

Anti-Microbial Testing

For

Forbo Flooring BV

Final Report

Work Carried Out By

T. Glazier

Group Leader

Angie Miller

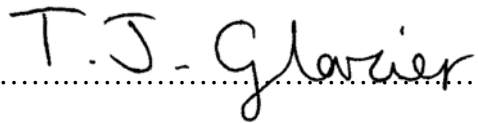


Final Report

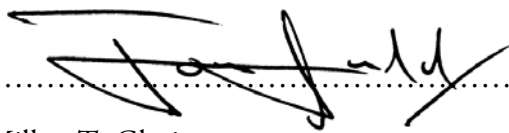
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Work Requested Anti-Microbial Testing

Samples Submitted Samples of Linoleum

Work Carried out by 

T. Glazier

Approved by pp 

A. Miller, T. Glazier

Authorised Signatory

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I Materials Submitted For Testing

Linoleum flooring samples

Bulletin Board PCO 52344

Corklinoleum PCO 50635

Artoleum PCO 52151

Marmoleum Real PCO 51996

Marmoleum Sport PCO 52165

Walton Cirrus PCO 52139

2 Test Procedure

Antibacterial activity was determined using the method described in ISO 22196 : 2011. An aliquot (225µl) of a log phase cell suspension of either *Staphylococcus aureus* (5.2×10^5 cells ml⁻¹; ATCC 8625) or MRSA (5.5×10^5 cells ml⁻¹; NCTC11939) prepared using the method described in ISO 22196 was held in intimate contact with each of 3 replicates of the test surfaces supplied using a 30 x 30 mm polyethylene film (cut from a sterile Stomacher bag) for 24 hours at 35°C. The size of the surviving population was determined using the method described in ISO 22196. The viable cells in the suspension were enumerated by spiral dilution on to Trypcase Soya Agar and by the pour plate method described in ISO 22196. These plates were incubated at 35°C for 24 hours and then counted. An additional 3 replicate unfortified surfaces were also inoculated in the manner described above but were then analysed immediately for the size of microbial population present to provide 0-time control data. The method is described schematically in Figure 1 below.

All data were converted to colony forming units (CFU) cm⁻² and then transformed (Log₁₀) to provide a data set that conformed to a Gaussian distribution. Potential outliers were tested using Dixon's Q-test (P = 0.05).

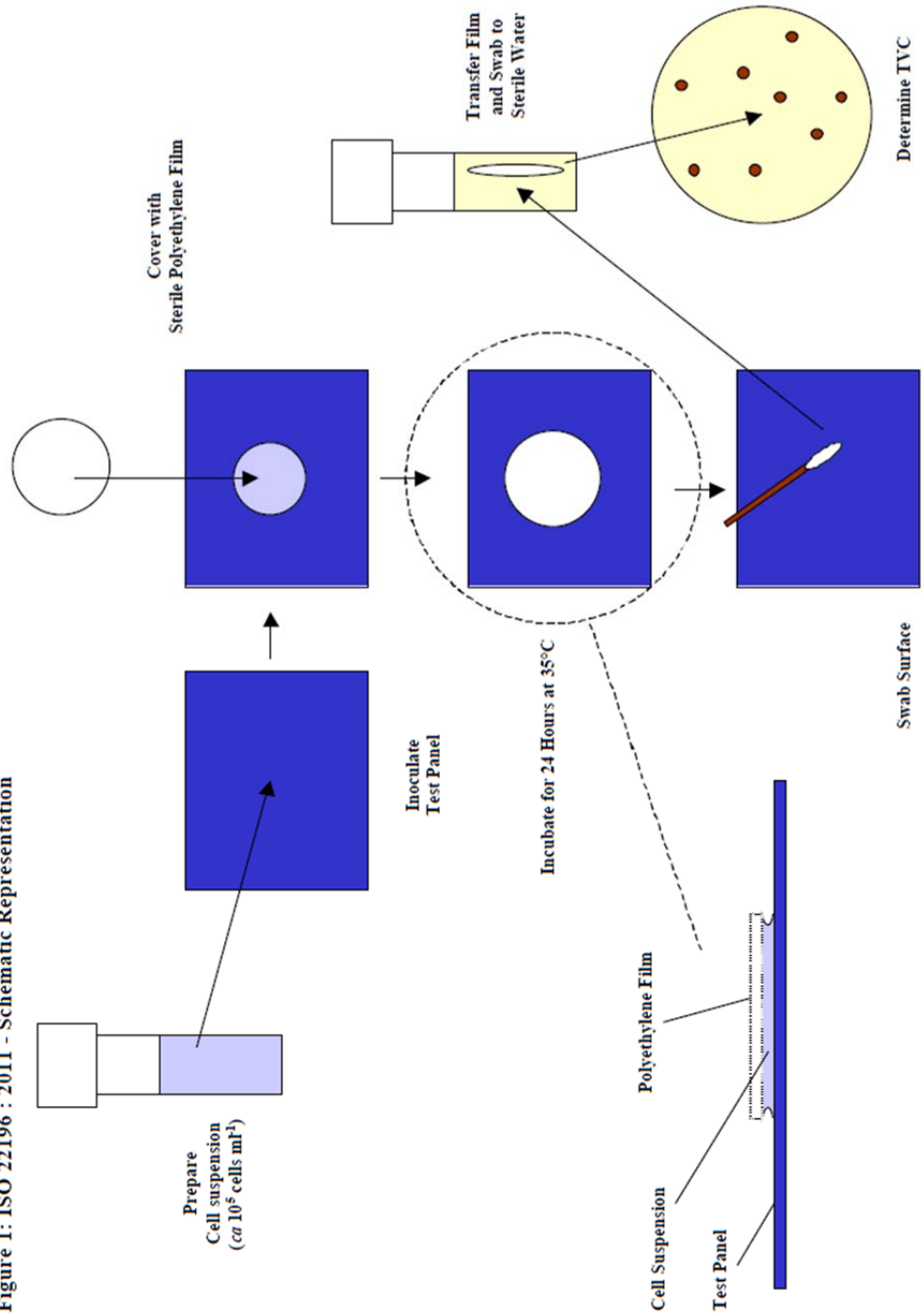


Figure 1: ISO 22196 : 2011 - Schematic Representation

3 Results and Observations

The results are shown in Tables 1 - 2 and Figure 2 below.

Table 1: Activity of coatings against Staphylococcus aureus
(Geometric mean of 3 replicates as Colony Forming Units cm⁻²)

Sample	Contact Time		Reduction from Initial	
	0 Hours	24 Hours	%	Log ₁₀
Polypropylene	2.1x 10 ⁴	1.3 x10 ⁴	39.43	0.2
Bulletin Board PCO 52344	2.1 x10 ⁴	≤1.00	≥99.99	≥4.3
Corklinoleum PCO 50635	2.1 x10 ⁴	≤1.00	≥99.99	≥4.3
Artoleum PCO 52151	2.1 x10 ⁴	1.5	99.99	4.2
Marmoleum Real PCO 51996	2.1 x10 ⁴	≤1.00	≥99.99	≥4.3
Marmoleum Sport PCO 52165	2.1 x10 ⁴	≤1.00	≥99.99	≥4.3
Walton Cirrus PCO 52139	2.1 x10 ⁴	≤1.00	≥99.99	≥4.3

‡ The theoretical limit of detection is 1 CFU cm⁻²

The data in Table 2 shows that the population of Staphylococcus aureus held in contact with the IMSL Polypropylene surface declined by 39.43%. This is considered a normal response for this species on an inert surface under the conditions imposed by ISO 22196. In contrast, the populations of Staphylococcus aureus exposed to the surfaces of Bulletin Board PCO 52344, Corklinoleum PCO 50635, Artoleum PCO 52151, Marmoleum Real PCO 51996, Marmoleum Sport PCO 52165 and Walton Cirrus PCO 52139 all declined by 99.99% or greater after 24 hours compared to the initial population.

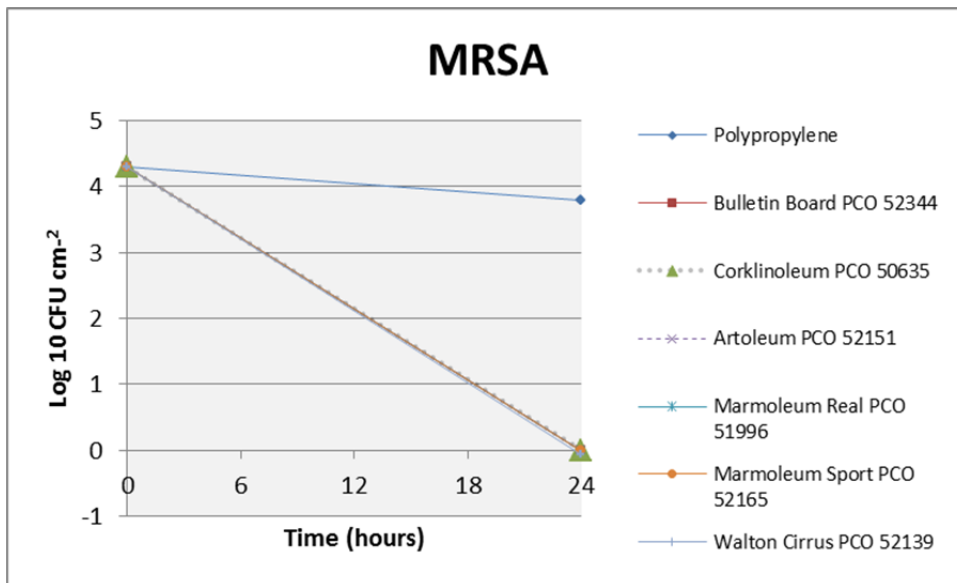
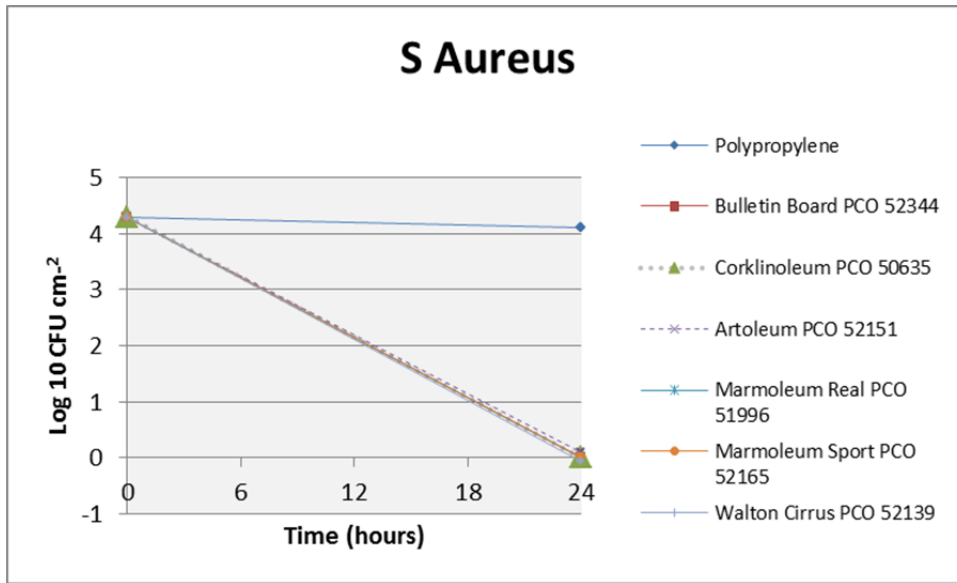
Table 2: Activity of coatings against MRSA
(Geometric mean of 3 replicates as Colony Forming Units cm⁻²)

Sample	Contact Time		Reduction from Initial	
	0 Hours	24 Hours	%	Log10
Polypropylene	2.0 x10 ⁴	6.8 x10 ³	68.78	0.5
Bulletin Board PCO 52344	2.0 x10 ⁴	≤1.00	≥99.99	≥4.3
Corklinoleum PCO 50635	2.0 x10 ⁴	≤1.00	≥99.99	≥4.3
Artoleum PCO 52151	2.0 x10 ⁴	≤1.00	≥99.99	≥4.3
Marmoleum Real PCO 51996	2.0 x10 ⁴	≤1.00	≥99.99	≥4.3
Marmoleum Sport PCO 52165	2.0 x10 ⁴	≤1.00	≥99.99	≥4.3
Walton Cirrus PCO 52139	2.0 x10 ⁴	≤1.00	≥99.99	≥4.3

‡ The theoretical limit of detection is 1 CFU cm⁻²

The data in Table 2 shows that the population of MRSA held in contact with the IMSL polypropylene surface declined by 66.78%. This is again considered a normal response for this species on an inert surface under the conditions imposed by ISO 22196. In contrast, the populations of MRSA exposed to the surfaces of Bulletin Board PCO 52344, Corklinoleum PCO 50635, Artoleum PCO 52151, Marmoleum Real PCO 51996, Marmoleum Sport PCO 52165 and Walton Cirrus PCO 52139 all declined by > 99.99% to below the limit of detection after 24 hours compared to the initial population.

Figure 2: Results as Log₁₀ CFU cm⁻²



End of Report

TJG



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