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Lab Log # M16-190

Microbiology Laboratory Report

To: Tim Dixon, Piedmont Chemical
From: Daniel Price, Ph.D., and Brandi Prestridge
Date: 31 October 2016
Re: ASTM 2180 test of Wood with Treated Coating

Introduction:

Wood coupons coated with a coating containing varying levels of antimicrobial treatment were tested for inhibitory activity against the Gram-positive bacteria *Staphylococcus aureus* and the Gram-negative bacteria *Klebsiella pneumoniae*.

Materials and Methods

ASTM 2180 was used to quantitatively assess the antibacterial activity of the samples. Samples used were 40 mm x 40 mm wood coupons. 500 ul inoculum slurry used.

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Results:

Gram-positive bacteria

Staphylococcus aureus ATCC 6538

| Sample | Avg. 24 hr SS Control CFU | Avg. 24 hr Treated CFU | Log Reduction | Percent Reduction |
|---------------------|------------------------------|---------------------------|---------------|----------------------|
| ZTREX 72MUP 0.1% | 4.0×10^5 | $<1.0 \times 10^2$ | 3.65 | 99.97 |
| ZTREX 72MUP 0.5% | 4.0×10^5 | $<1.0 \times 10^2$ | 3.65 | 99.97 |
| ZTREX 72MUP 0.8% | 4.0×10^5 | $<1.0 \times 10^2$ | 3.65 | 99.97 |

Gram-negative bacteria

Klebsiella pneumoniae ATCC 4352

| Sample | Avg. 24 hr SS Control CFU | Avg. 24 hr Treated CFU | Log Reduction | Percent Reduction |
|---------------------|------------------------------|---------------------------|---------------|----------------------|
| ZTREX 72MUP 0.1% | 2.0×10^5 | $<1.0 \times 10^2$ | 3.35 | 99.95 |
| ZTREX 72MUP 0.5% | 2.0×10^5 | $<1.0 \times 10^2$ | 3.35 | 99.95 |
| ZTREX 72MUP 0.8% | 2.0×10^5 | $<1.0 \times 10^2$ | 3.35 | 99.95 |

Formula for Log reduction:

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Determine Log ($x \cdot 10^a$) of control samples
Determine Log ($x \cdot 10^a$) of treated samples

Determine geometric mean of control samples:
Log values of control samples: $b_1, b_2, b_3, \dots, b_n$
Mean = $(b_1 \cdot b_2 \cdot b_3 \cdot \dots \cdot b_n)^{1/n}$

Determine geometric mean of treated samples:
Log values of treated samples: $c_1, c_2, c_3, \dots, c_n$
Mean = $(c_1 \cdot c_2 \cdot c_3 \cdot \dots \cdot c_n)^{1/n}$

Log reduction = geometric mean of the control samples – geometric mean of the treated samples

Where:

x = value of samples

a = exponent value

b = log value of control samples

c = log value of treated samples

n = number of log values in set

Formula for Percent Reduction:

$$(1 - 10^{-\text{log reduction}}) \times 100$$

Discussion:

All three treatment levels of the ZTRES MUP coating samples reduced the Gram-positive bacteria *Staphylococcus aureus* by over 3 logs and the Gram-negative bacteria *Klebsiella pneumoniae* greater than 3 logs in this screen.

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