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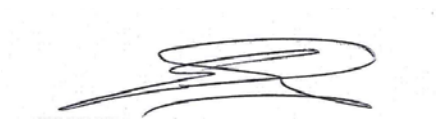
Dresden, 09/09/2014

Test report
Order no. 2214035-4

Client:	M. Kaindl KG / Kaindl Flooring GmbH Kaindlstrasse 2, 5071 Wals / Salzburg, Austria
Order date:	25/08/2014 order number (client): 1813868
Order:	Determination of the antibacterial properties of a laminate surface
Contractor:	Entwicklungs- und Prüflabor Holztechnologie GmbH Zellescher Weg 24, 01217 Dresden, Germany
Person in charge:	Dipl.Biol. Katharina Plaschkies



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Dr. Wolfram Scheiding

Head of Laboratory Biological Testing
Surveillance Body FPC/EUTR

The test report contains 4 pages and 1 annex with 1 page. Any duplication, even in part, requires written permission of EPH. These test results are exclusively related to the tested material.

1 Task

Determination of the antibacterial properties of a laminate surface

2 Test material

Sample receipt at the contractor: 28/08/2014

Name: Laminate for

- Kaindl worktop
- Worktop system products
- Laminate Bonded Board
- Window sills

3 Test performance

The test was carried out according to ISO 22196 (2007): Plastics – Measurement of antibacterial activity on plastics surfaces.

A defined bacteria suspension (inoculum) was spread over the specimen's surface by covering with a polyethylene film (thickness 0,065 mm). These inoculated test specimens were incubated in a humid chamber at 36 °C for 24 hours. The antibacterial activity was determined from the number of viable bacteria.

As reference sample without any antibacterial effect as well as for covering of the sus-pension on the specimens, a film from polyethylene was used.

Further details of the test:

Test strains:	*Staphylococcus aureus* subsp. *aureus* DSM 799 *Escherichia coli* DSM 1576
Size of the specimen surface:	50 mm × 50 mm
Size of the tested surface area:	40 mm × 40 mm
Film for covering:	polyethylene 40 mm × 40 mm × 0,065 mm
Cleaning of the specimens:	disinfection by 70% ethanol
Replicates:	6 (3 specimens of the test material, 2 replicates of each dilution series)
Volume of test inoculum:	400 µl
Non-ionic surfactant:	Tween 80 (7,0 g/l)
Procedure for the determination of the viable number of bacteria:	plating of 50 µl on nutrient agar using a spiral plater, incubation at 36 °C
Date of the test:	September 02nd-04th 2014

4 Validity of the test

The test was valid (table 1).

Table 1: Criteria for valid values

Criteria (reference material)	Demand	Determined value in the test *Staphylococcus aureus*	*Escherichia coli*
$\frac{[(lgN_0)_{max.} - (lgN_0)_{min.}]}{(lgN_0)_{average}}$	≤ 0.2	0.04 (valid)	0.04 (valid)
$N_{0average}$ [cfu/cm²]	6.2×10^3 up to 2.5×10^4	9.8×10^3 (valid)	8.3×10^3 (valid)
$N_{24minimum}$ [cfu/cm²]	6.2×10^1	3.8×10^2 (valid)	2.6×10^3 (valid)

cfu colony forming units (viable bacteria)
N_0 number of viable bacteria prior the incubation N_{24} number of viable bacteria after 24 h incubation

5 Basis for evaluation

The antibacterial activity R describes the reduction of the viable bacteria on the test surface within 24 hours in comparison to the reference material.

$R = U_T - A_T$

U_T: average of the common logarithm of the number of viable bacteria recovered from the reference material immediately after 24 hours in bacteria/cm²

A_T: average of the common logarithm of the number of viable bacteria recovered from the test material immediately after 24 hours in bacteria/cm²

6 Results

The number of viable*Escherichia coli* increased on the reference material polyethylene film within 24 hours by more than 1.0 lg-stages. The number of *Staphylococcus aureus* was reduced by one lg-stage.

On the tested laminate, no viable bacteria were detected after 24 hours. The number of *Escherichia coli* decreased by more than 4.3 lg-stages and for *Staphylococcus aureus by more than* 2.1 lg-stages.

Values are given in table 2 and in the annex.

Tab. 2 Ergebnisse

	Staphylococcus aureus	*Escherichia coli*
Concentration of the inoculum (determined by counter chamber)	4.3×10^5 cfu/ml	4.2×10^5 cfu/ml
Theoretical recovery rate on the material	1.1×10^4 cfu/cm²	1.0×10^4 cfu/cm²
Recovery rate of viable bacteria after 0 hours on the reference material	9.8×10^3 cfu/cm² lg = 4.0	8.3×10^3 cfu/cm² lg = 3.9
Recovery rate of viable bacteria after 24 hours		
▪ Reference material Polyethylene film	8.2×10^2 cfu/cm² lg = 2.9 = U_T	1.4×10^5 cfu/cm² lg = 5.1 = U_T
▪ Testmaterial Laminatflooring Classic Touch 8.0	< 6 cfu/cm² lg = < 0.8 = A_T Antibacterial activity $R = U_T - A_T > 2.1$	< 6 cfu/cm² lg = < 0.8 = A_T Antibacterial activity $R = U_T - A_T > 4.3$

7 Conclusion

A laminate surface for Kaindl worktop, worktop system products, laminate bonded board and window sills was tested to its antibacterial properties according to ISO 22196:2007. Following values of the antibacterial activity were determined:

Staphylococcus aureus: R > 2.1
Escherichia coli: R > 4.3

A clear antibacterial activity is given for R ≥ 1.

K. Plaschkies

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Dipl.-Biol. Katharina Plaschkies
Person in charge

annex: single values

Tab. A1: Single values for *Staphylococcus aureus* subsp. *aureus*

		Reference polyethylene film		Test material laminate
		after 0 hours	after 24 hours	after 24 hours
C: determined single values [cfu/ml]	Value 1	16,568	4,600	< 10
	Value 2	15,582	5,000	< 10
	Value 3	18,217	800	< 10
	Value 4	16,279	600	< 10
	Value 5	12,426	600	< 10
	Value 6	15,504	800	< 10
$C_{average}$		15,660	1,320	< 10
V: volume of the suspension [ml]		10	10	10
A: area of the test surface [cm²]		16	16	16
Number of the viable bacteria N=(CxV)/A [cfu/cm²]		9,788	825	< 6
lgN		4.0	2.9	< 0.8 = A_T
Antibacterial activityR=UT - AT				> 2.1

Tab. A2: Single values for *Escherichia coli*

		Reference polyethylene film		Test material laminate
		after 0 hours	after 24 hours	after 24 hours
C: determined single values [cfu/ml]	Value 1	10,.651	5,523	< 10
	Value 2	14,596	4,208	< 10
	Value 3	13,.566	1,400,000	< 10
	Value 4	13,018	1,130,000	< 10
	Value 5	15,891	1,820,000	< 10
	Value 6	13,018	1,950,000	< 10
$C_{average}$		13,357	225,.209	< 10
V: volume of the suspension [ml]		10	10	10
A: area of the test surface [cm²]		16	16	16
Number of the viable bacteria N=(CxV)/A [cfu/cm²]		8,348	140,756	< 6
lgN		3.9	5.1	< 0.8 = A_T
Antibacterial activityR=UT - AT				> 4.3