



**UNIVERSITY  
OF MALAYA**

**LAB REPORT**

**Measurement of Antibacterial Activity on Plastics and  
Textile**

**Conducted and prepared by**

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Centre for Research Services,  
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University of Malaya**

**on**

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## REPORT

### Measurement of antibacterial activity on plastics and other non-porous surfaces

Client:	SentuhSafe Royce Lim 017-2933875 <a href="mailto:royce@sentuhsafe.com">royce@sentuhsafe.com</a>								
Description of study:	This study aims to measure the antibacterial activity on plastics and textile								
Objective:	To measure the antibacterial activity ( <i>E. coli</i> , <i>Salmonella</i> and <i>Staphylococcus aureus</i> ) on antimicrobial-treated plastics using the modified ISO 22196 (for plastic) and modified AATCC 100 (for textile) standards.								
Sample:	<p>A total of 2 antimicrobial-coated/-treated plastics/textile will be tested for its antimicrobial activity. ONE non-treated sample (PET sheet) will also be included in this test.</p> <table border="1"> <thead> <tr> <th>Sample</th> <th>Type of sample</th> </tr> </thead> <tbody> <tr> <td>Control (non-coated sheet)</td> <td>Non-coated PET sheet</td> </tr> <tr> <td>SentuhSafe coated PET sheet (transparent)</td> <td>antimicrobial-coated PET sheet</td> </tr> <tr> <td>SentuhSafe coated woven fabric</td> <td>antimicrobial-coated textile</td> </tr> </tbody> </table>	Sample	Type of sample	Control (non-coated sheet)	Non-coated PET sheet	SentuhSafe coated PET sheet (transparent)	antimicrobial-coated PET sheet	SentuhSafe coated woven fabric	antimicrobial-coated textile
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Control (non-coated sheet)	Non-coated PET sheet								
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SentuhSafe coated woven fabric	antimicrobial-coated textile								
Brief description of experiment:	<p><b>Bacterial Inoculum</b> – Gram-negative <i>Escherichia coli</i> ATCC 25922, <i>Salmonella enterica</i> serovar Enteritidis ATCC13076 and the Gram-positive <i>Staphylococcus aureus</i> ATCC 25923 were included in the antimicrobial test.</p> <p><b>Sample Preparation</b> – The bacteria strains were sub-cultured following the standard. In brief, prior to the inoculation, the strains were sub-cultured into fresh TSB at 1:50 and incubated in shaking incubator for 2 h at 37 °C, before centrifugation (2000 rpm, 10 min) and resuspended in phosphate buffered saline (PBS) (modified ISO 22196) or Mueller-hinton broth (modified AATCC 100) . The number of bacteria of the inoculum were adjusted to <math>\sim 10^8</math> CFUs/mL and confirmed by culturing approach.</p> <p><b>Microbiological assays</b> - The ISO 22196 with slight modifications was performed to evaluate the antimicrobial activities of the control (non-coated sheet) and SentuhSafe coated PET sheet (transparent). The samples were cut into pieces of 2.5 cm × 5 cm carefully and each piece were placed in an individual sterile petri dish. A total volume of 200 <math>\mu</math>L of inoculum (<math>\sim 10^5</math> cfu/ml) was pipetted onto the surface of the sample and covered with sterilised thin film to evenly spread the inoculum and ensure of close contact with the surface.</p> <p>For SentuhSafe coated woven fabric, modified AATCC 100 method was used. The samples were cut into pieces of 2.5 cm × 5 cm carefully and each piece were placed in an individual sterile petri dish. A total volume of 200 <math>\mu</math>L of inoculum (<math>\sim 10^5</math> cfu/ml) was pipetted onto the surface of the sample and the inoculum was allowed to be</p>								

fully absorbed into the fabric. The sample was placed in a sealed container for incubation.

The specimens were then incubated for 18-24 h at  $35\pm 2$  °C and a relative humidity > 90%. To recover the bacteria from the surfaces of the plastic samples, the sample was washed and shook rigorously with 5ml of Soybean Casein Lecithin Polysorbate (SCDLP) broth. The SCDLP broth was then enumerated. The number of viable bacteria per  $\text{cm}^2$  was calculated.

## RESULTS

**Table 1:** Number of viable bacterial cells (log CFU/cm<sup>2</sup>) detected on the tested materials using a modified method of ISO22196 (plastics) and AATCC100 (fabric).

Sample	Number of viable bacteria cells (log CFU/ cm <sup>2</sup> )					
	<i>Staphylococcus aureus</i> ATCC 25923		<i>E. coli</i> ATCC 25922		Salmonella Enteritidis ATCC 13076	
	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
Control (non-coated sheet)	5.3	5.33	5.43	5.37	5.37	5.4
SentuhSafe coated PET sheet (transparent)	3.3	3.41	1.62	2.06	2.23	2.3
SentuhSafe coated woven fabric	1.84	1.79	0.3	0.08	0.38	0.2

**Table 2:** Log reduction (log CFU/cm<sup>2</sup>) of SentuhSafe coated PET sheet and SentuhSafe coated woven fabric in comparison with the control (non-coated sheet).

Sample	Log reduction <sup>a</sup> (% antimicrobial activity) <sup>b</sup>					
	<i>Staphylococcus aureus</i> ATCC 25923		<i>E. coli</i> ATCC 25922		<i>Salmonella</i> Enteritidis ATCC 13076	
	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
SentuhSafe coated PET sheet (transparent)	2.00 (99.000%)	1.92 (98.792%)	3.81 (99.984%)	3.31 (99.951%)	3.14 (99.929%)	3.10 (99.920%)
SentuhSafe coated woven fabric	3.46 (99.966%)	3.54 (99.971%)	5.13 (99.999%)	5.29 (99.999%)	4.99 (99.999%)	5.20 (99.999%)

<sup>a</sup> Log reduction = Number of viable cells on control sample (log CFU/cm<sub>2</sub>) – number of viable cells on samples (log CFU/cm<sub>2</sub>)

<sup>b</sup> % antimicrobial activity = [number of viable cells on control (CFU/cm<sup>2</sup>)– number of viable cells on sample (CFU/cm<sup>2</sup>)] / number of viable cells on control (CFU/cm<sup>2</sup>). Refer to the table below for conversion of log reduction to percent reduction:

Log Reduction	Reduction Factor	Percent Reduced
2	100	99%
3	1,000	99.9%
4	10,000	99.99%
5	100,000	99.999%

Prepared by:

A handwritten signature in black ink, appearing to read 'Chai Lay Ching', written in a cursive style.

Associate Prof Dr Chai Lay Ching  
Lab Director  
INFRA Microbiology Laboratory  
PPP

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