Laboratory Report

Client: Freudenberg Haushaltsprodukte KG, Corporate Technical Centre
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Your date of order:	16.01.2004	Receipt of samples/sampling:	21.01.2004
Your order no.:		Date of analysis:	26.01.2004
BMA-order no.:	AU040116-02	Date of report:	02.02.2004
BMA-sample no.:	040121-01	Report no.:	BE040116-02/K2

Test object

Mop pad: SWEP-High Speed Finnmop (Vileda) prewashed at 60°C

Analyses

Evaluation of capability of SWEP-High Speed Finnmop to reduce bacteria on floor surfaces

1. Purpose of the study / Conclusion

It was the purpose of the present study to investigate „SWEP-High Speed Finnmop (Vileda)" with regard to its cleaning effects in hospitals.

The first test of the present study shows, that the SWEP-High Speed Finnmop reduces bacteria considerably (84,4%) on the surface of a heavily used laboratory vinyl floor without desinfectans, which was normaly cleaned onetime the week without desinfectans.

As it is not the purpose of cleaning in hospitals to remove ubiquitous environmental germs on the surface of a heavily used floor, but to reduce the number of pathogenic or optional pathogenic microorganisms two bacterial strains (*Pseudomonas aeruginosa* and *Staphylococcus aureus*) are used in a second test, which are typical pathogens in hospitals. During this test the SWEP-High Speed Finnmop (Vileda) shows considerably high reduction (99,8%) of both bacteria test strains, which were applied on the surface of a new sterile vinyl floor in a cleanbench under standard labortory conditions before cleaning.

The results of the present study clearly demonstrate, that efficient sanitation is independent from desinfection.

2. Materials and Methods

Method 1

Material

Test surface: The test was performed on a heavily used laboratory vinyl floor (non structured, more than 5 years old). The floor was cleaned onetime the week (wet cleaning without desinfection). Last cleaning 3 days before testing.

Finnmop system: SWEP-High Speed Finnmop (Vileda) prewashed at 60°C

Neutral cleaner: Tana Neutral-Reiniger 04631 (TANA Chemie GmbH, Mainz, Germany)

Contact plates: 25 cm^2 contact plates with tryptone soya agar (U.S.P.)

Method

Determination of bacteria:

The determination of bacteria from the surface of the floor was carried out by using contact plates with tryptone soya agar based on EN 1174-2. The contact plates were cultivated 3 days at 30°C.

Cleaning procedure with the Finnmop system:

The dry Finnmop was damped by spraying 200 ml water with 1% neutral cleaner without desinfectans onto the mop. Then the Finnmop was wiped once across the test surface by moving it in form of an 8 at a speed of approx. 5 cm/s based on instructions of manufacturer (see catalogue "vileda Professional")

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Samples:

The test surface was divided into 3 areas, measuring 21 x 18 cm each.

Before cleaning, the bacteria concentration of the surface of the first test area was determined using 15 contact plates.

After cleaning the bacteria concentration of the wet surface of the second test area was determined using 15 contact plates as well.

75 minutes after cleaning the bacteria concentration of the dry surface of the third test area was determined by the same procedure as described above.

Method 2

Material

Test surface:	new vinyl floor (Cushioned Vinyl, 40 x 100 cm), non structured
Finnmop system:	SWEP-High Speed Finnmop (Vileda) prewashed at 60°C
Neutral cleaner:	Tana Neutral-Reiniger 04631 (TANA Chemie GmbH, Mainz, Germany)
Bacteria strains:	*Pseudomonas aeruginosa* (ATCC 9027) *Staphylococcus aureus* (ATCC 6538)
Tubes	50 ml Falcon tube
Liquid agar for the pour plating method:	tryptone soya agar (45°C)
Lolid agar for the spread plates method:	tryptone soya agar

Method

This test was performed in a cleanbench under standard conditions.

Test surface

Before testing the floor was disinfected in the cleanbench.

Application of bacteria on the test surface

The bacteria strains *Pseudomonas aeruginosa* and *Staphylococcus aureus* were applied on the test surface as per emulsion. The concentration of *Pseudomonas aeruginosa* and *Staphylococcus aureus* in suspension was $1,27 \times 10^8$ cfu / ml (cfu = colony forming unit) for each strain. 5 ml of this bacteria suspension was applied onto 4000 cm^2 yielding in $1,6 \times 10^5$ cfu / cm^2.

Determination of bacteria from the surface of the floor based on EN 1174-2

Areas of 7 x 9 cm were suspended in 15 ml 0,09 % NaCl solution in a falcon tube and shaked 20 min end to end. The bacteria concentration of the suspension was analysed using the pour plating method (mixing of the suspension with hot liquid tryptone soya agar (45°C) and plating) for low concentrations and the spread plates method (plating 100 µl of the suspension on a solid tryptone soya agar plate, 2 parallel plates per dilution) for high concentrations. The agar plates were cultivated 4 days at 30°C.

Cleaning procedure with the Finnmop system

The dry Finnmop was pulled on a 30 cm holder and damped by spraying 130 ml water with 1% neutral cleaner (without desinfectans) onto the mop. Then the Finnmop was wiped once across the test surface by moving it form of a 8 at a speed of approx. 5 cm/s based on instrutions of manufacturer (see catalogue "vileda Professional")

Controll of desinfection:

Before application of bacteria the desinfection was controlled by suspension of 3 floor areas of 7 x 9 cm and determination of bacteria by using the pour plating method.

Samples:

After application of bacteria and drying of the floor for one an hour the recovery of the test was determined by suspension of 6 floor areas of 7 x 9 cm and determination of bacteria using the spread plates method. After application of bacteria and drying of the test surface $0,47 \times 10^5$ cfu of cultivable bacteria / cm^2 (+/- 0,24 x 10^5 cfu / cm^2) were detectable.

After cleaning the bacteria concentration was determined by suspension of 15 floor areas of 7 x 9 cm using the pour plating method and 15 floor areas using the spread plates method.

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3. Results

The results of the measurements and analyses exclusively refer to the examined article(s).

3.1 Capability of SWEP-High Speed Finnmop to reduce bacteria on a heavily used laboratory vinyl floor (non structured, more than 5 years old)

Table 1: Bacteria concentrations on the floor surface before and after cleaning

| Sample / Sample identification | | Bacteria concentration | | Reduc-tion [%] | Bacteria concentration | Reduc-tion [%] |
		before cleaning [CFU / m^2]	directly after cleaning (wet floor) [CFU / m^2]		75 min after cleaning (dry floor) [CFU / m^2]	
SWEP-High Speed Finnmop (Vileda), prewashed 040121-01	mean	90.000	31.200	65,3	14.000	84,4
	standard deviation	13.787	9.826	10,9	2.718	3,0

detection limit: 400 CFU / m^2

Comparison of recoveries from wet and dry floor: The higher recovery from the wet floor in comparison to the dry floor may be caused by a higher removal of bacteria from heavily used wet Floors by using contact plates.

Based on the results described above only the comparison of the results from the experiments carried out with the dry floors is permissible in order to give a final judgement.

3.2 Capability of SWEP-High Speed Finnmop to reduce bacteria on a new vinyl floor under standard conditions with 2 bacteria test strains (*Pseudomonas aeruginosa* and *Staphylococcus aureus*)

Table 2: Bacteria concentrations on the floor surface before and after cleaning

| Sample / Sample identification | | Bacteria concentration before cleaning | | Bacteria concentration after cleaning | | Reduction [%] |
		[CFU / cm^2]	[CFU / m^2]	[CFU / cm^2]	[CFU / m^2]	
SWEP-High Speed Finnmop (Vileda), prewashed 040121-01	mean	47.024	$4{,}702 \times 10^8$	73,6	$7{,}361 \times 10^5$	99,844
	standard deviation	24.621	$2{,}462 \times 10^8$	28,7	$2{,}865 \times 10^5$	0,061

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Annex

Single Results

The results of the measurements and analyses exclusively refer to the examined article(s).

Table 1: Capability of SWEP-High Speed Finnmop to reduce bacteria on a heavily used laboratory vinyl floor (non structured, more than 5 years old). Bacteria concentrations on the floor surface before and after cleaning

Sample / Sample identification	Sample No.	before cleaning [CFU / m²]	Sample No.	directly after cleaning (wet floor) [CFU / m²]	Reduction [%]	Sample No.	75 min after cleaning (dry floor) [CFU / m²]	Reduction [%]
SWEP-High Speed Finnmop (Vileda), prewashed	1.1.1	88.400	1.2.1	51.200	43	1.3.1	9.200	90
	1.1.2	n.e.	1.2.2	43.600	52	1.3.2	17.200	81
040121-01	1.1.3	84.400	1.2.3	36.000	60	1.3.3	15.600	83
	1.1.4	n.e.	1.2.4	42.800	52	1.3.4	n.e.	-
	1.1.5	83.200	1.2.5	27.200	70	1.3.5	12.000	87
	1.1.6	113.600	1.2.6	34.800	61	1.3.6	14.000	84
	1.1.7	104.400	1.2.7	31.200	65	1.3.7	16.400	82
	1.1.8	80.000	1.2.8	39.600	56	1.3.8	14.800	84
	1.1.9	76.000	1.2.9	27.200	70	1.3.9	11.600	87
	1.1.10	n.e.	1.2.10	23.600	74	1.3.10	17.200	81
	1.1.11	n.e.	1.2.11	17.200	81	1.3.11	17.600	80
	1.1.12	n.e.	1.2.12	21.200	76	1.3.12	10.800	88
	1.1.13	n.e.	1.2.13	25.600	72	1.3.13	12.400	86
	1.1.14	n.e.	1.2.14	26.400	71	1.3.14	n.e.	-
	1.1.15	n.e.	1.2.15	20.400	77	1.3.15	13.200	85
mean		90.000,0		31.200,0	65,3		14.000,0	84,4
standard deviation		13.787,0		9.825,9	10,9		2.717,8	3,0

detection limit: 1 CFU / 25 cm²

n.e.: This sample could not be evaluated (overflow of colonies on this surface) and therefore was not included into the calculation of the mean and standard deviation.

Table 2: Capability of SWEP-High Speed Finnmop to reduce bacteria on a new vinyl floor under standard conditions with two bacteria test strains (*Pseudomonas aeruginosa* and *Staphylococcus aureus*). Bacteria concentrations on the floor surface before and after cleaning. All results were obtained by the spread plates method. The results of the pour plating method could not be evaluated because of overflow of colonies in all samples.

Sample / Sample identification	Sample No.	Bacteria concentration before cleaning			
		spread plates method (100 µl of the 1:1000 dilution) [CFU / agar plate]		[CFU / cm^2]	[CFU / m^2]
SWEP-High Speed Finnmop (Vileda), prewashed 040121-01	2.2.1	15	21	42.857	4,286 x 10^8
	2.2.2	13	10	27.381	2,738 x 10^8
	2.2.3	61[1]	95[1]	18.571	1,857 x 10^8
	2.2.4	35	38	86.905	8,690 x 10^8
	2.2.5	21	31	61.905	6,190 x 10^8
	2.2.6	162[1]	212[1]	44.524	4,452 x 10^8
mean				47.024	4,702 x 10^8
standard deviation				24.621	2,462 x 10^8

Sample / Sample identification	Sample No.	Bacteria concentration after cleaning			
		spread plates method (100 µl of the suspension) [CFU / agar plate]		[CFU / cm^2]	[CFU / m^2]	Reduction [%]
SWEP-High Speed Finnmop (Vileda), prewashed 040121-01	2.3.1	10	16	31	309.524	99,93
	2.3.2	20	17	44	440.476	99,91
	2.3.3	27	27	64	642.857	99,86
	2.3.4	19	23	50	500.000	99,89
	2.3.5	30	20	60	595.238	99,87
	2.3.6	45	43	105	1.047.619	99,78
	2.3.7	42	45	104	1.035.714	99,78
	2.3.8	55	42	115	1.154.762	99,75
	2.3.9	40	50	107	1.071.429	99,77
	2.3.10	15	30	54	535.714	99,89
	2.3.11	43	31	88	880.952	99,81
	2.3.12	32	20	62	619.048	99,87
	2.3.13	n.e.	n.e.	n.e.	n.e.	n.e.
	2.3.14	n.e.	n.e.	n.e.	n.e.	n.e.
	2.3.15	n.e.	n.e.	n.e.	n.e.	n.e.
mean		30,9		73,6	736.111,1	99,844
standard deviation		12,0		28,7	286.517,3	0,061

[1]: 100 µl of the 1:100 dilution

n.e.: This sample could not be evaluated and therefore was not included into the calculation of the mean and standard deviation.