



Description: Chamber Test Analysis on Eco-RX Inc. Model 400 Air Purifier

Purpose:

To determine the effectiveness of the Eco-RX Inc. Model 400 Air Purifier for the removal of various airborne bacteria.

Summary of Results:

<u>Organism:</u>	<u>Average Log Reduction:</u>	<u>Average % Removed:</u>
• <i>Bacillus subtilis</i>	≥ 4.6 over 4 hours	99.9977
• <i>Staphylococcus aureus</i>	≥ 4.3 over 4 hours	99.9944
• <i>Pseudomonas aeruginosa</i>	≥ 3.8 over 4 hours	99.9739
• <i>Klebsiella pneumoniae</i>	≥ 4.5 over 4 hours	99.9965

Conclusion:

This product appears to be effective in reducing bacteria counts in ambient atmospheres, effectively removing more than 99.9% of bacteria in a short period of time.

Approved By: **Alan C. Johnson** *(email copy)*
 Laboratory Director

**Method:****Chamber:**

The chamber is a square wooden frame work using 6-mil polyethylene for walls, ceiling and floor. The floor is double layered, sealed to interior of framework leaving no wood exposed, and forming a flat interior surface.

- Dimensions: 8' x 8.17' x 6.67'; which equals 436 cubic feet, 12,346 Liters, or 12.35 cubic meters.
- Entrance: Z-flap polyethylene

An open table next to entrance is used for sampling operations. Dry box gloves are mounted in the wall and used for sample manipulation. A small air-lock / decontamination chamber is used to remove samples.

The chamber can be placed under negative pressure through use of a HEPA vacuum taped into a side wall.

The chamber contains the following for use in disinfecting:

- Two germicidal UV lamps
- Two germicidal UV / Ozone filter units (previously supplied by Eco-RX).

Air circulation in the chamber is created by two Eco-RX Model 400 units, (one without UV lamps), plus a small, ten inch floor fan. Eco-RX model 400 units are run at maximum velocity.

Eco-RX units are stationed next to door for accessibility, and angled at 45 degrees, (diagonal), to the wall. The fan is placed at the base of the table, 45 degrees to the wall in the opposite direction.

**Procedure for Sampling:**

1. Start air circulation through use of floor fan and inactive UV model 400.
2. Allow circulation to stabilize (30) minutes.
3. During stabilization period, set up sampling materials and supplies:
 - a. Label the 9mL dilution tubes.
 - b. Pour into impingers.
 - c. Set flow on pump to 4 LPM.
 - d. Attach first impinger, check flow.
4. Seal door.
5. After 30 minute stabilization, start background sampling, using gloves.
 - a. Set timer.
 - b. Sample at ten minutes.
6. At end of sampling, turn off pump.
 - a. Disconnect impinger.
 - b. Pour contents back into the 9mL dilution bottle.
 - c. Disinfect with Clorox Wipes®.
 - d. Remove through air lock.
7. Attach next impinger. (Repeat this process for all remaining samples.)
8. Inoculate chamber with test organism using the DeVilbiss atomizer.
 - a. Aerosolize all 9mL.
9. Allow air in chamber to mix at least 30 minutes.
10. Take baseline sample.
11. After baseline sampling is complete, turn on active UV model 400 and turn off the inactive UV model 400.
12. Sample at 30 minute intervals for the first two hours (30, 60, 90, 120 minutes) and hourly thereafter (3, 4 hours).
13. At end of sampling period, turn on UV lamps, UV/ozone filters and HEPA vacuum to evacuate chamber. Allow at least one hour disinfection time before re-entering chamber.
14. Plate samples in lab, inoculate 48 hours (\pm 3 hours) at 35°C.
15. Count and enumerate per Standard Methods for the Examination of Dairy Products.



16. All counts rounded to two significant digits.

Cultures Used:

- *Bacillus subtilis*, ATCC 6538
- *Klebsiella pneumoniae*, ATCC 4352
- *Pseudomonas aeruginosa*, ATCC 9027
- *Staphylococcus aureus*, ATCC 6538

Preparation of Cultures for Inoculation:

1. Cultures are streaked from slants onto Tryptic Soy Agar and onto Sheep's Blood Agar using sterile applicators.
2. Incubate for two days at 35°C.
3. Surface growth is removed to 9mL, sterile phosphate buffer using sterile applicator moistened with the buffer. Growth from two to three plates is used to produce a highly turbid opaque solution.
4. Tubes containing the culture are sonicated for 15 minutes, (30 minutes for *K. pneumoniae*).
5. Concentration was checked by Direct Microscopic Clump Count.
6. The culture was decanted into the DeVilbiss reservoir.
7. The culture was then aerosolized by use of pressurized air canister (1mL/second aerosolize rate)
8. One drop of sterile Tween-80 (non-ionic surfactant) was added to *K. pneumoniae* cultures before sonicating in order to facilitate dispersion of the bacteria in the water. There were problems in recovering the *K. pneumoniae* cultures from the air; apparently due to clumping of the organisms and a rapid settling of the cells.

**Definitions:**

1. **Diluent Volume:** 9 milliliter (see media for Bio-trace Mini Flip-top Dilution Bottles).
2. **DMCC:** Direct Microscopic Clump Count. Standard Methods for the Examination of Dairy Products / BAM online chapter 2.) This was used as a basis for estimating the levels of bacteria which would be obtained by aerosolizing the culture suspension.
3. **Impinger Solution Volume:** Amount of sterile phosphate buffer placed in the impinger for use as an absorbent medium for air borne bacteria, (see diluent volume).
4. **Air Circulation:** Use of the inactive model-400 and the floor fan, (see equipment) to set up air circulation in the chamber.
5. **Background:** Sample of inoculated air after allowing the bacteria to mix.
6. **Time UV unit started:** Time the active model-400 UV lamps and fans turned on.
7. **PAC Counts:** Petrifilm aerobic count, (see media).
8. **Impinger Control:** Impinger blank, (to confirm sterility of impinger).
9. **LPM:** Liters per minute.
10. **TNTC:** Too numerous to count (plate overgrown).
11. **Estimated count:** Calculated from the DMCC, an estimate as to microbial loading in the chamber.

Media:

1. **PAC Plates:** 3m Petrifilm Aerobic Count, AOAC 986.33 / 990.12
2. **SBA:** Trypticase Soy Agar with 5% Sheep's Blood, BD 221239
3. **SMA:** Standard Methods Agar, Bottled Bio-Trace, BP-9081-200
4. **TSA:** Tryptic Soy Agar, Accumedica 7100A

Sterile Buffered Water:

1. **Phosphate Buffer with magnesium chloride,** 99mL sterile, Weber Scientific # 3127-27.
2. **Mini Flip-Top Dilution Bottles,** sterile 9mL, Butterfield's Buffer # BP-PFV-9BFD.
3. **Swabs:** 5mL RediSwab, Lethen Broth, Biotrace # RS-960-5Let.
4. **Tween 80**

Sampling Equipment

1. **Sampling Pumps:**
 - a. Air One Personal Air Sampling Pump Model T1-004.
 - b. Air Pro-4000D Air Sampling Pump.



Flow Meters:

- a. **Primary Standard:** Universal Pump Calibrator, Inspectors Model No. 302 (1000mL), Environmental Compliance Corporation.
 - b. **Secondary Standard:** Gilmont No.13 Flow-meter, (0.2-14LPM), For use inside chamber during sampling.
 - c. **Kurz Model 541S Flow Calibrator:** (Electronic), used to check pumps outside of the chamber at the start of day.
2. **Impingers:** SKC 225-0020 PTFE Impinger.

Calibration of Flow-meters

- 1. Set the flow from the compressed air tank through the regulator.

Measurement:

Primary: Volume 1000mL, (1L).

<u>Time</u> <u>(per second)</u>	<u>Flow</u> <u>(L/minute or LPM)</u>
13.52	4.44
13.59	4.42
13.62	4.41
13.50	4.44
13.45	4.46

Average= 4.43

Kurz: Initial 4.4 LPM, no adjustment.

Gilmont: 4.5 LPM, no correction factor.

Miscellaneous Equipment:

- 1. Anemometer: ExTech 45118
- 2. HEPA (High Efficiency Particulate Air), Vacuum: DeWalt Model DC500.
- 3. Pressurized Dust Remover: Clean Safe 10oz. moisture free air (IQ Products).
- 4. Splintax Smoke Matches.
- 5. DeVilbiss Model 15 Atomizer with 15mL reservoir; pressurized air used to volatilize contents, (volatilizes 1mL per second).
- 6. Clorox Disinfectant Wipes.





Face Velocities, (FPM) at Maximum Flow:

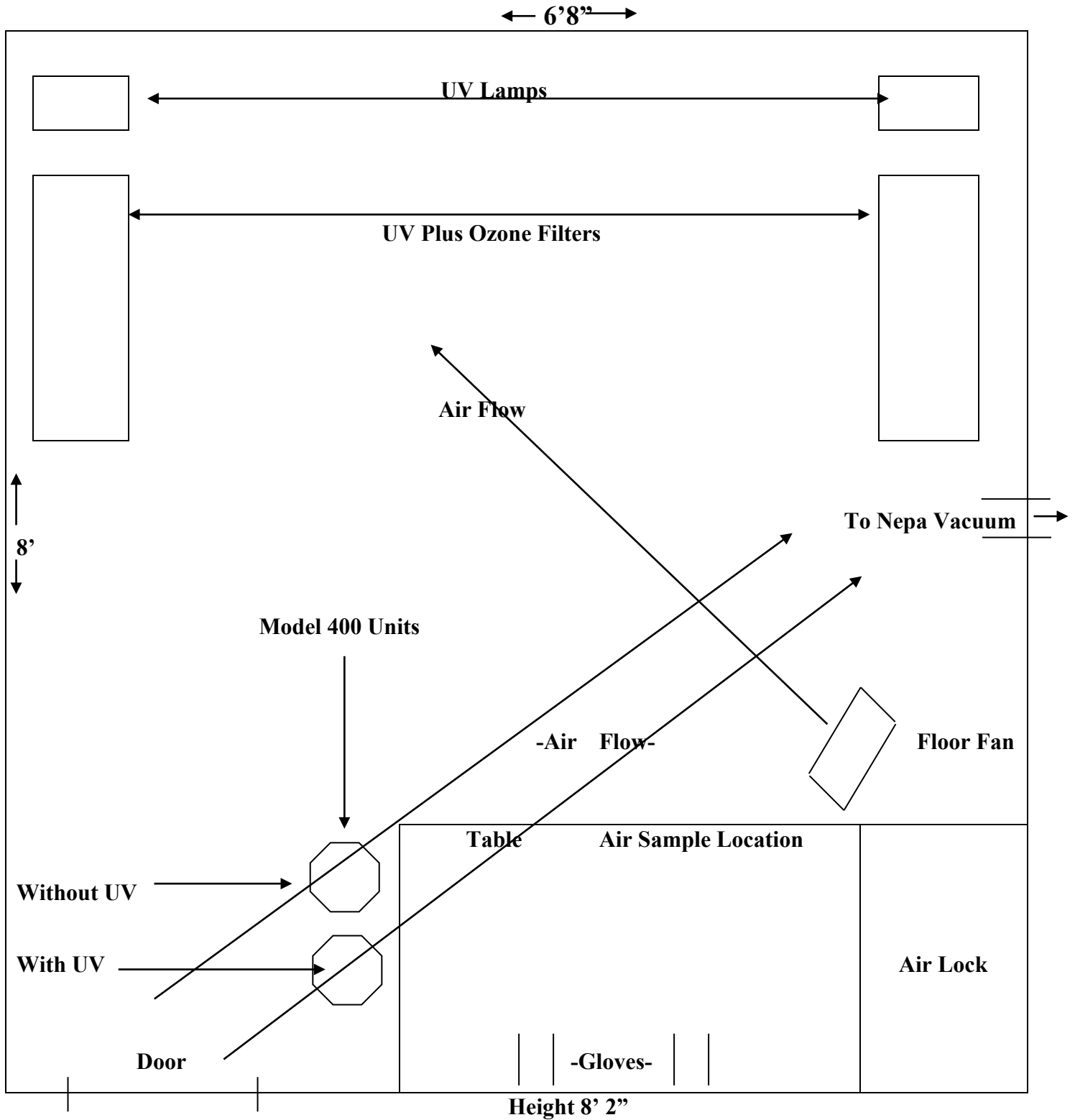
- **Model 400 Without UV:**
 - **At surface:** 1456
 - **At 1 foot distance:** 846
 - **At 3 feet distance:** 373
 - **Intake:** 767

- **Model 400 With UV:**
 - **At surface:** 1515
 - **At 1 foot distance:** 966
 - **At 3 feet distance:** 373
 - **Intake:** 865

- **Floor Fan:**
 - **At surface:** 1377
 - **At 1 foot distance:** 885
 - **At 3 feet distance:** 432



Schematic: (not proportional)



**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	9-29-06	Temperature:	70	°F
Barometer reading:	29.75	Relative Humidity:	50	%
Test organism:	<i>Bacillus subtilis</i>	ATCC#:	6633	
Diluent volume:	9 mL	Sonicated:	15	min
DMCC/mL:	12,000,000			

Estimated count in chamber:	8,700,000	Cfu/m³
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Testing:

Impinger solution volume:	9	mL
Air circulation started:	10:30	AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	11:01	11:12	4.0	44

Time Chamber Inoculated: 11:15

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline	11:45	12:00	4.0	60

Time UV Unit Started: 12:00 Noon

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	12:30	12:40	4.0	40
Time 2 (60 min)	1:04	1:12	4.0	32
Time 3 (90 min)	1:30	1:42	4.0	48
Time 4 (120 min)	2:00	2:10	4.0	40
Time 5 (180 min)	3:00	4:10	4.0	40
Time 6 (240 min)	4:00	4:12	4.0	48

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	0	0	---	---	<150	2.2	---
Baseline	TNTC	680	280	30	6,800,000	6.8	---
Time 1	72	17	3	1	16,000	4.2	2.6
Time 2	25	2	0	0	7,000	3.8	3.0
Time 3	39	4	0	0	7,300	3.9	2.9
Time 4	9	2	0	0	2,000	3.3	3.5
Time 5	1	0	---	---	230	2.4	4.4
Time 6	0	0	---	---	<190	2.3	4.5

% Removed: 99.9972**Controls**

Dilution Blank:	0	Cfu/mL	Impinger Blank:	0	Cfu/mL	Outside Air:	0	Cfu/15 min
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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	10-03-06	Temperature:	69	°F
Barometer reading:	30.20	Relative Humidity:	50	%
Test organism:	<i>Bacillus subtilis</i>	ATCC#:	6633	
Diluent volume:	9 mL	Sonicated:	15	min
DMCC/mL:	18,000,000			

Estimated count in chamber:	13,000,000	Cfu/m³
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Testing:

Impinger solution volume:	9	mL
Air circulation started:	11:00	AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	11:30	11:45	4.0	60

Time Chamber Inoculated: 12:00

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline:	12:30	12:40	4.0	40

Time UV Unit Started: 1:00

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	1:30	1:40	4.0	40
Time 2 (60 min)	2:00	2:10	4.0	40
Time 3 (90 min)	2:30	2:42	4.0	48
Time 4 (120 min)	3:00	3:10	4.0	40
Time 5 (180 min)	4:00	4:10	4.0	40
Time 6 (240 min)	5:00	5:15	4.0	60

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	1	0	---	---	150	2.2	---
Baseline	TNTC	TNTC	300	48	11,000,000	7.0	---
Time 1	62	6	2	0	14,000	4.1	2.9
Time 2	17	0	1	0	4,800	3.7	3.3
Time 3	12	4	0	0	2,300	3.4	3.6
Time 4	5	0	---	---	1,100	3.0	4.0
Time 5	0	0	---	---	<230	2.4	4.6
Time 6	0	0	---	---	<150	2.2	4.8

% Removed: 99.9986

Controls

Dilution Blank:	0	Cfu/mL	Impinger Blank:	0	Cfu/mL	Outside Air:	0	Cfu/15 min
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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date: 10-04-06
Barometer reading: 30.11
Test organism: *Bacillus subtilis*
Diluent volume: 9 mL
DMCC/mL: 30,000,000

Temperature: 85 °F
Relative Humidity: 45 %
ATCC#: 6633
Sonicated: 15 min

Estimated count in chamber: 21,000,000

Cfu/m³**Testing:**

Impinger solution volume: 9 mL
Air circulation started: 10:30 AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	11:10	11:25	4.0	15

Time Chamber Inoculated: 11:30

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline	12:04	12:14	4.0	40

Time UV Unit Started: 12:15

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	12:45	12:55	4.0	40
Time 2 (60 min)	1:15	1:25	4.0	40
Time 3 (90 min)	1:45	1:55	4.0	40
Time 4 (120 min)	2:15	2:30	4.0	60
Time 5 (180 min)	3:15	3:25	4.0	40
Time 6 (240 min)	4:15	4:26	4.0	44

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m ³ (per plate)	Log	Log Reduction
Background	1	0	---	---	150	2.2	---
Baseline	TNTC	TNTC	300	34	7,700,000	6.9	---
Time 1	16	4	0	0	3,600	3.6	3.3
Time 2	15	1	0	0	3,400	3.5	3.4
Time 3	4	1	0	0	600	2.8	4.1
Time 4	5	1	0	0	750	2.9	4.0
Time 5	0	0	---	---	<230	2.4	4.5
Time 6	0	0	---	---	<200	2.3	4.6

% Removed: 99.9974

Controls

Dilution Blank: 0 Cfu/mL **Impinger Blank:** 0 Cfu/mL **Outside Air:** 0 Cfu/15 min

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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	11-08-06	Temperature:	70	°F
Barometer reading:	29.90	Relative Humidity:	45	%
Test organism:	<i>Staphylococcus aureus</i>	ATCC#:	6538	
Diluent volume:	9 mL	Sonicated:	15	min
DMCC/mL:	11,000,000			

Estimated count in chamber:	8,000,000	Cfu/m³
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Testing:

Impinger solution volume:	9	mL
Air circulation started:	10:35	AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	11:24	11:58	4.0	136

Time Chamber Inoculated: 12:00

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline:	12:30	12:40	4.0	40

Time UV Unit Started: 12:45

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	1:15	1:25	4.0	40
Time 2 (60 min)	1:45	1:55	4.0	40
Time 3 (90 min)	2:15	2:27	4.0	48
Time 4 (120 min)	2:45	2:56	4.0	44
Time 5 (180 min)	3:46	3:56	4.0	40
Time 6 (240 min)	4:45	4:58	4.0	52

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	10	1	---	---	660	2.8	---
Baseline	---	540	79	6	1,800,000	6.3	---
Time 1	TNTC	80	14	2	180,000	5.3	1.0
Time 2	41	7	0	0	9,200	4.0	2.3
Time 3	7	0	0	0	1,300	3.1	3.2
Time 4	3	0	---	---	610	2.8	3.5
Time 5	0	0	---	---	<230	2.4	3.9
Time 6	0	0	---	---	<170	2.2	4.1

% Removed: 99.9905**Controls**

Dilution Blank:	0	Cfu/mL	Impinger Blank:	0	Cfu/mL	Outside Air:	2	Cfu/15 min
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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	11-09-06	Temperature:	75	°F
Barometer reading:	29.62	Relative Humidity:	45	%
Test organism:	<i>Staphylococcus aureus</i>	ATCC#:	6538	
Diluent volume:	9 mL	Sonicated:	15	min
DMCC/mL:	18,000,000			

Estimated count in chamber:	13,000,000	Cfu/m³
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Testing:

Impinger solution volume:	9	mL
Air circulation started:	10:00	AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	11:14	11:30	4.0	40

Time Chamber Inoculated: 11:31

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline:	12:00	12:10	4.0	40

Time UV Unit Started: 12:15

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	12:45	12:55	4.0	40
Time 2 (60 min)	1:15	1:25	4.0	40
Time 3 (90 min)	1:45	1:55	4.0	40
Time 4 (120 min)	2:15	2:28	4.0	52
Time 5 (180 min)	3:16	3:27	4.0	44
Time 6 (240 min)	4:15	4:25	4.0	40

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	0	0	---	---	230	2.4	---
Baseline	---	TNTC	260	28	6,300,000	6.8	---
Time 1	TNTC	TNTC	110	10	2,500,000	6.4	0.4
Time 2	10	3	0	0	2,300	3.4	3.4
Time 3	3	0	0	0	680	2.8	4.0
Time 4	1	0	0	0	170	2.2	4.6
Time 5	0	0	---	---	<200	2.3	4.5
Time 6	0	0	---	---	<230	2.4	4.4

% Removed: 99.9963

Controls

Dilution Blank:	0	Cfu/mL	Impinger Blank:	0	Cfu/mL	Outside Air:	1	Cfu/15 min
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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	11-10-06	Temperature:	69	°F
Barometer reading:	30.01	Relative Humidity:	40	%
Test organism:	<i>Staphylococcus aureus</i>	ATCC#:	6538	
Diluent volume:	9 mL	Sonicated:	15	min
DMCC/mL:	9,600,000			

Estimated count in chamber:	7,000,000	Cfu/m³
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Testing:

Impinger solution volume:	9	mL
Air circulation started:	10:00	AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	11:40	11:55	4.0	60

Time Chamber Inoculated: 11:55

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline:	12:20	12:30	4.0	40

Time UV Unit Started: 12:30

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	1:00	1:10	4.0	40
Time 2 (60 min)	1:30	1:40	4.0	40
Time 3 (90 min)	2:01	2:11	4.0	40
Time 4 (120 min)	2:30	2:41	4.0	44
Time 5 (180 min)	3:30	3:40	4.0	40
Time 6 (240 min)	4:30	4:48	4.0	72

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	0	0	---	---	<150	2.2	---
Baseline	TNTC	TNTC	160	10	3,600,000	6.6	---
Time 1	---	75	7	1	170,000	2.2	4.4
Time 2	30	2	0	0	6,800	3.8	2.8
Time 3	6	1	0	0	1,400	3.1	3.5
Time 4	1	0	---	---	200	2.3	4.3
Time 5	0	0	---	---	230	2.4	4.2
Time 6	0	0	---	---	130	2.1	4.5

% Removed: 99.9964**Controls**

Dilution Blank:	0	Cfu/mL	Impinger Blank:	0	Cfu/mL	Outside Air:	1	Cfu/15 min
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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	11-13-06	Temperature:	72	°F
Barometer reading:	31.20	Relative Humidity:	45	%
Test organism:	<i>Pseudomonas aeruginosa</i>	ATCC#:	9027	
Diluent volume:	9 mL	Sonicated:	15	min
DMCC/mL:	8,300,000			

Estimated count in chamber:	6,000,000	Cfu/m³
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Testing:

Impinger solution volume:	9	mL
Air circulation started:	9:45	AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	11:00	11:45	4.0	40

Time Chamber Inoculated: 11:20

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline	11:50	12:00	4.0	40

Time UV Unit Started: 12:00

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	12:30	12:40	4.0	40
Time 2 (60 min)	1:00	1:10	4.0	40
Time 3 (90 min)	1:30	1:40	4.0	40
Time 4 (120 min)	2:00	2:10	4.0	40
Time 5 (180 min)	3:00	3:12	4.0	48
Time 6 (240 min)	4:00	4:20	4.0	80

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	2	0	---	---	450	2.7	---
Baseline	---	---	71	8	1,600,000	6.2	---
Time 1	TNTC	22	2	0	50,000	4.7	1.5
Time 2	2	0	0	0	450	2.7	3.5
Time 3	0	0	0	0	<230	2.4	3.8
Time 4	0	0	---	---	<230	2.4	3.8
Time 5	0	0	---	---	<190	2.3	3.9
Time 6	0	0	---	---	<110	2.0	4.2

% Removed: 99.9931**Controls**

Dilution Blank: 0 Cfu/mL Impinger Blank: 0 Cfu/mL Outside Air: 4 Cfu/15 min

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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	11-14-06	Temperature:	69	°F
Barometer reading:	29.75	Relative Humidity:	48	%
Test organism:	<i>Pseudomonas aeruginosa</i>	ATCC#:	9027	
Diluent volume:	9 mL	Sonicated:	15	min
DMCC/mL:	2,200,000			

Estimated count in chamber:	1,600,000	Cfu/m³
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Testing:

Impinger solution volume:	9	mL
Air circulation started:	8:45	AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	9:45	10:16	4.0	80

Time Chamber Inoculated: 10:30

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline:	10:59	11:10	4.0	44

Time UV Unit Started: 11:10

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	11:40	11:50	4.0	40
Time 2 (60 min)	12:10	12:20	4.0	40
Time 3 (90 min)	12:40	12:50	4.0	40
Time 4 (120 min)	1:10	1:20	4.0	40
Time 5 (180 min)	2:10	2:20	4.0	40
Time 6 (240 min)	3:10	3:30	4.0	80

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	1	0	---	---	110	2.0	---
Baseline	---	91	10	1	190,000	5.3	---
Time 1	10	1	0	0	2,300	3.4	1.9
Time 2	6	0	0	0	1,400	3.1	2.2
Time 3	2	0	0	0	450	2.7	2.6
Time 4	1	0	---	---	230	2.4	2.9
Time 5	0	0	---	---	<230	2.4	2.9
Time 6	0	0	---	---	<110	2.0	3.3

% Removed: 99.9421**Controls**

Dilution Blank:	0	Cfu/mL	Impinger Blank:	0	Cfu/mL	Outside Air:	0	Cfu/15 min
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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	11-15-2006	Temperature:	72	°F
Barometer reading:	30.00	Relative Humidity:	55	%
Test organism:	<i>Pseudomonas aeruginosa</i>	ATCC#:	9027	
Diluent volume:	9 mL	Sonicated:	15	min
DMCC/mL:	2,500,000			

Estimated count in chamber:	1,800,000	Cfu/m³
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Testing:

Impinger solution volume:	9	mL
Air circulation started:	9:30	AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	10:30	10:50	4.0	80

Time Chamber Inoculated: 10:50

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline	11:20	11:30	4.0	40

Time UV Unit Started: 11:30

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	12:00	12:10	4.0	40
Time 2 (60 min)	12:30	12:40	4.0	40
Time 3 (90 min)	1:00	1:10	4.0	40
Time 4 (120 min)	1:30	1:40	4.0	40
Time 5 (180 min)	2:30	2:40	4.0	40
Time 6 (240 min)	3:30	4:00	4.0	120

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	0	0	---	---	<110	2.0	---
Baseline	---	250	25	5	560,000	5.7	---
Time 1	5	0	0	0	1,100	3.0	2.7
Time 2	1	0	0	0	230	2.4	3.3
Time 3	0	0	0	0	<230	2.4	3.3
Time 4	0	0	---	---	<230	2.4	3.3
Time 5	0	0	---	---	<230	2.4	3.3
Time 6	0	0	---	---	<75	1.9	3.8

% Removed: 99.9866**Controls**

Dilution Blank: 0 Cfu/mL Impinger Blank: 0 Cfu/mL Outside Air: 0 Cfu/15 min

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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	11-27-06	Temperature:	62	°F
Barometer reading:	30.25	Relative Humidity:	60	%
Test organism:	<i>Klebsiella pneumoniae</i>	ATCC#:	4352	
Diluent volume:	9 mL	Sonicated:	30	min
DMCC/mL:	18,000,000	PAC/mL	32,000,000	
Estimated count in chamber:	13,000,000	Cfu/m³		

Testing:

Impinger solution volume: 9 mL + 1 drop of sterile Tween 80
Air circulation started: 8:30 AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	9:30	9:50	4.0	80

Time Chamber Inoculated: 9:50

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline:	10:20	10:30	4.0	40

Time UV Unit Started: 10:30

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	11:00	11:10	4.0	40
Time 2 (60 min)	11:30	11:40	4.0	40
Time 3 (90 min)	12:00	12:10	4.0	40
Time 4 (120 min)	12:30	12:50	4.0	80
Time 5 (180 min)	1:30	1:50	4.0	80
Time 6 (240 min)	2:30	3:00	4.0	120

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	2	0	---	---	230	2.4	---
Baseline	TNTC	TNTC	300	38	4,900,000	6.7	---
Time 1	11	2	0	0	2,500	3.4	3.3
Time 2	3	1	0	0	680	2.8	3.9
Time 3	0	0	0	0	<230	2.4	4.3
Time 4	0	0	---	---	<110	2.0	4.7
Time 5	0	0	---	---	<110	2.0	4.7
Time 6	0	0	---	---	<75	1.9	4.8

% Removed: 99.9985**Controls**

Dilution Blank: 0 Cfu/mL **Impinger Blank:** 0 Cfu/mL **Outside Air:** 0 Cfu/15 min

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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date:	11-29-06	Temperature:	76	°F
Barometer reading:	30.58	Relative Humidity:	30	%
Test organism:	<i>Klebsiella pneumoniae</i>	ATCC#:	4352	
Diluent volume:	9 mL	Sonicated:	30	min
DMCC/mL:	16,000,000	PAC/mL	92,000,000	
Estimated count in chamber:	12,000,000	Cfu/m³		

Testing:

Impinger solution volume: 9 mL + 1 drop of sterile Tween 80
Air circulation started: 8:30 AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	9:38	9:58	4.0	80

Time Chamber Inoculated: 10:00

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline:	10:20	10:30	4.0	40

Time UV Unit Started: 10:30

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	11:00	11:15	4.0	60
Time 2 (60 min)	11:30	11:45	4.0	60
Time 3 (90 min)	12:00	12:20	4.0	80
Time 4 (120 min)	12:30	12:50	4.0	80
Time 5 (180 min)	1:30	1:50	4.0	80
Time 6 (240 min)	2:30	3:00	4.0	120

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	1	0	---	---	110	2.0	---
Baseline	TNTC	480	60	1	1,400,000	6.1	---
Time 1	17	0	0	0	2,600	3.4	2.7
Time 2	6	0	0	0	900	3.0	3.1
Time 3	1	0	0	0	110	2.0	4.1
Time 4	0	0	---	---	<110	2.0	4.1
Time 5	0	0	---	---	<110	2.0	4.1
Time 6	0	0	---	---	<75	1.9	4.2

% Removed: 99.9946**Controls**

Dilution Blank: 0 Cfu/mL **Impinger Blank:** 0 Cfu/mL **Outside Air:** 0 Cfu/15 min

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**Chamber Study Raw Data:**

Chamber volume: 12.35 cubic meters/(12,346L)/436 cubic feet

Date: 2-20-07	Temperature: 65	°F
Barometer reading: 30.05	Relative Humidity: 72	%
Test organism: <i>Klebsiella pneumoniae</i>	ATCC#: 4352	
Diluent volume: 9 mL	Sonicated: 30	min
DMCC/mL: 12,000,000	PAC/mL: 20,000,000	

Estimated count in chamber: 8,700 000 **Cfu/m³**

Testing:

Impinger solution volume: 9 mL + 1 drop of sterile Tween 80
Air circulation started: 9:15 AM

Sampling:

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Background	10:00	10:15	4.0	60

Time Chamber Inoculated: 10:20

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Baseline:	10:50	11:00	4.0	40

Time UV Unit Started: 11:00

Air Pump:	Time on:	Time off:	Flow (LPM):	Volume (liters)
Time 1 (30 min)	11:30	11:40	4.0	40
Time 2 (60 min)	12:00	12:15	4.0	60
Time 3 (90 min)	12:30	12:45	4.0	60
Time 4 (120 min)	1:00	1:20	4.0	80
Time 5 (180 min)	2:00	2:25	4.0	100
Time 6 (240 min)	3:00	3:40	4.0	160

PAC Counts

Sample Volume	1 mL	0.1 mL	0.01 mL	0.001 mL	CFU/m³ (per plate)	Log	Log Reduction
Background	0	0	---	---	<150	2.2	---
Baseline	TNTC	410	66	4	1,500,000	6.2	---
Time 1	9	0	0	0	2,000	3.3	2.9
Time 2	6	0	0	0	900	3.0	3.2
Time 3	1	0	---	---	150	2.2	4.0
Time 4	0	0	---	---	<110	2.0	4.2
Time 5	0	0	---	---	<90	2.0	4.2
Time 6	0	0	---	---	<56	1.7	4.5

% Removed: 99.9963

Controls

Dilution Blank: 0 Cfu/mL **Impinger Blank:** 0 Cfu/mL **Outside Air:** 0 Cfu/15 min