FINAL REPORT

Antimicrobial Efficacy Testing of Vinyl Textiles

PROTOCOL
ASTM E2180

PRODUCT TESTED
AGIVIR

EMSL ORDER NUMBER
152001614

TESTING LABORATORY
EMSL Analytical, Inc.
5950 Fairbanks North Houston Rd.
Houston TX 77040
Phone: (713) 686-3635
Web: www.emsl.com

SPONSOR
Serge Ferrari
BP 54 - 38352
La Tour-du-Pin Cedex, 38110
France
Contact: Catherine Merillon

STUDY START DATE
March 5, 2020

STUDY COMPLETION DATE
March 30, 2020

Test Summary

Project Title: Antimicrobial Efficacy Testing of Vinyl Textile Materials

Study Methods: Protocol ASTM E2180

Sponsor: Serge Ferrari

Product: Textile Materials
Sample 1: AGIVIR – Top (X) & Bottom
Sample 2: 501 Control sample (Standard)

Test Conditions:

Challenge Organisms:
Staphylococcus aureus (*S. aureus*) - ATCC 6538
Klebsiella pneumonia (*K. pneumonia*) - ATCC 31488

Contact time: 24 hours

Contact Temperature: 35°C

Study Dates and Facilities

All analytical testing was performed at EMSL Analytical, Inc. in Houston, Texas from date 3/5/2020 to 3/30/2020.

Record Retention

All raw data and a copy of the final report will be archived and stored by EMSL Analytical, Inc. for 5 years.

Objectives

To determine the antimicrobial activity of the AGIVIR (Top), and 501 control (Standard) material samples.

Experimental Summary:

The testing procedure was designed after discussions between EMSL Analytical, the testing company, and Serge Ferrari. The testing procedure follows ASTM E2180, with the testing conducted on vinyl textile samples submitted by Serge Ferrari for its ability to control (reduce) bacterial growth during a 24 hours exposure.

Test Method:

Culture preparation*: K. pneumonia* and *S. aureus* were grown separately on tryptic soy agar supplemented with sheep blood (TSAB) at 35°C for 24 hours. Well isolated colonies were then taken and placed into 10 mL of tryptic soy broth (TSB) and incubated at 35°C for 24 hours. Two separate agar slurries were prepared, one for each organism. The agar slurries contained 1 mL of the test organism broth with 0.85 g NaCl, 0.3 g agar, and 100 mL of deionized water. The final slurry inoculum concentration for *K. pneumonia* was 4.5 $x10^6$ colony-forming units/mL (CFU/mL) and 2.5 $x10^6$ CFU/mL for *S. aureus*.

Inoculation of test material*:* Serge Ferrari submitted textile test samples, AGIVIR (Top & Bottom) and an untreated control 501 sample (standard). The top sides were marked with a cross (X). EMSL supplied an untreated polyethylene film as a laboratory control material. Individual test and control pieces were cut in 2 X 2 inch squares and placed in 47 mm sterile Petri dishes. Each square was inoculated with 1 mL of the bacterial agar slurry as prepared above at a concentration of ~1 x 10^6 CFU/mL and all tests were performed in triplicate. Simultaneously, the control film was similarly prepared and inoculated. The Petri dishes were sealed with Parafilm, placed into a sealed plastic container to avoid evaporation, and then incubated at 35°C for 24 hrs.

Recovery of Test Organisms: Following incubation, the entire inoculated test material was removed with pre-sterilized forceps and placed into 20 mL of D/E neutralizing broth. The material was then vortexed for 30 seconds to recover any remaining bacteria into suspension. The suspension was then serially diluted and plated onto aerobic plate count Petrifilm plates and incubated at 35±1°C for 48 hour before colonies were counted.

Experimental Results:

Table 1. Quantitative counts for *K. pneumonia* exposed to the AGIVIR (Topside & Backside), 501 control (standard), and lab control. The CFUs are based on the average of three Petrifilm counts.

Sample	Exposure Time (hours)	Bacterial Recovery CFU/Test Surface (average of 3 surfaces)	Log Reduction	% Reduction
Lab Control	0	5,230,000		
Lab Control	24	67,700,000		
501 Control Topside	24	83,700,000		
AGIVIR Topside	24	<100	>5.92	>99.9999
AGIVIR Backside	24	<100	>5.92	>99.9999

CFU: Colony forming Units, Detection limit = 100 CFU/test surface.
% Reduction – Percent difference between untreated population (501 Control Topside) and treated population recovered from the incubation period.

Table 2. Quantitative counts for *S. aureus* exposed AGIVIR (Topside & Backside), 501 control (standard) and lab control. The CFU are based on the average of three Petrifilm counts.

Sample	Exposure Time (hours)	Bacterial Recovery CFU/Test Surface (average of 3 surfaces)	Log Reduction	% Reduction
Lab Control	0	3,530,000		
Lab Control	24	17,000,000		
501 Control Topside	24	8,400,000		
AGIVIR Topside	24	55,300	2.19	99.3
AGIVIR Backside	24	3,740	3.37	99.96

CFU: Colony forming Units, Detection limit = 100 CFU/test surface.
% Reduction – Percent difference between untreated population (501 Control Topside) and treated population recovered from the incubation period.

Conclusions/Observations:

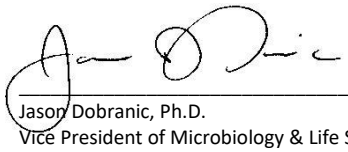
- The AGIVIR sample showed >99.9999% reduction of *K. pneumonia* on the both topside and backside.
- The AGIVIR sample showed 99.3% reduction of *S. aureus* on the topside and 99.96% on the backside.

Signatures

Study Performed by:

Mona Ramadi, Ph.D.
Microbiologist

Report Issued by:



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