 99.9908%	-4.15+/-0.127 99.9928% +/- 0.002%

Table 2: **Phase I** Executive Summary

Biological Test Matrix

Trial	Run	Fan Setting	Pathogenic Organism	Surrogate Species (gram, description)	ATCC Ref	Target Monodispersed Particle Size	Challenge Conc. (#/L)	Trial Time (min)	Sample Time (min)	Sampling	Plating and Enumeration
1 2 3	Challenge Challenge Challenge	Speed 1	*Influenza* , (tentative surrogate for *Sars-cov2*)	*MS2 bacteriophage (E. coli phage)*	15597-B1	<1.0um	10^4-10^6	90	0, 30, 60, 90	APS, Impingers	all samples in triplicate
4 5 6	Challenge Challenge Challenge	Speed 1	*C. difficile* & *Bacillus anthracis* (spore)	*Bacillus subtilis endospore*	49760	<3.5 um	10^4-10^6	90	0, 30, 60, 90	APS, Impingers	all samples in triplicate

Table 3: Phase II Test Matrix for Multi-speed bioaerosol testing.

Phase II Methods: Bioaerosol Efficacy Testing

The second part of this study used the same methods as the first with the exception of the device fan speed setting being different. For the 'Speed 1' testing, a net 4 log reduction was reached in a longer amount of time probably due to the decreased rate of filtration by the device. The more air being pulled through the device the faster the air in the chamber is being cleared of bioaerosol and particulates. The test matrix for Phase II is picture above in **Table 3.**

Phase II Results– Speed 1

Phase II of this study was designed to test the efficacy of the device at different fan speeds. The device had a total of two speeds tested with two of the test organisms. MS2 and *Bacillus subtilis* endospores were chosen for the multi speed tests for their resilience to natural decay. Testing with hardier organisms was crucial in determining efficacy.

The MS2 bacteriophage tested on Speed 1 was observed to have a net reduction of 5.29 +/- 0.13 logs in 90 minutes. *Bacillus subtilis* spores tested on Speed 1 were observed to have a net reduction of 4.37 +/- 0.11 logs after 90 minutes. When the device was tested with inert particles ranging from 0.5 to 4.0 µm on Speed 1 there was a reduction of over 4 net log in 45 minutes. The results for inert particle reduction testing can be found in **Figure 13** below.

Similar reductions across all fan speeds demonstrated a robust performance of the M40 device. Net log and net percent reductions are shown in **Table 4** and **Figure 14** on the following page.

Phase II Conclusion:

Phase II demonstrated consistent results achieving a net 4 log reduction of the two selected species of microorganisms. Speed 1 yielded an average reduction of net 4 log reduction in only 90 minutes. The effectiveness of the M40 device at two of the operating speeds was key to demonstrating the device's efficacy.

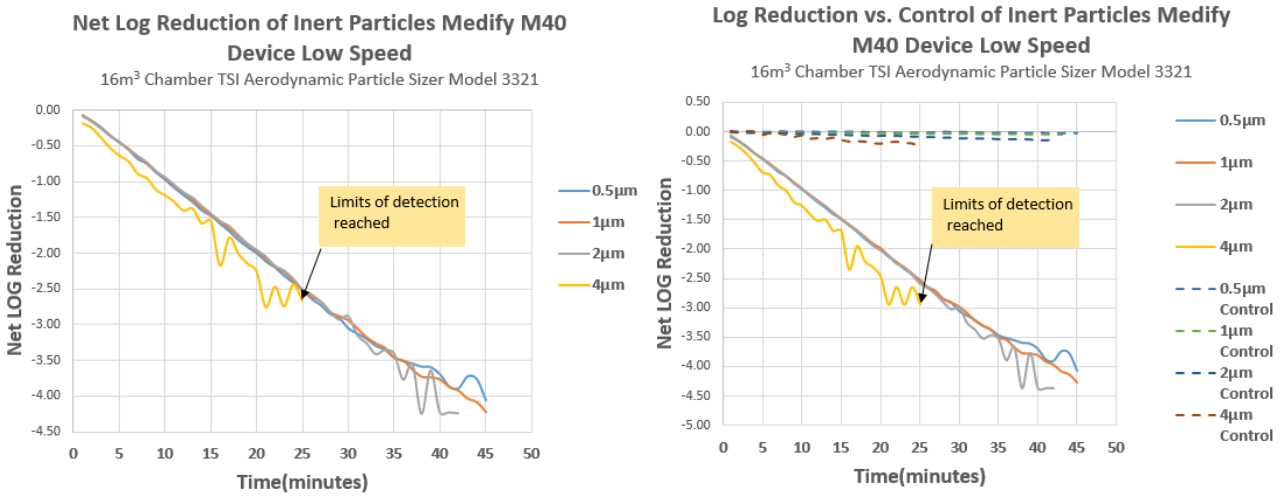


Figure 13: PSL Microspheres Chamber Trials for the Control and M40 Device at High Speed. First figure (Left) shows the net log reduction of four different inert particles normalized to 100% for T=0 sample for both control and M40 trials. Second figure (Right) show the log reduction of inert particles by the M40 unit.

Average % NET Reduction and NET LOG Reduction of Viable BioAerosols

Device Setting	Species (gram, description)	Number of Trials	Total Trial Time(minutes)	Data Type	Trial 1	Trial 2	Trial 3	Average
Speed 1	*MS2 bacteriophage* (DNA E. coli phage)	*3*	*90*	*Net Log Reduction* *Net % Reduction*	-5.41 99.9996%	-5.28 99.9995%	-5.16 99.999%	-5.29+/-0.13 99.9995% +/- 0.0002%
Speed 1	*Bacillus subtilis* (vegetative, spore forming)	*3*	*90*	*Net Log Reduction* *Net % Reduction*	-4.28 99.995%	-4.35 99.996%	-4.49 99.997%	-4.37+/-0.11 99.9957% +/- 0.001%

Table 4: Phase II Executive Summary Triplicate net reduction data from each trial performed

Deviations and Data Analysis:

No deviations from the protocol were noted throughout the trials.

Because of the nature of the data and the normal variation, there was no need to perform statistical analyses. All results were ≤0.30 standard deviations from the mean.

In accordance with ARE Labs standard practice and in compliance with GLPs, all data were verified for accuracy.

Overall Study Summary:

In conclusion, the M40 device achieved a net 4 log reduction of all bioaerosols within a relatively short period of time. The device proved to be highly effective in reducing the aerosol bioburden of a broad range of microbial species. It is anticipated that such a reduction should reduce the likelihood of individuals contracting airborne infectious diseases in any enclosed environment, medical or otherwise.

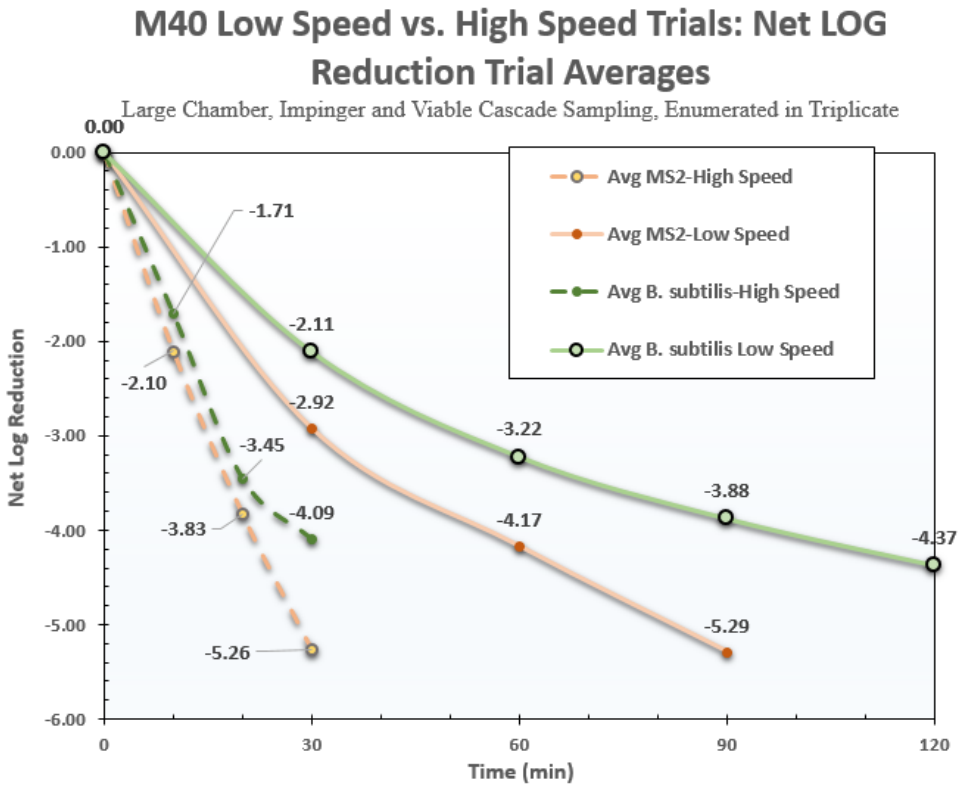


Figure 14: M40 device net log reduction of average triplicate at 'Speed 1' and 'Speed 3' of MS2 and *B. subtilis*

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.

U.S. Department of Health and Human Services Food and Drug Administration. *Enforcement Policy for Sterilizers, Disinfectant Devices, and Air Purifiers During the Coronavirus Disease 2019 (COVID-19) Public Health Emergency Guidance for Industry and Food and Drug Administration Staff*. March 2009

Analytical Testing Facility

Aerosol Research and Engineering Labs, Inc.
15320 S. Cornice Street
Olathe, KS 66062

Project

10940.10

Study Director

Jamie Balarashti
Aerosol Research and Engineering Laboratories

GLP Statement

We, the undersigned, herby certify that the work described herein was conducted by Aerosol Research and Engineering Laboratories 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. have no affiliations with, or involvement in any capacity, with Medify's financial interests such as; membership, employment, stock ownership, or other equity interest.

Study Director:

8/9/2021
Date

Jamie Balarashti
Study Director
ARE Labs Inc.

Principal Investigator:

8/9/2021
Date

Sean McLeod
Principal Investigator
ARE Labs, Inc.

Phase I Additional Figures: Speed 3 LOG and Net LOG Reduction Graphs

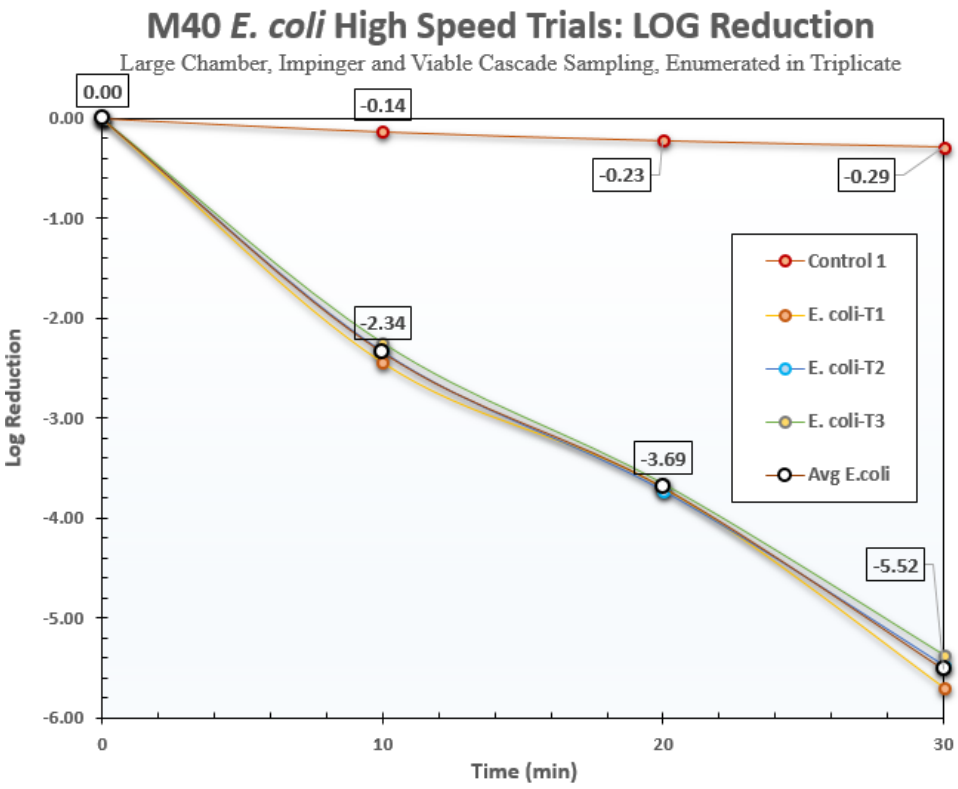


Figure 1A: *E.coli* M40 LOG Reduction

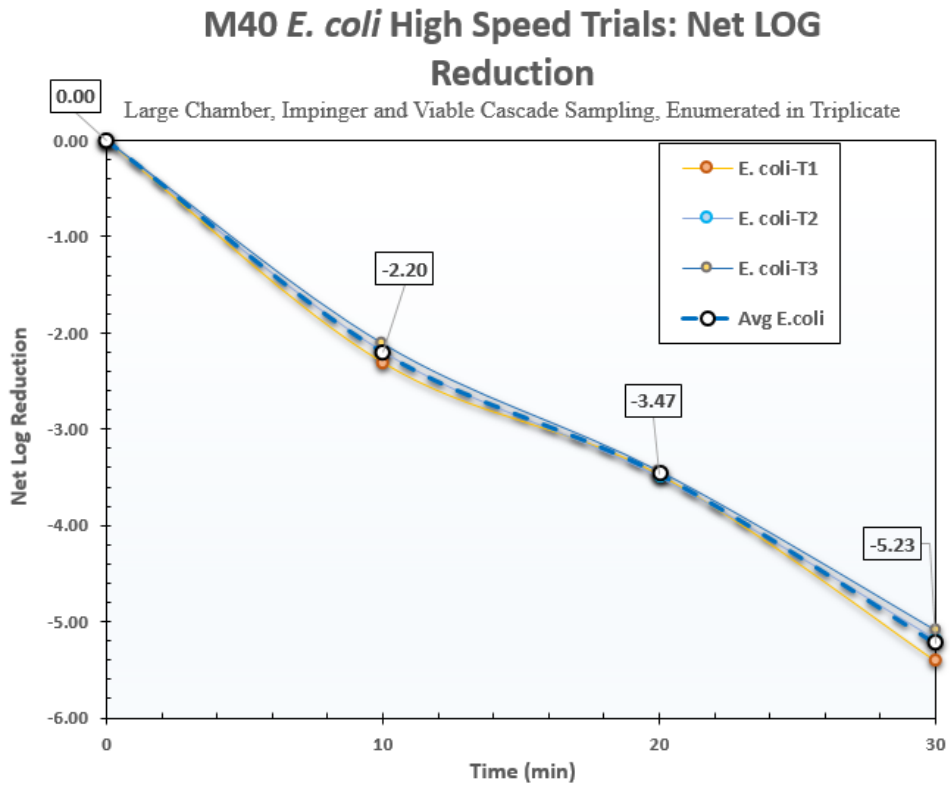


Figure 2A: *E.coli* M40 Net LOG Reduction

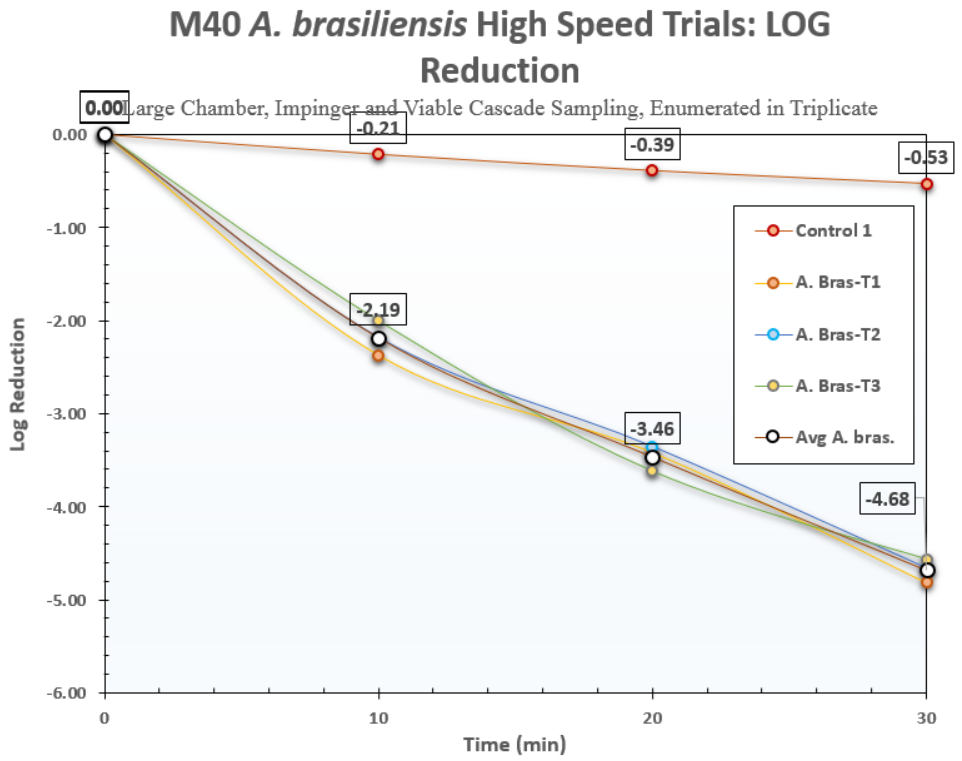


Figure 3A: *A.brasiliensis* M40 LOG Reduction

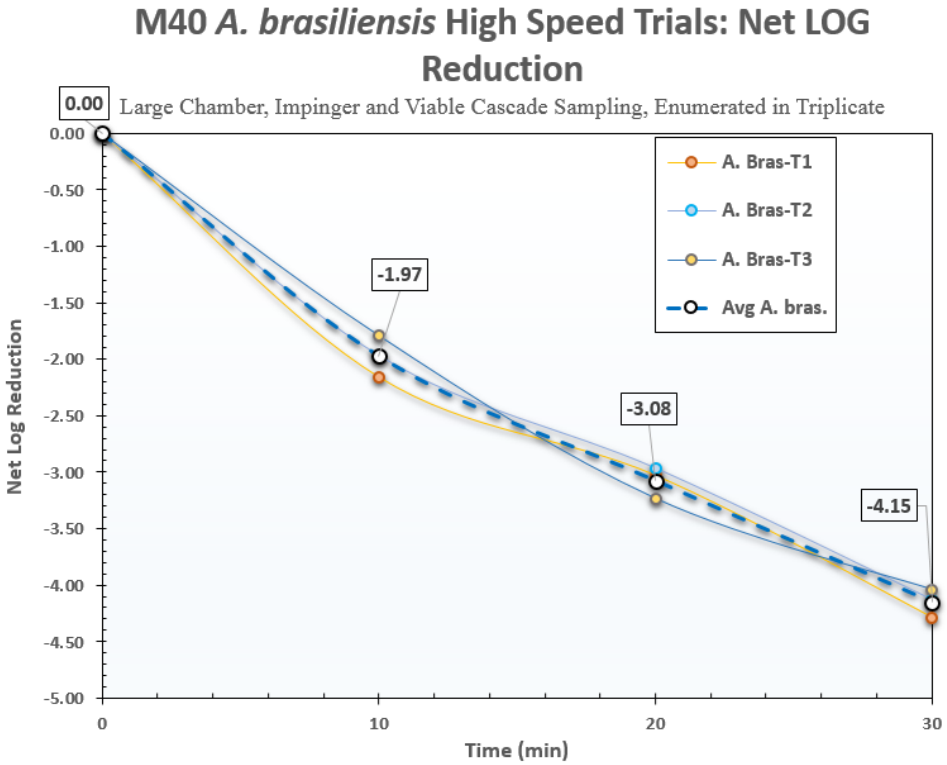


Figure 4A: *A.brasiliensis* M40 Net LOG Reduction

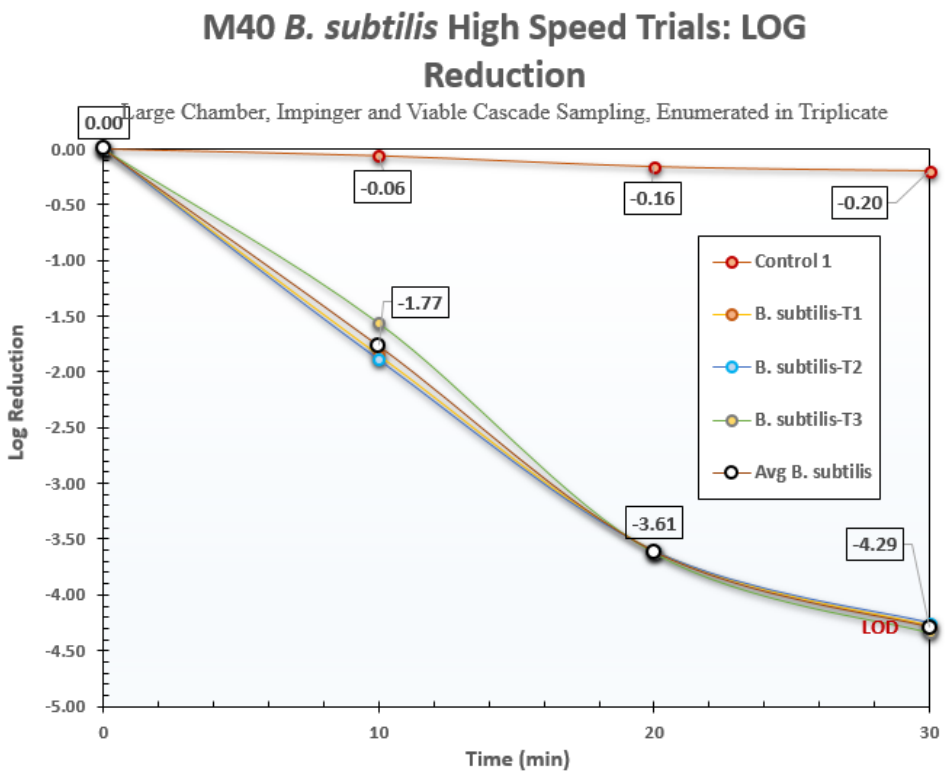


Figure 5A: *B. subtilis* M40 LOG Reduction

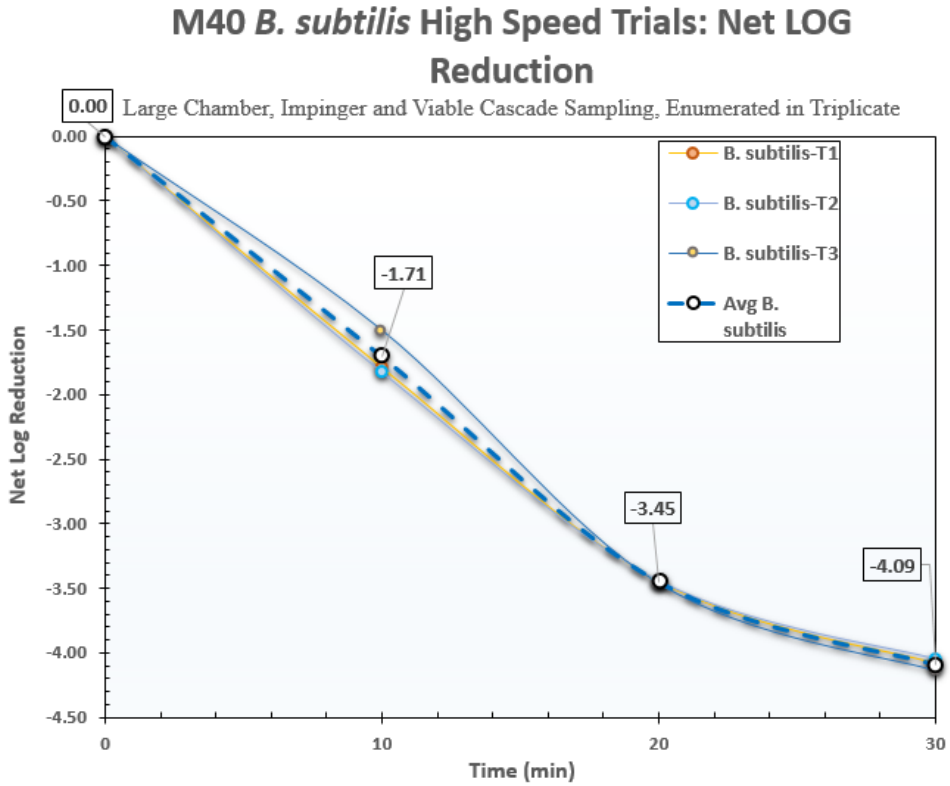


Figure 6A: *B. subtilis* M40 Net LOG Reduction

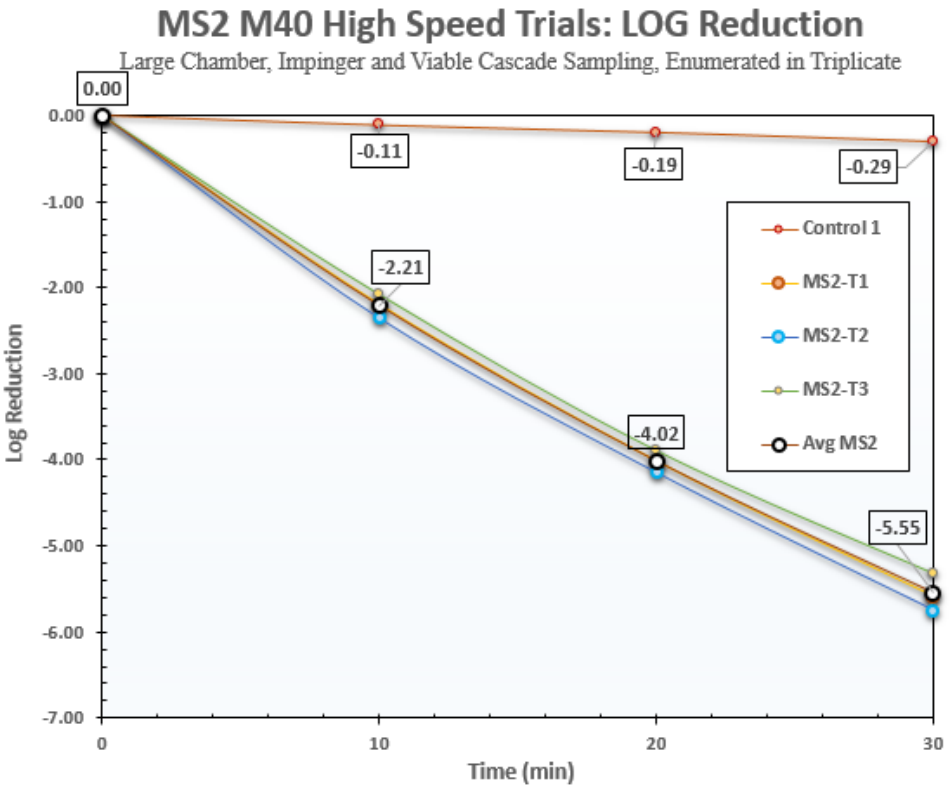


Figure 7A: MS2 LOG Reduction for the M40

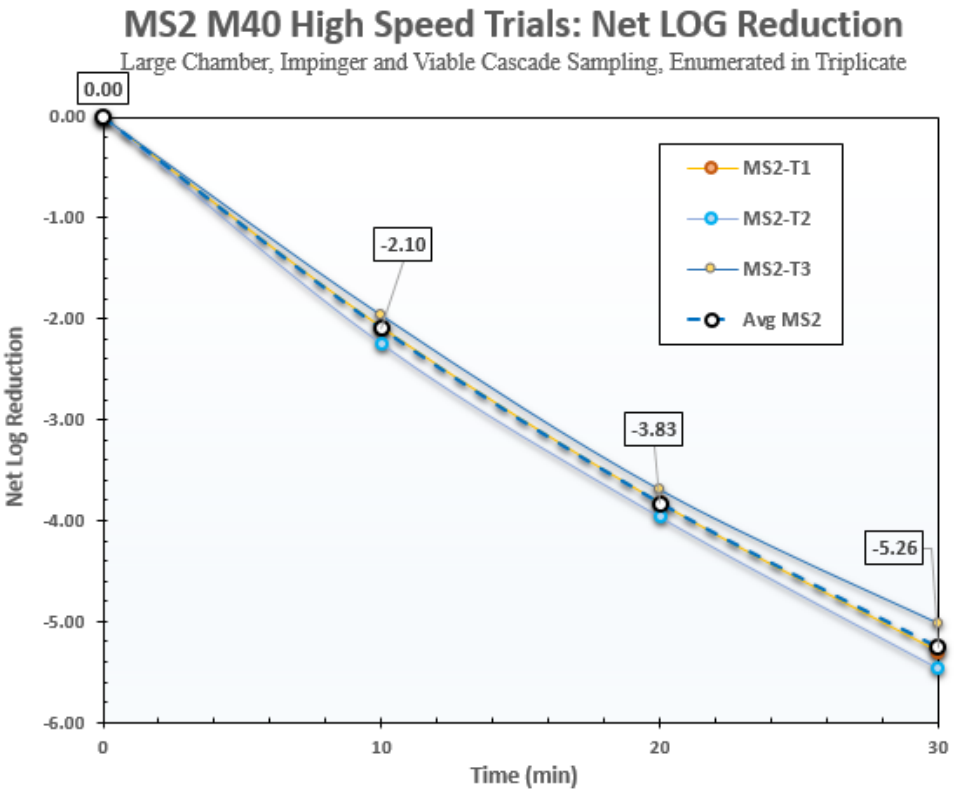


Figure 8A: MS2 Net LOG Reduction for the M40

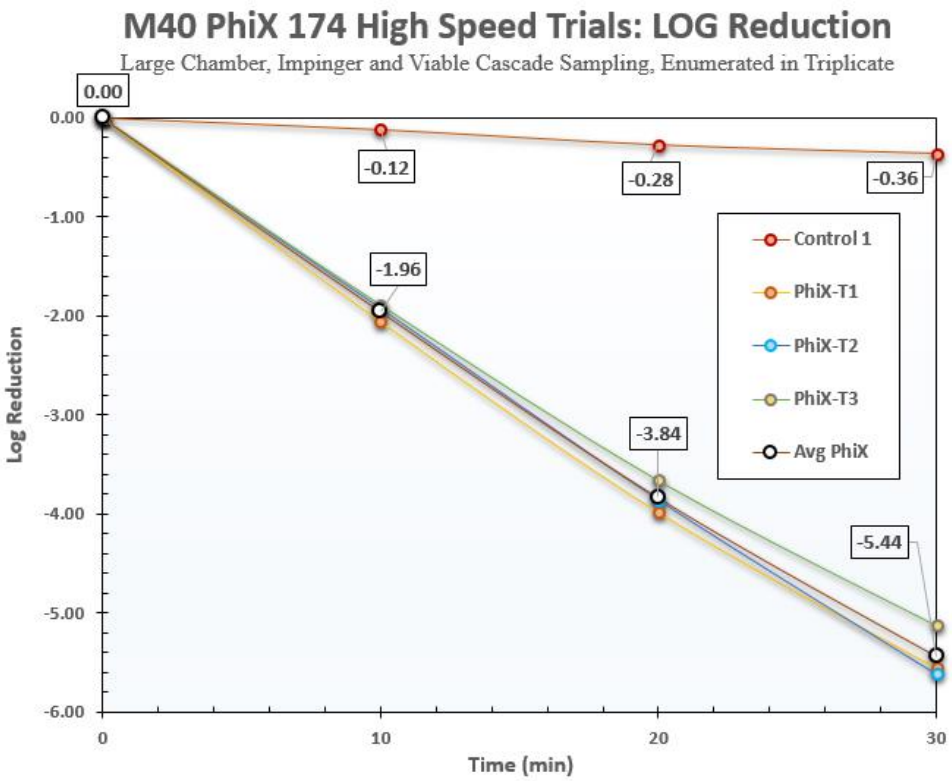


Figure 9A: Phi X 174 M40 LOG Reduction

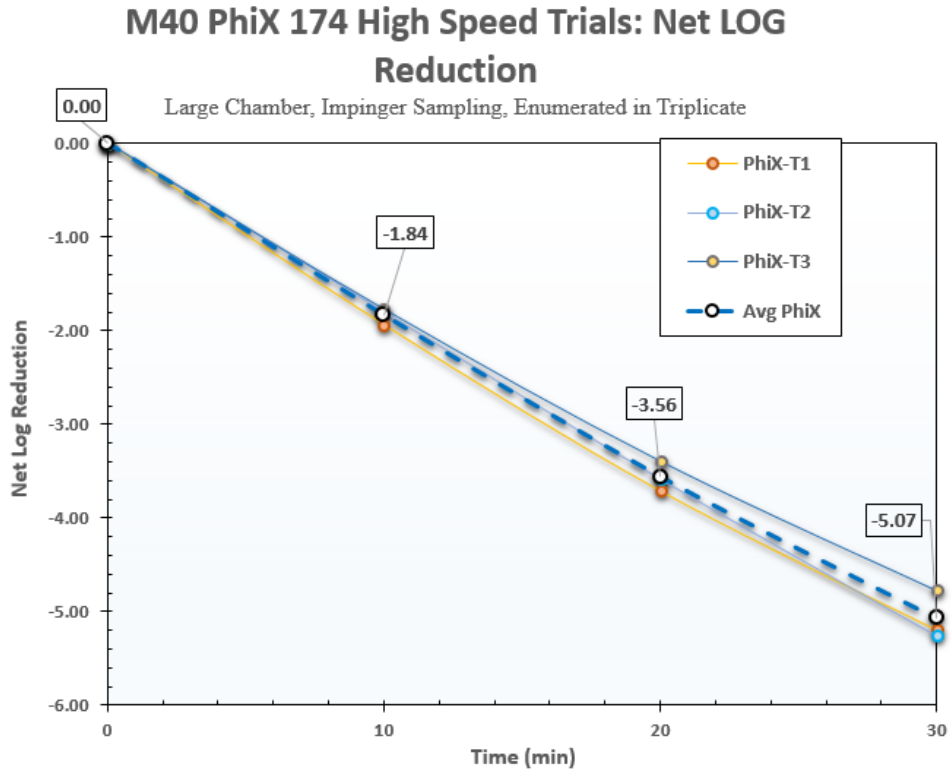


Figure 10A: Phi X 174 M40 net LOG Reduction

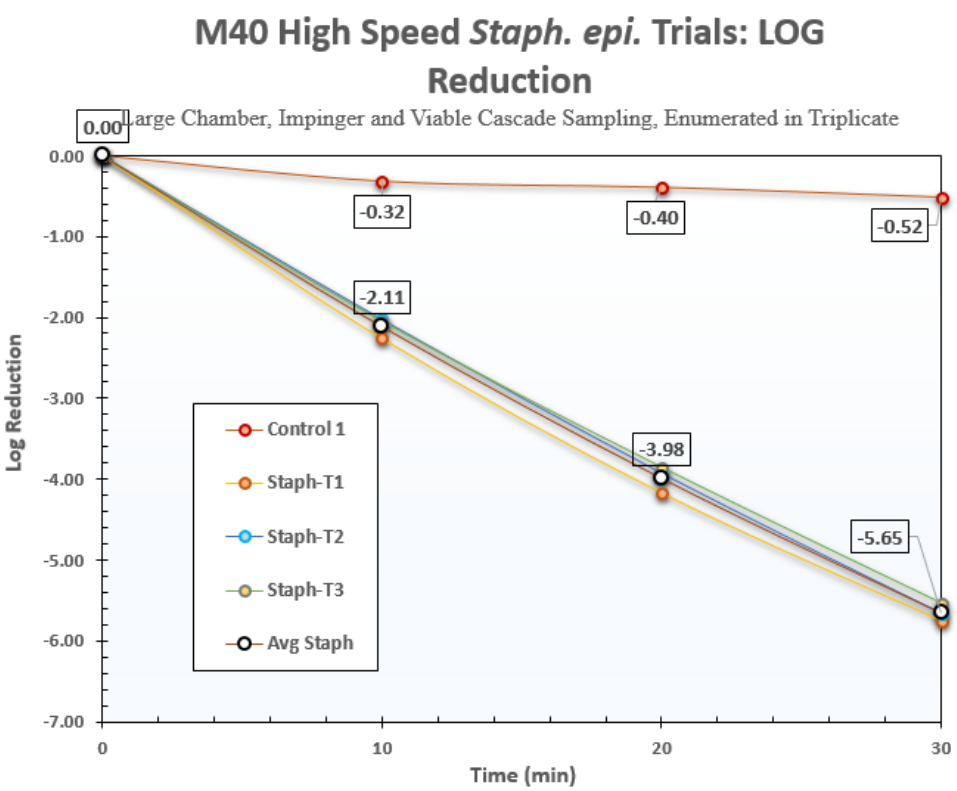


Figure 11A: Staph M40 LOG Reduction

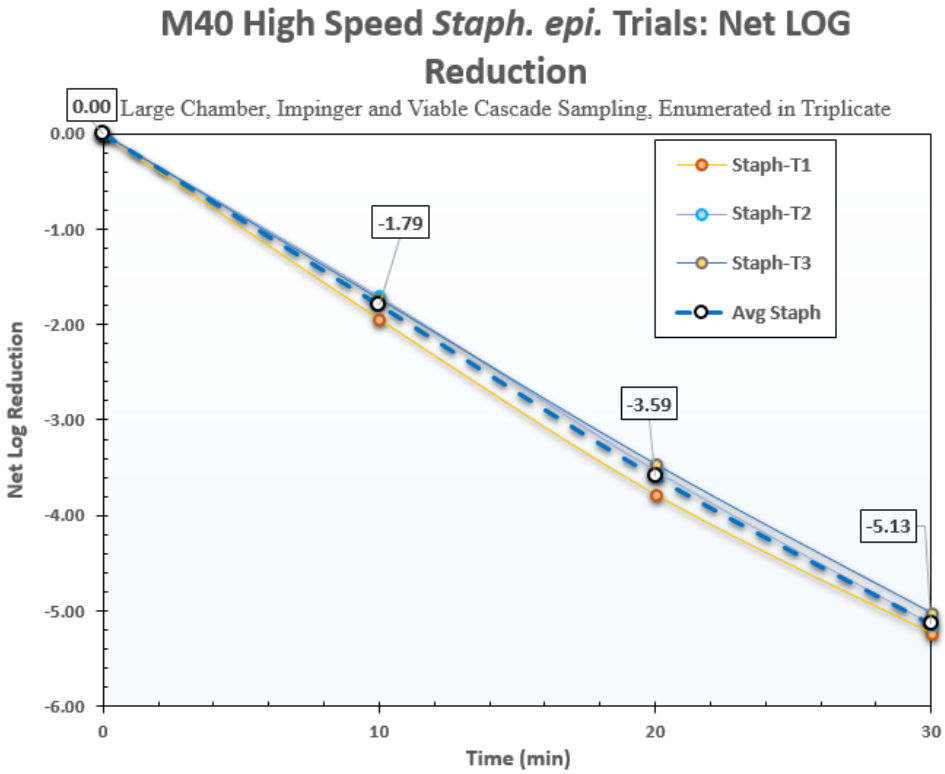


Figure 12A: Staph M40 net LOG Reduction

Phase II Results: Speed 1 Reduction Graphs by Organism

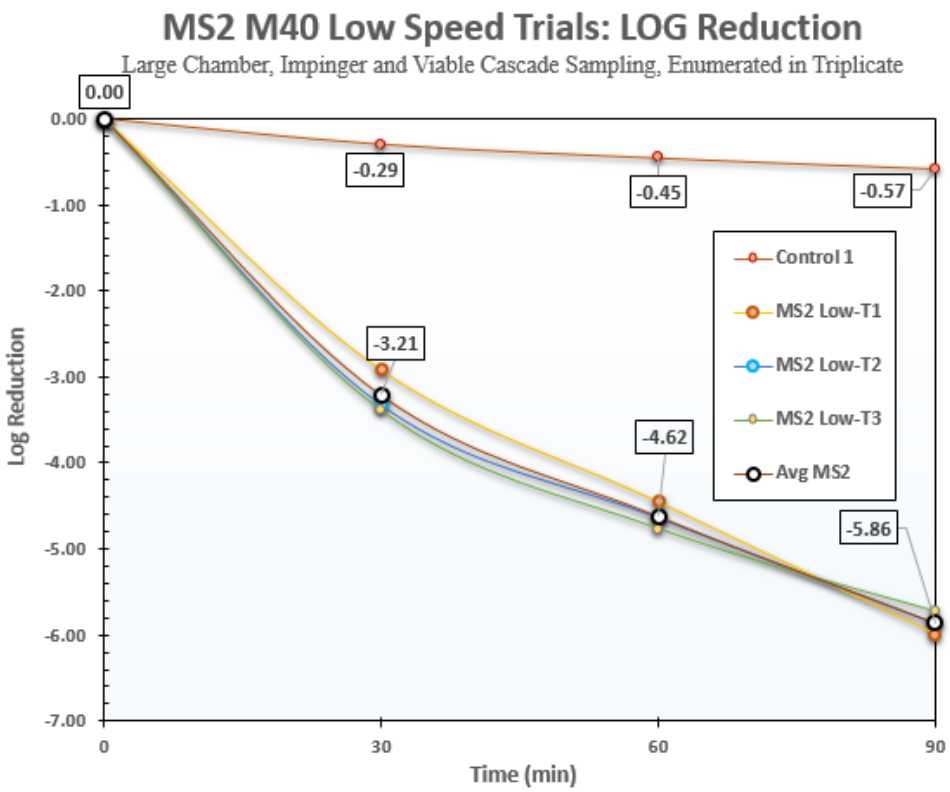


Figure 1B: M40 MS2 LOG Reduction Speed 1

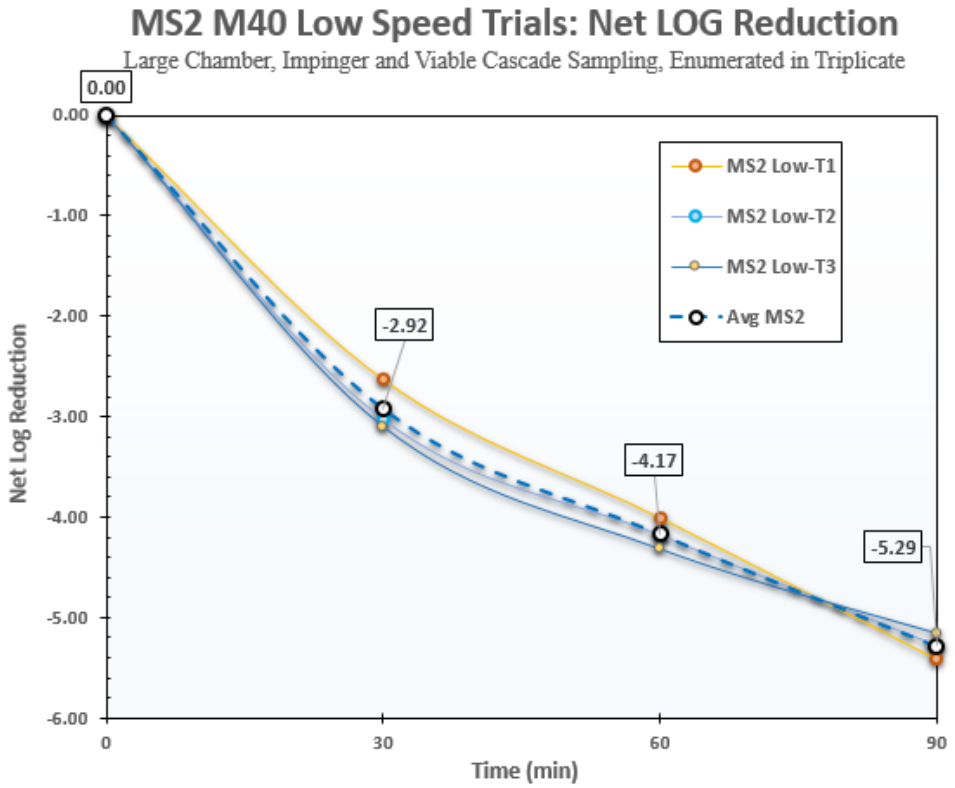


Figure 2B: M40 MS2 net LOG Reduction MS2 Speed 1

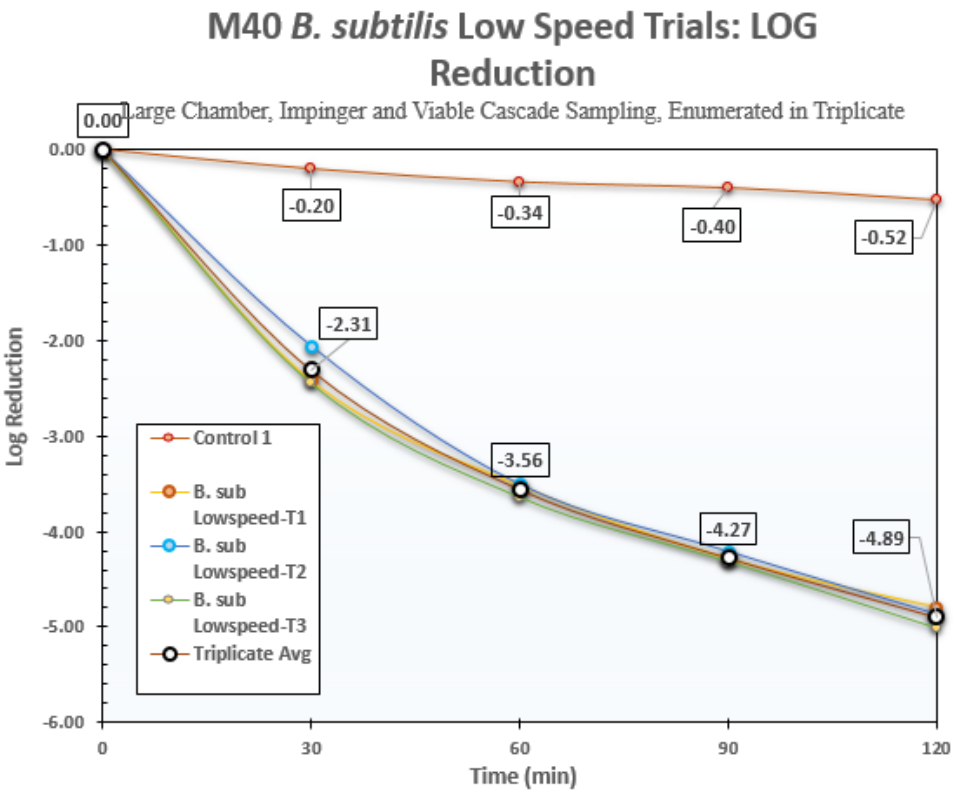


Figure 3B: M40 LOG Reduction *Bacillus subtilis* Speed 1

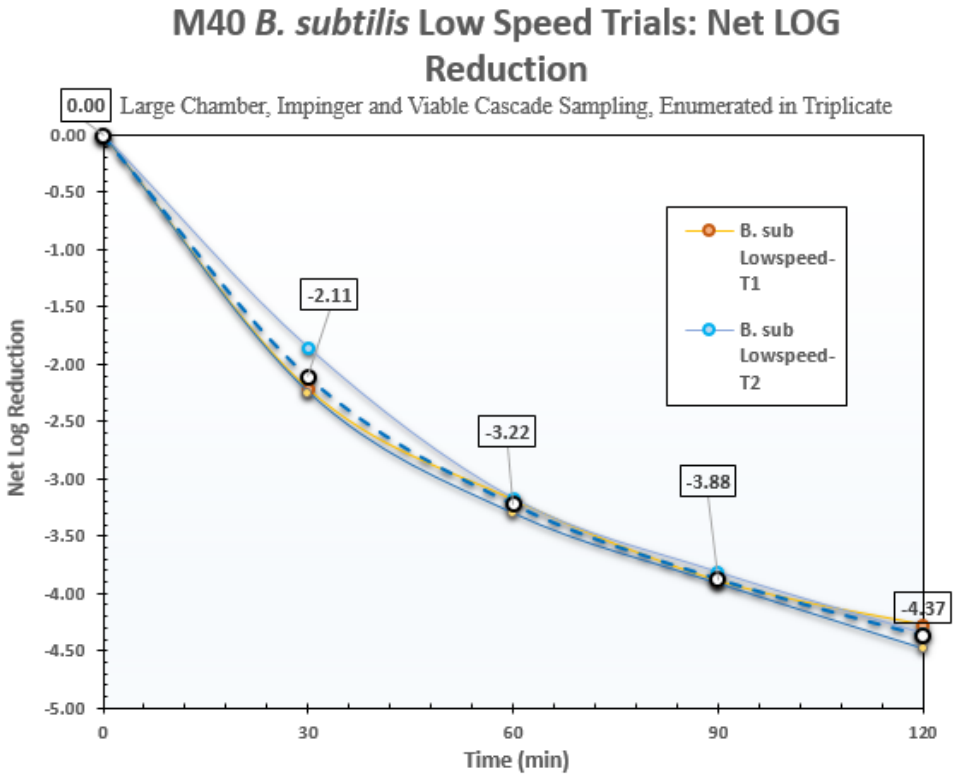


Figure 4B: M40 net LOG Reduction *Bacillus subtilis* Speed 1

Phase I Raw Data

Trial Information

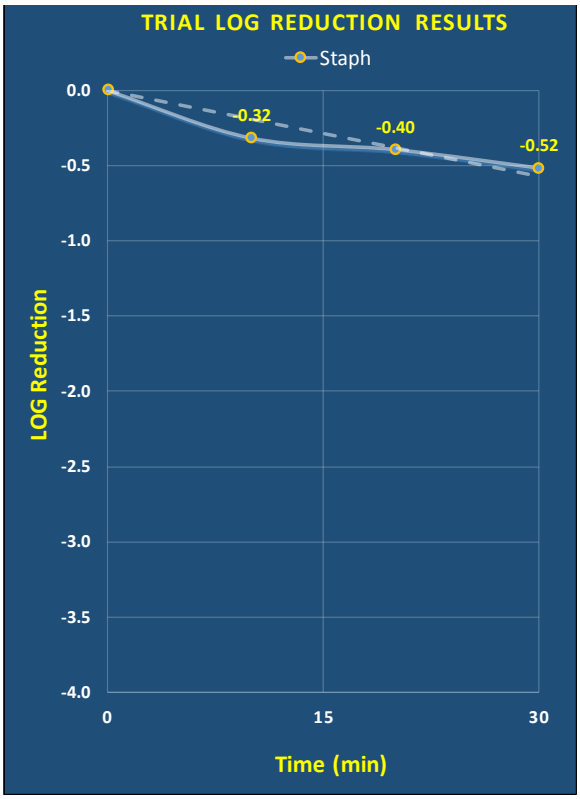
TEST DATE:	Tuesday, July 20, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	Control
TEST ORGANSIM:	Staph
TRIAL NAME ID (GRAPHS/TABLES):	Staph

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions

TEST CHAMBER VOLUME (m^3):	
NEBULIZER CONDITIONS:	16
SAMPLING METHOD:	Collison 24-Jet; approx. 20 min neb
CHAMBER MIXING FAN:	Impinger
TEMP (F):	yes
RH (%):	74
OTHER INSTRUMENTS:	70
TRIAL COMMENTS/NOTES	na
	na



BIOAEROSOL Sample ID and Summary Data	S1		S2	S3
SAMPLING TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.232E+06	5.920E+05	4.960E+05	3.733E+05
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.232E+06**	**5.920E+05**	**4.960E+05**	**3.733E+05**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**48.0519%**	**40.2597%**	**30.3030%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**51.9481%**	**59.7403%**	**69.6970%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-0.32**	**-0.40**	**-0.52**

Impinger Sampling Conditions

SAMPLING TIME (min)	**0**		**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	2.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1	**DILUTION RATIO (10^x)**	**-3**	**-3**	**-3**	**-3**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	160 155 147	190 180 185	150 155 160	117 124 109
	PLATE AVERAGE COUNT (# / drop)	154.00	185.00	155.00	116.67
	IMPINGER CONCENTRATION (cfu or pfu/ml)	1,540,000	1,850,000	1,550,000	1,166,667
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.23E+06	5.92E+05	4.96E+05	3.73E+05

Figure 1B: *S. epidermidis* Control

Trial Information

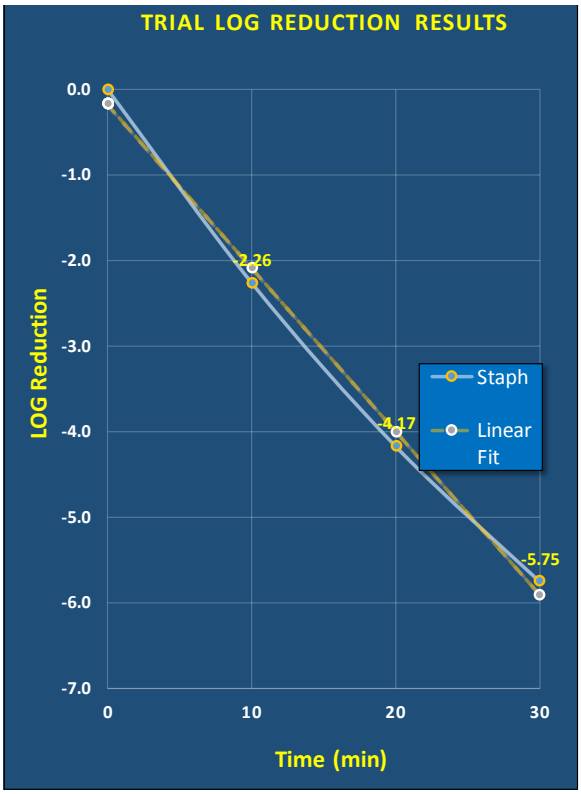
TEST DATE:	Tuesday, July 20, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	Staph
TRIAL NAME ID (GRAPHS/TABLES):	Staph

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.280E+06	7.040E+03	8.640E+01	2.276E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.280E+06**	**7.040E+03**	**8.640E+01**	**2.276E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.5500%**	**0.0068%**	**0.0002%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.4500%**	**99.9933%**	**99.9998%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.26**	**-4.17**	**-5.75**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	18 24 30	24 24 18	29 23 29	3 7 6
	PLATE AVERAGE COUNT (# / drop)	24.00	22.00	27.00	5.33
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,400,000	22,000	270	7
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	**1.28E+06**	**7.04E+03**	**8.64E+01**	**2.28E+00**

Figure 2B: *S. epidermidis* Trial 1

Trial Information

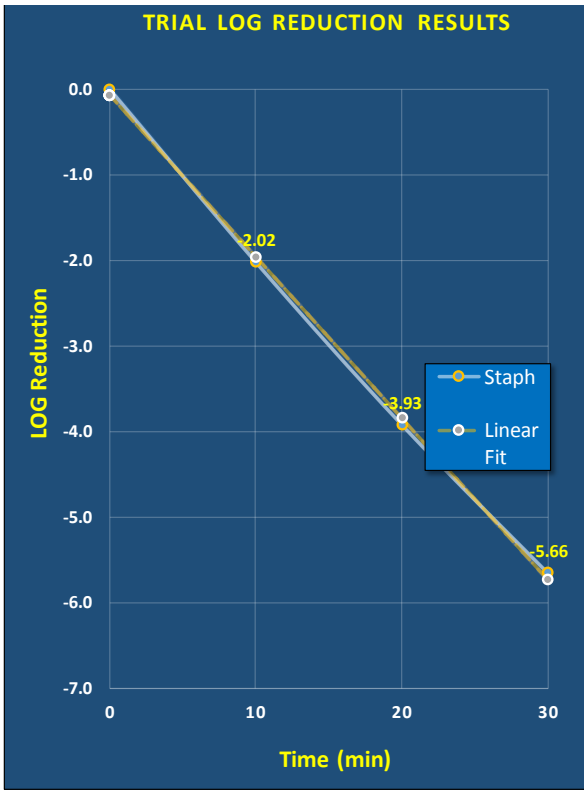
TEST DATE:	Tuesday, July 20, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	Staph
TRIAL NAME ID (GRAPHS/TABLES):	Staph

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.689E+06	1.600E+04	2.005E+02	3.698E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.689E+06**	**1.600E+04**	**2.005E+02**	**3.698E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.9474%**	**0.0119%**	**0.0002%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.0526%**	**99.9881%**	**99.9998%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.02**	**-3.93**	**-5.66**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	36 25 34	52 43 55	56 64 68	11 10 5
	PLATE AVERAGE COUNT (# / drop)	31.67	50.00	62.67	8.67
	IMPINGER CONCENTRATION (cfu or pfu/ml)	3,166,667	50,000	627	12
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.69E+06	1.60E+04	2.01E+02	3.70E+00

Figure 3B: *S. epidermidis* Trial 2

Trial Information

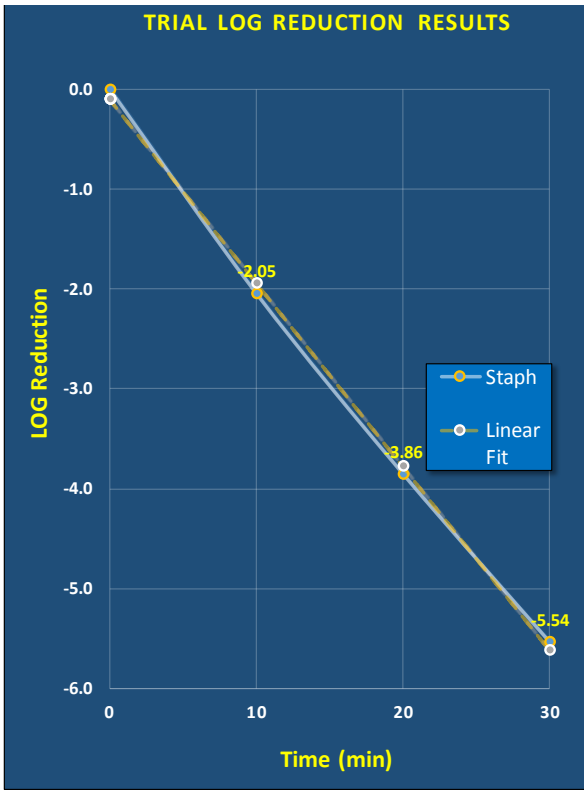
TEST DATE:	Tuesday, July 20, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	Staph
TRIAL NAME ID (GRAPHS/TABLES):	Staph

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.476E+06	1.323E+04	2.059E+02	4.267E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.476E+06**	**1.323E+04**	**2.059E+02**	**4.267E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.8964%**	**0.0140%**	**0.0003%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.1036%**	**99.9860%**	**99.9997%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.05**	**-3.86**	**-5.54**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	28 25 30	48 42 34	76 60 57	11 11 8
	PLATE AVERAGE COUNT (# / drop)	27.67	41.33	64.33	10.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,766,667	41,333	643	13
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	**1.48E+06**	**1.32E+04**	**2.06E+02**	**4.27E+00**

Figure 4B: *S. epidermidis* Trial 3

Trial Information

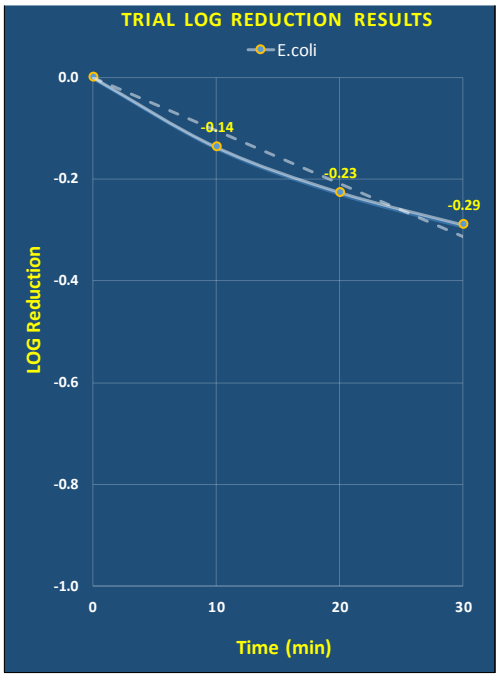
TEST DATE:	Friday, July 16, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	Control
TEST ORGANSIM:	E.coli
TRIAL NAME ID (GRAPHS/TABLES):	E.coli

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger & Cascade
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2		S3
SAMPLE TIME (min)	0	10	20	30
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	7.893E+01	5.760E+01	4.693E+01	4.053E+01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**7.893E+01**	**5.760E+01**	**4.693E+01**	**4.053E+01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**72.9730%**	**59.4595%**	**51.3514%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**27.0270%**	**40.5405%**	**48.6486%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-0.14**	**-0.23**	**-0.29**

Impinger Sampling Conditions

	SAMPLE TIME (min)	0	10	20	30
	IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
	IMPINGER SAMPLING TIME (min)	5.0	5.0	5.0	5.0
	IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5
Dilution Range #1	**DILUTION RATIO (10^x)**	**0**	**0**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	25 25 24	22 17 15	15 15 14	15 13 10
	PLATE AVERAGE COUNT (# / drop)	24.67	18.00	14.67	12.67
	IMPINGER CONCENTRATION (cfu or pfu/ml)	247	180	147	127
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	7.89E+01	5.76E+01	4.69E+01	4.05E+01
Dilution Range #1	**DILUTION RATIO (10^x)**	**-3**	**-2**		**-2**
	DROPLET SIZE (µl)	**100**	**100**		**100**
	ENUMERATED PLATE COUNTS (# / drop)				
	PLATE AVERAGE COUNT (# / drop)				
	IMPINGER CONCENTRATION (cfu or pfu/ml)				
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)				

Figure 5B: *E. coli* Control

Trial Information

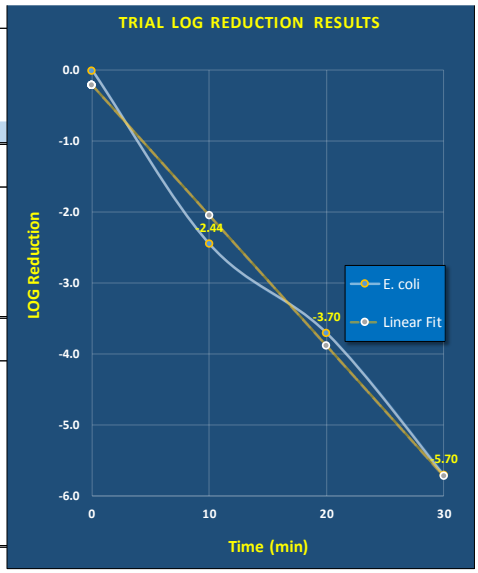
TEST DATE:	Monday, July 19, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	E. Coli
TRIAL NAME ID (GRAPHS/TABLES):	E. coli

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
IMPINGER USED (y / n)	y	y	n	n
VIABLE CASCADE USED (y / n)	n	n	y	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	9.956E+03	3.584E+01		
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)			2.000	0.020
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**9.956E+03**	**3.584E+01**	**2.000E+00**	**2.000E-02**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.3600%**	**0.0201%**	**0.0002%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.6400%**	**99.9799%**	**99.9998%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.44**	**-3.70**	**-5.70**

Impinger Sampling Conditions

	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5
Dilution Range #1 — **DILUTION RATION (10^x)**	-3	0	-1	0
Dilution Range #1 — **DROPLET SIZE (µl)**	100	100	100	750
Dilution Range #1 — ENUMERATED PLATE COUNTS (# / drop)				
Dilution Range #1 — PLATE AVERAGE COUNT (# / drop)				
Dilution Range #1 — IMPINGER CONCENTRATION (cfu or pfu/ml)				
Dilution Range #1 — CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)				
Dilution Range #1 — **DILUTION RATION (10^x)**	-2	0	0	-2
Dilution Range #1 — **DROPLET SIZE (µl)**	100	500	100	100
Dilution Range #1 — ENUMERATED PLATE COUNTS (# / drop)	20 17 19	56		
Dilution Range #1 — PLATE AVERAGE COUNT (# / drop)	18.67	56.00		
Dilution Range #1 — IMPINGER CONCENTRATION (cfu or pfu/ml)	18,667	112		
Dilution Range #1 — CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	9.96E+03	3.58E+01		

Viable Cascade Sampling Conditions ****Statistical Correction Applied Automatically for counts>60**

	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
Viable Cascade #1 — **VIABLE CASCADE SAMPLING TIME (min)**	1.0	2.0	1.0	5.0
Viable Cascade #1 — **VIABLE CASCADE FLOW RATE (lpm)**	30	30	30	30
Viable Cascade #1 — ENUMERATED PLATE COUNTS (# / plate)			60	3
Viable Cascade #1 — STATISTICALLY CORRECTED PLATE COUNTS (# / plate)			60	3
Viable Cascade #1 — PLATE AVERAGE COUNT (# / plate)			60.00	3.00
Viable Cascade #1 — CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)			2.000	0.020

Figure 6B: *E. coli* Trial 1

Trial Information

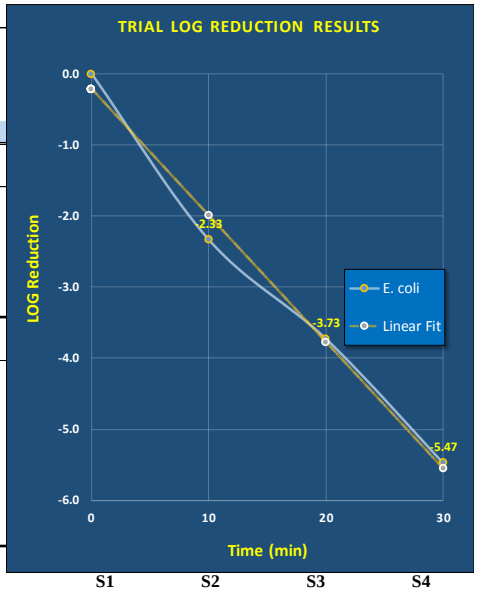
TEST DATE:	Monday, July 19, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T2
TEST ORGANSIM:	E. Coli
TRIAL NAME ID (GRAPHS/TABLES):	E. coli

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
IMPINGER USED (y / n)	y	y	n	n
VIABLE CASCADE USED (y / n)	n	n	y	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.387E+04	6.453E+01		
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)			2.611	0.047
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	26.67%	48.75%		
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.387E+04**	**6.453E+01**	**2.611E+00**	**4.667E-02**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.4654%**	**0.0188%**	**0.0003%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.5346%**	**99.9812%**	**99.9997%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.33**	**-3.73**	**-5.47**

Impinger Sampling Conditions

SAMPLE TIME (min)	0	10	20	30
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-3**	**0**	**-1**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	5 1 3	11 15 15		
	PLATE AVERAGE COUNT (# / drop)	3.00	13.67		
	IMPINGER CONCENTRATION (cfu or pfu/ml)	30,000	137		
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.60E+04	4.37E+01		

Dilution Range #1					
	DILUTION RATIO (10^x)	**-2**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	24 21 21	2 3 3		
	PLATE AVERAGE COUNT (# / drop)	22.00	2.67		
	IMPINGER CONCENTRATION (cfu or pfu/ml)	22,000	267		
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.17E+04	8.53E+01		

Viable Cascade Sampling Conditions ****Statistical Correction Applied Automatically for counts>60**

	SAMPLE TIME (min)	0	10	20	30
Viable Cascade #1	**VIABLE CASCADE SAMPLING TIME (min)**	**1.0**	**2.0**	**1.0**	**5.0**
	VIABLE CASCADE FLOW RATE (lpm)	**30**	**30**	**30**	**30**
	ENUMERATED PLATE COUNTS (# / plate)			75	7
	STATISTICALLY CORRECTED PLATE COUNTS (# / plate)			78	7
	PLATE AVERAGE COUNT (# / plate)			78.34	7.00
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)			2.611	0.047

Figure 7B: *E. coli* Trial 2

Trial Information

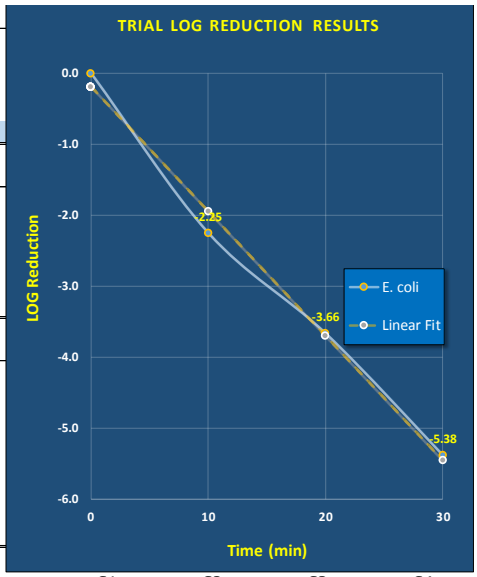
TEST DATE:	Monday, July 19, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T3
TEST ORGANSIM:	E. Coli
TRIAL NAME ID (GRAPHS/TABLES):	E. coli

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
IMPINGER USED (y / n)	y	y	n	n
VIABLE CASCADE USED (y / n)	n	n	y	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	7.911E+03	4.480E+01		
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)			1.733	0.033
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	22.00%	9.09%		
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**7.911E+03**	**4.480E+01**	**1.733E+00**	**3.333E-02**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.5663%**	**0.0219%**	**0.0004%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.4337%**	**99.9781%**	**99.9996%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.25**	**-3.66**	**-5.38**

Impinger Sampling Conditions

SAMPLE TIME (min)	0	10	20	30
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
DILUTION RATIO (10^x)	**-3**	**0**	**-1**	**0**
DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
ENUMERATED PLATE COUNTS (# / drop)	2 2 1	14 16 14		
PLATE AVERAGE COUNT (# / drop)	1.67	14.67		
IMPINGER CONCENTRATION (cfu or pfu/ml)	16,667	147		
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	8.89E+03	4.69E+01		

Dilution Range #1				
DILUTION RATIO (10^x)	**-2**	**-1**	**0**	**-2**
DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
ENUMERATED PLATE COUNTS (# / drop)	14 19 6	1 3 0		
PLATE AVERAGE COUNT (# / drop)	13.00	1.33		
IMPINGER CONCENTRATION (cfu or pfu/ml)	13,000	133		
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	6.93E+03	4.27E+01		

Viable Cascade Sampling Conditions ****Statistical Correction Applied Automatically for counts>60**

Viable Cascade #1				
SAMPLE TIME (min)	0	10	20	30
VIABLE CASCADE SAMPLING TIME (min)	**1.0**	**2.0**	**1.0**	**5.0**
VIABLE CASCADE FLOW RATE (lpm)	**30**	**30**	**30**	**30**
ENUMERATED PLATE COUNTS (# / plate)			52	5
STATISTICALLY CORRECTED PLATE COUNTS (# / plate)			52	5
PLATE AVERAGE COUNT (# / plate)			52.00	5.00
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)			1.733	0.033

Figure 8B: *E. coli* Trial 3

Trial Information

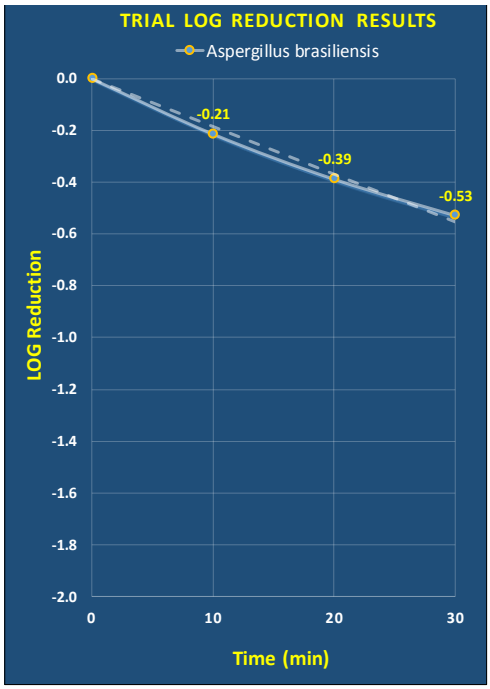
TEST DATE:	Monday, July 19, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	Control
TEST ORGANSIM:	Aspergillus brasiliensis
TRIAL NAME ID (GRAPHS/TABLES):	Aspergillus brasiliensis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLING TIME (min)	0	10	20	30
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	2.267E+03	1.387E+03	9.280E+02	6.720E+02
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	30.00%			
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**2.267E+03**	**1.387E+03**	**9.280E+02**	**6.720E+02**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**61.1765%**	**40.9412%**	**29.6471%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**38.8235%**	**59.0588%**	**70.3529%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-0.21**	**-0.39**	**-0.53**

Impinger Sampling Conditions

SAMPLING TIME (min)	0	10	20	30
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	2.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
DILUTION RATIO (10^x)	**-2**	**-2**	**-1**	**-1**
DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
ENUMERATED PLATE COUNTS (# / drop)	4 1 2	5 6 2	30 25 32	22 25 16
PLATE AVERAGE COUNT (# / drop)	2.33	4.33	29.00	21.00
IMPINGER CONCENTRATION (cfu or pfu/ml)	2,333	4,333	2,900	2,100
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.87E+03	1.39E+03	9.28E+02	6.72E+02

Dilution Range #1				
DILUTION RATIO (10^x)	**-3**	**-2**	**-2**	**0**
DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
ENUMERATED PLATE COUNTS (# / drop)	1 0 0			
PLATE AVERAGE COUNT (# / drop)	0.33			
IMPINGER CONCENTRATION (cfu or pfu/ml)	3,333			
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	2.67E+03			

Figure 9B: *A. brasiliensis* Control

Trial Information

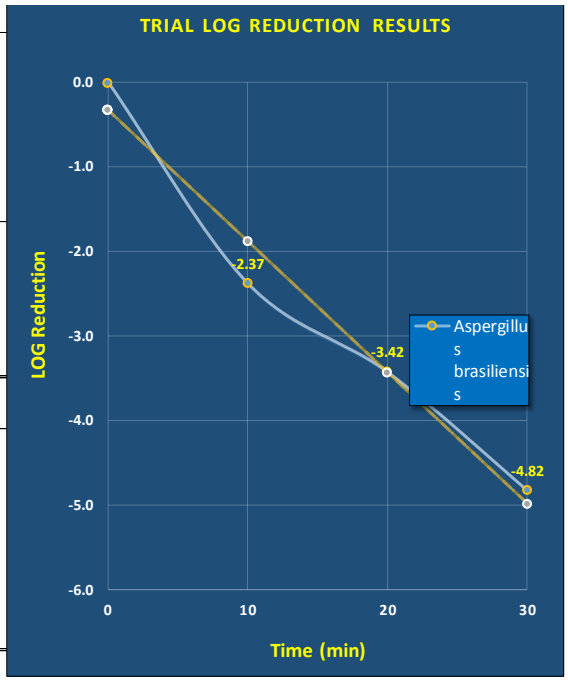
TEST DATE:	Monday, July 19, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	Aspergillus brasiliensis
TRIAL NAME ID (GRAPHS/TABLES):	Aspergillus brasiliensis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	9.333E+03	3.947E+01	3.556E+00	1.422E-01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	25.00%	15.00%		
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**9.333E+03**	**3.947E+01**	**3.556E+00**	**1.422E-01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.4229%**	**0.0381%**	**0.0015%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.5771%**	**99.9619%**	**99.9985%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.37**	**-3.42**	**-4.82**

Impinger Sampling Conditions

	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-3**	**0**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**750**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	1 2 3	11 15 8	9 9 7	0 0 1
	PLATE AVERAGE COUNT (# / drop)	2.00	11.33	8.33	0.33
	IMPINGER CONCENTRATION (cfu or pfu/ml)	20,000	113	11	0
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.07E+04	3.63E+01	3.56E+00	1.42E-01

Dilution Range #1					
	DILUTION RATIO (10^x)	**-2**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	12 14 19	2 1 1		
	PLATE AVERAGE COUNT (# / drop)	15.00	1.33		
	IMPINGER CONCENTRATION (cfu or pfu/ml)	15,000	133		
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	8.00E+03	4.27E+01		

Figure 10B: *A. brasiliensis* Trial 1

Trial Information

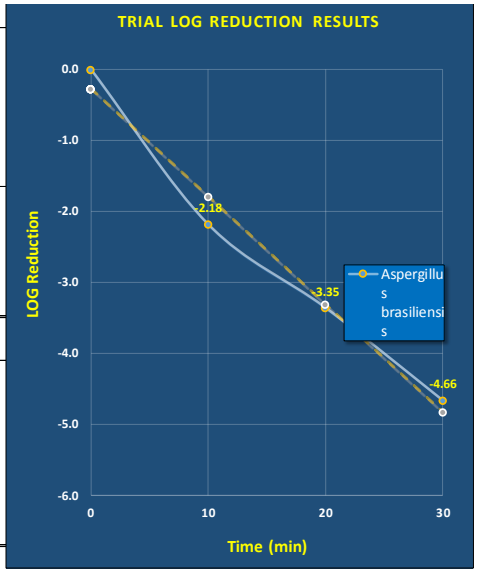
TEST DATE:	Monday, July 19, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T2
TEST ORGANSIM:	Aspergillus brasiliensis
TRIAL NAME ID (GRAPHS/TABLES):	Aspergillus brasiliensis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	9.956E+03	6.560E+01	4.409E+00	1.422E-01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				0.295
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	13.33%	4.76%		
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				51.75%
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**9.956E+03**	**6.560E+01**	**4.409E+00**	**2.185E-01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.6589%**	**0.0443%**	**0.0022%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.3411%**	**99.9557%**	**99.9978%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.18**	**-3.35**	**-4.66**

Impinger Sampling Conditions

SAMPLE TIME (min)	0	10	20	30
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5
Dilution Range #1 **DILUTION RATIO (10^x)**	**-3**	**0**	**0**	**0**
DROPLET SIZE (µl)	**100**	**100**	**750**	**750**
ENUMERATED PLATE COUNTS (# / drop)	1 2 3	19 26 18	12 11 8	0 0 1
PLATE AVERAGE COUNT (# / drop)	2.00	21.00	10.33	0.33
IMPINGER CONCENTRATION (cfu or pfu/ml)	20,000	210	14	0
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.07E+04	6.72E+01	4.41E+00	1.42E-01

Dilution Range #1 **DILUTION RATIO (10^x)**	**-2**	**-1**	**0**	**-2**
DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
ENUMERATED PLATE COUNTS (# / drop)	20 16 16	2 1 3		
PLATE AVERAGE COUNT (# / drop)	17.33	2.00		
IMPINGER CONCENTRATION (cfu or pfu/ml)	17,333	200		
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	9.24E+03	6.40E+01		

Viable Cascade Sampling Conditions ****Statistical Correction Applied Automatically for counts>60**

SAMPLE TIME (min)	0	10	20	30
Viable Cascade #1 **VIABLE CASCADE SAMPLING TIME (min)**	**1.0**	**2.0**	**1.0**	**5.0**
VIABLE CASCADE FLOW RATE (lpm)	**30**	**30**	**30**	**38**
ENUMERATED PLATE COUNTS (# / plate)				56
STATISTICALLY CORRECTED PLATE COUNTS (# / plate)				56
PLATE AVERAGE COUNT (# / plate)				56.00
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)				0.295

Figure 11B: *A. brasiliensis* Trial 2

Trial Information

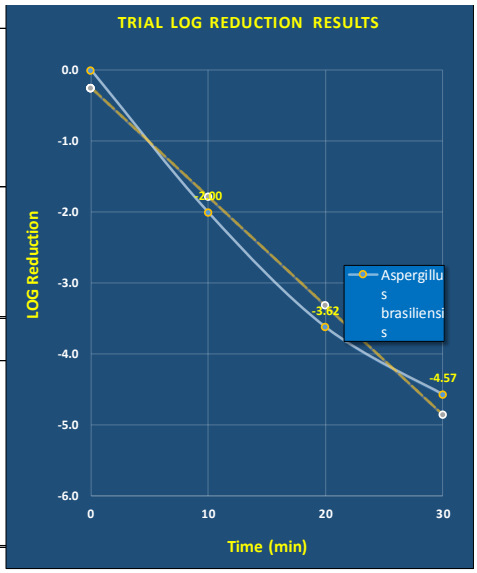
TEST DATE:	Monday, July 19, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T3
TEST ORGANSIM:	Aspergillus brasiliensis
TRIAL NAME ID (GRAPHS/TABLES):	Aspergillus brasiliensis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	0	10	20	30
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.067E+04	1.056E+02	2.560E+00	2.844E-01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				0.295
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	28.57%	20.00%		
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				3.49%
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.067E+04**	**1.056E+02**	**2.560E+00**	**2.896E-01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.9900%**	**0.0240%**	**0.0027%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.0100%**	**99.9760%**	**99.9973%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.00**	**-3.62**	**-4.57**

Impinger Sampling Conditions

SAMPLE TIME (min)	0	10	20	30
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
DILUTION RATIO (10^x)	**-3**	**0**	**0**	**0**
DROPLET SIZE (µl)	**100**	**100**	**750**	**750**
ENUMERATED PLATE COUNTS (# / drop)	4 1 2	31 32 25	8 3 7	0 1 1
PLATE AVERAGE COUNT (# / drop)	2.33	29.33	6.00	0.67
IMPINGER CONCENTRATION (cfu or pfu/ml)	23,333	293	8	1
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.24E+04	9.39E+01	2.56E+00	2.84E-01

Dilution Range #1				
DILUTION RATIO (10^x)	**-2**	**-1**	**0**	**-2**
DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
ENUMERATED PLATE COUNTS (# / drop)	18 17 15	2 4 5		
PLATE AVERAGE COUNT (# / drop)	16.67	3.67		
IMPINGER CONCENTRATION (cfu or pfu/ml)	16,667	367		
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	8.89E+03	1.17E+02		

Viable Cascade Sampling Conditions ****Statistical Correction Applied Automatically for counts>60**

Viable Cascade #1				
SAMPLE TIME (min)	0	10	20	30
VIABLE CASCADE SAMPLING TIME (min)	**1.0**	**2.0**	**1.0**	**5.0**
VIABLE CASCADE FLOW RATE (lpm)	**30**	**30**	**30**	**38**
ENUMERATED PLATE COUNTS (# / plate)				56
STATISTICALLY CORRECTED PLATE COUNTS (# / plate)				56
PLATE AVERAGE COUNT (# / plate)				56.00
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)				0.295

Figure 12B: *A. brasiliensis* Trial 3

Trial Information

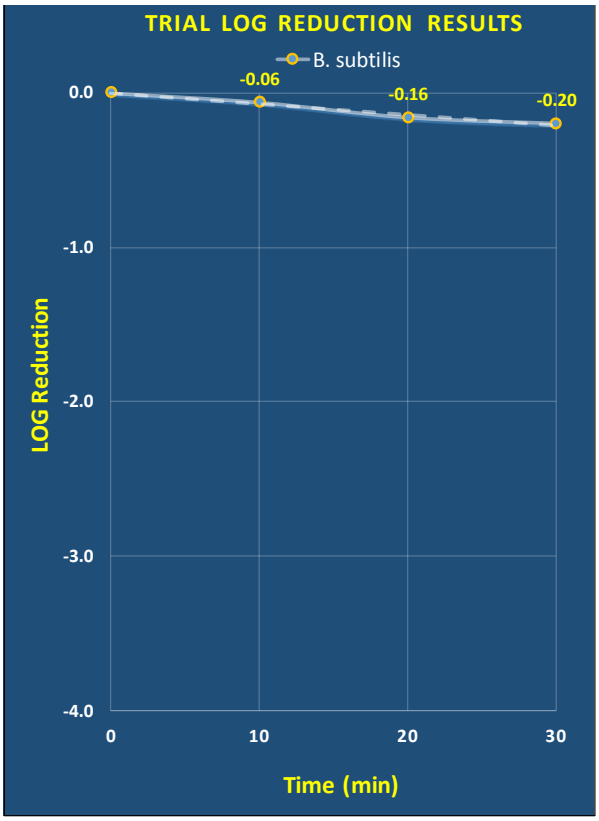
TEST DATE:	Friday, July 30, 2021
TRIAL PERFORMED BY:	ZC
TRIAL NUMBER:	T1
TEST ORGANSIM:	B. subtilis
TRIAL NAME ID (GRAPHS/TABLES):	B. subtilis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1		S2	S3
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	7.253E+05	6.293E+05	5.013E+05	4.587E+05
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**7.253E+05**	**6.293E+05**	**5.013E+05**	**4.587E+05**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**86.7647%**	**69.1176%**	**63.2353%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**13.2353%**	**30.8824%**	**36.7647%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-0.06**	**-0.16**	**-0.20**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**		**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	5.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-4**	**-4**	**-4**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	20 23 25	18 21 20	18 14 15	18 16 9
	PLATE AVERAGE COUNT (# / drop)	22.67	19.67	15.67	14.33
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,266,667	1,966,667	1,566,667	1,433,333
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	**7.25E+05**	**6.29E+05**	**5.01E+05**	**4.59E+05**

Figure 13B: *B. subtilis* Control

Trial Information

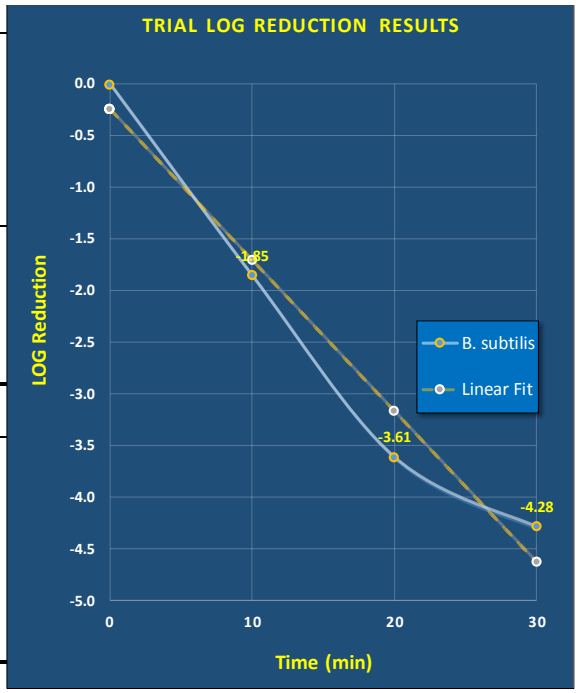
TEST DATE:	Friday, July 30, 2021
TRIAL PERFORMED BY:	ZC
TRIAL NUMBER:	T1
TEST ORGANSIM:	B. subtilis
TRIAL NAME ID (GRAPHS/TABLES):	B. subtilis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	4.382E+05	6.187E+03	1.088E+02	2.304E+01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**10.38%**			
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**4.382E+05**	**6.187E+03**	**1.088E+02**	**2.304E+01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**1.4118%**	**0.0248%**	**0.0053%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**98.5882%**	**99.9752%**	**99.9947%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-1.85**	**-3.61**	**-4.28**

Impinger Sampling Conditions

	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**500**
	ENUMERATED PLATE COUNTS (# / drop)	7 8 11	15 21 22	33 33 36	36
	PLATE AVERAGE COUNT (# / drop)	8.67	19.33	34.00	36.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	866,667	19,333	340	72
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	4.62E+05	6.19E+03	1.09E+02	2.30E+01

Dilution Range #1					
	DILUTION RATIO (10^x)	**-3**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	80 82 71			
	PLATE AVERAGE COUNT (# / drop)	77.67			
	IMPINGER CONCENTRATION (cfu or pfu/ml)	776,667			
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	4.14E+05			

Figure 14B: *B. subtilis* Trial 1

Trial Information

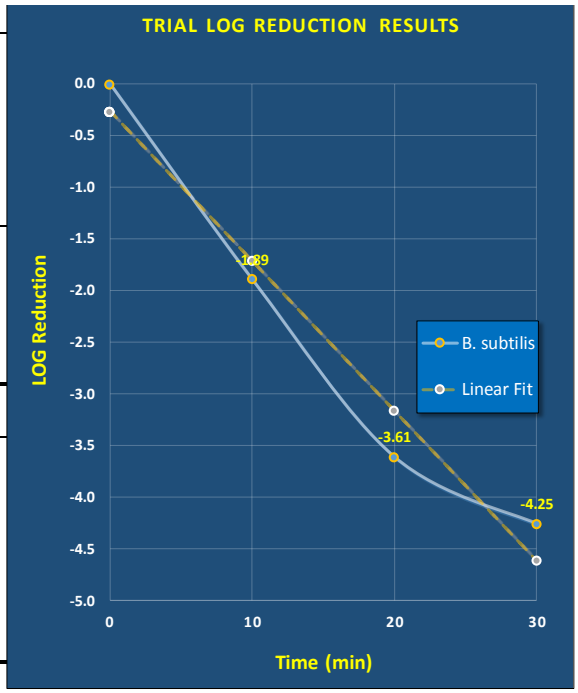
TEST DATE:	Friday, July 30, 2021
TRIAL PERFORMED BY:	ZC
TRIAL NUMBER:	T2
TEST ORGANSIM:	B. subtilis
TRIAL NAME ID (GRAPHS/TABLES):	B. subtilis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data

	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	5.378E+05	6.933E+03	1.333E+02	3.008E+01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**22.06%**			
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**5.378E+05**	**6.933E+03**	**1.333E+02**	**3.008E+01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**1.2893%**	**0.0248%**	**0.0056%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**98.7107%**	**99.9752%**	**99.9944%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-1.89**	**-3.61**	**-4.25**

Impinger Sampling Conditions

	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**500**
	ENUMERATED PLATE COUNTS (# / drop)	10 13 11	16 23 26	42 32 51	47
	PLATE AVERAGE COUNT (# / drop)	11.33	21.67	41.67	47.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	1,133,333	21,667	417	94
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	6.04E+05	6.93E+03	1.33E+02	3.01E+01

Dilution Range #1					
	DILUTION RATIO (10^x)	**-3**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	85 89 91			
	PLATE AVERAGE COUNT (# / drop)	88.33			
	IMPINGER CONCENTRATION (cfu or pfu/ml)	883,333			
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	4.71E+05			

Figure 15B: *B. subtilis* Trial 2

Trial Information

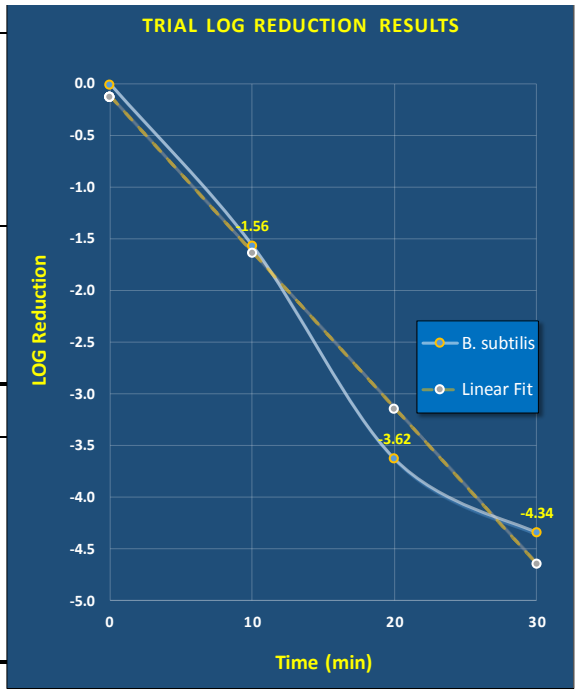
TEST DATE:	Friday, July 30, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T3
TEST ORGANSIM:	B. subtilis
TRIAL NAME ID (GRAPHS/TABLES):	B. subtilis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	y
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	2.329E+05	6.400E+03	5.547E+01	1.067E+01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**36.25%**			
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**2.329E+05**	**6.400E+03**	**5.547E+01**	**1.067E+01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**2.7481%**	**0.0238%**	**0.0046%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**97.2519%**	**99.9762%**	**99.9954%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-1.56**	**-3.62**	**-4.34**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	7 4 5	22 21 17	22 12 18	25
	PLATE AVERAGE COUNT (# / drop)	5.33	20.00	17.33	25.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	533,333	20,000	173	33
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	2.84E+05	6.40E+03	5.55E+01	1.07E+01

Dilution Range #1					
	DILUTION RATIO (10^x)	**-3**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	35 29 38			
	PLATE AVERAGE COUNT (# / drop)	34.00			
	IMPINGER CONCENTRATION (cfu or pfu/ml)	340,000			
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.81E+05			

Figure 16B: *B. subtilis* Trial 3

Trial Information

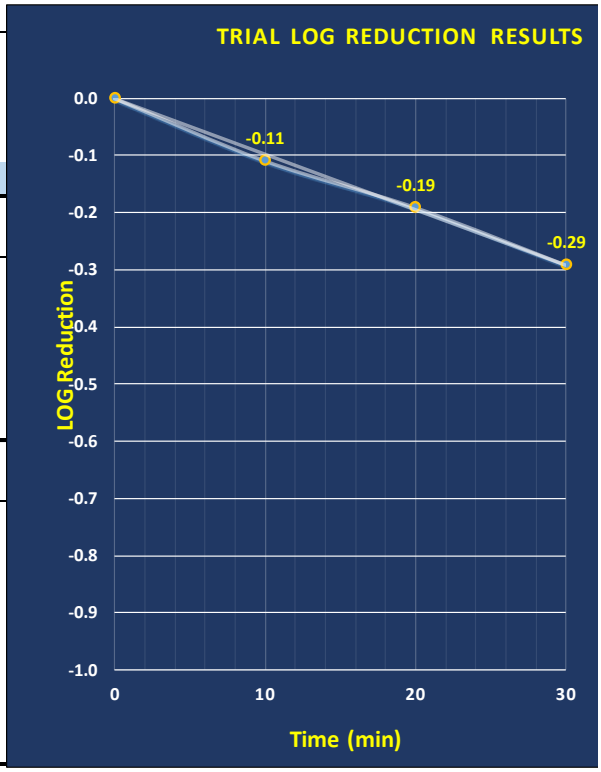
TEST DATE:	Wednesday, July 21, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	Control
TEST ORGANSIM:	MS2
TRIAL NAME ID (GRAPHS/TABLES):	MS2 T1

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1		S2	S3
SAMPLING TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.440E+06	1.120E+06	9.280E+05	7.360E+05
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.440E+06**	**1.120E+06**	**9.280E+05**	**7.360E+05**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**77.7778%**	**64.4444%**	**51.1111%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**22.2222%**	**35.5556%**	**48.8889%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-0.11**	**-0.19**	**-0.29**

Impinger Sampling Conditions

SAMPLING TIME (min)	**0**		**15**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	2.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5
DILUTION RATIO (10^x)	**-4**	**-4**	**-4**	**-4**
DROPLET SIZE (µl)	**50**	**50**	**50**	**50**
Dilution Range #1 ENUMERATED PLATE COUNTS (# / drop)	12 6	18 17	10 19	12 11
PLATE AVERAGE COUNT (# / drop)	9.00	17.50	14.50	11.50
IMPINGER CONCENTRATION (cfu or pfu/ml)	1,800,000	3,500,000	2,900,000	2,300,000
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	**1.44E+06**	**1.12E+06**	**9.28E+05**	**7.36E+05**

Figure 17B: MS2 Control

Trial Information

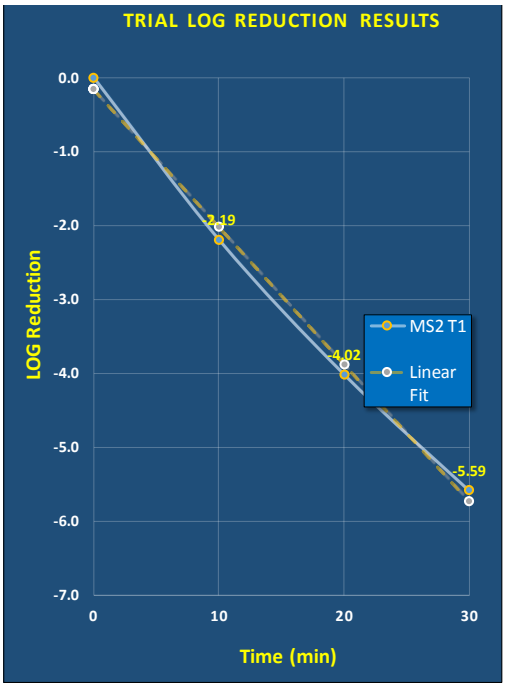
TEST DATE:	Wednesday, July 21, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	MS2
TRIAL NAME ID (GRAPHS/TABLES):	MS2 T1

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	9.956E+05	6.400E+03	9.600E+01	2.560E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**40.00%**		**0.00%**	
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**9.956E+05**	**6.400E+03**	**9.600E+01**	**2.560E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.6429%**	**0.0096%**	**0.0003%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.3571%**	**99.9904%**	**99.9997%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.19**	**-4.02**	**-5.59**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1	**DILUTION RATIO (10^x)**	**-5**	**-2**	**-1**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	2 2 3	24 20 16	2 2 5	6
	PLATE AVERAGE COUNT (# / drop)	2.33	20.00	3.00	6.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,333,333	20,000	300	8
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.24E+06	6.40E+03	9.60E+01	2.56E+00

Dilution Range #1	**DILUTION RATIO (10^x)**	**-4**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	12 12 18		32 30 28	
	PLATE AVERAGE COUNT (# / drop)	14.00		30.00	
	IMPINGER CONCENTRATION (cfu or pfu/ml)	1,400,000		300	
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	7.47E+05		9.60E+01	

Figure 18B: MS2 Trial 1

Trial Information

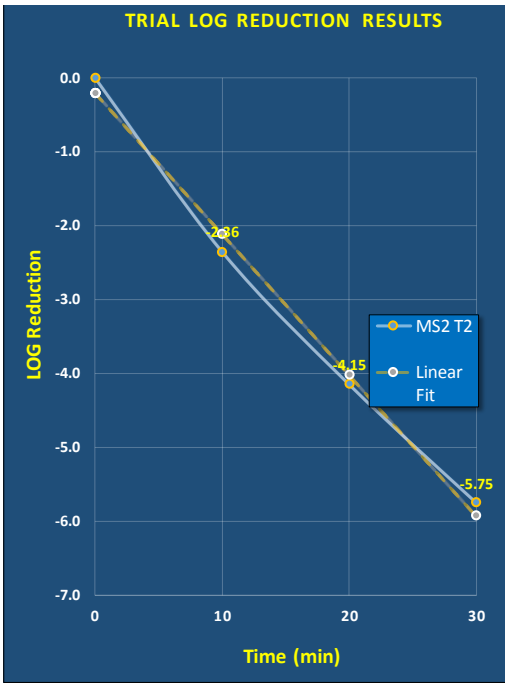
TEST DATE:	Wednesday, July 21, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T2
TEST ORGANSIM:	MS2
TRIAL NAME ID (GRAPHS/TABLES):	MS2 T2

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.209E+06	5.333E+03	8.533E+01	2.133E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**5.71%**			
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.209E+06**	**5.333E+03**	**8.533E+01**	**2.133E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.4412%**	**0.0071%**	**0.0002%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.5588%**	**99.9929%**	**99.9998%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.36**	**-4.15**	**-5.75**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-5**	**-2**	**-1**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	5 1 1	18 16 16	6 1 1	6 4
	PLATE AVERAGE COUNT (# / drop)	2.33	16.67	2.67	5.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,333,333	16,667	267	7
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.24E+06	5.33E+03	8.53E+01	2.13E+00

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	28 20 18			
	PLATE AVERAGE COUNT (# / drop)	22.00			
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,200,000			
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.17E+06			

Figure 19B: MS2 Trial 2

Trial Information

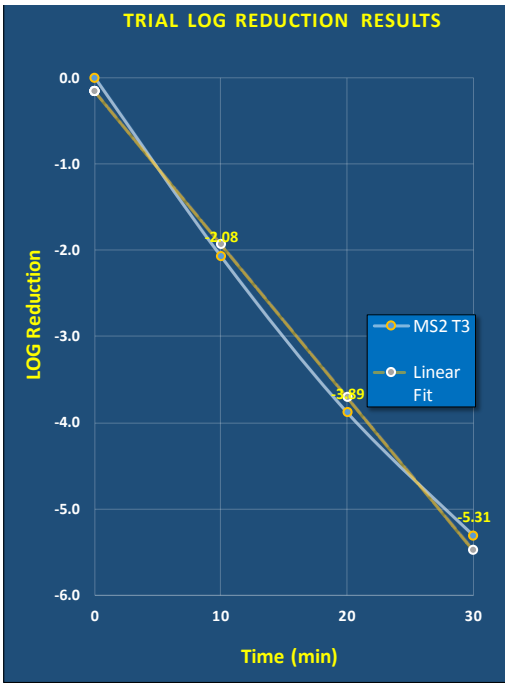
TEST DATE:	Wednesday, July 21, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T3
TEST ORGANSIM:	MS2
TRIAL NAME ID (GRAPHS/TABLES):	MS2 T3

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	2.551E+06	2.144E+04	3.307E+02	1.237E+01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**31.18%**			
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**2.551E+06**	**2.144E+04**	**3.307E+02**	**1.237E+01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.8404%**	**0.0130%**	**0.0005%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.1596%**	**99.9870%**	**99.9995%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.08**	**-3.89**	**-5.31**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-5**	**-2**	**-1**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	6 6 5	66 70 65	10 10 11	29
	PLATE AVERAGE COUNT (# / drop)	5.67	67.00	10.33	29.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	5,666,667	67,000	1,033	39
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	3.02E+06	2.14E+04	3.31E+02	1.24E+01

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	46 37 34			
	PLATE AVERAGE COUNT (# / drop)	39.00			
	IMPINGER CONCENTRATION (cfu or pfu/ml)	3,900,000			
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	2.08E+06			

Figure 20B: MS2 Trial 3

Trial Information

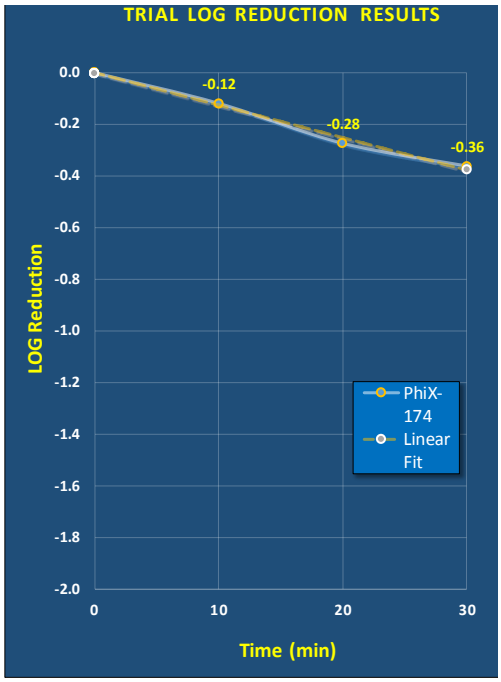
TEST DATE:	Thursday, July 22, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	Control
TEST ORGANSIM:	PhiX-174
TRIAL NAME ID (GRAPHS/TABLES):	PhiX-174

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1			S2
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.307E+05	9.920E+04	6.933E+04	5.653E+04
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**4.00%**			
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.307E+05**	**9.920E+04**	**6.933E+04**	**5.653E+04**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**75.9184%**	**53.0612%**	**43.2653%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**24.0816%**	**46.9388%**	**56.7347%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-0.12**	**-0.28**	**-0.36**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**		**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	2.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1	**DILUTION RATIO (10^x)**	**-4**	**-3**	**-3**	**-3**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	3 1 1	30 30 33	20 21 24	15 20 18
	PLATE AVERAGE COUNT (# / drop)	1.67	31.00	21.67	17.67
	IMPINGER CONCENTRATION (cfu or pfu/ml)	166,667	310,000	216,667	176,667
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.33E+05	9.92E+04	6.93E+04	5.65E+04

Dilution Range #1	**DILUTION RATIO (10^x)**	**-3**	**-2**
	DROPLET SIZE (µl)	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	16 14 18	
	PLATE AVERAGE COUNT (# / drop)	16.00	
	IMPINGER CONCENTRATION (cfu or pfu/ml)	160,000	
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.28E+05	

Figure 21B: Phi X Control

Trial Information

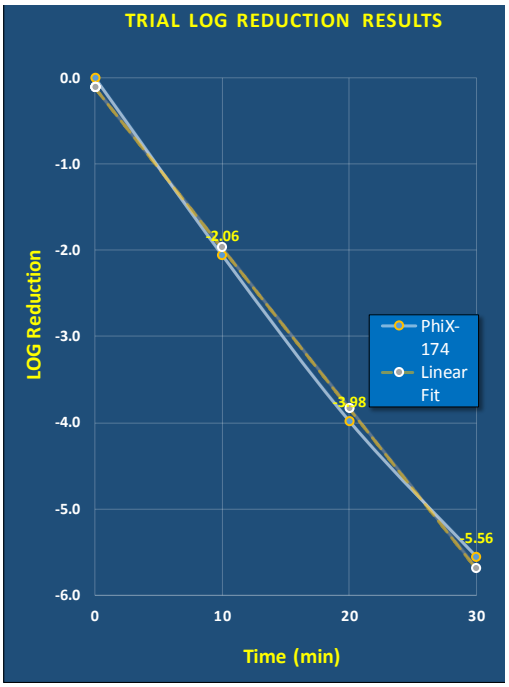
TEST DATE:	Thursday, July 22, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	PhiX-174
TRIAL NAME ID (GRAPHS/TABLES):	PhiX-174

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	2.311E+05	2.027E+03	2.400E+01	6.400E-01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)			**26.92%**	
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**2.311E+05**	**2.027E+03**	**2.400E+01**	**6.400E-01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.8769%**	**0.0104%**	**0.0003%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.1231%**	**99.9896%**	**99.9997%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.06**	**-3.98**	**-5.56**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1	**DILUTION RATIO (10^x)**	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	4 3 6	9 6 4	8 3 8	1 2
	PLATE AVERAGE COUNT (# / drop)	4.33	6.33	6.33	1.50
	IMPINGER CONCENTRATION (cfu or pfu/ml)	433,333	6,333	63	2
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	2.31E+05	2.03E+03	2.03E+01	6.40E-01

Dilution Range #1	**DILUTION RATIO (10^x)**	**-3**	**0**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**500**	**750**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	TNTC		65	
	PLATE AVERAGE COUNT (# / drop)			65.00	
	IMPINGER CONCENTRATION (cfu or pfu/ml)			87	
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)			2.77E+01	

Figure 22B: Phi X Trial 1

Trial Information

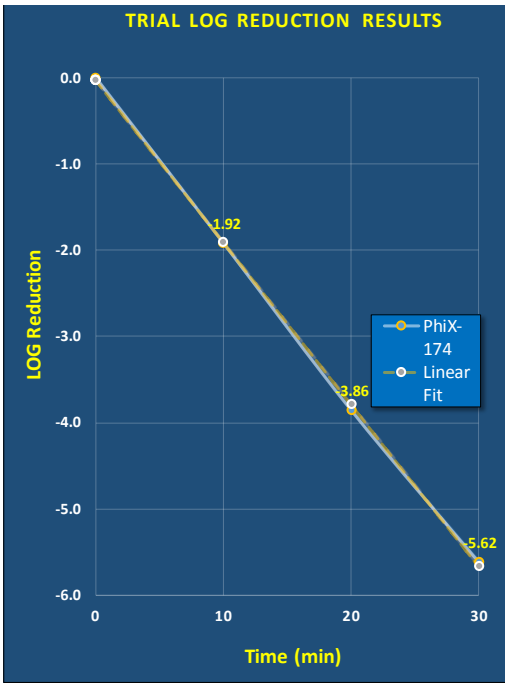
TEST DATE:	Thursday, July 22, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T2
TEST ORGANSIM:	PhiX-174
TRIAL NAME ID (GRAPHS/TABLES):	PhiX-174

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.778E+05	2.133E+03	2.464E+01	4.267E-01
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)			**28.89%**	
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.778E+05**	**2.133E+03**	**2.464E+01**	**4.267E-01**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**1.2000%**	**0.0139%**	**0.0002%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**98.8000%**	**99.9861%**	**99.9998%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-1.92**	**-3.86**	**-5.62**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	4 3 3	7 6 7	7 11 9	1 1
	PLATE AVERAGE COUNT (# / drop)	3.33	6.67	9.00	1.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	333,333	6,667	90	1
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.78E+05	2.13E+03	2.88E+01	4.27E-01

Dilution Range #1					
	DILUTION RATIO (10^x)	**-3**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**750**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	TNTC	TNTC	54 42	
	PLATE AVERAGE COUNT (# / drop)			48.00	
	IMPINGER CONCENTRATION (cfu or pfu/ml)			64	
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)			2.05E+01	

Figure 23B: Phi X Trial 2

Trial Information

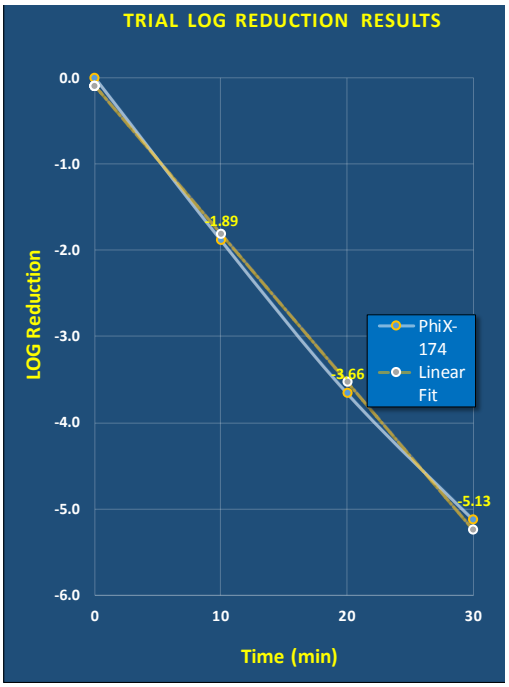
TEST DATE:	Thursday, July 22, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T3
TEST ORGANSIM:	PhiX-174
TRIAL NAME ID (GRAPHS/TABLES):	PhiX-174

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	2.311E+05	2.987E+03	5.013E+01	1.707E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**2.311E+05**	**2.987E+03**	**5.013E+01**	**1.707E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**1.2923%**	**0.0217%**	**0.0007%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**98.7077%**	**99.9783%**	**99.9993%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-1.89**	**-3.66**	**-5.13**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**10**	**20**	**30**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	4 5 4	10 8 10	16 15 16	4
	PLATE AVERAGE COUNT (# / drop)	4.33	9.33	15.67	4.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	433,333	9,333	157	5
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	2.31E+05	2.99E+03	5.01E+01	1.71E+00

Dilution Range #1					
	DILUTION RATIO (10^x)	**-3**	**-1**	**0**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**750**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	TNTC	TNTC		
	PLATE AVERAGE COUNT (# / drop)				
	IMPINGER CONCENTRATION (cfu or pfu/ml)				
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)				

Figure 24B: Phi X Trial 3

Phase II Raw Data

Trial Information

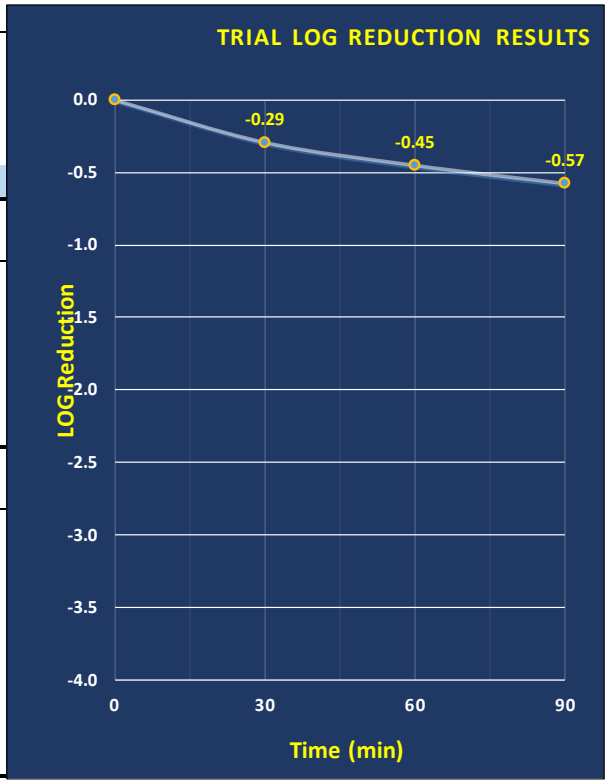
TEST DATE:	Monday, July 19, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	Control
TEST ORGANSIM:	MS2
TRIAL NAME ID (GRAPHS/TABLES):	Control

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	na
FITER ID #:	na
FILTER LOT #:	na

General Testing Conditions

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impingers
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	Na
TRIAL COMMENTS/NOTES	normal speed



BIOAEROSOL Sample ID and Summary Data	S1	S3	S5	S6
SAMPLING TIME (min)	**0**	**30**	**60**	**90**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.440E+06	7.360E+05	5.120E+05	3.840E+05
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)				
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.440E+06**	**7.360E+05**	**5.120E+05**	**3.840E+05**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**51.1111%**	**35.5556%**	**26.6667%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**48.8889%**	**64.4444%**	**73.3333%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-0.29**	**-0.45**	**-0.57**

Impinger Sampling Conditions

SAMPLING TIME (min)	**0**	**30**	**60**	**90**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	2.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-4**	**-4**	**-4**
	DROPLET SIZE (µl)	**50**	**50**	**50**	**50**
	ENUMERATED PLATE COUNTS (# / drop)	12 6	12 11	8 8	6 6
	PLATE AVERAGE COUNT (# / drop)	9.00	11.50	8.00	6.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	1,800,000	2,300,000	1,600,000	1,200,000
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	**1.44E+06**	**7.36E+05**	**5.12E+05**	**3.84E+05**

Figure 1C: MS2 Control

Trial Information

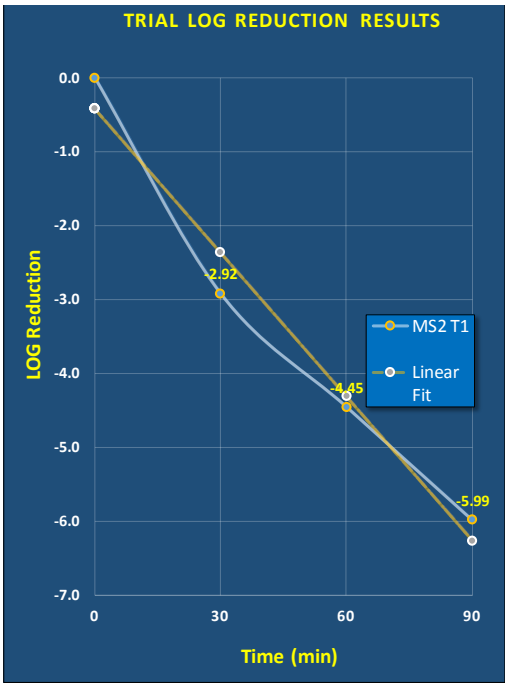
TEST DATE:	Wednesday, July 21, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	MS2
TRIAL NAME ID (GRAPHS/TABLES):	MS2 T1

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**30**	**60**	**90**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.244E+06	1.493E+03	4.373E+01	1.280E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**25.00%**			
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.244E+06**	**1.493E+03**	**4.373E+01**	**1.280E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.1200%**	**0.0035%**	**0.0001%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.8800%**	**99.9965%**	**99.9999%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.92**	**-4.45**	**-5.99**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**30**	**60**	**90**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-5**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	3 2 3		15 10 16	3
	PLATE AVERAGE COUNT (# / drop)	2.67		13.67	3.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,666,667		137	4
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.42E+06		4.37E+01	1.28E+00

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-1**	**-2**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	20 17 23	47 47 46		
	PLATE AVERAGE COUNT (# / drop)	20.00	46.67		
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,000,000	4,667		
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.07E+06	1.49E+03		

Figure 2C: MS2 Speed 1 Trial 1

Trial Information

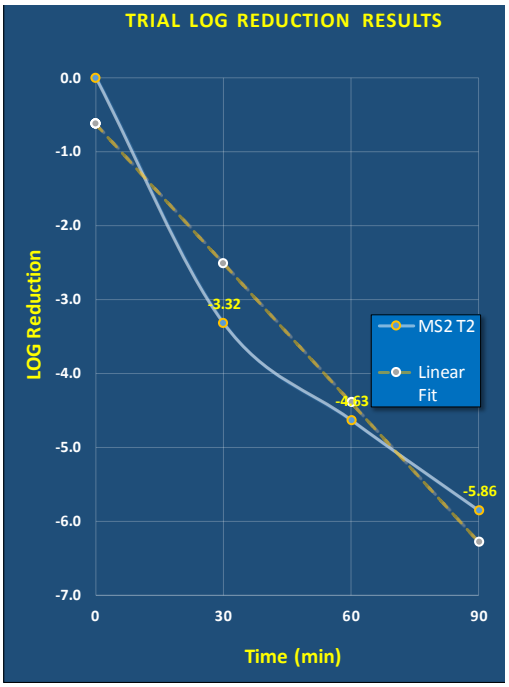
TEST DATE:	Thursday, July 22, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T2
TEST ORGANSIM:	MS2
TRIAL NAME ID (GRAPHS/TABLES):	MS2 T2

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	**0**	**30**	**60**	**90**
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	2.604E+06	1.243E+03	6.080E+01	3.627E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	**27.65%**	**20.77%**		
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**2.604E+06**	**1.243E+03**	**6.080E+01**	**3.627E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.0477%**	**0.0023%**	**0.0001%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.9523%**	**99.9977%**	**99.9999%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-3.32**	**-4.63**	**-5.86**

Impinger Sampling Conditions

SAMPLE TIME (min)	**0**	**30**	**60**	**90**
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
	DILUTION RATIO (10^x)	**-5**	**-2**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	4 6 7	5 4 4	20 19 18	5 12
	PLATE AVERAGE COUNT (# / drop)	5.67	4.33	19.00	8.50
	IMPINGER CONCENTRATION (cfu or pfu/ml)	5,666,667	4,333	190	11
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	3.02E+06	1.39E+03	6.08E+01	3.63E+00

Dilution Range #1					
	DILUTION RATIO (10^x)	**-4**	**-1**	**-2**	**-2**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	44 39 40	32 35 36		
	PLATE AVERAGE COUNT (# / drop)	41.00	34.33		
	IMPINGER CONCENTRATION (cfu or pfu/ml)	4,100,000	3,433		
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	2.19E+06	1.10E+03		

Figure 3C: MS2 Speed 1 Trial 2

Trial Information

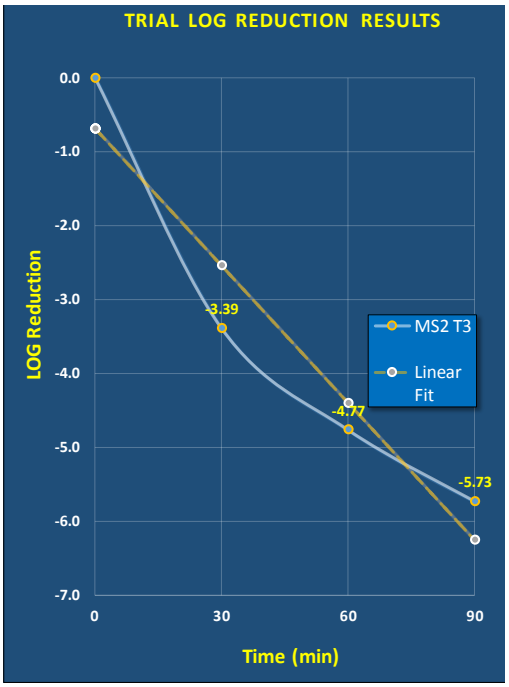
TEST DATE:	Thursday, July 22, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T3
TEST ORGANSIM:	MS2
TRIAL NAME ID (GRAPHS/TABLES):	MS2 T3

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4
SAMPLE TIME (min)	0	30	60	90
IMPINGER USED (y / n)	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	4.622E+06	1.872E+03	7.893E+01	8.533E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)				
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)		32.86%		
VIABLE CONSISTENCY CHECKS (% agreement)				
IMP & VIABLE CROSS CHECK (% agreement)				
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**4.622E+06**	**1.872E+03**	**7.893E+01**	**8.533E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.0405%**	**0.0017%**	**0.0002%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.9595%**	**99.9983%**	**99.9998%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-3.39**	**-4.77**	**-5.73**

Impinger Sampling Conditions

SAMPLE TIME (min)	0	30	60	90
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	3.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5

Dilution Range #1					
DILUTION RATIO (10^x)	**-5**	**-2**	**0**	**0**
DROPLET SIZE (µl)	**100**	**100**	**100**	**750**
ENUMERATED PLATE COUNTS (# / drop)	10 8 8	9 5 7	20 25 29	20
PLATE AVERAGE COUNT (# / drop)	8.67	7.00	24.67	20.00
IMPINGER CONCENTRATION (cfu or pfu/ml)	8,666,667	7,000	247	27
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	4.62E+06	2.24E+03	7.89E+01	8.53E+00

Dilution Range #1				
DILUTION RATIO (10^x)	**-4**	**-1**	**-2**	**0**
DROPLET SIZE (µl)	**100**	**100**	**100**	**100**
ENUMERATED PLATE COUNTS (# / drop)	TNTC	48 49 44		
PLATE AVERAGE COUNT (# / drop)		47.00		
IMPINGER CONCENTRATION (cfu or pfu/ml)		4,700		
CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)		1.50E+03		

Figure 4C: MS2 Speed 1 Trial 3

Trial Information

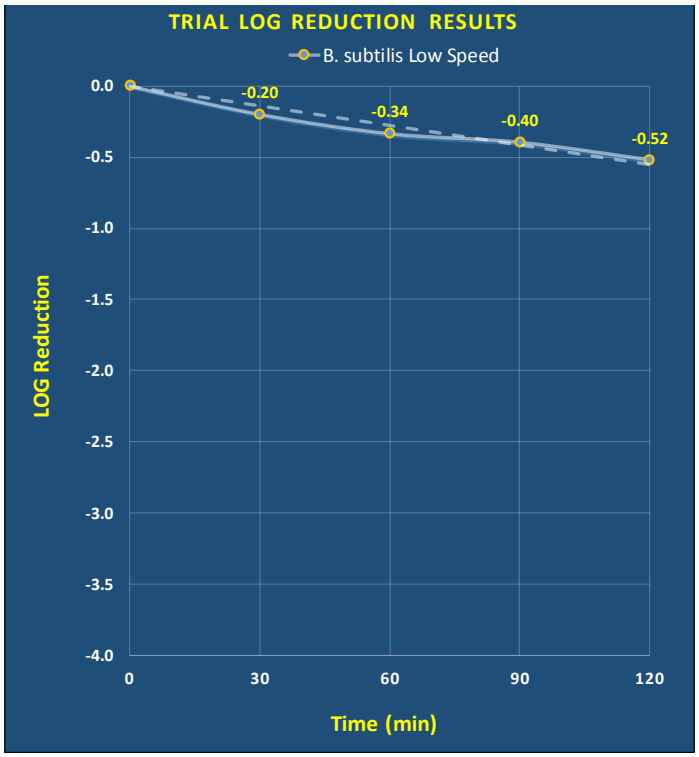
TEST DATE:	Tuesday, July 27, 2021
TRIAL PERFORMED BY:	Smm
TRIAL NUMBER:	Control
TEST ORGANSIM:	B. subtilis
TRIAL NAME ID (GRAPHS/TABLES):	B. subtilis Low Speed

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M50
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

NEBULIZER CONDITIONS:	16
SAMPLING METHOD:	Collison 24-Jet; approx. 20 min neb
CHAMBER MIXING FAN:	Impinger
	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	Low Speed



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4	S5
SAMPLE TIME (min)	0	30	60	90	120
IMPINGER USED (y / n)	y	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	7.253E+05	4.587E+05	3.349E+05	2.912E+05	2.187E+05
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)					
VIABLE CONSISTENCY CHECKS (% agreement)					
IMP & VIABLE CROSS CHECK (% agreement)					
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**7.253E+05**	**4.587E+05**	**3.349E+05**	**2.912E+05**	**2.187E+05**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**63.2353%**	**46.1765%**	**40.1471%**	**30.1471%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**36.7647%**	**53.8235%**	**59.8529%**	**69.8529%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-0.20**	**-0.34**	**-0.40**	**-0.52**

Impinger Sampling Conditions

SAMPLE TIME (min)	0	30	60	90	120
IMPINGER FILL VOL (ml)	20.0	20.0	20.0	20.0	20.0
IMPINGER SAMPLING TIME (min)	5.0	5.0	5.0	5.0	5.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5	12.5

Dilution Range #1						
	DILUTION RATIO (10^x)	**-4**	**-4**	**-3**	**-3**	**-3**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	20 23 25	18 16 9	104 108 102	90 98 85	70 70 65
	PLATE AVERAGE COUNT (# / drop)	22.67	14.33	104.67	91.00	68.33
	IMPINGER CONCENTRATION (cfu or pfu/ml)	2,266,667	1,433,333	1,046,667	910,000	683,333
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	7.25E+05	4.59E+05	3.35E+05	2.91E+05	2.19E+05

Figure 5C: *B. subtilis* Control

Trial Information

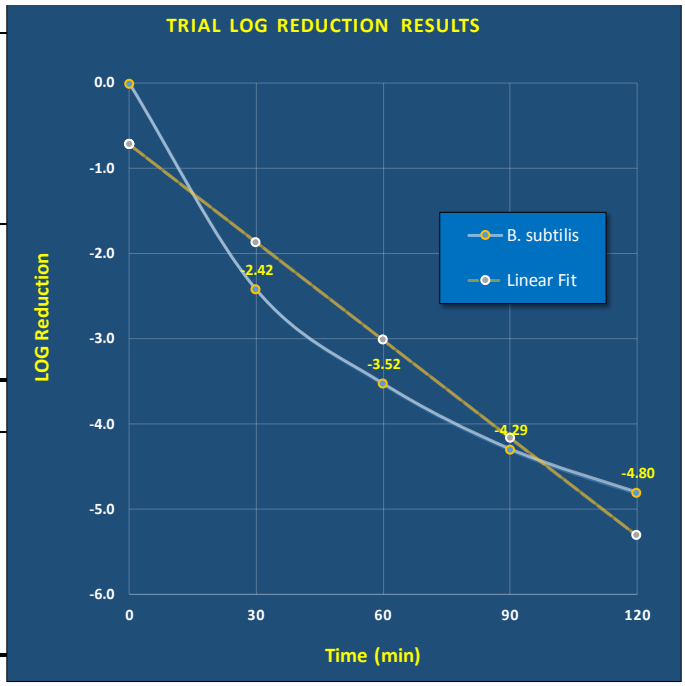
TEST DATE:	Friday, July 30, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T1
TEST ORGANSIM:	B. subtilis
TRIAL NAME ID (GRAPHS/TABLES):	B. subtilis

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4	S5
SAMPLE TIME (min)	0	30	60	90	120
IMPINGER USED (y / n)	y	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	6.044E+05	2.293E+03	1.813E+02	3.093E+01	9.600E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)		13.04%	30.00%		
VIABLE CONSISTENCY CHECKS (% agreement)					
IMP & VIABLE CROSS CHECK (% agreement)					
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**6.044E+05**	**2.293E+03**	**1.813E+02**	**3.093E+01**	**9.600E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.3794%**	**0.0300%**	**0.0051%**	**0.0016%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.6206%**	**99.9700%**	**99.9949%**	**99.9984%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.42**	**-3.52**	**-4.29**	**-4.80**

Impinger Sampling Conditions

SAMPLE TIME (min)	0	30	60	90	120
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	10.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5	12.5

Dilution Range #1						
	DILUTION RATIO (10^x)	**-4**	**-3**	**-2**	**-1**	**-1**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	14 12 8	1 1 0	2 0 0		
	PLATE AVERAGE COUNT (# / drop)	11.33	0.67	0.67		
	IMPINGER CONCENTRATION (cfu or pfu/ml)	1,133,333	6,667	667		
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	6.04E+05	2.13E+03	2.13E+02		

Dilution Range #1						
	DILUTION RATIO (10^x)	**-3**	**-2**	**-1**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)		11 7 5	8 2 4	8 12 9	4 6 8
	PLATE AVERAGE COUNT (# / drop)		7.67	4.67	9.67	6.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)		7,667	467	97	60
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)		2.45E+03	1.49E+02	3.09E+01	9.60E+00

Figure 6C: *B. subtilis* Speed 1 Trial 1

Trial Information

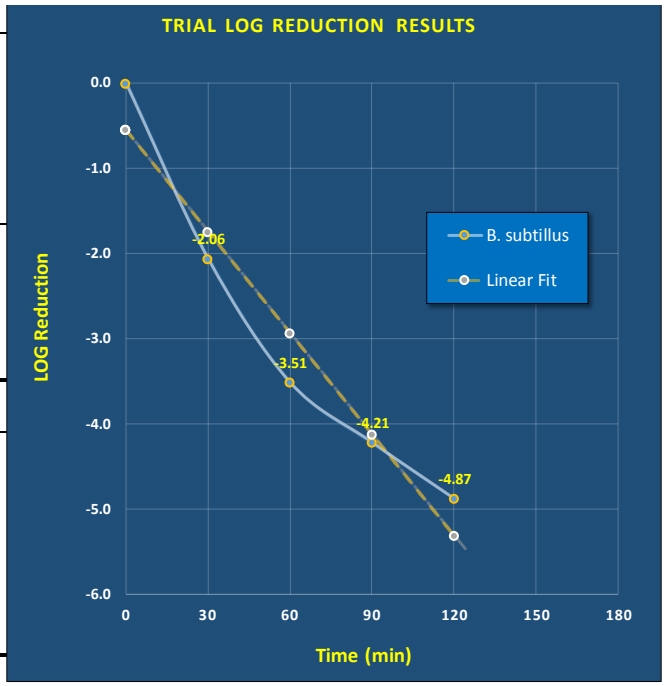
TEST DATE:	Monday, August 2, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T2
TEST ORGANSIM:	B. subtillus
TRIAL NAME ID (GRAPHS/TABLES):	B. subtillus

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4	S5
SAMPLE TIME (min)	0	30	60	90	120
IMPINGER USED (y / n)	y	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.582E+05	1.387E+03	4.907E+01	9.707E+00	2.133E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	38.18%			34.55%	
VIABLE CONSISTENCY CHECKS (% agreement)					
IMP & VIABLE CROSS CHECK (% agreement)					
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.582E+05**	**1.387E+03**	**4.907E+01**	**9.707E+00**	**2.133E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.8764%**	**0.0310%**	**0.0061%**	**0.0013%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.1236%**	**99.9690%**	**99.9939%**	**99.9987%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.06**	**-3.51**	**-4.21**	**-4.87**

Impinger Sampling Conditions

SAMPLE TIME (min)	0	30	60	90	120
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	10.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5	12.5

Dilution Range #1						
	DILUTION RATIO (10^x)	**-4**	**-2**	**-1**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	4 4 3	6 4 3		18	10
	PLATE AVERAGE COUNT (# / drop)	3.67	4.33		18.00	10.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	366,667	4,333		24	13
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.96E+05	1.39E+03		7.68E+00	2.13E+00

Dilution Range #1						
	DILUTION RATIO (10^x)	**-3**	**-2**	**0**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	25 28 15		18 14 14	4 4 3	
	PLATE AVERAGE COUNT (# / drop)	22.67		15.33	3.67	
	IMPINGER CONCENTRATION (cfu or pfu/ml)	226,667		153	37	
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.21E+05		4.91E+01	1.17E+01	

Figure 7C: *B. subtilis* Speed 1 Trial 2

Trial Information

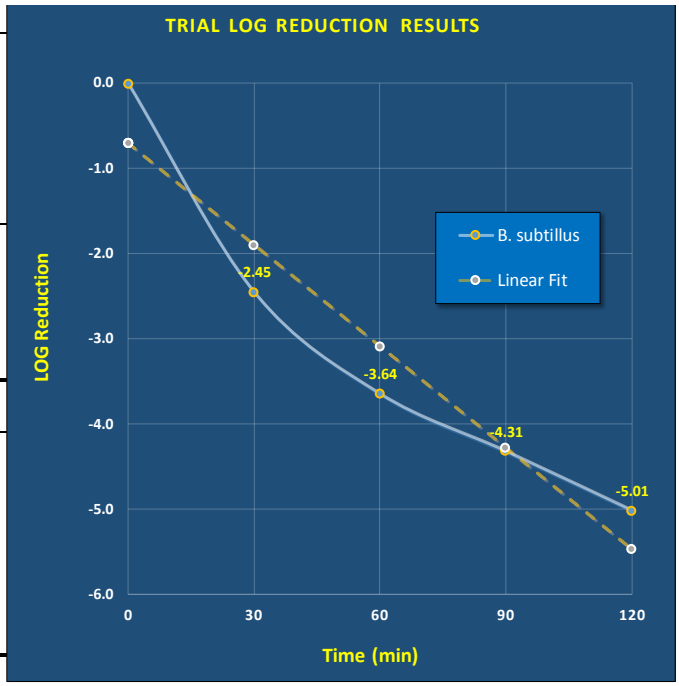
TEST DATE:	Monday, August 2, 2021
TRIAL PERFORMED BY:	SMM
TRIAL NUMBER:	T3
TEST ORGANSIM:	B. subtillus
TRIAL NAME ID (GRAPHS/TABLES):	B. subtillus

Device Information

MANUFACTURER:	Medify
UNIT MODEL:	M40
FAN SPEED (CFM):	
UNIT SERIAL #:	
FITER ID #:	
FILTER LOT #:	

General Testing Conditions (Can Be User Defined)

TEST CHAMBER VOLUME (m^3):	16
NEBULIZER CONDITIONS:	Collison 24-Jet; approx. 20 min neb
SAMPLING METHOD:	Impinger
CHAMBER MIXING FAN:	yes
TEMP (F):	74
RH (%):	70
OTHER INSTRUMENTS:	na
TRIAL COMMENTS/NOTES	na



BIOAEROSOL Sample ID and Summary Data	S1	S2	S3	S4	S5
SAMPLE TIME (min)	0	30	60	90	120
IMPINGER USED (y / n)	y	y	y	y	y
VIABLE CASCADE USED (y / n)	n	n	n	n	n
CHAMBER IMPINGER BIOBIOAEROSOL CONCENTRATION (cfu pfu/L Air)	1.956E+05	6.987E+02	4.480E+01	9.493E+00	1.920E+00
CHAMBER VIABLE BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)					
IMPINGER DILUTION CONSISTENCY CHECKS (% agreement)	16.67%	36.25%		38.18%	
VIABLE CONSISTENCY CHECKS (% agreement)					
IMP & VIABLE CROSS CHECK (% agreement)					
CHAMBER BIOBIOAEROSOL CONCENTRATION (cfu or pfu/L Air)	**1.956E+05**	**6.987E+02**	**4.480E+01**	**9.493E+00**	**1.920E+00**
RELATIVE PERCENT REMAINING FROM T=0 (%)	**100.0000%**	**0.3573%**	**0.0229%**	**0.0049%**	**0.0010%**
RELATIVE PERCENT REMOVAL FROM T=0 (%)	**0.0000%**	**99.6427%**	**99.9771%**	**99.9951%**	**99.9990%**
LOG REDUCTION FROM T=0 (log_{10})	**0.00**	**-2.45**	**-3.64**	**-4.31**	**-5.01**

Impinger Sampling Conditions

	S1	S2	S3	S4	S5
SAMPLE TIME (min)	0	30	60	90	120
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	10.0
IMPINGER FLOW RATE (lpm)	12.5	12.5	12.5	12.5	12.5

Dilution Range #1						
	DILUTION RATIO (10^x)	**-4**	**-2**	**0**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**750**	**750**
	ENUMERATED PLATE COUNTS (# / drop)	8 1 3	1 2 5	10 19 13	17	9
	PLATE AVERAGE COUNT (# / drop)	4.00	2.67	14.00	17.00	9.00
	IMPINGER CONCENTRATION (cfu or pfu/ml)	400,000	2,667	140	23	12
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	2.13E+05	8.53E+02	4.48E+01	7.25E+00	1.92E+00

Dilution Range #1						
	DILUTION RATIO (10^x)	**-3**	**-1**	**0**	**0**	**0**
	DROPLET SIZE (µl)	**100**	**100**	**100**	**100**	**100**
	ENUMERATED PLATE COUNTS (# / drop)	33 18 49	20 17 14		3 1 7	
	PLATE AVERAGE COUNT (# / drop)	33.33	17.00		3.67	
	IMPINGER CONCENTRATION (cfu or pfu/ml)	333,333	1,700		37	
	CHAMBER BIOAEROSOL CONCETRATION (cfu or pfu/L Air)	1.78E+05	5.44E+02		1.17E+01	

Figure 8C: *B. subtilis* Speed 1 Trial 3

Appendix D: Calculations

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

- Plating and enumeration of the biological to derive the concentration of the stock suspension (C_s) in pfu/mL or 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:

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

Plating and enumeration of the biological to derive the concentration of the dry powder (C_p) in cfu/g.

- Eductor use rate (M_p) (Mass of powder generated by the eductor in grams)
- 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 dry powder stock concentration (C_p) is calculated as:

$$\text{Eductor: } V_P = \frac{C_p \cdot M_p}{V_c}$$

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 enumeration of impinger sample or filter sample.
- Impinger sample collection volume (I_{vol}) = 20 mL collection fluid/impinger, or extraction fluid for filter.
- AGI–30 impinger 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:

$$C_a = \frac{C_{Imp} \cdot I_{vol}}{Q_{imp}} t$$

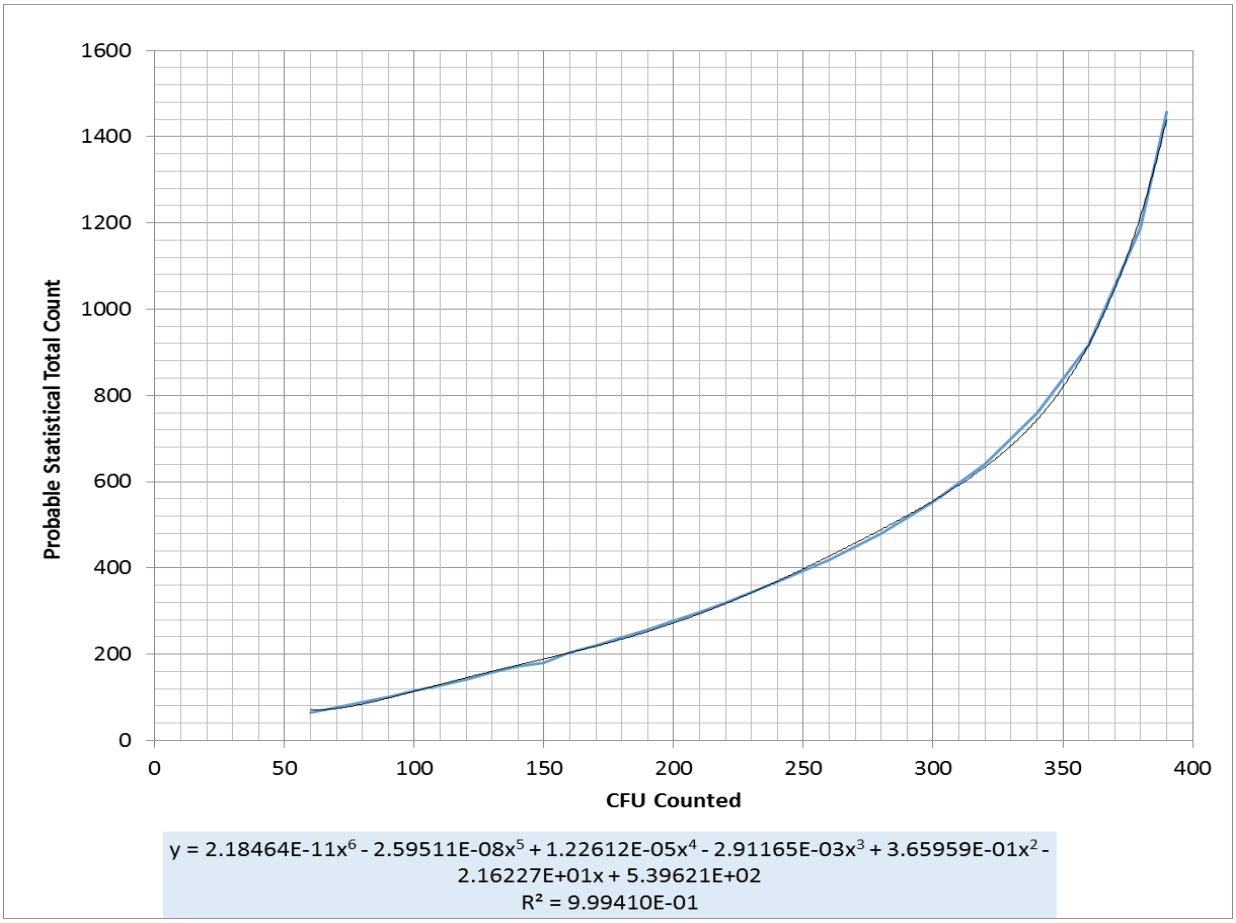
The aerosol system viable delivery efficiency (expressed as %) is:

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

The table below is based on the principle that, as the number of viable particles being impinged on a given plate increases, the probability of the next particle going into an “empty hole” decreases.
This can be corrected statistically by using the conversion formula of Feller [4]:

Pr = N [1/N + 1/N-1 + 1/N-2 + ... 1/N-r+1]

N is the number of holes (400) in the sampling head.
For easy use of this formula please refer to the table in chapter 17.2
For each colony count **r** a statistically corrected total count **Pr** can be easily seen in the table.


Probable Statistical Total Count
CFU Counted
0
200
400
600
800
1000
1200
1400
1600
0
50
100
150
200
250
300
350
400
y = 2.18464E-11x^6 - 2.59511E-08x^5 + 1.22612E-05x^4 - 2.91165E-03x^3 + 3.65959E-01x^2 - 2.16227E+01x + 5.39621E+02
R² = 9.99410E-01

17.2 Positive hole conversion table for all MAS-100 air monitoring systems

r = number of colony forming units counted on 100 mm petri dish Pr = probable statistical total count

r	Pr	r	Pr	R	Pr	R	Pr	R	Pr	r	Pr	R	Pr	R	Pr
1	1	51	54	101	116	151	189	201	279	251	394	301	557	351	836
2	2	52	56	102	118	152	191	202	281	252	397	302	561	352	844
3	3	53	57	103	119	153	193	203	283	253	400	303	565	353	853
4	4	54	58	104	120	154	194	204	285	254	402	304	569	354	861
5	5	55	59	105	122	155	196	205	287	255	405	305	573	355	870
6	6	56	60	106	123	156	197	206	289	256	408	306	578	356	879
7	7	57	61	107	124	157	199	207	291	257	411	307	582	357	888
8	8	58	63	108	126	158	201	208	293	258	413	308	586	358	897
9	9	59	64	109	127	159	202	209	295	259	416	309	591	359	907
10	10	60	65	110	128	160	204	210	297	260	419	310	595	360	917
11	11	61	66	111	130	161	206	211	299	261	422	311	599	361	927
12	12	62	67	112	131	162	207	212	301	262	425	312	604	362	937
13	13	63	68	113	133	163	209	213	304	263	428	313	608	363	947
14	14	64	70	114	134	164	211	214	306	264	431	314	613	364	958
15	15	65	71	115	135	165	212	215	308	265	433	315	618	365	969
16	16	66	72	116	137	166	214	216	310	266	436	316	622	366	981
17	17	67	73	117	138	167	216	217	312	267	439	317	627	367	992
18	18	68	74	118	140	168	218	218	314	268	442	318	632	368	1005
19	19	69	76	119	141	169	219	219	317	269	445	319	637	369	1017
20	20	70	77	120	142	170	221	220	319	270	449	320	642	370	1030
21	22	71	78	121	144	171	223	221	321	271	452	321	647	371	1043
22	23	72	79	122	145	172	224	222	323	272	455	322	652	372	1057
23	24	73	80	123	147	173	226	223	325	273	458	323	657	373	1071
24	25	74	82	124	148	174	228	224	328	274	461	324	662	374	1086
25	26	75	83	125	150	175	230	225	330	275	464	325	667	375	1102
26	27	76	84	126	151	176	232	226	332	276	467	326	673	376	1118
27	28	77	85	127	153	177	233	227	335	277	471	327	678	377	1134
28	29	78	87	128	154	178	235	228	337	278	474	328	684	378	1152
29	30	79	88	129	156	179	237	229	339	279	477	329	689	379	1170
30	31	80	89	130	157	180	239	230	342	280	480	330	695	380	1189
31	32	81	90	131	158	181	241	231	344	281	484	331	701	381	1209
32	33	82	92	132	160	182	242	232	346	282	487	332	706	382	1230
33	34	83	93	133	161	183	244	233	349	283	491	333	712	383	1252
34	35	84	94	134	163	184	246	234	351	284	494	334	718	384	1276
35	37	85	95	135	164	185	248	235	353	285	497	335	724	385	1301
36	38	86	97	136	166	186	250	236	356	286	501	336	730	386	1327
37	39	87	98	137	167	187	252	237	358	287	504	337	737	387	1356
38	40	88	99	138	169	188	254	238	361	288	508	338	743	388	1387
39	41	89	101	139	171	189	255	239	363	289	511	339	749	389	1420
40	42	90	102	140	172	190	257	240	366	290	515	340	756	390	1456
41	43	91	103	141	174	191	259	241	368	291	519	341	763	391	1496
42	44	92	104	142	175	192	261	242	371	292	522	342	769	392	1541
43	45	93	106	143	177	193	263	243	373	293	526	343	776	393	1591
44	47	94	107	144	178	194	265	244	376	294	530	344	783	394	1648
45	48	95	108	145	180	195	267	245	378	295	534	345	791	395	1715
46	49	96	110	146	181	196	269	246	381	296	537	346	798	396	1795
47	50	97	111	147	183	197	271	247	384	297	541	347	805	397	1895
48	51	98	112	148	185	198	273	248	386	298	545	348	813	398	2028
49	52	99	114	149	186	199	275	249	389	299	549	349	820	399	2228
50	53	100	115	150	188	200	277	250	391	300	553	350	828		