

STUDY TITLE

Evaluation of Antimicrobial Activity of UV Illumination /  
Hydroxyl Exposure

**Test Organisms:**

*Aspergillus niger* (ATCC 16404)  
*Listeria monocytogenes* (ATCC 19111)

PRODUCT IDENTITY

Odorox Mobile Disinfection Unit Hydroxyl Generator

AUTHOR

Scott R. Steinagel, B.S.  
Manager, Microbiology Laboratory Operations

STUDY COMPLETION DATE

November 26, 2008

PERFORMING LABORATORY

ATS Labs  
1285 Corporate Center Drive, Suite 110  
Eagan, MN 55121

SPONSOR

Safety Performance Solutions, Inc.  
3908 Kingston Drive  
Bismarck, ND 58503

PROJECT NUMBER

A07003

## STUDY REPORT

### GENERAL STUDY INFORMATION

**Study Title:** Evaluation of Antimicrobial Activity of UV Illumination / Hydroxyl Exposure  
**Project Number:** A07003  
**TRF Number:** SPS01110608.CUST

### TEST SUBSTANCE IDENTITY

**Test Substance Name:** Odorox Mobile Disinfection Unit Hydroxyl Generator

### STUDY DATES

**Date Sample Received:** September 30, 2008  
**Study Initiation Date:** November 11, 2008  
**Experimental Start Date:** November 12, 2008  
**Experimental End Date:** November 17, 2008  
**Study Completion Date:** November 26, 2008

Test Organism	ATCC #	Culture Medium	Subculture Plate Medium
<i>Aspergillus niger</i>	16404	Sabouraud Agar Modified	Sab Dex Agar
<i>Listeria monocytogenes</i>	19111	Brain Heart Infusion broth	Tryptic Soy Agar with 5% Sheep's Blood (BAP)

The microorganisms used in this study were obtained from the American Type Culture Collection (ATCC), Manassas, Virginia.

**Test Exposure:** *Aspergillus niger* (ATCC 16404)= 24 hours  
*Listeria monocytogenes* (ATCC 19111)= 4 hours

**Exposure Temperature:** Room temperature (21-22°C)

**Number of Carriers Tested/lot:** Duplicate carriers per exposure time, per test organism utilizing two carrier types, 1" x 1" stainless steel and 1" x 1" cotton fabric

**Soil Load Description:** No organic soil load required

**Neutralizing Subculture Medium:** Lethen Broth with 0.07% Lecithin and 0.5% Tween 80

### EXPERIMENTAL DESIGN

A room (approximately 14' by 24' x 10') was prepared for testing by sealing all HVAC vents and the single doorway with 4 mil plastic sheeting and duct tape. The Odorox Mobile Disinfection Unit Hydroxyl Generator was powered on and was allowed to run for 59 minutes in the prepared room. Duplicate test carriers, per carrier type, per test organism, inoculated with a dried film of test culture, were placed within the room. Fabric carriers were allowed to hang freely, while stainless steel carriers were exposed within Petri dishes with the dish lids fully ajar. Following exposure, the carriers were neutralized, mixed and assayed for survivors. Appropriate purity, carrier sterility, neutralizing subculture medium sterility, and carrier quantitation controls were performed. Percent and log<sub>10</sub> reductions were determined for the test carriers as compared to the carrier quantitation control carriers (evaluated immediately after drying).

**TABLE 1: CONTROL RESULTS**

Type of Control		Results	
		<i>Aspergillus niger</i> (ATCC 16404)	<i>Listeria monocytogenes</i> (ATCC 19111)
Purity Control		Pure	Pure
Neutralizing Subculture Medium Sterility Control		No Growth	
Carrier Sterility Control	Stainless Steel	No Growth	
	Cotton Fabric	No Growth	

**TABLE 2: EVALUATION OF CARRIER QUANTITATION CONTROL DATA  
 (Evaluation immediately after drying)**

Test Organism	Carrier type	Average CFU/carrier	Average Log <sub>10</sub>
<i>Aspergillus niger</i> (ATCC 16404)	Stainless Steel	3.43 x 10 <sup>5</sup>	5.519
	Cotton Fabric	2.95 x 10 <sup>5</sup>	5.470
<i>Listeria monocytogenes</i> (ATCC 19111)	Stainless Steel	3.77 x 10 <sup>6</sup>	6.574
	Cotton Fabric	3.10 x 10 <sup>5</sup>	5.49

CFU = Colony Forming Unit

**TABLE 3: EVALUATION OF CARRIER QUANTITATION CONTROL DATA  
 (Evaluation following the test exposure period)**

Test Organism	Carrier type	CFU/carrier	Log <sub>10</sub>
<i>Aspergillus niger</i> (ATCC 16404) (24 hours)	Stainless Steel	2.10 x 10 <sup>5</sup>	5.322
	Cotton Fabric	9.2 x 10 <sup>4</sup>	4.96
<i>Listeria monocytogenes</i> (ATCC 19111) (4 hours)	Stainless Steel	4.46 x 10 <sup>5</sup>	5.649
	Cotton Fabric	3.48 x 10 <sup>3</sup>	3.542

CFU = Colony Forming Unit

**TABLE 4: EVALUATION OF TEST CARRIER DATA**

Test Substance	Test Organism	Carrier type	Average CFU/carrier	Average Log <sub>10</sub>
Odorox Mobile Disinfection Unit Hydroxyl Generator	<i>Aspergillus niger</i> (ATCC 16404) (24 hours)	Stainless Steel	1.7 x 10 <sup>5</sup>	5.23
		Cotton Fabric	1.4 x 10 <sup>5</sup>	5.12
	<i>Listeria monocytogenes</i> (ATCC 19111) (4 hours)	Stainless Steel	2.0 x 10 <sup>5</sup>	5.30
		Cotton Fabric	4.28 x 10 <sup>3</sup>	3.625

CFU = Colony Forming Unit

**TABLE 5: CALCULATED VALUES**

Test Substance	Test Organism	Carrier type	Percent Reduction	Log <sub>10</sub> Reduction
Odorox Mobile Disinfection Unit Hydroxyl Generator	<i>Aspergillus niger</i> (ATCC 16404) (24 hours)	Stainless Steel	50.4%	0.29
		Cotton Fabric	52.5%	0.35
	<i>Listeria monocytogenes</i> (ATCC 19111) (4 hours)	Stainless Steel	94.7%	1.27
		Cotton Fabric	98.6%	1.87

CFU = Colony Forming Unit

**CONTROL RESULTS**

The results of controls run for purity, carrier sterility, neutralizing subculture medium sterility, and carrier quantitation were all acceptable.

**ANALYSIS**

**Odorox Mobile Disinfection Unit Hydroxyl Generator, demonstrated a 50.4% (0.29 log<sub>10</sub>) reduction on stainless steel and a 52.5% (0.35 log<sub>10</sub>) reduction on cotton fabric for *Aspergillus niger* (ATCC16404) following a 24 hour exposure period when tested at room temperature (21-22°C).**

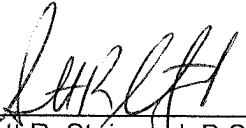
**Odorox Mobile Disinfection Unit Hydroxyl Generator, demonstrated a 94.7% (1.27 log<sub>10</sub>) reduction on stainless steel and a 98.6% (1.87 log<sub>10</sub>) reduction on cotton fabric for *Listeria monocytogenes* (ATCC 19111) following a 4 hour exposure period when tested at room temperature (21-22°C).**

This study was performed following ATS Labs' Standard Operating Procedures (SOPs) and internal quality systems.

**PROFESSIONAL PERSONNEL INVOLVED:**

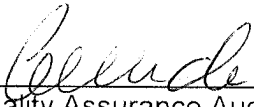

David Rottjakob, M.T.	- Director, Microbiology Services
Scott R. Steinagel, B.S.	- Manager, Microbiology Laboratory Operations
Anne Stemper, B.S.	- Research Scientist I
Becky Lien, B.A.	- Research Scientist I
Erin Hawkinson, B.S.	- Research Assistant I
Megan McDonald, B.S.	- Research Assistant I

**PREPARED BY:**

  
\_\_\_\_\_  
Scott R. Steinagel, B.S.  
Manager, Microbiology Laboratory Operations

11-26-08  
\_\_\_\_\_  
Date

**REVIEWED BY:**

   
\_\_\_\_\_  
Quality Assurance Auditor

11/26/08  
\_\_\_\_\_  
Date

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