ACCURATUS
—LAB SERVICES—
THE ANTIMICROBIAL AUTHORITY

FINAL STUDY REPORT

STUDY TITLE

AOAC Use-Dilution Method

Test Organisms:

Pseudomonas aeruginosa (ATCC 15442)
Staphylococcus aureus (ATCC 6538)

PRODUCT IDENTITY

Oxine
Lot # 1605-011-2LCL, Lot# 1606-012-2LCL and Lot# 1606-013-2LCL

TEST GUIDELINE

OCSPP 810.2200

PROTOCOL NUMBER

BCI03061516.UD

AUTHOR

Jamie Herzan, B.S.
Study Director

STUDY COMPLETION DATE

August 18, 2016

PERFORMING LABORATORY

Accuratus Lab Services
1285 Corporate Center Drive, Suite 110
Eagan, MN 55121

SPONSOR

Bio-Cide International, Inc.
2650 Venture Drive
Norman, OK 73026

PROJECT NUMBER

A21358

STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

No claim of confidentiality, on any basis whatsoever, is made for any information contained in this document. I acknowledge that information not designated as within the scope of FIFRA sec. 10(d)(1)(A), (B), or (C) and which pertains to a registered or previously registered pesticide is not entitled to confidential treatment and may be released to the public, subject to the provisions regarding disclosure to multinational entities under FIFRA 10(g).

Company: Bio-Cide International, Inc.

Company Agent: James P. Ringo

Vice President of Regulatory Affairs
Title

James P. Ringo
Signature

Date: 10/12/2016

GOOD LABORATORY PRACTICE STATEMENT

The study referenced in this report was conducted in compliance with U.S. Environmental Protection Agency Good Laboratory Practice (GLP) regulations set forth in 40 CFR Part 160 with the following exceptions:

Stability testing of the compounds was not performed by the Sponsor prior to use in the study or concurrent with the study per 40 CFR Part 160.

The following studies were not performed following GLP regulations: characterization of the compounds.

Submitter: Dr. [signature] Date: 10/12/16

Sponsor: [signature] Date: 10/12/2016

Study Director: Jamie Herzan Date: 8-18-16
Jamie Herzan, B.S.

QUALITY ASSURANCE UNIT SUMMARY

Study: AOAC Use-Dilution Method

The objective of the Quality Assurance Unit is to monitor the conduct and reporting of non-clinical laboratory studies. This study has been performed in accordance to standard operating procedures and the study protocol. In accordance with Good Laboratory Practice regulation 40 CFR Part 160, the Quality Assurance Unit maintains a copy of the study protocol and standard operating procedures and has inspected this study on the date(s) listed below. Studies are inspected at time intervals to assure the integrity of the study. The findings of these inspections have been reported to Management and the Study Director.

Phase Inspected	Date of Phase Inspection	Date Reported to Study Director	Date Reported to Management
Critical Phase Audit: Exposure Conditions	July 28, 2016	July 28, 2016	July 29, 2016
Final Report	August 12, 2016	August 12, 2016	August 18, 2016

Quality Assurance Specialist: Cody Young Date: 8/18/16

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STUDY PERSONNEL

STUDY DIRECTOR: Jamie Herzan, B.S.

Professional personnel involved:

Becky Lien, B.A.	- Manager, Study Director Operations
Kristen Niehaus, B.A.	- Supervisor, Microbiology Laboratory Operations
Adam W. Pitt, B.S.	- Lead Research Scientist
John Egan, B.S.	- Microbiologist
Andrea Epperly, B.S.	- Microbiologist
Kyle Kuras, B.S.	- Microbiologist
Thomas Casey, B.S.	- Microbiologist
T'Yanna Singleton, B.S.	- Associate Microbiologist
Matthew Kranz, B.S.	- Associate Microbiologist

STUDY REPORT

GENERAL STUDY INFORMATION

Study Title: AOAC Use-Dilution Method

Project Number: A21358

Protocol Number: BCI03061516.UD

Sponsor: Bio-Cide International, Inc.
2650 Venture Drive
Norman, OK 73026

Test Facility: Accuratus Lab Services
1285 Corporate Center Drive, Suite 110
Eagan, MN 55121

TEST SUBSTANCE IDENTITY

Test Substance Name: Oxine

Lot/Batch(s): Lot# 1605-011-2LCL, Lot# 1606-012-2LCL and Lot# 1606-013-2LCL

Test Substance Characterization
Test substance characterization as to identity, strength, purity, solubility and composition, as applicable, was documented prior to its use in the study, however, not in accordance to 40 CFR, Part 160, Subpart F [160.105]. The Test Substance Certificate of Analysis Reports may be found in Attachments I-III.

STUDY DATES

Date Sample Received: July 6, 2016
Study Initiation Date: July 11, 2016
Experimental Start Date: July 28, 2016 (Start time: 1:53 pm)
Experimental End Date: August 3, 2016 (End time: 9:30 am)
Study Completion Date: August 18, 2016

OBJECTIVE

The objective of this study was to determine the effectiveness of the Sponsor's product as a disinfectant for hard surfaces following the AOAC Use-Dilution Method. This method is in compliance with the requirements of the U.S. Environmental Protection Agency (EPA).

SUMMARY OF RESULTS

Test Substance:	Oxine (Lot# 1605-011-2LCL, Lot# 1606-012-2LCL and Lot# 1606-013-2LCL)
Dilution:	1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of sterile tap water
Test Organisms:	*Pseudomonas aeruginosa* (ATCC 15442) *Staphylococcus aureus* (ATCC 6538)
Exposure Time:	10 minutes
Exposure Temperature:	20±1°C (19.0-20.5°C)
Organic Soil Load:	No organic soil load required
Number of Carriers:	60 per batch
Efficacy Result:	Oxine demonstrated efficacy of three batches evaluated on three separate test dates against *Pseudomonas aeruginosa*, and therefore, meets the performance requirements set forth by the U.S. EPA following a 10 minute exposure time at 20±1°C (19.0-20.5°C). Oxine demonstrated efficacy of three batches evaluated on three separate test dates against *Staphylococcus aureus*, and therefore, meets the performance requirements set forth by the U.S. EPA following a 10 minute exposure time at 20±1°C (19.5-20.0°C).

STUDY MATERIALS

Test System/Growth Media

Test Organism	Designation #	Growth Medium	Incubation Parameters
Pseudomonas aeruginosa	15442	Synthetic Broth	35-37°C, aerobic
Staphylococcus aureus	6538	Synthetic Broth	35-37°C, aerobic

The test organism(s) used in this study was/were obtained from the American Type Culture Collection (ATCC), Manassas, VA.

Recovery Media

Neutralizing Subculture Medium: Letheen Broth + 0.1% Sodium Thiosulfate

Agar Plate Medium: Tryptic Soy Agar with 5% Sheep Blood (BAP)

Reagents
Tap Water Description:
The Sponsor specified sterile tap water was used as the test substance diluent in testing. For testing performed on 7/28/16, the tap water used in testing was determined to have a 26 ppm hardness. For testing performed on 7/29/16 and 8/1/16, the tap water used in testing was determined to have a 25 ppm hardness.

Carriers
Carriers were screened according to the AOAC Official Method of Analysis and all carriers positive for growth were discarded. Only penicylinders which demonstrated no growth during screening were used in this test. Stainless steel penicylinders were pre-soaked overnight in 1N NaOH, washed in water until neutral and autoclaved in deionized water. Carriers were used within three months of sterilization.

TEST METHOD

To satisfy the requirement to evaluate each test substance lot on separate test dates, Lot# 1605-011-2LCL was tested on 7/28/16, Lot# 1606-012-2LCL was tested on 7/29/16 and Lot# 1606-013-2LCL was tested on 8/1/16.

Preparation of Test Substance
On each test date, 0.5 grams of dry activator crystals (Trichloro-s-Triazinetrione) were added to 94.6 mL of Oxine solution. The solution was gently stirred with a magnetic stir bar (See Protocol Deviation) until the activator crystals were completely dissolved. An equivalent dilution of 1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of diluent, was prepared using 50.0 mL of the test substance and 1950 mL of filter sterilized soft tap water. Volumetric glassware was used.

The prepared test substance was homogenous as determined by visual observation and was used within three hours of preparation. Ten (10.0) mL aliquots of the test substance at the concentration under test were transferred to sterile 25 x 150 mm tubes, placed in a 20±1°C (19.0-20.5°C) water bath and allowed to equilibrate for ≥10 minutes prior to testing.

Preparation of Test Organisms
A 10 µL aliquot of a thawed, vortex mixed cryovial of stock organism broth culture was transferred to an initial 10 mL tube of growth medium.

The tube was mixed and the initial culture was incubated for 24±2 hours at 35-37°C. Following incubation, without vortex mixing the *Pseudomonas aeruginosa* culture, a 10 µL aliquot of culture was transferred to sufficient 20 x 150 mm Morton Closure tubes containing 10 mL of culture medium (daily transfer #1). For testing performed on 7/28/16, three additional daily transfers were prepared inoculating a sufficient number of tubes for the final test culture. For testing performed on 7/29/16, four additional daily transfers were prepared inoculating a sufficient number of tubes for the final test culture. The final test cultures were incubated for 48-54 hours at 35-37°C.

On the day of use, the pellicle was carefully aspirated from the *Pseudomonas aeruginosa* culture by vacuum aspiration. Care was taken to avoid disrupting the pellicle and any visible pellicle on the bottom of the tube was not harvested. To avoid harvesting any visible pellicle at the bottom of the tube, the upper portion of the culture was transferred to a sterile tube. Any culture with disrupted pellicle was not used.

Each test culture was vortex mixed for 3 to 4 seconds and allowed to stand for ≥10 minutes prior to use. After this time, the upper portion of the culture was removed, leaving behind any clumps or debris and was pooled in a sterile vessel and mixed. The *Pseudomonas aeruginosa* culture was visually inspected to ensure no pellicle fragments were present.

The *Pseudomonas aeruginosa* culture was diluted using sterile growth medium by combining 17.5 mL of test organism suspension with 52.5 mL of sterile growth medium.

The *Staphylococcus aureus* culture was diluted using sterile growth medium by combining 35.0 mL of test organism suspension with 35.0 mL of sterile growth medium.

Each final test culture was mixed thoroughly prior to use.

Contamination of Carriers
The culture was transferred to the penicylinders (after siphoning off the water) and the carriers were immersed for 15±2 minutes in a prepared suspension at a ratio of one carrier per one mL of culture. The carriers were completely covered by the culture. A maximum of 100 carriers were inoculated per vessel and each vessel inoculated was considered a part of one total inoculation run per test organism. The inoculated carriers were transferred to sterile Petri dishes matted with filter paper after tapping the carrier against the side of the container to remove excess inoculum. No more than twelve carriers were placed in each Petri dish. The carriers were dried for 38 minutes at 35-37°C (36.5-36.7°C) and at 49.6-54.1% relative humidity. Carriers were used in the test procedure within 2 hours of drying.

Exposure Conditions
Each contaminated and dried carrier was placed into a separate tube containing 10.0 mL of the test substance at its use-dilution. Immediately after placing each test carrier in the test tube, the tube was swirled using approximately 2–3 gentle rotations to release any air bubbles trapped in or on the carrier. The carriers were exposed for 10 minutes at 19.0-20.5°C. Care was taken to avoid touching the sides of the tubes. The carrier was placed into the test substance within ±5 seconds of the exposure time following a calibrated timer.

Test System Recovery
Following the Sponsor specified exposure time, each medicated carrier was transferred by wire hook at staggered intervals to 10 mL of neutralizing subculture medium and each tube was shaken thoroughly. To accomplish this, the carrier was removed from the disinfectant tube with a sterile hook, tapped against the interior sides of the tube to remove the excess disinfectant and transferred into the subculture tube. Tapping the carrier against the upper third of the tube was avoided. Care was taken to avoid excessive contact with the interior sides of the subculture tubes during transfer.

Incubation and Observation
All subculture vessels and control plates were incubated for 48±2 hours at 35-37°C. For testing performed on 7/28/16 and 7/29/16, subcultures were stored at 2-8°C for two days prior to examination. Following incubation and storage, the subcultures were visually examined for the presence or absence of growth.

On 8/2/16, representative test and positive control subculture tubes showing growth were subcultured to Tryptic Soy Agar + 5% Sheep's blood and incubated at 35-37°C for one day. The resultant growth was visually examined, Gram stained and biochemically assayed to confirm or rule out the presence of the test organism.

STUDY CONTROLS

Study controls were performed the same on each test date, unless otherwise noted.

Purity Control
A "streak plate for isolation" was performed on each organism culture and following incubation examined in order to confirm the presence of a pure culture. The acceptance criterion for this study control is a pure culture demonstrating colony morphology typical of the test organism.

Carrier Sterility Control
A representative uninoculated carrier was added to the neutralizing subculture medium. The subculture medium containing the carrier was incubated and examined for growth. The acceptance criterion for this study control is lack of growth.

Neutralizing Subculture Medium Sterility Control
A representative sample of uninoculated neutralizing subculture medium was incubated and visually examined. The acceptance criterion for this study control is lack of growth.

Viability Control
One representative inoculated carrier, per test organism, was added to a vessel containing subculture medium. The vessels containing each carrier were incubated and visually examined for growth. The acceptance criterion for this study control is growth in the subculture medium.

Neutralization Confirmation Control
The neutralization of the test substance was confirmed concurrent with testing by exposing at least one sterile carrier to the test substance and transferring the carrier to subcultures containing 10 mL of neutralizing subculture medium as in the test. The subcultures were inoculated with a target of 10-100 colony forming units (CFU) of each test organism, incubated under test conditions and visually examined for the presence of growth. This control was performed with multiple replicates using different dilutions of the test organism. A standardized spread plate procedure was run concurrently in order to enumerate the number of CFU per tube actually added. .

The acceptance criterion for this study control is growth in the subculture broth following inoculation with ≤100 CFU per tube.

Carrier Population Control
Two sets of three inoculated carriers (one set prior to testing and one set following testing) for each organism carrier set were assayed. Each inoculated carrier was individually subcultured into a tube containing 10 mL of neutralizing subculture medium and sonicated for 1 minute ±5 seconds. Tubes were contained in a beaker with water suspended in the ultrasonic cleaner such that all fluids were level. Following sonication, the contents of the three subcultured carriers were pooled (30 mL) and briefly vortex mixed. Appropriate serial ten-fold dilutions were prepared and the duplicate aliquots spread plated on agar plate medium and incubated. Following incubation, the resulting colonies were enumerated and the CFU per carrier set was calculated. The individual CFU per carrier set results were calculated and the Log_{10} value of each carrier set was determined. The average Log_{10} value per organism was calculated. the acceptance criterion for this study control is a minimum average Log_{10} value of 6.0.

STUDY ACCEPTANCE CRITERIA

Test Substance Performance Criteria
For *Staphylococcus aureus*, the efficacy performance requirements for label claims state that the test substance must kill the microorganism on 57 out of the 60 inoculated carriers.

For *Pseudomonas aeruginosa*, the efficacy performance requirements for label claims state that the test substance must kill the microorganism on 54 out of the 60 inoculated carriers.

Control Acceptance Criteria
The study controls must perform according to the criteria detailed in the study controls description section.

PROTOCOL CHANGES

Protocol Amendment:
Due to a typographical error, the protocol is amended to check the "Yes" box on page 10 that indicates that a supplemental information form is attached to the protocol.

Protocol Deviation:
Per the protocol, the test substance solution was to be stirred gently with a glass rod until the activator crystals were completely dissolved. In testing, a magnetic stir bar was used to stir the test substance solution until the activator crystals were completely dissolved. This deviation has no impact on the overall intent of the protocol as the activator crystals were completely dissolved in the test substance solution when stirred with a magnetic stir bar.

DATA ANALYSIS

Calculations

The CFU/Carrier set in the Carrier Population Control was determined using all average counts between 0-300 CFU as follows:

$$\text{CFU/carrier} = \frac{[(\text{avg. CFU for } 10^{-x}) + (\text{avg. CFU for } 10^{-y}) + (\text{avg. CFU for } 10^{-z})] \times (\text{Volume of neutralizer})}{[10^{-x} + 10^{-y} + 10^{-z}] \times (\text{Volume plated}) \times (\#\text{ of carriers per set})}$$

Where 10^{-x}, 10^{-y}, and 10^{-z} are example dilutions that may be used

$$\text{Average } \text{Log}_{10} \text{ Carrier Population Control} = \frac{\text{Log}_{10}X_1 + \text{Log}_{10}X_2 + \ldots \text{Log}_{10}X_N}{N}$$

Where: X equals CFU/carrier set
N equals number of control carrier sets

Statistical Analysis

None used.

STUDY RETENTION

Record Retention

All of the original raw data developed exclusively for this study shall be archived at Accuratus Lab Services, 1285 Corporate Center Drive, Suite 110, Eagan, MN 55121 for a minimum of five years following the study completion date. After this time, the Sponsor (or the Sponsor Representative, if applicable) will be contacted to determine the final disposition. The original data includes, but is not limited to, the following:

1. All handwritten raw data for control and test substances including, but not limited to, notebooks, data forms and calculations.
2. Any protocol amendments/deviation notifications.
3. All measured data used in formulating the final report.
4. Memoranda, specifications, and other study specific correspondence relating to interpretation and evaluation of data, other than those documents contained in the final study report.
5. Original signed protocol.
6. Certified copy of final study report.
7. Study-specific SOP deviations made during the study.

Test Substance Retention

The test substance will be discarded following study completion. It is the responsibility of the Sponsor to retain a sample of the test substance.

REFERENCES

1. Association of Official Analytical Chemists (AOAC) Official Method 964.02, Testing Disinfectants against *Pseudomonas aeruginosa* - Use-Dilution Method. In Official Methods of Analysis of the AOAC, 2013 Edition.
2. Association of Official Analytical Chemists (AOAC) Official Method 955.15, Testing Disinfectants against *Staphylococcus aureus* - Use-Dilution Method. In Official Methods of Analysis of the AOAC, 2013 Edition.
3. Association of Official Analytical Chemists (AOAC) Official Method 955.14, Testing Disinfectants against *Salmonella enterica*- Use-Dilution Method. In Official Methods of Analysis of the AOAC, 2013 Edition.
4. Association of Official Analytical Chemists (AOAC) Official Method 960.09, Germicidal and Detergent Sanitizing Action of Disinfectants Method [Preparation of Synthetic Hard Water]. In Official Methods of Analysis of the AOAC, 2013 Edition.
5. U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, Product Performance Test Guidelines, OCSPP 810.2000: General Considerations for Uses of Antimicrobial Agents, September 4, 2012.
6. U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, Product Performance Test Guidelines, OCSPP 810.2200: Disinfectants for Use on Hard Surfaces- Efficacy Data Recommendations, September 4, 2012.

RESULTS

For Control and Neutralization Results, see Tables 1-3.
All data measurements/controls including the culture purity, viability, neutralizing subculture medium sterility, carrier sterility, carrier population, and neutralization confirmation were within acceptance criteria.

For Test Results, see Table 4.

ANALYSIS

Oxine (Lot# 1605-011-2LCL) diluted 1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of sterile tap water, demonstrated no growth of *Pseudomonas aeruginosa* (ATCC 15442) in any of the 60 subculture tubes following a 10 minute exposure time at 20±1°C (20.0°C).

Oxine (Lot# 1606-012-2LCL) diluted 1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of sterile tap water, demonstrated growth of *Pseudomonas aeruginosa* (ATCC 15442) in 1 of the 60 subculture tubes following a 10 minute exposure time at 20±1°C (20.5°C).

Oxine (Lot# 1606-013-2LCL) diluted 1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of sterile tap water, demonstrated no growth of *Pseudomonas aeruginosa* (ATCC 15442) in any of the 60 subculture tubes following a 10 minute exposure time at 20±1°C (19.0°C).

Oxine (Lot# 1605-011-2LCL) diluted 1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of sterile tap water, demonstrated no growth of *Staphylococcus aureus* (ATCC 6538) in any of the 60 subculture tubes following a 10 minute exposure time at 20±1°C (20.0°C).

Oxine (Lot# 1606-012-2LCL) diluted 1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of sterile tap water, demonstrated growth of *Staphylococcus aureus* (ATCC 6538) in 3 of the 60 subculture tubes following a 10 minute exposure time at 20±1°C (20.0°C).

Oxine (Lot# 1606-013-2LCL) diluted 1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of sterile tap water, demonstrated no growth of *Staphylococcus aureus* (ATCC 6538) in any of the 60 subculture tubes following a 10 minute exposure time at 20±1°C (19.5°C).

STUDY CONCLUSION

Under the conditions of this investigation, Oxine, diluted 1:40 / 480 ppm defined as 25.0 mL of test substance + 975.0 mL of sterile tap water, evaluated on three separate test dates, demonstrated efficacy against *Pseudomonas aeruginosa* and *Staphylococcus aureus* as required by the U.S. EPA following a 10 minute exposure time at 20±1°C (19.0-20.5°C).

In the opinion of the Study Director, there were no circumstances that may have adversely affected the quality or integrity of the data.

TABLE 1: CONTROL RESULTS

The following results from controls confirmed study validity:

Type of Control	Results	
	Pseudomonas aeruginosa **(ATCC 15442)**	***Staphylococcus aureus*** **(ATCC 6538)**
Date Performed: 7/28/16		
Purity Control	Pure	Pure
Viability Control	Growth	Growth
Neutralizing Subculture Medium Sterility Control	No Growth	
Carrier Sterility Control	No Growth	
Date Performed: 7/29/16		
Purity Control	Pure	Pure
Viability Control	Growth	Growth
Neutralizing Subculture Medium Sterility Control	No Growth	
Carrier Sterility Control	No Growth	
Date Performed: 8/1/16		
Purity Control	Pure	Pure
Viability Control	Growth	Growth
Neutralizing Subculture Medium Sterility Control	No Growth	
Carrier Sterility Control	No Growth	

TABLE 2: CARRIER POPULATION CONTROL RESULTS

Test Organism: *Pseudomonas aeruginosa*								
Test Date	Carrier Set	Dilution Factor (0.100 mL plated)				CFU/ carrier	Log_{10}	Average Log_{10}
		10^{-1}	10^{-2}	10^{-3}	10^{-4}			
7/28/16	Pre-testing	T, T	202, 220	33, 26	1, 5	2.20×10^6	6.34	6.19
	Post-testing	T, T	102, 102	25, 9	3, 2	1.10×10^6	6.04	
7/29/16	Pre-testing	T, T	T, T	40, 59	8, 7	5.3×10^6	6.72	6.63
	Post-testing	T, T	T, T	35, 32	6, 3	3.5×10^6	6.54	
8/1/16	Pre-testing	T, T	T, T	86, 82	9, 4	8.3×10^6	6.92	6.81
	Post-testing	T, T	T, T	42, 44	9, 13	4.9×10^6	6.69	
Test Organism: *Staphylococcus aureus*								
Test Date	Carrier Set	Dilution Factor (0.100 mL plated)				CFU/ carrier	Log_{10}	Average Log_{10}
		10^{-1}	10^{-2}	10^{-3}	10^{-4}			
7/28/16	Pre-testing	T, T	162, 299	30, 31	4, 2	2.39×10^6	6.38	6.24
	Post-testing	T, T	126, 102	21, 19	1, 0	1.22×10^6	6.09	
7/29/16	Pre-testing	T, T	T, T	33, 31	4, 3	3.3×10^6	6.52	6.39
	Post-testing	T, T	190, 150	26, 22	2, 2	1.77×10^6	6.25	
8/1/16	Pre-testing	T, T	T, T	37, 52	3, 6	4.5×10^6	6.65	6.65
	Post-testing	T, T	T, T	40, 48	5, 7	4.5×10^6	6.65	

CFU = Colony Forming Unit
T = Too Numerous To Count (>300 colonies)

TABLE 3: NEUTRALIZATION CONFIRMATION CONTROL RESULTS

Test Substance	Test Organism	Dilution	CFU Added	Average CFU	Number of Subcultures	
					Tested	Positive
Test Date: 7/28/16						
Oxine Lot# 1605-011-2LCL	*Pseudomonas aeruginosa* (ATCC 15442)	10^{-5}	160, 200	180	1	1
		10^{-6}	36, 18	27	1	1
		10^{-7}	2, 1	2	1	1
	Staphylococcus aureus (ATCC 6538)	10^{-5}	240, 176	208	1	1
		10^{-6}	34, 32	33	1	1
		10^{-7}	4, 1	3	1	1
Test Date: 7/29/16						
Oxine Lot# 1606-012-2LCL	*Pseudomonas aeruginosa* (ATCC 15442)	10^{-5}	T, T	>300	1	1
		10^{-6}	31, 34	33	1	1
		10^{-7}	6, 0	3	1	0
	Staphylococcus aureus (ATCC 6538)	10^{-5}	T, T	>300	1	1
		10^{-6}	24, 45	35	1	1
		10^{-7}	5, 7	6	1	1
Test Date: 8/1/16						
Oxine Lot# 1606-013-2LCL	*Pseudomonas aeruginosa* (ATCC 15442)	10^{-5}	T, T	>300	1	1
		10^{-6}	97, 86	92	1	1
		10^{-7}	15, 3	9	1	1
	Staphylococcus aureus (ATCC 6538)	10^{-5}	T, T	>300	1	1
		10^{-6}	62, 38	50	1	1
		10^{-7}	2, 1	2	1	1

CFU = Colony Forming Unit
T = Too Numerous To Count (>300 colonies)

TABLE 4: TEST RESULTS

Test Substance	Test Organism	Sample Dilution	Number of Carriers		
			Exposed	Showing Growth	Confirmed As Test Organism
Test Date: 7/28/16					
Oxine Lot# 1605-011-2LCL	*Pseudomonas aeruginosa* (ATCC 15442)	1:40 / 480 ppm defined as 25.0 mL test substance + 975.0 mL diluent	60	0	0
	Staphylococcus aureus (ATCC 6538)		60	0	0
Test Date: 7/29/16					
Oxine Lot# 1606-012-2LCL	*Pseudomonas aeruginosa* (ATCC 15442)	1:40 / 480 ppm defined as 25.0 mL test substance + 975.0 mL diluent	60	1	1
	Staphylococcus aureus (ATCC 6538)		60	3	3
Test Date: 8/1/16					
Oxine Lot# 1606-013-2LCL	*Pseudomonas aeruginosa* (ATCC 15442)	1:40 / 480 ppm defined as 25.0 mL test substance + 975.0 mL diluent	60	0	0
	Staphylococcus aureus (ATCC 6538)		60	0	0

ATTACHMENT I: TEST SUBSTANCE CERTIFICATE OF ANALYSIS – LOT 1605-011-2LCL

Bio-Cide INTERNATIONAL

CERTIFICATE OF ANALYSIS
Product: 2% CHLORINE DIOXIDE

The following Product Lot has been inspected and found to conform to Bio-Cide International's specifications.

Bio-Cide Lot No. 1605-011-2LCL Mfg. Date 7/1/2016

SPECIFICATIONS

Parameter	Specification
Titratable ClO_2	2.05 - 2.10% (w/w)
pH	8.2 - 8.5
Spectral Analysis (Absorbance at 400 nm)	<0.1 AU

RESULTS FROM LOT-SPECIFIC ANALYSIS

Titratable ClO_2 1.90% A_{400} 0.020

pH 8.44

Neeraj Khanna, Ph.D.
Q.C. Supervisor
(405) 329-5556

EXACT COPY
INITIALS JLH DATE 8-18-16

ATTACHMENT II: TEST SUBSTANCE CERTIFICATE OF ANALYSIS – LOT 1606-012-2LCL

Bio-Cide INTERNATIONAL

CERTIFICATE OF ANALYSIS
Product: 2% CHLORINE DIOXIDE

The following Product Lot has been inspected and found to conform to Bio-Cide International's specifications.

Bio-Cide Lot No. 1606-012-2LCL Mfg. Date 7/1/2016

SPECIFICATIONS

Parameter	Specification
Titratable ClO_2	2.05 - 2.10% (w/w)
pH	8.2 - 8.5
Spectral Analysis (Absorbance at 400 nm)	<0.1 AU

RESULTS FROM LOT-SPECIFIC ANALYSIS

Titratable ClO_2 1.91% A_{400} 0.033

pH 8.43

Neeraj Khanna, Ph.D.
Q.C. Supervisor
(405) 329-5556

EXACT COPY
INITIALS JLH DATE 8-18-16

ATTACHMENT III: TEST SUBSTANCE CERTIFICATE OF ANALYSIS – LOT 1606-013-2LCL

Bio-Cide INTERNATIONAL

CERTIFICATE OF ANALYSIS
Product: 2% CHLORINE DIOXIDE

The following Product Lot has been inspected and found to conform to Bio-Cide International's specifications.

Bio-Cide Lot No. 1606-013-2LCL Mfg. Date 7/1/2016

SPECIFICATIONS

Parameter	Specification
Titratable ClO_2	2.05 - 2.10% (w/w)
pH	8.2 - 8.5
Spectral Analysis (Absorbance at 400 nm)	<0.1 AU

RESULTS FROM LOT-SPECIFIC ANALYSIS

Titratable ClO_2 1.92% A_{400} 0.022

pH 8.30

Neeraj Khanna, Ph.D.
Q.C. Supervisor
(405) 329-5556

EXACT COPY
INITIALS JLH DATE 8-18-16

AMENDMENT TO GLP TEST PROTOCOL

ACCURATUS —LAB SERVICES— THE ANTIMICROBIAL AUTHORITY

Amendment No.:	1
Effective Date:	August 2, 2016
Sponsor:	Bio-Cide International, Inc. 2650 Venture Drive Norman, OK 73026
Test Facility:	Accuratus Lab Services 1285 Corporate Center Drive, Suite 110 Eagan, MN 55121
Protocol Title:	AOAC Use-Dilution Method
Protocol Number:	BCI03061516.UD
Project Number:	A21358

Modifications to Protocol:

Due to a typographical error, the protocol is amended to check the "Yes" box on page 10 that indicates that a supplemental information form is attached to the protocol.

Changes to the protocol are acceptable as noted.

Jamie Hurcan
Study Director

8-3-16
Date

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(For Laboratory Use Only) A21358
Accuratus Lab Services Project # KJP 7.19.16
Test Substance Tracking # T30706.16.BCI03
KJP 7-7-16

ACCURATUS LAB SERVICES

PROTOCOL

AOAC Use-Dilution Method

Test Organism(s):

Staphylococcus aureus (ATCC 6538)
Pseudomonas aeruginosa (ATCC 15442)

PROTOCOL NUMBER

BCI03061516.UD

PREPARED FOR/SPONSOR

Bio-Cide International, Inc.
2650 Venture Drive
Norman, OK 73026

PREPARED BY/TESTING FACILITY

Accuratus Lab Services
1285 Corporate Center Drive, Suite 110
Eagan, MN 55121

DATE

June 15, 2016

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AOAC Use-Dilution Method

PURPOSE

The purpose of this study is to determine the effectiveness of the Sponsor's product as a disinfectant for hard surfaces following the AOAC Use-Dilution Method. This method is in compliance with the requirements of and may be submitted to, one or more of the following agencies as indicated by the Sponsor: U.S. Environmental Protection Agency (EPA), Health Canada and Australian Therapeutic Goods Administration (TGA).

TEST SUBSTANCE CHARACTERIZATION

According to 40 CFR, Part 160, Subpart F [160.105] test substance characterization as to identity, strength, purity, solubility and composition, as applicable, shall be documented before its use in this study. The stability of the test substance shall be determined prior to or concurrently with this study. Pertinent information, which may affect the outcome of this study, shall be communicated in writing to the Study Director upon sample submission to Accuratus Lab Services. Accuratus Lab Services will append Sponsor-provided Certificates of Analysis (C of A) to this study report, if requested and supplied. Characterization and stability studies not performed following GLP regulations will be noted in the Good Laboratory Practice compliance statement.

SCHEDULING AND DISCLAIMER OF WARRANTY

Experimental start dates are generally scheduled on a first-come/first-serve basis once Accuratus Lab Services receives the Sponsor approved/completed protocol, signed fee schedule and corresponding test substance(s). Based on all required materials being received at this time, the proposed experimental start date is July 6, 2016. Verbal results may be given upon completion of the study with a written report to follow on the proposed completion date of August 3, 2016. To expedite scheduling, please be sure all required paperwork and test substance documentation is complete/accurate upon arrival at Accuratus Lab Services.

If a test must be repeated, or a portion of it, due to failure by Accuratus Lab Services to adhere to specified procedures, it will be repeated free of charge. If a test must be repeated, or a portion of it, due to failure of internal controls, it will be repeated free of charge. "Methods Development" fees shall be assessed, however, if the test substance and/or test system require modifications due to complexity and difficulty of testing. If the Sponsor requests a repeat test, they will be charged for an additional test. Neither the name of Accuratus Lab Services nor any of its employees are to be used in advertising or other promotion without written consent from Accuratus Lab Services.

The Sponsor is responsible for any rejection of the final report by the regulating agencies concerning report format, pagination, etc. To prevent rejection, Sponsor should carefully review the Accuratus Lab Services final report and notify Accuratus Lab Services of any perceived deficiencies in these areas before submission of the report to the regulatory agency. Accuratus Lab Services will make reasonable changes deemed necessary by the Sponsor, without altering the technical data.

JUSTIFICATION FOR SELECTION OF THE TEST SYSTEM

Regulatory Agencies require that a specific organism claim for a test substance intended for use on hard surfaces be supported by appropriate scientific data demonstrating the efficacy of the test substance against the claimed organism. This is accomplished in the laboratory by treating the target organism with the test substance under conditions which simulate as closely as possible the actual conditions under which the test substance is designed to be used. For products intended for use on hard surfaces (dry, inanimate environmental surfaces), a carrier method is used in the generation of the supporting data. The experimental design in this protocol meets these requirements.

TEST PRINCIPLE

A film of organism cells dried on a surface of stainless steel carriers is exposed to the test substance for a specified exposure time. After exposure, the carriers are transferred to vessels containing neutralizing subculture media and assayed for survivors. Appropriate culture purity, sterility, viability, carrier population and neutralization confirmation controls are performed. The current revision of Standard Operating Procedure CGT-0041 reflects the methods which shall be used in this study.

TEST METHOD

Table 1:

Test Organism	Designation #	Growth Medium	Incubation Parameters
Staphylococcus aureus	6538	Synthetic Broth	35-37°C, aerobic
Pseudomonas aeruginosa	15442	Synthetic Broth	35-37°C, aerobic

The test organism(s) to be used in this study was/were obtained from the American Type Culture Collection (ATCC), Manassas, VA.

Recovery Agar Medium: Tryptic Soy Agar + 5% Sheep's Blood

Carriers

Carriers will be screened according to AOAC Official Method of Analysis and any carrier positive for growth will be discarded. Only penicylinders showing no growth may be used. Stainless steel penicylinders will be pre-soaked overnight in 1N NaOH, washed in water until neutral and autoclaved in deionized water. Carriers shall be used within three months of sterilization.

Preparation of Test Organism

Transfer 10 µL of a thawed, vortex mixed, cryovial of stock organism broth culture to an initial 10 mL tube of growth medium. For organisms not defined in the AOAC Use Dilution method, a loopful of stock slant culture may be used to inoculate the initial 10 mL tube of growth medium.

Mix and incubate the initial culture for 24±2 hours at the incubation conditions above. Following incubation, transfer 10 µL of culture to sufficient 20 x 150 mm Morton closure tubes containing 10 mL of culture medium (daily transfer #1). One daily transfer is required but up to four additional daily transfers may be prepared. Incubate the final test culture for 48-54 hours at the incubation conditions above. During culture transfers, the *Pseudomonas* culture will not be vortex mixed. On the day of use, the pellicle will be carefully aspirated from the *Pseudomonas aeruginosa* culture by vacuum aspiration. Care will be taken to avoid disrupting the pellicle and any visible pellicle on the bottom of the tube will not be harvested. To avoid harvesting any visible pellicle at the bottom of the tube, the upper portion of the culture may be transferred to a sterile tube. Any disruption of the pellicle resulting in dropping or breaking up of the pellicle before or during removal renders that culture tube unusable.

The test culture will be vortex mixed for 3 to 4 seconds and allowed to stand for ≥10 minutes prior to use. After this time, the upper portion of the culture will be removed, leaving behind any clumps or debris and will be pooled in a sterile vessel and mixed.

The *Pseudomonas* culture will be visually inspected to ensure no pellicle fragments are present.

The culture may be diluted or centrifuge-concentrated. Applicable culture dilutions shall be performed using sterile growth medium. An organic soil load will be added to the test culture per Sponsor's request. The final test culture will be mixed thoroughly prior to use.

Contamination of Carriers
The culture will be transferred to the penicylinders (after siphoning off the water) and the carriers will be immersed for 15±2 minutes in a prepared suspension at a ratio of one carrier per one mL of culture to completely cover the carriers. A maximum of 100 carriers will be inoculated per vessel and each vessel inoculated may be considered a part of one total inoculation run per organism. The inoculated carriers will be transferred to sterile Petri dishes matted with filter paper after tapping the carrier against the side of the container to remove excess inoculum. No more than twelve carriers will be placed in each Petri dish. The carriers will be dried for 40±2 minutes. *NOTE: Organisms not specifically mentioned in the AOAC methodology may require modified drying conditions for the purpose of obtaining maximum survival following drying. The actual drying conditions will be clearly documented.* Carriers will be used in the test procedure within 2 hours of drying. Carriers that touch during drying or have fallen over will not be used in the test.

Drying Conditions: 35-37°C.

Preparation of Test Substance
The test substance(s) to be assayed will be used as directed by the Sponsor. If a dilution of the test substance is requested by the Sponsor, the diluted test substance(s) shall be used within three hours of preparation. For products requiring dilution, use ≥1.0 mL or ≥1.0 g of test substance and volumetric glassware when preparing the dilution unless otherwise specified by the Sponsor. Ten (10) mL of the test substance at its use-dilution will be aliquotted into the required number of sterile 25 x 150 mm or 25 x 100 mm tubes. The tubes will be placed into a waterbath at the specified exposure temperature, and allowed to equilibrate for ≥10 minutes prior to testing.

Exposure Conditions
Each contaminated and dried carrier will be placed into a separate tube containing 10 mL of the test substance at its use-dilution for the desired exposure time and temperature. Immediately after placing each test carrier in the test tube, swirl the tube using approximately 2–3 gentle rotations to release any air bubbles trapped in or on the carrier. Care will be taken to avoid touching the sides of the tubes which may compromise exposure. The carrier will be placed into the test substance within ±5 seconds of the exposure time for exposure times above 1 minute following a calibrated timer. The carrier will be placed into the test substance within ±3 seconds of the exposure time for exposure times of ≤1 minute. If the exposure conditions are compromised in any way for a given carrier, a new carrier may be treated in its place. If this cannot be done, the carrier will be marked and the compromised carrier will be identified in the raw data. If a marked carrier demonstrates a positive result, the carrier set may be invalidated and repeated by Sponsor request.

Test System Recovery
Following the Sponsor specified exposure time, each medicated carrier will be transferred by wire hook at staggered intervals to 10 mL of primary neutralizing subculture medium and each tube will be shaken thoroughly. To accomplish this, the carrier is removed from the disinfectant tube with a sterile hook, tapped against the interior sides of the tube to remove the excess disinfectant, avoiding the upper one-third of the tube, and transferred into the subculture tube. Care will be taken to avoid excessive contact to the interior sides of the subculture tubes during transfer. If secondary neutralization is requested by the Sponsor or deemed necessary due to test substance active and/or concentration, carriers will be transferred into individual secondary subculture tubes containing 10 mL of neutralizing broth beginning approximately 25-60 minutes after subculture of the carrier into the primary neutralizing subculture medium. Shake each tube thoroughly. If neutralization is a concern, 20 mL of subculture medium may be used.

Incubation and Observation
All subcultures are incubated under the conditions listed in table 1 for 48±2 hours.

Following incubation, the subcultures will be visually examined for growth. If necessary, the subcultures may be placed at 2-8°C for up to three days prior to examination.

Representative subculture tubes showing growth will be subcultured, stained and/or biochemically assayed to confirm or rule out the presence of the test organism. If growth cannot be determined visually, appropriate test and/or control subcultures may be streaked to agar to determine the presence or absence of growth.

STUDY CONTROLS

Purity Control
A "streak plate for isolation" will be performed on the organism culture and following incubation examined in order to confirm the presence of a pure culture. The acceptance criterion for this study control is a pure culture demonstrating colony morphology typical of the test organism.

Organic Soil Sterility Control
Prior to or concurrent with testing and if applicable, the serum used for the organic soil load will be cultured, incubated, and visually examined for lack of growth. The acceptance criterion for this study control is lack of growth.

Carrier Sterility Control
Prior to or concurrent with testing, a representative uninoculated carrier will be added to an appropriate subculture medium. The subculture medium containing the carrier will be incubated and examined for growth. The acceptance criterion for this study control is lack of growth.

Neutralizing Subculture Medium Sterility Control
Prior to or concurrent with testing, a representative sample of uninoculated neutralizing subculture medium will be incubated and visually examined. The acceptance criterion for this study control is lack of growth.

Viability Control
One representative inoculated carrier will be added to a vessel containing each type of subculture medium. If secondary subcultures are performed using a different media type, one carrier will be placed in the primary subculture medium and one carrier will be placed in the secondary subculture medium. The vessels containing each carrier will be incubated and visually examined for growth. The acceptance criterion for this study control is growth in the subculture media.

Neutralization Confirmation Control
Prior to testing or concurrent with testing, the neutralization of the test substance will be confirmed by exposing at least one sterile carrier to the test substance and transferring the carrier to primary subcultures containing 10-20 mL of neutralizing subculture medium as in the test. If performed in the test procedure, each carrier will then be transferred from primary subcultures into individual secondary subcultures beginning approximately 25-60 minutes following the primary transfer. The subcultures (primary and secondary as applicable) will be inoculated with a target of 10-100 colony forming units (CFU) of each test organism, incubated under test conditions and visually examined for the presence of growth. This control will be performed with multiple replicates using different dilutions of the test organism. A standardized spread plate procedure will be run concurrently in order to enumerate the number of CFU actually added per tube. NOTE: Only the most concentrated test substance dilution and/or shortest exposure time needs to be evaluated in this control.

The acceptance criterion for this study control is growth in the final subculture broth, minimally, following inoculation with ≤100 CFU per tube. If all the organism dilution(s) used in this control fail to provide adequate numbers (10-100 CFU) which coincides in a failure to meet the acceptance criterion for this study control, the control may be repeated in its entirety.

Carrier Population Control
Two sets of three inoculated carriers (one set prior to testing and one set following treatment) for each organism carrier set will be assayed. Each inoculated carrier will be individually subcultured into a tube containing 10 mL of neutralizing subculture medium and sonicated for 1 minute±5 seconds. Tubes will be contained in a beaker with water suspended in the ultrasonic cleaner such that all fluids will be level. Following sonication, the contents of the three subcultured carriers will be pooled (30 mL) and briefly vortex mixed. Appropriate serial ten-fold dilutions will be prepared and the duplicate 0.1 mL aliquots spread plated on agar plate medium, and incubated. If serial dilutions are not performed and plated immediately following sonication, the vessels may be refrigerated at 2-8°C for up to 2 hours prior to dilution. Following incubation, the resulting colonies will be enumerated. The individual CFU per carrier set results will be calculated, and the Log_{10} value of each carrier set determined. The average Log_{10} value per organism will be calculated. The acceptance criterion for this study control is a minimum average Log_{10} value of 6.0.

PROCEDURE FOR IDENTIFICATION OF THE TEST SYSTEM

Accuratus Lab Services maintains Standard Operating Procedures (SOPs) relative to efficacy testing studies. Efficacy testing is performed in strict adherence to these SOPs which have been constructed to cover all aspects of the work including, but not limited to, receipt, log-in, and tracking of biological reagents including test organism strains for purposes of identification, receipt and use of chemical reagents. These procedures are designed to document each step of efficacy testing studies. Appropriate references to medium, batch number, etc. are documented in the raw data collected during the course of each study.

Additionally, each efficacy test is assigned a unique Project Number when the protocol for the study is initiated by the Study Director. This number is used for identification of the test subcultures, etc. during the course of the test. Test subcultures are also labeled with reference to the test organism, experimental start date, and test product. Microscopic and/or macroscopic evaluations of positive subcultures are performed in order to confirm the identity of the test organism. These measures are designed to document the identity of the test system.

METHOD FOR CONTROL OF BIAS: NA

STUDY ACCEPTANCE CRITERIA

Test Substance Performance Criteria

For *Staphylococcus aureus,* the efficacy performance requirements for label claims state that the test substance must kill the microorganism on 57 out of the 60 inoculated carriers.

For *Pseudomonas aeruginosa,* the efficacy performance requirements for label claims state that the test substance must kill the microorganism on 54 out of the 60 inoculated carriers.

Control Acceptance Criteria

The study controls must perform according to the criteria detailed in the study controls description section. If any control acceptance criteria are not met, the test may be repeated under the current protocol number. If the population control exceeds an average $\log_{10}$ value of 7.0, and the test substance does not meet the performance criteria, the Sponsor may invalidate the study and repeat testing.

Any positive test carriers confirmed as a contaminant will be reported. Any test carrier set that demonstrates a number of contaminated tubes that contributes to results that exceed the product performance/success criteria may be invalidated per Sponsor's request and may be re-tested. For sixty carrier studies, contamination exceeding one tube per carrier set may warrant invalidation and repeat testing by Sponsor's request.

If any portion of the protocol is executed incorrectly warranting repeat testing, the test may be repeated under the current protocol number. If the population control fails to meet the minimum requirement or if the neutralization control acceptance criteria is not met and the study fails to meet the efficacy requirements, repeat testing is not required.

REPORT

The report will include, but not be limited to, identification of the sample, date received, initiation and completion dates, identification of the organism strains used, description of media and reagents, description of the methods employed, tabulated results and conclusion as it relates to the purpose of the test, and all other items required by 40 CFR Part 160.185.

PROTOCOL CHANGES

If it becomes necessary to make changes in the approved protocol, the revision and reasons for changes will be documented, reported to the Sponsor and will become a part of the permanent file for that study. Similarly, the Sponsor will be notified as soon as possible whenever an event occurs that may have an effect on the validity of the study.

Standard operating procedures used in this study will be the correct effective revision at the time of the work. Any minor changes to SOPs (for this study) or methods used will be documented in the raw data and approved by the Study Director.

TEST SUBSTANCE RETENTION

It is the responsibility of the Sponsor to retain a sample of the test substance. All unused test substance will be discarded following study completion unless otherwise indicated by Sponsor.

RECORD RETENTION

Study Specific Documents

All of the original raw data developed exclusively for this study shall be archived at Accuratus Lab Services for a minimum of five years for GLP studies or a minimum of six months for all other studies following the study completion date. After this time, the Sponsor (or the Sponsor Representative, if applicable) will be contacted to determine the final disposition. These original data include, but are not limited to, the following:

1. All handwritten raw data for control and test substances including, but not limited to notebooks, data forms and calculations.
2. Any protocol amendments/deviation notifications.
3. All measured data used in formulating the final report.
4. Memoranda, specifications, and other study specific correspondence relating to interpretation and evaluation of data, other than those documents contained in the final study report.
5. Original signed protocol.
6. Certified copy of final study report.
7. Study-specific SOP deviations made during the study.

Facility Specific Documents

The following records shall also be archived at Accuratus Lab Services. These documents include, but are not limited to, the following:

1. SOPs which pertain to the study conducted.
2. Non study-specific SOP deviations made during the course of this study which may affect the results obtained during this study.
3. Methods which were used or referenced in the study conducted.
4. QA reports for each QA inspection with comments.
5. Facility Records: Temperature Logs (ambient, incubator, etc.), Instrument Logs, Calibration and Maintenance Records.
6. Current curriculum vitae, training records, and job descriptions for all personnel involved in the study.

REFERENCES

1. Association of Official Analytical Chemists (AOAC) Official Method 964.02, Testing Disinfectants against *Pseudomonas aeruginose* - Use-Dilution Method. In Official Methods of Analysis of the AOAC, 2013 Edition.
2. Association of Official Analytical Chemists (AOAC) Official Method 955.15, Testing Disinfectants against *Staphylococcus aureus* - Use-Dilution Method. In Official Methods of Analysis of the AOAC, 2013 Edition.
3. Association of Official Analytical Chemists (AOAC) Official Method 955.14, Testing Disinfectants against *Salmonella enterica*- Use-Dilution Method. In Official Methods of Analysis of the AOAC, 2013 Edition.
4. Association of Official Analytical Chemists (AOAC) Official Method 960.09, Germicidal and Detergent Sanitizing Action of Disinfectants Method [Preparation of Synthetic Hard Water]. In Official Methods of Analysis of the AOAC, 2013 Edition.
5. U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, Product Performance Test Guidelines, OCSPP 810.2000: General Considerations for Uses of Antimicrobial Agents, September 4, 2012.
6. U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, Product Performance Test Guidelines, OCSPP 810.2200: Disinfectants for Use on Hard Surfaces- Efficacy Data Recommendations, September 4, 2012.
7. Health Canada, January, 2014. Guidance Document – Safety and Efficacy Requirements for Hard Surface Disinfectant Drugs.
8. Health Canada, January, 2014. Guidance Document - Disinfectant Drugs.
9. Australian Therapeutic Goods Administration (TGA), February 1998. Guidelines for the Evaluation of Sterilants and Disinfectants.
10. Australian Therapeutic Goods Administration (TGA), February 1998. Therapeutic Goods Order No. 54: Standard for Disinfectants and Sterilants.
11. Australian Therapeutic Goods Administration (TGA), March 1997. Therapeutic Goods Order No. 54A: Amendment to the Standard for Disinfectants and Sterilants (TGO 54).

DATA ANALYSIS

Calculations

Determine the CFU/Carrier set in the Carrier Population Control using all average counts between 0-300 CFU as follows:

$$\text{CFU/carrier} = \frac{[(\text{avg. CFU for } 10^{-x}) + (\text{avg. CFU for } 10^{-y}) + (\text{avg. CFU for } 10^{-z})] \times (\text{Volume of neutralizer})}{[10^{-x} + 10^{-y} + 10^{-z}] \times (\text{Volume plated}) \times (\#\text{ of carriers per set})}$$

where 10^{-x}, 10^{-y}, and 10^{-z} are example dilutions that may be used

$$\text{Average Log}_{10}\text{ Carrier Population Control} = \frac{\text{Log}_{10}X_1 + \text{Log}_{10}X_2 + \ldots \text{Log}_{10}X_N}{N}$$

Where: X equals CFU/carrier set
N equals number of control carrier sets

Statistical Analysis
None used.

STUDY INFORMATION

(All blank sections are completed by the Sponsor or Sponsor Representative as linked to their signature, unless otherwise noted.)

Test Substance (Name & Batch Numbers) exactly as it should appear on final report:

Test Date #1: Oxine Lot # 1605-011-2LCL
Test Date #2: Oxine Lot # 1606-012-2LCL
Test Date #3: Oxine Lot # 1606-013-2LCL

Testing at the lower certified limit (LCL) is required for registration, no aged batch is necessary.

Product Description:

- ☐ Quaternary ammonia
- ☐ Iodophor
- ☐ Sodium hypochlorite
- ☐ Peracetic acid
- ☐ Peroxide
- ☑ Other Chlorine Dioxide

Approximate Test Substance Active Concentration (upon submission to Accuratus Lab Services):

1.90% - 1.92% or 19,000 - 19,200 ppm

(This value is used for neutralization planning only. This value is not intended to represent characterization values.)

Neutralization/Subculture Broth: ☐ _____

(NOTE: All broth must also serve as an appropriate growth medium for the test organism)

☑ Accuratus Lab Services' Discretion. By checking, the Sponsor authorizes Accuratus Lab Services, at their discretion, to perform neutralization confirmation assays at the Sponsor's expense prior to testing to determine the most appropriate neutralizer. (See Fee Schedule).

Storage Conditions:

- ☑ Room Temperature
- ☐ 2-8°C
- ☐ Other: _____

Hazards:

- ☐ None known: Use Standard Precautions
- ☑ Material Safety Data Sheet, Attached for each product
- ☐ As Follows: _____

Product Preparation

- ☐ No dilution required, Use as received (RTU)
- ☑ *Dilution(s) to be tested:

1:40/480 ppm (example: 1 oz/gallon) defined as 25.0 mL (amount of test substance) + 975.0 mL (amount of diluent) *See attached activation and dilution instructions

- ☐ Deionized Water (Filter or Autoclave Sterilized)
- ☑ Tap Water (Filter or Autoclave Sterilized) - All tap water is softened; the water hardness for the batch of tap water used will be determined and reported.
- ☐ AOAC Synthetic Hard Water: _____PPM
- ☐ Other _____

Note: An equivalent dilution may be made unless otherwise requested by the Sponsor.

Test Organism(s): ☑ *Pseudomonas aeruginosa* (ATCC 15442)
☑ *Staphylococcus aureus* (ATCC 6538)

Carrier Number: 60 per batch

Exposure Time: 10 Minutes **Exposure Temperature:** 20 ± 1 °C

Organic Soil Load:

- ☐ Minimum 5% Organic Soil Load (Fetal Bovine Serum)
- ☑ No Organic Soil Load Required
- ☐ Other: _____

TEST SUBSTANCE SHIPMENT STATUS

(This section is for informational purposes only.)

☐ Test Substance is already present at Accuratus Lab Services.

☑ Test Substance has been or will be shipped to Accuratus Lab Services.

Date of expected receipt at Accuratus Lab Services: July 6, 2016

☐ Test Substance to be hand-delivered (must arrive by noon at least one day prior to testing or other arrangements made with the Study director).

COMPLIANCE

Study to be performed under EPA Good Laboratory Practice regulations (40 CFR Part 160) in accordance to standard operating procedures.

☑ Yes

☐ No (Non-GLP or Development Study)

REGULATORY AGENCY(S) THAT MAY REVIEW DATA

☑ U.S. EPA

☐ Health Canada

☐ Therapeutic Goods Administration (Australian TGA)

PROTOCOL MODIFICATIONS

☑ Approved without modification

☐ Approved with modification

PROTOCOL ATTACHMENTS

Supplemental Information Form Attached - ☐ Yes ☑ No

TEST SUBSTANCE CHARACTERIZATION & STABILITY TESTING
[Verification required per 40 CFR Part 160 Subpart B (160.31(d))]

☐ Characterization/Stability testing is not required (For Non-GLP or Development testing only)

OR

Physical and Chemical Characterization (Identity, purity, strength, solubility, as applicable) of the test lots

☑ **Physical & Chemical Characterization has been or will be completed prior to efficacy testing.**

GLP compliance status of physical & chemical characterization testing:
☐ Testing was or will be performed following 40 CFR Part 160 GLP regulations
①☑ Characterization has not been or will not be performed following GLP regulations

Check and complete the following that apply:
☑ A Certificate of Analysis (C of A) may be provided for each lot of test substance. If provided, the C of A will be appended to the report.
☐ Testing has been or will be conducted at Accuratus Lab Services under protocol or study #:

_____

☐ Test has been or will be conducted by another facility under protocol or study #:
To be conducted/certified by Bio-Cide International

☐ **Physical & Chemical Characterization was not or will not be performed prior to efficacy testing.**

Stability Testing of the formulation

☐ **Stability testing has been or will be completed prior to or concurrent with efficacy testing.**

GLP compliance status of stability testing:
(GLP compliance is required by 40 CFR Part 160)
☐ Testing was or will be performed following 40 CFR Part 160 GLP regulations
☐ Stability testing has not been or will not be performed following GLP regulations

Check and complete the following that apply:
☐ Testing has been or will be conducted at Accuratus Lab Services under protocol or study #:

_____

☐ Test has been or will be conducted by another facility under protocol or study #:

_____

☑ **Stability testing was not or will not be performed prior to or concurrent with efficacy testing.**

If test substance characterization or stability testing information is not provided or is not performed following GLP regulations, this will be indicated in the GLP compliance statement of the final report.

①updated per email. JLH 7-8-16

APPROVAL SIGNATURES

SPONSOR:

NAME: Mr. Jim Ringo TITLE: Director of Regulatory Affairs

SIGNATURE: James P. Ringo DATE: July 6, 2016

PHONE: (405) 329 - 5556 FAX: (405) 329 – 2681 EMAIL: Jringo@bio-cide.com

For confidentiality purposes, study information will be released only to the sponsor/representative signing the protocol (above) unless other individuals are specifically authorized in writing to receive study information.

Other individuals authorized to receive information regarding this study: ☐ See Attached

Accuratus Lab Services:

NAME: Jamie Herzan
Study Director

SIGNATURE: Jamie Herzan DATE: 7-11-16
Study Director

Attachment 1 to protocol BCI03061516.UD, page 1 of 1 JLH 7-8-16

Activation Protocol for Oxine®

Prepare 1 Liter of 480 ppm Oxine® (Lower Certified Limit Test Solution) by following the directions below:

1. Measure out 94.6 mL of Oxine® solution.
2. Weigh 0.5 gram of dry activator crystals (Trichloro-s-Triazinetrione) and add to the above solution.
3. Mix the solution by stirring gently with glass rod until the activator crystals are completely dissolved.
4. Add 25.0 mL of the above activated concentrate to 975.0 mL of water and stir gently to achieve thorough mixing.
5. The active solution (480 ppm) is ready for use.

Prepared By:

Ben Whyatt
Chemist
July 5, 2016

2650 Venture Drive · Norman · OK 73069 · Office: 405 329 5556 · Fax: 405 329 2681 · Web: www.bio-cide.com