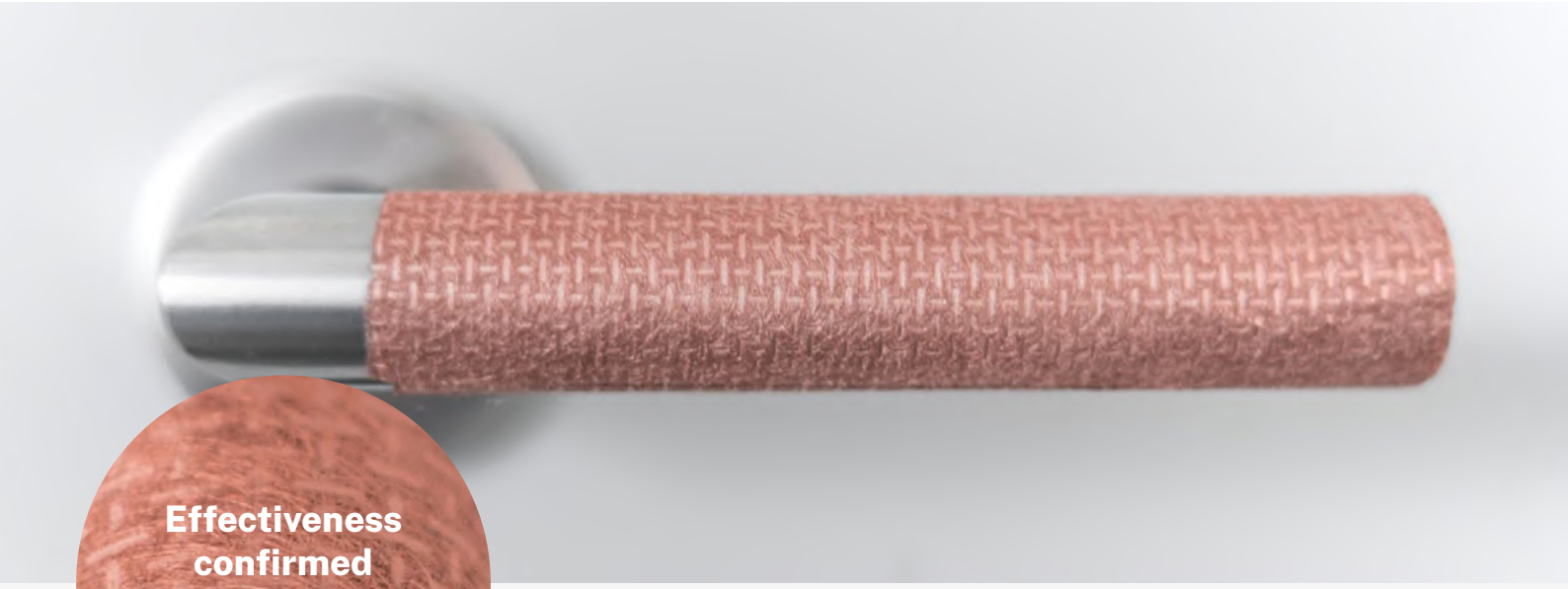
Shieldex®
Copper-Tape

Just stick it on. Protect from viruses!

Inactivates 99.98% of viruses and bacteria after only a few minutes*.



Effectiveness confirmed in 3 independent Laboratory tests*

Rapidly effective

Antiviral & Antibacterial

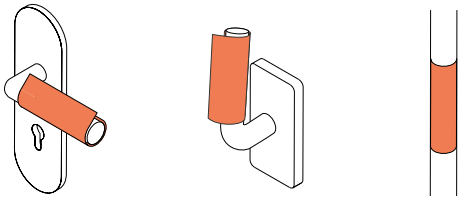
Self-disinfecting

Employee protection

The ion release of copper significantly shortens the survival time of viruses, bacteria and fungi. Due to its positive properties, hospitals, for example, also use solid copper door handles. Our three-dimensionally copper-plated textile has a 7-fold higher ion release compared to solid copper. After only a few minutes, this enables a demonstrable inactivation of 99.98% of corona viruses, among others*.

* Eurovir Laboratories (Results from 16/04/20 available on request)

Flexible application



Door handles | **Window handles** | **Others***

* Push handles. Handrails, shopping carts and much more.

We are there for you:
service@copper-tape.com

Statex Produktions- und Vertriebs GmbH
Kleiner Ort 11, 28357 Bremen, Germany

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Shieldex®
Copper-Tape Flex

NEW

1000 cm x 2 cm

Suitable for use on curved shapes

For all smooth and metallic surfaces

Antiviral and antibacterial

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Against oxidation

Against defilement

We are here for you!

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Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Eurovir® Hygiene-Labor
Antivirale Validierung & Rabies

Testing the virucidal activity of the product *Shieldex® Kiel-SK-96*

Screening test using a praxis-near carrier test system following ISO 21702:2019 against the *Bovine Coronavirus (BoCV-Coronavirus)* - Test run S2 dated 12.06.2020

Short report: screening test S2

by
PD Dr. Olaf Thraenhart and Dr. Christian Jursch

Test period: in June 2020

Principal: STATEX Produktions- und Vertriebs GmbH
Kleiner Ort 11
D-28357 Bremen, Germany

Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Principal: STATEX Produktions- und Vertriebs GmbH
Kleiner Ort 11
D-28357 Bremen, Germany

Products:

- Test item w/o the active component: Shieldex® PBN II Raw material 1,5 Oz
- Test item with active component: Shieldex® Kiel-SK-96
- All test items were applied by the principal

Test parameter:

- Test conditions: T = 25 °C (according to ISO 18184) and 90 % r.LF
- Protein load: no additional protein load; the virus material (cell culture supernatant) was spread onto the surface(s) w/o any further manipulation/alteration
- Volume to square ratio: 157 µL distributed to 3,14/cm² (discs, with d = 2 cm)
- Incubation: 7 min., 15 min. and 30 min. in a climate chamber (KBF 115; Fa. Binder).
- The test discs were placed into the wells of a 12-well cell culture plate (TPP). Incubation was carried out with the lid closed.
- Recovery of the virus material was performed in the same wells as the incubation. After 5 mL of cell culture medium had been added to the well, the sample disk was rinsed repeatedly (15x) with V = 1 mL of medium using a pipette.

Test system:

- Bovines Coronavirus (Beta-Coronavirus); Stamm: S379 Riems
  (Origin: Virusbank of the Friedrich Löffler-Institute, Insel Riems, Germany)
- HRT-18 cells
  (Origin: Inst. f. Hygiene und Infektionskrankheiten der Tiere, Giessen, Germany)

Test procedure:

- The test was performed following ISO 18184:2019. Test principle: quantitative virucidal carrier test at T = 25 °C (in a climate chamber)
- the test was performed w/o (additional) protein load

***Tab. 1:* Product samples tested**

No.	Product (s)	Storage conditions [1]
#1	Shieldex® PBN II Raw material 1,5 Oz (control sample)	at RT
#2	Shieldex® Kiel-SK-96 (test sample)	at RT

[1] = *access limited*

Performing the test

Coating of the test items

- The textile test material (active and control samples) were equipped with the antiviral coponent by the client, who provided this material as ready-to-use material.
- At Eurovir, round sample disks (test disks) with d = 2 cm were cut out of this sample material using a hole punch.

Performing the test

- From the square shaped product material round test disks were prepared using a 2 cm hole punch. Afterwards, the disks were transferred to a 12-well cell culture plate where the testing was then carried out. The incubation was performed with the lid closed.
- The test samples were not sterilised by autoclaving. The test material consists of a synthetic fiber, which does not survive the autoclaving.

Test results:

Observations:

- With the "Virus control" sample disks (VK; sample material without equipment), not all of the virus suspension was absorbed by the textile specimen. Consequently, the test disk was partially immersed in the virus suspension.
- When the test disks (coated with product) were inoculated, the virus material initially remained as small droplets on the surface. As the time progressed, the material was absorbed completely.
- The test disks (coated with product) were provided with a self-adhesive material on the back (including a protective film). As a consequence, these test disks were liquid-tight towards the bottom - in contrast to the control material (VK).
- Up to 30 min. of incubation no drying of the material was observed.
- Resuspending of the virus material was performed apparently unremarkable.
- No further observations / unforeseen events were recorded

Virustitrations

Tab. 2.1: Virus control *(Virus titration by limiting dilution)*

Sample	VK-1a	VK-1b
	Virus control / 1 h	
Titer/Test vol. ($lg\ ID_{50}$)	5,1	5,1
av. virus titer ± K (95%) [1]	**5,10 ± 0,29 / 100 µL**	

[1] = Calculation of the virus titer and its 95% confidence interval according to EN14476

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***Tab. 2.2*: Virus inactivation** (Virus titration by limiting dilution)*

Sample	In-7a	In-7b	In-8a	In-8b	In-9a	In-9b
	Shieldex® Kiel-SK-96 / 7 Min.		Shieldex® Kiel-SK-96 / 15 Min.		Shieldex® Kiel-SK-96 / 30 Min.	
Titer/Test vol. ($lg\ ID_{50}$)	≤ 0,30	≤ 0,30	≤ 0,30	≤ 0,30	≤ 0,30	≤ 0,30
av. virus titer ± K (95%) [1]	≤ 0,30		≤ 0,30		≤ 0,30	
Reduction [2] ($lg\ ID_{50}$ ± K [95%])	**≥ 4,80 ± 0,29**		**≥ 4,80 ± 0,29**		**≥ 4,80 ± 0,29**	

[1] = Calculation of the virus titer and its 95% confidence interval according to EN14476
[2] = Virus reduction: lg ID_{50} of virus input (virus control) minus lg ID_{50} of sample (at the given time point)

***Virus inactivation:** (cf. Tab. 2)*

- Shorter contact times were tested as part of this test (t = 7, 15 and 30 minutes). The virus control VK-1 was used as a reference point for determining the virus reduction.
- Even after the shortest contact time (t = 7 min.) no residual virus was detectable in both test samples. With the two longer contact times the same result was obtained (no residual test virus detectable). Accordingly the product-associated reduction factor was determined to RF ≥ 4,80 ± 0,29 with all three contact times.

Conclusions:

- Even with the shortest contact time a significant virus reduction was recorded. With no residual test virus detected virus reduction amounted to RF ≥ 4,8 (corresponding to a reduction rate of more than 99,99%).
- It can be concluded from the data obtained that under the test conditions a high-level virus-inactivating effect against the *bovine coronavirus* was given. This high-level virus-inactivating effect can be attributed to the antimicrobial equipment.
- The observed virus-inactivating effect of the coating was determined using the *bovine coronavirus* as the test virus. This virus belongs to the enveloped viruses which are in general considered to be inactivated comparable easily. This means that the observed virus inactivation cannot be transferred necessarily to other viruses. This may also apply to other enveloped viruses.

Annotation:

- The data described above were collected in a so-called screening test. This test is a basic test, carried out based on the underlying set of rules and with the omission of validity checks. This test therefore does not correspond to a complete product validation according to ISO 18184.

Luckenwalde, 10th of June 2020

Dr. Ch. Jursch
(GF und Laborleiter Eurovir)

Dr. Christian Jursch
Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

Eurovir® Hygiene-Labor
Antivirale Validierung & Rabies

Testing the virucidal activity of the product Shieldex® Kiel-SK-96

Examination using a praxis-near carrier test system following ISO 21702:2019 against the *Transmissible Gastroenteritis Virus (TGEV-Coronavirus)* - Test run S1 dated 09.04.2020

Short report: screening test S1

by
PD Dr. Olaf Thraenhart and Dr. Christian Jursch

Test period:	in April 2020
Principal:	STATEX Produktions- und Vertriebs GmbH Kleiner Ort 11 D-28357 Bremen, Germany

Principal: STATEX Produktions- und Vertriebs GmbH
Kleiner Ort 11
D-28357 Bremen, Germany

Products:

- Test item with active component: Shieldex® Kiel-SK-96 Copper Plated Non-Woven + adhesive
- Test item w/o the active component: Shieldex® PBN II Raw material 1,5 Oz
- All test items were applied by the principal

Test parameter:

- Test conditions: T = 25 °C (according to ISO 18184) and 60 % r.LF
- Protein load: no additional protein load; the virus material (cell culture supernatant) was spread onto the surface(s) w/o any further manipulation/alteration
- Volume to square ratio: 200 µL distributed to 3,14/cm² (discs, with d = 2 cm)
- Incubation: 1h, 2h and 4h in a climate chamber (KBF 115; Fa. Binder).

Test system:

- Transmissible Gastroenteritis Virus of Swine (TGEV-Coronavirus); strain: Toyama 36 [used in test as the model virus for SARS-CoV]
  (Origin: Virusbank of the Friedrich Löffler-Institute, Insel Riems, Germany)
- ST75/2 cells (foetal testis cells of swine)
  (Origin: Robert Koch-Institute, Berlin, Germany)

Test procedure:

- The test was performed following ISO 21702:2019. Test principle: quantitative virucidal carrier test at T = 25 °C (in a climate chamber)
- the test was performed w/o (additional) protein load

Tab. 1: Product samples tested

No.	Product (s)	Storage conditions [1]
#1	Shieldex® Kiel-SK-96 Copper Plated Non-Woven + adhesive (test sample)	at RT
#2	Shieldex® PBN II Raw material 1,5 Oz (control sample)	at RT

[1] = *access limited*

Performing the test

Coating of the test items

- The textile test material (active and control samples) were equipped with the antiviral coponent by the client, who provided this material as ready-to-use material.
- At Eurovir, round sample disks (test disks) with d = 2 cm were cut out of this sample material using a hole punch.

Performing the test

- The test samples were not sterilised by autoclaving. The test material consists of a synthetic fiber, which does not survive the autoclaving.
- From the square shaped product material round test disks were prepared using a 2 cm hole punch. Afterwards, the disks were transferred to a 12-well cell culture plate where the testing was then carried out. The incubation was performed with the lid closed.
- Resuspending of the virus material was also carried out in the 12-well cell culture plate. For virus recovery 5 mL of cell culture medium was added to the test specimen which was then rinsed repeatedly (15x) using a pipette (with V = 1 mL).

Test results:

Observations:

- With the "Virus control" sample disks (VK; sample material without equipment), not all of the virus suspension was absorbed by the textile specimen. Consequently, the test disk was partially immersed in the virus suspension.
- When the test disks (coated with product) were inoculated, the virus material initially remained as small droplets on the surface. As the time progressed, the material was absorbed completely.
- The test disks (coated with product) were provided with a self-adhesive material on the back (including a protective film). As a consequence, these test disks were liquid-tight towards the bottom - in contrast to the control material (VK).
- Up to 4h of incubation no drying of the material was observed.
- Resuspending of the virus material was performed apparently unremarkable.
- No further observations / unforeseen events were recorded

Virustitrations

Tab. 2.1: Virus control *(Virus titration by limiting dilution)*

Sample	VK-1a	VK-1b	VK-2a	VK-2b	VK-3a	VK-3b
	Virus control / 1 h		Virus control / 2 h		Virus control / 4 h	
Titer/Test vol. ($lg\ ID_{50}$)	3,9	4,2	3,9	3,6	2,85	3,45
av. virus titer ± K (95%) [1]	**4,05 ± 0,38 / 100 µL**		**3,75 ± 0,33 / 100 µL**		**3,15 ± 0,33 / 100 µL**	

[1] = Calculation of the virus titer and its 95% confidence interval according to EN14476

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Eurovir Hygiene-Labor GmbH
Im Biotechnologiepark TGZ I
D-14943 Luckenwalde

***Tab. 2.2*: Virus inactivation** (Virus titration by limiting dilution)*

Sample	In-1a	In-1b	In-2a	In-2b	In-3a	In-3b
	Inactivation / 1 h		Inactivation / 2 h		Inactivation / 4 h	
Titer/Test vol. (lg ID_{50})	≤ 0,30	≤ 0,30	1,35	≤ 0,30	≤ 0,90	≤ 0,90
av. virus titer ± K (95%) [1]	≤ 0,30		≤ 0,38 ± 0,15		≤ 0,90	
Reduction [2] (lg ID_{50} ± K [95%])	**≥ 3,75 ± 0,38**		**≥ 3,37 ± 0,36**		**≥ 2,25 ± 0,33**	

[1] = Calculation of the virus titer and its 95% confidence interval according to EN14476
[2] = Virus reduction: lg ID_{50} of virus input (virus control) minus lg ID_{50} of sample (at the given time point)

***Virus inactivation:** (cf. Tab. 2)*

- Even without the virucidal component the initial amount of virus was slightly reduced with time. After 4h of incubation a virus reduction of approx. 0,9 Log was recorded.
- It was expected in general that the amount of virus would be different with the 3 different time points. To take that into account the amount of virus was determined at each exposure time point separately (virus control [s] at the respective time). Thus the amount of virus at the respective time point (cf. Table 2.1) represents the reference point for determining the product-associated virus inactivation (virus reduction; cf. Table 2.2)..
- Even after t = 1 hour, no residual virus was detectable in both test samples. After t = 2 hours, residual virus was detected in one out of the two test samples whereas the second sample was virus negative. After t = 4 hours the sample material became slightly cytotoxic ($lgTD_{50}$ = 0.9). No residual virus was detectable in the next following dilution.
- After the exposure time was due (1 hour, 2 hours and 4 hours) and under the described test conditions the following product-associated reduction factors were determined: after 1 hour RF ≥ 3,75 ± 0,38, after 2 hours RF ≥ 3,37 ± 0,36 and after 4 hours RF ≥ 2,25 ± 0,33.

Conclusions:

- Even after t = 1 hour a significant virus reduction was recorded. With no residual test virus detected virus reduction was calculated to RF ≥ 3,75 (corresponding to a reduction of 99,98%).
- It can be concluded from the data obtained that under the test conditions and after 1 hour of incubation a high-level virus-inactivating effect vs. the TGEV-coronavirus was given. This high-level virus-inactivating effect can be attributed to the antimicrobial equipment.

Luckenwalde, 16th of April 2020

Dr. Ch. Jursch
(GF und Laborleiter Eurovir)

Laboratorien Dr. Döring Haferwende 21 28357 Bremen

Statex
Produktions- und Vertriebs GmbH
Kleiner Ort 11

28357 BREMEN

March 25th, 2020

TEST REPORT 240320032

Order No. Customer:	-
Project Name:	Copper Tape Kiel
Sampling:	by Customer
Sample Transport:	by Customer on 24.03.2020
Sample Reception:	24.03.2020
Period of Measurement	24.03.2020 – 25.03.2020
Sample Number:	118032 - 118035 / 20
Sample Material:	Solid
Packaging:	PE-Bag
Remarks:	express test
Miscellaneous:	Measuring errors of these analytical measurements are within normal ranges. More information about this upon request. Results are only valid for the samples of this analysis. Copying and distribution of this report requires written permission by Laboratorien Dr. Döring GmbH
Results of Analysis:	Page 2
Measurement Methods:	Eluate — DIN EN 12457-4: 2003-01 Copper — DIN EN ISO 17294-2 (E29): 2005-02
Quality Check:	

M. Sc. Farzin Mostaghimi
(Project Manager)

Dr. Joachim Döring
(CEO)

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gmbh, hrb 15929
gf dr. joachim döring
st-nr 60/120/08234
www.dr-doering.com

Laboratory Number	118032	118033	118034	118035
Sampel Name	**Shieldex Kiel 1**	**Shieldex Kiel 2**	**Reference Sample Cu-tube 1**	**Reference Sample Cu-tube 2**
Remarks	DIN EN 12457-4	DIN EN 12457-4	DIN EN 12457-4	DIN EN 12457-4
Dimension	ELUATE [µg/L]	ELUATE [µg/L]	ELUATE [µg/L]	ELUATE [µg/L]
Area[cm^2]	30,7	28,8	28,1	28,3
Copper	23.000	23.000	3.300	3.400

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Summary of laboratory results

All samples have been cut to equivalent size with a comparable surface area. The weight of the Copper-Tape sample has been about half of the solid Copper tube weight. Within a time period of 12 hours the Copper-Tape released 23.000 µg/L Cu-Ions in an aqueous solution. However the elemental copper tube released 3.400 µg/L Cu-Ions in the same time. Compared to usual Copper, the Copper-Tape is able to release more Cu-Ions in the same time with a comparable surface area and less weight.

The product benefits from the concentration of Cu-Ions due to the three dimensional metallization process. Ion-release rates are proportionately 7 times more efficient with the Copper-Tape compared to solid Copper.

HOHENSTEIN

Hohenstein Laboratories · Schlosssteige 1 · 74357 Bönnigheim · GERMANY

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j.secker@hohenstein.de

Zuständig für Rückfragen / *Contact person*	Unser Zeichen / *Our ref.*	Datum / *Date*
Jutta Secker	jkr	14. Mai 2020

Bericht Nr. / *Report No.* 20.8.3.0080

Auftraggeber: *Client:*	siehe Anschrift *see address*
Prüfgegenstand: *Test sample:*	siehe Seite 2 *see page 2*
Auftragsdatum: *Date of order:*	30.04.2020
Eingang Prüfgegenstand: *Receipt of test samples:*	30.04.2020
Prüfzeitraum: *Period of testing:*	11.05.2020 bis / to 13.05.2020
Probenahme: *Sampling:*	Der Prüfgegenstand wurde uns vom Auftraggeber übersandt. *The test sample has been delivered to us by the client.*

Der Bericht umfasst 4 Seiten. / *The report comprises 4 pages.*

UNTERSUCHUNGSZIEL / *AIM OF TEST*

Prüfung von Textilien und textilen Flächengebilden auf antivirale Aktivität mit einem unbehüllten Prüfvirus.

Testing of textile materials for an antiviral activity using a non-enveloped test virus.

PRÜFGEGENSTAND / *TEST SAMPLES*

Probennr. / *Sample No.*	Prüfgegenstand / *Test sample*
20.8.3.0080-1	Shieldex® Tüll 115, PN:02030420
20.8.3.0080-2	Shieldex® Bonn, PN:01210219
20.8.3.0080-3	Shieldex® MedTex P-130, PN: 05150318
20.8.3.0080-4	Shieldex® Kiel 30, PN: 201096

Der Prüfgegenstand wurde wie vom Auftraggeber eingesandt für die Prüfung verwendet.

The sample was used like handed over by the customer.

METHODE / *METHODS*

PRÜFGRUNDLAGE

AW-QM-11.08.03.054
Methode mit Testvirus **Bakteriophage MS2** (DSM 13767, ATCC 15597-B1).
Die Prüfmethode wird in Anlehnung an Vorgaben der ISO 18184: 2019-06 „Textilien - Bestimmung der antiviralen Aktivität von Textilwaren" durchgeführt und beinhaltet Modifikationen beruhend auf dem verwendeten Teststamm.

TEST SPECIFICATION

AW-QM-11.03.054
*Method using test virus **bacteriophage MS2** (DSM 13767, ATCC 15597-B1).*
The test method is conducted based on the specifications of ISO 18184:2019-06 "Textiles - Determination of antiviral activity of textile products" and contains modifications based on the test strain used.

MODIFIKATION

- Sterilisation: UV
- Inokulationsmedium:
  NaCl 0,85 %
- Elutionsmedium:
  NaCl 0,85 % + 0,20 % Tween 80
- Auswertung:
  Plaqueassay modifiziert für verwendetes Testvirus
- Wirtsbakterium:
  Escherichia coli (DSM 5695, ATCC 12435)
- Kontaktzeit: 18 h

MODIFICATION

- *Sterilisation: UV*
- *Thinning agent for inoculation:*
  NaCl 0,85 %
- *Thinning agent for elution:*
  NaCl 0,85 % + 0,20 % Tween 80
- *Analysis:*
  Plaque assay modified for test virus used
- *Host strain:*
  Escherichia coli (DSM 5695, ATCC 12435)
- *Contact time: 18 h*

BERECHNUNGSGRUNDLAGE

Berechnet wird die Partikelreduktion über 18 Stunden auf der Probe gegenüber dem Kontroll- oder Referenzmaterial, nach der Formel

CALCULATION

The particle reduction is calculated over 18 hours on the sample, in comparison to the control material and reference material respectively, according to the formula:

$$A = \log_{10}(R) - \log_{10}(P)$$

A = Partikelreduktion / antivirale Aktivität
R = Kontrollmaterial / Referenzmaterial nach Kontaktzeit
P = Probematerial nach Kontaktzeit

A = particle reduction / antiviral activity
R = control material / reference material after contact time
P = test material after contact time

ERGEBNIS / *RESULT*

BAKTERIOPHAGE / *BACTERIOPHAGE* MS2 (DSM 13767, ATCC 15597-B1)

Konzentration des Inokulats / *Concentration of inoculum:* 7,40x10^8 PFU/ml

Reduktionswerte / *Reduction values:*

Prüfgegenstand/ *test sample*		Mittelwert / *average value* PFU absolut *pfu absolute*	$\log_{10}$ PFU *$\log_{10}$ pfu*	Partikelreduktion / *Particle reduction* A $\log_{10}$ PFU *$\log_{10}$ pfu*
Kontrolle / *control* PES [1]	0 h	2,33x10^8 [2]	8,37	–
	18 h	7,03x10^7 [2]	7,85	–
20.8.3.0081-1	18 h	3,71x10^6 [2]	6,57	1,28
20.8.3.0081-2	18 h	9,73x10^4 [2]	4,99	2,86
20.8.3.0081-3	18 h	1,51x10^6 [2]	6,18	1,67
20.8.3.0081-4	18 h	1,95x10^3 [2]	3,29	4,56

[1] Kontrollmaterial (nicht antiviral aktiv)
[2] *Logarithmus der Anzahl Plaque-bildender Einheiten (Mittelwert von 3 Prüflingen)*

[1] *Reference material (not antiviral active)*
[2] *Common logarithm of number of plaque forming units (average of 3 test pieces)*

ZUSAMMENFASSUNG / *CONCLUSION*

BEURTEILUNGSKRITERIEN

In Anlehnung an ISO 18184:2014-09, Anhang G

Effektivität der antiviralen Eigenschaft	Wert der antiviralen Wirkung A [$\log_{10}$ PFU]
keine	A < 2
gering	2 ≤ A < 3
signifikant	A ≥ 3

ASSESSMENT CRITERIA

According to ISO 18184:2014-09, Appendix G

Efficacy of the antiviral property	*Value of the antiviral efficacy A [$\log_{10}$ pfu]*
no	*A < 2*
small	*2 ≤ A < 3*
significant	*A ≥ 3*

BEURTEILUNG

- **Kontrollen**

Die Ergebnisse der Kontrollversuche waren nicht zu beanstanden. Damit war der Versuchsverlauf valide.

- **Probe / *sample* 20.8.3.0081-1**

Unter gegebenen Versuchbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber dem eingesetzten Testvirus Bakteriophage MS2 **keine** antivirale Aktivität nachgewiesen.

ASSESSMENT

- ***Controls***

The results of the controls were not objectionable. The experimental procedure was valid.

- **Probe / *sample* 20.8.3.0081-1**

*There is **no** antiviral activity to the test virus bacteriophage MS2 under given test conditions for the tested sample, calculated with the control material (non treated PES).*

- Probe / *sample* 20.8.3.0081-2

Unter gegebenen Versuchbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber dem eingesetzten Testvirus Bakteriophage MS2 eine **geringe** antivirale Aktivität nachgewiesen.

*There is a **small** antiviral activity to the test virus bacteriophage MS2 under given test conditions for the tested sample, calculated with the control material (non treated PES).*

- Probe / *sample* 20.8.3.0081-3

Unter gegebenen Versuchbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber dem eingesetzten Testvirus Bakteriophage MS2 **keine** antivirale Aktivität nachgewiesen.

*There is **no** antiviral activity to the test virus bacteriophage MS2 under given test conditions for the tested sample, calculated with the control material (non treated PES).*

- Probe / *sample* 20.8.3.0081-4

Unter gegebenen Versuchbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber dem eingesetzten Testvirus Bakteriophage MS2 eine **signifikante** antivirale Aktivität nachgewiesen.

*There is a **significant** antiviral activity to the test virus bacteriophage MS2 under given test conditions for the tested sample, calculated with the control material (non treated PES).*

ANMERKUNG

Die Untersuchung wurde mit einem unbehüllten Virus (Bakteriophage MS2) durchgeführt. Die Ergebnisse dieser Prüfung gelten für das eingesetzte Testvirus.

NOTE

The test was carried out with a non-enveloped virus (bacteriophage MS2). The results of this test apply to the test virus used.

Schloss Hohenstein, 14. Mai 2020

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Zuständig für Rückfragen / *Contact person*	Unser Zeichen / *Our ref.*	Datum / *Date*
Jutta Secker	jkr	30. März 2020

Bericht Nr. / *Report No.* 20.8.3.0026/1

Auftraggeber: *Client:*	siehe Anschrift *see address*
Prüfgegenstand: *Test sample:*	siehe Seite 2 *see page 2*
Auftragsdatum: *Date of order:*	23.03.2020
Eingang Prüfgegenstand: *Receipt of test samples:*	23.03.2020
Prüfzeitraum: *Period of testing:*	25.03.2020 bis / to 27.03.2020
Probenahme: *Sampling:*	Der Prüfgegenstand wurde uns vom Auftraggeber übersandt. *The test sample has been delivered to us by the client.*

Der Bericht umfasst 6 Seiten. / *The report comprises 5 pages.*

UNTERSUCHUNGSZIEL / *AIM OF TEST*

Prüfung von textilen Flächengebilden und Materialien auf antibakterielle Aktivität.

Textile materials – Determining the antibacterial activity.

PRÜFGEGENSTAND / *TEST SAMPLES*

Probennr. / *Sample No.*	Prüfgegenstand / *Test sample*
20.8.3.0026-1	Shieldex 33/10 dtex rd Z-Turns PN02110220
20.8.3.0026-2	Shieldex 44/10 dtex rd Z-Turns PN01090320
20.8.3.0026-3	Shieldex 78/18dtex rd T-Turns
20.8.3.0026-4	Shieldex Bern – silver plated Non-Woven Fabric (PBN-II 0,3oz)
20.8.3.0026-5	Shieldex Bremen RS parachute silk + Ag
20.8.3.0026-6	Shieldex Köln copper plated Non-Woven
20.8.3.0026-7	Shieldex Med-tex P130 silver plated knitted fabric

Der Prüfgegenstand wurde wie vom Auftraggeber eingesandt für die Prüfung verwendet.

The sample was used like handed over by the customer.

METHODE / *METHODS*

PRÜFGRUNDLAGE

DIN EN ISO 20743[A]:2013-12
Textilien - Bestimmung der antibakteriellen Wirkung antibakteriell behandelter Erzeugnisse“
8.1 Absorptionsverfahren
Messverfahren: Plattenzählverfahren

Testkeime*:*
- *Staphylococcus aureus* ATCC 6538
- *Klebsiella pneumoniae* ATCC 4352

Lieferquelle: DSMZ

Sterilisation*:* UV

TEST SPECIFICATION

DIN EN ISO 20743[A]:2013-12
Textiles - Determination of the antibacterial activity of antibacterial finished products”
8.1. Absorption method
Measurement method: plate count method

Test strains:
- *Staphylococcus aureus ATCC 6538*
- *Klebsiella pneumoniae ATCC 4352*

Source of supply: DSMZ

Sterilisation: *UV*

MODIFIKATIONEN

- Standard PES als Kontrollmaterial
- *Berechnung:* $log_{10}C_0 = log_{10}T_0$

MODIFICATIONS

- *Standard PES as control material*
- *Calculation:* $log_{10}C_0 = log_{10}T_0$

BERECHNUNGSGRUNDLAGE

Berechnet wird der Keimwachstumswert über 18 Stunden auf der Probe gegenüber dem Kontroll- oder Referenzmaterial, nach der Formel

CALCULATION

The value of germ growth is calculated over 18 hours on the sample, in comparison to the control or reference material and according to the formula:

$$A = (\lg C_{18h} - \lg C_{0h}) - (\lg T_{18h} - \lg T_{0h})$$

C = Kontrollmaterial / Referenzmaterial
T = Probenmaterial

C = control / reference material
T = sample

HOHENSTEIN

ERGEBNIS / *RESULT*

STAPHYLOCOCCUS AUREUS ATCC 6538

Konzentration des Inokulats / *Concentration of inoculum:* 1,16x10^5 KBE/ml / *cfu/ml*

Reduktionswerte / *Reduction values:*

Prüfgegenstand/ *test sample*		Mittelwert / *average value*		Reduktionswert / *reduction value* A	
		KBE absolut *cfu absolute*	lg KBE *lg cfu*	lg KBE *lg cfu*	% (informativ) *(informative)*
Kontrolle / *control* PES [1]	0 h	1,56x10^5 [2]	5,19	--	--
	18 h	4,58x10^6 [2]	6,66	--	--
20.8.3.0026-1	18 h	< 20 [2]	≤ 1,28	≥ 5,38	≥ 99,9996
20.8.3.0026-2	18 h	< 20 [2]	≤ 1,28	≥ 5,38	≥ 99,9996
20.8.3.0026-3	18 h	< 20 [2]	≤ 1,28	≥ 5,38	≥ 99,9996
20.8.3.0026-4	18 h	1,14x10^5* [2]	5,06	1,60	97,5
20.8.3.0026-5	18 h	1,92x10^3 ** [2]	3,28	3,38	99,96
20.8.3.0026-6	18 h	1,94x10^3 *** [2]	3,29	3,37	99,96
20.8.3.0026-7	18 h	7,07x10^3 [2]	3,85	2,81	99,8

1) Kontrollmaterial (nicht antibakteriell aktiv)
2) Die KBE-Bestimmung erfolgt im 3-fach Ansatz; angegeben wird der Mittelwert

1) Reference material (not antibacterial active)
2) Mean value of colony count in triplicate

* Die Differenz der Einzelwerte ist >2 log-Stufen: 1,10x10^4 / 3,31x10^5 / 1,22x10^3
** Die Differenz der Einzelwerte ist >2 log-Stufen: < 20 / < 20 / 5,71x10^3
*** Die Differenz der Einzelwerte ist >2 log-Stufen: < 20 / < 20 / 5,79x10^3

** The difference between the individual values is >2 log steps: 1,10x10^4 / 3,31x10^5 / 1,22x10^3*
*** The difference between the individual values is >2 log steps: < 20 / < 20 / 5,71x10^3*
**** The difference between the individual values is >2 log steps: < 20 / < 20 / 5,79x10^3*

KLEBSIELLA PNEUMONIAE ATCC 4352

Konzentration des Inokulats / *Concentration of inoculum:* 1,43x10^5 KBE/ml / *cfu/ml*

Reduktionswerte / *Reduction values:*

Prüfgegenstand/ *test sample*		Mittelwert / *average value*		Reduktionswert / *reduction value* A	
		KBE absolut *cfu absolute*	lg KBE *lg cfu*	lg KBE *lg cfu*	% (informativ) *(informative)*
Kontrolle / *control* PES 1)	0 h	2,57x10^4 2)	4,41	--	--
	18 h	1,26x10^8 2)	8,10	--	--
20.8.3.0026-1	18 h	< 20 2)	≤ 1,28	≥ 6,82	≥ 99,99998
20.8.3.0026-2	18 h	< 20 2)	≤ 1,28	≥ 6,82	≥ 99,99998
20.8.3.0026-3	18 h	7,61x10^3 * 2)	3,88	4,22	99,994
20.8.3.0026-4	18 h	2,70x10^4 2)	4,43	3,67	99,98
20.8.3.0026-5	18 h	1,96x10^4 ** 2)	4,29	3,81	99,98
20.8.3.0026-6	18 h	9,66x10^2 *** 2)	2,98	5,12	99,9992
20.8.3.0026-7	18 h	2,54x10^5 **** 2)	5,40	2,70	99,8

1) Kontrollmaterial (nicht antibakteriell aktiv)
2) Die KBE-Bestimmung erfolgt im 3-fach Ansatz; angegeben wird der Mittelwert

1) Reference material (not antibacterial active)
2) Mean value of colony count in triplicate

* Die Differenz der Einzelwerte ist >2 log-Stufen: < 20 / < 20 / 2,28x10^4
** Die Differenz der Einzelwerte ist >2 log-Stufen: < 20 / 5,87x10^4 / < 20
*** Die Differenz der Einzelwerte ist >2 log-Stufen: < 20 / 2,86x10^3 / < 20
**** Die Differenz der Einzelwerte ist >2 log-Stufen: 1,35x10^5 / 6,26x10^5 / < 20

** The difference between the individual values is >2 log steps: < 20 / < 20 / 2,28x10^4*
*** The difference between the individual values is >2 log steps: < 20 / 5,87x10^4 / < 20*
**** The difference between the individual values is >2 log steps: < 20 / 2,86x10^3 / < 20*
***** The difference between the individual values is >2 log steps: 1,35x10^5 / 6,26x10^5 / < 20*

ZUSAMMENFASSUNG / *CONCLUSION*

BEURTEILUNGSKRITERIEN

Nach DIN EN ISO 20743:2013-12, Anhang F

Effiktivität der antibakteriellen Eigenschaft	Wert der antibakteriellen Wirkung A [lg KBE]
keine	A < 2
signifikant	2 ≤ A < 3
stark	A ≥ 3

Anmerkung: Eine Zertifizierung der antibakteriellen Wirksamkeit ist erst ab einer signifikanten Aktivität möglich - unabhängig einer Wirksamkeitseinteilung

ASSESSMENT CRITERIA

According to DIN EN ISO 20743:2013-12, Appendix F

Efficacy of the antibacterial property	*Value of the antibacterial efficacy A [lg cfu]*
no	*A < 2*
significant	*2 ≤ A < 3*
strong	*A ≥ 3*

Note: A certificate of the antibacterial activity can be exposed only if a significant efficacy is given – independent of a efficacy graduation

BEURTEILUNG

▪ Kontrollen

Die biologische Aktivität der Teststämme und die Ergebnisse der Kontrollversuche waren nicht zu beanstanden. Damit war der Versuchsverlauf valide.

▪ Probe 20.8.3.0026-1

Unter gegebenen Versuchsbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber den eingesetzten Teststämmen *Staphylococcus aureus* ATCC 6538 und *Klebsiella pneumoniae* ATCC 4352 eine **starke** antibakterielle Aktivität nachgewiesen.

▪ Probe 20.8.3.0026-2

Unter gegebenen Versuchsbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber den eingesetzten Teststämmen *Staphylococcus aureus* ATCC 6538 und *Klebsiella pneumoniae* ATCC 4352 eine **starke** antibakterielle Aktivität nachgewiesen.

▪ Probe 20.8.3.0026-3

Unter gegebenen Versuchsbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber den eingesetzten Teststämmen *Staphylococcus aureus* ATCC 6538 und *Klebsiella pneumoniae* ATCC 4352 eine **starke** antibakterielle Aktivität nachgewiesen.

ASSESSMENT

▪ *Controls*

The biological activity of the test strains and the results of the controls were not to object. The experimental procedure was valid.

▪ *Sample 20.8.3.0026-1*

*There is a **strong** antibacterial activity with the test strains Staphylococcus aureus ATCC 6538 and Klebsiella pneumoniae ATCC 4352 under given test conditions for the tested samples, calculated with the control material (non-treated PES).*

▪ *Sample 20.8.3.0026-2*

*There is a **strong** antibacterial activity with the test strains Staphylococcus aureus ATCC 6538 and Klebsiella pneumoniae ATCC 4352 under given test conditions for the tested samples, calculated with the control material (non-treated PES).*

▪ *Sample 20.8.3.0026-3*

*There is a **strong** antibacterial activity with the test strains Staphylococcus aureus ATCC 6538 and Klebsiella pneumoniae ATCC 4352 under given test conditions for the tested samples, calculated with the control material (non-treated PES).*

■ Probe 20.8.3.0026-4

Unter gegebenen Versuchsbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber dem eingesetzten Teststamm *Staphylococcus aureus* ATCC 6538 **keine** und gegenüber *Klebsiella pneumoniae* ATCC 4352 eine **starke** antibakterielle Aktivität nachgewiesen.

■ *Sample 20.8.3.0026-4*

*There is **no** antibacterial activity with the test strain Staphylococcus aureus ATCC 6538 and a **strong** reduction of the test strain Klebsiella pneumoniae ATCC 4352 under given test conditions for the tested samples, calculated with the control material (non-treated PES).*

■ Probe 20.8.3.0026-5

Unter gegebenen Versuchsbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber den eingesetzten Teststämmen *Staphylococcus aureus* ATCC 6538 und *Klebsiella pneumoniae* ATCC 4352 eine **starke** antibakterielle Aktivität nachgewiesen.

■ *Sample 20.8.3.0026-5*

*There is a **strong** antibacterial activity with the test strains Staphylococcus aureus ATCC 6538 and Klebsiella pneumoniae ATCC 4352 under given test conditions for the tested samples, calculated with the control material (non-treated PES).*

■ Probe 20.8.3.0026-6

Unter gegebenen Versuchsbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber den eingesetzten Teststämmen *Staphylococcus aureus* ATCC 6538 und *Klebsiella pneumoniae* ATCC 4352 eine **starke** antibakterielle Aktivität nachgewiesen.

■ *Sample 20.8.3.0026-6*

*There is a **strong** antibacterial activity with the test strains Staphylococcus aureus ATCC 6538 and Klebsiella pneumoniae ATCC 4352 under given test conditions for the tested samples, calculated with the control material (non-treated PES).*

■ Probe 20.8.3.0026-7

Unter gegebenen Versuchsbedingungen wurde für die untersuchte Probe im Vergleich zum Kontrollmaterial (Standard PES) gegenüber den eingesetzten Teststämmen *Staphylococcus aureus* ATCC 6538 und *Klebsiella pneumoniae* ATCC 4352 eine **signifikante** antibakterielle Aktivität nachgewiesen.

■ *Sample 20.8.3.0026-7*

*There is a **significant** antibacterial activity with the test strains Staphylococcus aureus ATCC 6538 and Klebsiella pneumoniae ATCC 4352 under given test conditions for the tested samples, calculated with the control material (non-treated PES).*

Schloss Hohenstein, 30. März 2020

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Sources & evidence of the antiviral, antibacterial and antifungal effectiveness of copper

[1] Metallic Copper as an Antimicrobial Surface

„The antimicrobial properties of copper surfaces have now been firmly established. Hospital trials have shown a reduction in bacterial counts, indicating that copper surfaces are a promising additional tool alongside other hygienic measures to curb the number and severity of hospital-acquired infections."

Source 1.1: Applied and Environmental Microbiology of American Society for Microbiology (ASM)
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3067274/

[1] Inactivation of Norovirus on Dry Copper Alloy Surfaces

„There is now a considerable body of evidence from laboratory based studies that copper alloys are efficacious against a diverse range of pathogenic microorganisms. Earlier studies demonstrated a rapid kill of Escherichia coli O157, Listeria monocytogenes and methicillin-resistant Staphylococcus aureus (MRSA)"

Source 1.2: PLoS ONE by Public Library of Science
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3767632/

[1] Inactivation of Influenza A Virus on Copper versus Stainless Steel Surfaces

„Influenza A virus particles (2 × 106) were inoculated onto copper or stainless steel and incubated at 22°C at 50 to 60% relative humidity. Infectivity of survivors was determined by utilizing a defined monolayer with fluorescent microscopy analysis. After incubation for 24 h on stainless steel, 500,000 virus particles were still infectious. After incubation for 6 h on copper, only 500 particles were active."

Source 1.3: American Society for Microbiology (ASM)
https://aem.asm.org/content/73/8/2748

[2] Test report Laboratories Dr Döring 25 March 2020, comparison of Shieldex Kiel vs. metallic solid copper

"It has been shown that, due to the unique metallization process, the Shieldex® Kiel eluates have released an average 7 times higher concentration of copper ions than the copper sheet eluates"

Source 2: Laboratorien Dr. Döring on behalf of the company Statex Produktions- und Vertriebs GmbH
https://statex.de/pruefbericht-kupferionenfreisetzung-20200326/

[3] Copper against germs: Asklepios Klinikum Harburg ensures greater patient safety

„This project is the largest of its kind in Europe and the USA to date. Copper has a proven antimicrobial effect and can significantly reduce dangerous germs such as bacteria, fungi and viruses".

Source 3: Asklepios Klinikum Harburg
https://www.presseportal.de/download/document/301649-20141029-pm-copper-against-germs-asklepios-klinikum-harburg.pdf

[4] Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1

SARS-CoV-2 was more stable on plastic and stainless steel than on copper and cardboard, and viable virus was detected up to 72 hours after application to these surfaces, although the virus titer was greatly reduced. The stability kinetics of SARS-CoV-1 were similar. On copper, no viable SARS-CoV-2 was measured after 4 hours and no viable SARS-CoV-1 was measured after 8 hours. On cardboard, no viable SARS-CoV-2 was measured after 24 hours and no viable SARS-CoV-1 was measured after 8 hours.

Souce 4: Letter by Dr. van Doremalen, Mr. Bushmaker & Mr. Morris – published, 17.03.2020 at NEJM.org
https://www.nejm.org/doi/10.1056/NEJMc2004973