TEST METHODOLOGY

HYGIENIC HANDWASH

Explanatory Notes on the Test Methodology

The following requirements must be met to certify hygienic handwash products [1]:

Efficacy against bacteria and yeasts must be demonstrated.

1. To that effect, the following orientational tests must be conducted:

– Determination of bacteriostatic activity as well as of suitable neutralizers (Method 7).

– Determination of bactericidal efficacy in the qualitative suspension test (Method 8).

2. The following tests are obligatory:

– *Phase 2/Step 1*: Determination of bactericidal activity in the quantitative suspension test (Method 9) at 20 °C, with 50 % (final concentration in the test) and as a concentrate (in addition to the concentrations required for assessment of the activity limit) at 15 s, 30 s and 1 min.

The test product must reduce the number of the test organisms *S. aureus, E. hirae, P. aeruginosa, P. mirabilis*, E. coli** (*if this had proved to be more resistant than *P. aeruginosa* in the qualitative suspension test or if a qualitative suspension test is lacking) by at least 3 lg and *C. albicans* by at least 2 lg under dirty conditions within the recommended contact time (30 s or 1 min) at 20 °C.

– *Phase 2/Step 2*: Hygienic handwash – simulated-use test with volunteers (Method 10) (DIN EN 1499 [2]).

To compare the results of the test and reference procedures and evaluate the test procedure, the following requirements must be met:

> Complete results suitable for evaluation must be available for at least 12 of the 15 volunteers and

> the logarithmic (lg) total mean value of the pre-values for the reference and test procedure(s) must be at least 5.

If the mean value of the lg reduction factor of the test procedure is significantly greater than that of the soap-based reference procedure, the test product meets the requirements under simulated-use conditions.

References

1. Desinfektionsmittel-Kommission im VAH (Hrsg.). Anforderungen und Methoden zur VAH-Zertifizierung chemischer Desinfektionsverfahren. Ergänzungen mit Stand: 1.9.2022. [Online im Internet]: https://vah-online.de/de/fuer-laboratorien. English PDF files and amendments available from https://vah-online.de/en/expertise, https://vah-online.de/en/for-laboratories

2. EN 1499:2013. Chemical disinfectants and antiseptics. Hygienic handwash. Test method and requirements (phase 2/step 2).

HAND DISINFECTION

Explanatory Notes on the Test Methodology

1 Hygienic Hand Disinfection (Handrub)

The following minimum requirements must be met to certify products for hygienic hand disinfection [1, 2]:

Bactericidal (apart from mycobacteria) and yeasticidal (*C. albicans*) activity must be demonstrated.

1. To that effect, the following orientational preliminary tests must be conducted:

– Determination of bacteriostatic and yeaststatic activity as well as of suitable neutralizers (Method 7).

– Determination of bactericidal and yeasticidal activity in the qualitative suspension test (Method 8).

2. The following tests are obligatory:

– *Phase 2/Step 1*: Determination of bactericidal and yeasticidal activity (*C. albicans*) in the quantitative suspension test (Method 9) at 20 °C as a concentrate (in addition to the concentration required for assessment of the boundary region) using a high organic challenge at 15 s, 30 s and 1 min.

The test product must reduce the number of the test organisms *S. aureus, E. hirae, P. aeruginosa, P. mirabilis*, E. coli** (*if this has proved to be more resistant than *P. aeruginosa* in the qualitative suspension test or if no qualitative suspension test is carried out) under dirty conditions within the recommended contact time (30 s or 1 min) at 20 °C by at least 5 lg levels as well as of *C. albicans* by at least 4 lg levels. *Thus, each product listed has demonstrated efficacy against bacteria and yeasts (C. albicans).*

– *Phase 2/Step 2*: Hygienic hand disinfection – simulated-use test with volunteers (Method 11) (EN 1500 [2]).

To compare the results of the test and reference procedures and evaluate the test procedure, the following requirements must be met:

> Complete results must be available for at least 18 of the 20 volunteers and

> The total mean logarithmic value of the pre-values for the reference and test procedure(s) must be at least 5, and

> As a consequence of the stricter requirements on the statistical evaluation, the number of test results with a reduction < 3 lg may be adjusted to the actual number of test subjects evaluated. For example, for 30 evaluated test subjects, an increase from 3 to 4 results with a reduction < 3 lg is permitted.

The difference of the mean reduction values has to be tested for statistical significance. It has to be demonstrated that the test product is not significantly less effective than that of the propan-2-ol-based (60vol% application with 2 x 3 ml for 2 x 30 s) reference procedure. The test is performed according to the Hodges&Lehmann procedure.

Since 12 March 2021 the VAH certificate and the VAH Disinfectants List also states the volume of the hand disinfectant which was used for testing [3].

The Disinfectants Commission published a communication in 2020 regarding hand disinfectants applied as foam. These foams, too, must be tested according to simulated-use conditions [4].

2 Surgical Hand Disinfection

The following requirements must be met to certify products for surgical hand disinfection [1]:

Bactericidal and yeasticidal (*C. albicans)* activity must be demonstrated.

1. To that effect, the following orientational preliminary tests must be conducted:

– Determination of bacteriostatic and yeaststatic activity as well as of suitable neutralizers (Method 7).
– Determination of bactericidal and yeasticidal activity in the qualitative suspension test (Method 8).

2. The following tests are obligatory:

– Determination of bactericidal efficacy in the quantitative suspension test (Method 9) at 20 °C, with 50 % (final concentration in the test) and as a concentrate (in addition to the concentration required for assessment of the boundary region) using a low organic challenge at a minimum contact time of 1 min, 3 min or 5 min. If the contact time recommended by the manufacturer differs from these test contact times, a separate, additional test has to be performed for this time.
  The test product must reduce the number of test organisms of *S. aureus, E. hirae, P. aeruginosa, P. mirabilis*, E. coli** (*if these have proved to be more resistant than *P. aeruginosa* in the qualitative suspension test) under clean conditions within the recommended contact times (1–3 min, 5 min) at 20 °C by at least 5 lg as well as of *C. albicans* by at least 4 lg. *Thus, each product listed has demonstrated efficacy against bacteria and yeasts (C. albicans).*
– *Phase 2/Step 2*: Surgical hand disinfection – simulated-use test with volunteers (Method 12) (EN 12791 [6]).
  To compare the results of the test and reference procedures and evaluate the test procedure, the following requirements must be met:
  > Complete results must be available for at least 23 of the maximum 28 volunteers and
  > The total mean logarithmic value of the pre-values for the reference and test procedure(s) must be at least 3.5.

If the mean value of the lg reduction factor obtained for the immediate effect and the effect after 3 h of the test procedure is not significantly lower than that of the propan-1-ol-based reference procedure, the test product meets the requirements under simulated-use conditions.

The reference procedure is performed with 60 vol% propan-1-ol for 3 min. The test procedure may also be performed for shorter contact times, with a minimum of 1 min.

If, furthermore, the mean value of the lg reduction factor obtained for the sustained effect (after 3 h) of the test procedure is significantly greater than that of the propan-1-ol-based reference procedure, the test product meets the requirements under simulated-use conditions for a procedure endowed with "a sustained effect".

Listing of Virucidal Properties

(For more detailed information, please also refer to the General Preface)

According to the VAH Communication from August 2018 [7], the VAH Disinfectant Commission decided to conduct a conformity assessment procedure of virucidal effectiveness according to the test reports and test protocols and include virucidal properties in the VAH List of Disinfectants, if requested by the manufacturer. The concentration-contact time ratios for *activity against enveloped viruses*, *limited spectrum virucidal activity* and *virucidal activity* are listed in a separate row for the respective product, if applicable. Independent of the concentration-contact ratio recommended for activity against viruses in the experts reports, the values listed for bactericidal activity must be considered as the minimum requirement for practical use. Therefore, the virucidal activity values stated in the VAH List are never lower than the ones for bactericidal activity. Products with information on virucidal activity in the VAH List were subjected to a conformity assessment procedure corresponding to the current test methods [7–10] by independent experts of the Disinfectants Commission on the basis of at least one manufacturer-independent expert report including the pertinent test protocols.

The following tests are obligatory: Determination of the virucidal activity (all activity spectrums) in the the quantitative suspension test (method DVV/RKI 2005, 2008 or 2015 [7, 8, 9]) or EN 14476 [10]. The test protocols and expert reports have to comply with the requirements published by the VAH Working Group „Virucidal Activity" [11].

The product to be tested has to reduce the virus titre of the test organisms listed in **Table 1** under the prescribed conditions within the claimed contact time(s) at 20 °C by at least 4 lg.

This process will be in effect on an interim basis until a harmonised standard test and evaluation procedure for virucidal activity has been adopted in Europe which includes conditions simulating practical use.

References

1. Desinfektionsmittel-Kommission im VAH (Hrsg.). Anforderungen und Methoden zur VAH-Zertifizierung chemischer Desinfektionsverfahren. Ergänzungen mit Stand: 1.9.2022. [Online im Internet]: https://vah-online.de/de/fuer-laboratorien. English PDF files and amendments available from https://vah-online.de/en/expertise, https://vah-online.de/en/for-laboratories .
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12. Schwebke I, Eggers M, Gebel J, Geisel B, Glebe D, Rapp I, Steinmann J, Rabenau HF. Prüfung und Deklaration der Wirksamkeit von Desinfektionsmitteln gegen Viren zur Anwendung im human-medizinischen Bereich. Stellungnahme des Arbeitskreises Viruzidie beim Robert Koch-Institut. Bundesgesundheitsbl 2017; 60:353–363.

SKIN ANTISEPSIS

Explanatory Notes on the Test Methodology

The following requirements must be met to certify products for skin antisepsis [1]:

Bactericidal and yeasticidal (*C. albicans*) activity must be demonstrated.

1. To that effect, the following orientational preliminary tests must be conducted:

– Determination of bacteriostatic and yeaststatic activity as well as of suitable neutralizers (Method 7).
– Determination of bactericidal and yeasticidal activity in the qualitative suspension test (Method 8).

2. The following tests are obligatory:

– *Phase 2/Step 1*: Determination of bactericidal and yeasticidal activity (*C. albicans*) in the quantitative suspension test (Method 9) at 20 °C under dirty conditions at 15 s, 30 s, 1 min, 3 min, 5 min or 10 min.

The test product must reduce the number of the test organisms *S. aureus, E. hirae, P. aeruginosa, P. mirabilis*, E. coli** (*if this proved to be more resistant than *P. aeruginosa* in the qualitative suspension test or if no qualitative suspension test is carried out) within the recommended contact times (15 s, 30 s, 1 min, 3 min, 5 min and 1 min, 1.5 min, 2 min, 2.5 min, 3 min, 5 min, 10 min) at 20 °C by at least 5 lg levels as well as of *Candida albicans* by at least 4 lg levels [1]. *Thus, each product listed has demonstrated efficacy against bacteria and yeasts (C. albicans).*

The following test method is obligatory for evaluating the efficacy against the resident skin flora [1]:

– *Phase 2/Step 2*: Skin antisepsis (Method 13)

Table 1: Test conditions for virucidal activity for hygienic hand disinfectants in quantitative suspension tests.

Activity Spectrum	Test Organisms	Test Method	Interfering Substance[1]/ Test Concentrations[2]	Contact Times[3] at 20 °C ± 1 °C
Active against enveloped viruses	Vacciniavirus BVDV[4]	DVV/RKI [7, 8, 9] or DIN EN 14476 [10][5]	DVV/RKI interfering substance or clean conditions (EN)/ undiluted	15 s, 30 s, 1 min
Limited spectrum virucidal activity	Adenovirus Norovirus	DVV/RKI [7, 8, 9] or DIN EN 14476 [10][5]	DVV/RKI interfering substance or clean conditions (EN)/ undiluted	15 s, 30 s, 1 min 1.5 min, 2 min
Active against enveloped and non-enveloped viruses (virucidal activity)	Poliovirus Adenovirus Norovirus SV 40	DVV/RKI [7, 8, 9] or DIN EN 14476 [10][5]	DVV/RKI interfering substance or clean conditions (EN)/ undiluted	15 s, 30 s, 1 min, 1.5 min, 2 min

[1] The interference substance according to DVV/RKI is 10 % FCS (fetal calf serum) and Aqua dest., respectively, or, according to EN 14476 0.3 % BSA (bovine serum albumin) for clean conditions.
[2] At least two concentrations (use concentration and one that is ineffective) must be tested to determine the efficacy limits (see chapter 5).
[3] At least three of the contact times have to be tested, including the claimed contact times. The contact times are specified in the test methods and should be between 15 s and 2 min. The contact time should be ≤ 60 s at most.
[4] Additionally for products with oxidative activity
[5] Test reports based on EN 14476:2013 remain valid.

To compare the results of the test and reference procedures and evaluate the test procedure, the following requirements must be met:

> Complete results must be available for at least 18 of the 20 volunteers.

> The total mean logarithmic values of the pre-values has to be > 2.

If the mean value(s) of the reduction factor of the test procedure at the pertinent contact times is/are smaller than those of the reference procedure and if the difference is statistically corroborated for at least one mean value, the test product shall be rejected as being unsuitable.

This applies for skin that has both a low and a high density of sebaceous glands: For declaration of efficacy on skin that has a low density of sebaceous glands, tests are carried out on the upper arms of volunteers, and on the forehead for declaration of efficacy on skin that has a high density of sebaceous glands (cf. **Figure 1**). The skin is not artificially contaminated with test bacteria for these tests; rather, proof of efficacy is furnished on the basis of the existing bacterial contamination levels of the skin of each volunteer.

Reference

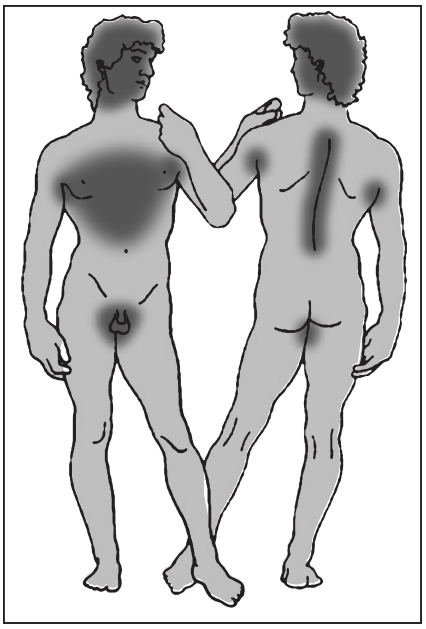
1. Desinfektionsmittel-Kommission im VAH (Hrsg.). Anforderungen und Methoden zur VAH-Zertifizierung chemischer Desinfektionsverfahren. Ergänzungen mit Stand: 1.9.2022. [Online im Internet]: https://vah-online.de/de/fuer-laboratorien. English PDF files and amendments available from https://vah-online.de/en/expertise, https://vah-online.de/en/for-laboratories

SURFACE DISINFECTION

Introductory Remarks

The application field "Surface" lists products with a minimum activity spectrum of bactericidal and yeasticidal *(C. albicans)* efficacy tested as per the "Requirements and Methods for VAH Certification of Chemical Disinfection Procedures" [1] and pertinent amendments and updates of the test methods.

In accordance with European standards, tests for surface disinfectants are conducted with low and high organic challenges in quantitative suspension tests and in tests reflecting everyday use conditions (contaminated germ carriers). Furthermore, a distinction is made between applications that involve "*no mechanical action*" and "*with mechanical action*" (wipe disinfection). Efficacy against *S. aureus, E. hirae, P. aeruginosa, E. coli*, P. mirabilis** (to be tested in the quantitative suspension test, if seen to be more resistant than *P. aeruginosa* in the qualitative suspension test or if no qualitative test is carried out) and *C. albicans* must be proven for each concentration/contact time ratio specified for a product in this section. Efficacy against *A. brasiliensis* (fungicidal), *M. terrae* (tuberculocidal) and *M. avium* (mycobactericidal) can be additionally claimed.



Skin with a low density of sebaceous glands (Ø100 sebaceous glands/cm²)

Skin with a high density of sebaceous glands (400 bis 900 sebaceous glands/cm²)

Figure 1: Density of sebaceous glands on human skin. For the palms of the hands, the recommendations for hand disinfection apply.

Explanatory Notes on the Test Methodology

Bacteria and Fungi/Yeasts

1. The following preliminary tests must be conducted as an orientational test for certification of products for surface disinfection:

– Determination of bacteriostatic and yeaststatic activity as well as of suitable neutralizer (Method 7) (not for *M. terrae, M. avium, A. brasiliensis*).

– Determination of bactericidal and yeasticidal (*C. albicans*) activity in the qualitative suspension test (Method 8) (not for *M. terrae, M. avium, A. brasiliensis*).

2. The following tests are obligatory:

– *Phase 2/Step 1*: Determination of bactericidal and yeasticidal (*C. albicans*) activity in the quantitative suspension test (Method 9) (test conditions see **Table 2**).

The test product must reduce the number of the test organisms *S. aureus, E. hirae, P. aeruginosa, P. mirabilis*, E. coli** (*if this proved to be more resistant than *P. aeruginosa* in the qualitative suspension test or if no qualitative test is carried out) under clean and/or dirty conditions within the specified contact times (5, 15, 30, 60 or 240 min) at 20 °C by at least 5 lg as well as the number of *C. albicans* by at least 4 lg. The test organisms *M. terrae, M. avium, A. brasiliensis,* which can be tested as an optional, additional claim, must be reduced by at least 4 lg.

– *Phase 2/Step 2:* Investigation of bactericidal and yeasticidal efficacy under practical conditions (Method 14.1 without mechanical action and Method 14.2 with mechanical action [1, 2, 3]).

> Two series of tests must be run in each case.

> Consult **Table 2** for the requirements addressed to this test

procedure. The test product has to reduce the test organisms *S. aureus, E. hirae* and *P. aeruginosa* under low or high organic load within the specified contact times (5, 15, 30, 60 or 240 min) at 20 °C by at least 5 lg or for *C. albicans* by at least 4 lg.

Thus, each product listed has demonstrated efficacy against bacteria and yeasts (C. albicans).

The test organisms *M. terrae, M. avium, A. brasiliensis,* which can be tested as an optional, additional claim, must be reduced by at least 4 lg.

Testing foams and sprays for mechanical application (wipe disinfection)

For the following two types of application of surface disinfectants, the disinfection process must be tested for suitability as part of a benchmark test:

1. the foam/spray is applied directly onto the surface and immediately distributed afterwards with a dry cloth,
2. the foam/spray is first applied onto a dry cloth and then immediately distributed over the surface with this cloth.

Details on the methodology can be found in the VAH communication published as of 23 August 2021 [4].

Efficacy against Fungi on Untreated Wood

Optional tests are:

– Germ carrier test on untreated wood for determination of the fungicidal efficacy (Method P1 [1]).

When using the recommended concentration/contact-time ratio, there must not be evidence of fungal growth during the test.

Listing of Virucidal Properties

(For more detailed information, please also refer to the General Preface)

As stated in the VAH Communication No. 3/2010 [5], the VAH Disinfectants Commission decided to assess the virucidal effectiveness of products on the basis of test protocols and expert reports, if the manufacturer applied for certification of virucidal effectiveness. Details of the certification process are specified in a VAH Communication from 2018 [6] and the updated requirements of VAH certification as of 1 November 2021 [7].

The concentration-contact time ratios for *activity against enveloped viruses*, *limited spectrum virucidal activity* and *virucidal activity* are listed in a separate row for the respective product, if applicable. Independent of the concentration-contact ratio recommended for activity against viruses in the experts reports, the values listed for bactericidal activity must be considered as the minimum requirement for real-use conditions. Therefore, the virucidal activity values stated in the VAH List are never below the ones for bactericidal activity. Products with information on virucidal activity in the VAH List were subjected to a conformity assessment procedure on the basis of at least one manufacturer-independent expert report with the pertinent test protocols corresponding to the current test methods [8–13] by independent experts of the Disinfectants Commission. The test protocols and expert reports have to comply with the requirements published by VAH [7].

The following tests are obligatory: Determination of the virucidal activity (all activity spectrums) in the the quantitative suspension test [8–11] and in tests simulating use-conditions [12, 13].

The simulated-use tests shall be performed in all cases in two independent test runs with two test surfaces each per contact-time-ratio, reference test, cytotoxicity control and virus control. In the second test run two test surfaces per claimed concentration-time ratio, cyototoxicity control and WSH control shall be included (**Tables 3 and 4)**.

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2. EN 17387:2021. Chemical disinfectants and antiseptics. Quantitative test for the evaluation of bactericidal and yeasticidal and/or fungicidal

Field of Application	Organic Load/ Contamination	Contact Times	Required Reduction
Surface disinfection with and/ or without mechanical action	*Clean conditions* 0.03 % albumin and/or *Dirty conditions* 0.3 % albumin and 0.3 % sheep erythrocytes	1 min 5 min 15 min 30 min 60 min 240 min	5 lg for bacteria (Exception: 4 lg for *P. aeruginosa* 60 and/or 240 min[1]) 4 lg for *C. albicans* (Exception: 3 lg for *C. albicans* 60 and/or 240 min[1]) *Optional*: 4 lg for mycobacteria 4 lg for *A. brasiliensis* 4 lg for viruses

[1] This reduction is permissible in the test conducted under simulated-use conditions if the control values for *P. aeruginosa* have dropped because of test organisms dying to a level where a 5 lg reduction (4 lg for *C. albicans*) cannot be demonstrated anymore.

Table 2: Test conditions and required lg reduction for surface disinfectants in the quantitative suspension test and under simulated-use conditions.

activity of chemical disinfectants in the medical area on non-porous surfaces without mechanical action. Test method and requirements (phase 2, step 2).

3. EN 16615:2015. Chemical disinfectants and antiseptics. Quantitative test method for the evaluation of bactericidal and yeasticidal activity on non-porous surfaces with mechanical action employing wipes in the medical area (4- field test). Test method and requirements (phase 2, step 2).
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Table 3: Test conditions for virucidal activity for surface disinfectants in quantitative suspension tests.

Activity Spectrum	Test Organisms	Test Method	Interfering Substance[1]/ Test Concentrations[2]	Test Temperature [°C]	Contact Times[3] [min]
Active against enveloped viruses	Vacciniavirus BVDV[4]	DVV/RKI [7, 8, 9] or EN 14476 [10][5]	Clean or dirty conditions/ use concentration[2]	20 ± 1	1, 5, 15, 30, 60
Limited spectrum virucidal activity	Adenovirus Norovirus	DVV/RKI [7, 8, 9] or EN 14476 [10][5]	Clean or dirty conditions/ use concentration[2]	20 ± 1	
Active against enveloped and non-enveloped viruses (virucidal activity)	Poliovirus Adenovirus Norovirus SV 40	DVV/RKI [7, 8, 9] or EN 14476 [10][5]	Clean or dirty conditions/ use concentration[2]	20 ± 1	

[1] The interfering substance based on DVV/RKI is 10 % FCS (fetal calf serum) and distilled water or, based on EN 14476, clean conditions mean an interfering substance of 0.3 % BSA (bovine serum albumin). The test with 3% BSA and 3% sheep erythrocytes is considered to be a test under dirty conditions.
[2] At least two concentrations (use concentration and one that is ineffective) must be tested to determine the efficacy limits (see chapter 5).
[3] At least three of the contact times have to be tested, including the contact times to be certified. Testing must include the contact time which is directly below the one applied for.
[4] Additionally for products with oxidative activity
[5] Test reports based on the prEN version of EN 14476:2013 remain valid.

Table 4: Test conditions for virucidal activity for surface disinfectants in tests simulating use-conditions.

Activity Spectrum	Test Organisms	Test Method	Interfering Substance[1]/ Test Concentrations[2]	Test Temperature [°C]	Contact Times[3] [min]
Active against enveloped viruses	Vacciniavirus	DVV Guideline 2012 [11] or EN 16777 [12][4]	Clean or dirty conditions/ use concentration[2]	22 ± 3	1, 5, 15, 30, 60
Limited spectrum virucidal activity (corresponds to low level virucidal)	Adenovirus Norovirus	DVV Guideline 2012 [11] or EN 16777 [12][4]	Clean or dirty conditions/ use concentration[2]	22 ± 3	
Active against enveloped and non-enveloped viruses (corresponds to high level virucidal)	Adenovirus* Norovirus* Parvovirus	DVV Guideline 2012 [11] or EN 16777 [12][4]	Clean or dirty conditions/ use concentration[2]	22 ± 3	

[1] The test with 0.3% BSA (bovine serum albumin) is considered to be performed under clean conditions, the test with 3% BSA and 3% sheep erythrocytes under dirty conditions.
[2] At least two concentrations (use concentration and one that is ineffective) must be tested to determine the efficacy limits (chapter 5).
[3] Besides the contact time which is to be certified the one which is below that one has to be included in the first test run. In the second test run the claimed concentration-contact time is confirmed with 2 test surfaces.
[4] Test reports based on the prEN version of EN 14476:2013 remain valid.
* If effectiveness for the claim low level virucidal activity has not been previously proven.

10. DVV, RKI. Leitlinie der Deutschen Vereinigung zur Bekämpfung der Viruskrankheiten (DVV) e.V. und des Robert Koch-Instituts (RKI) zur Prüfung von chemischen Desinfektionsmitteln auf Wirksamkeit gegen Viren in der Humanmedizin (Fassung vom 1.12.2014). Bundesgesundheitsbl Gesundheitsforschung Gesundheitsschutz 2015;58:493-504. English version available from: Bundesgesundheitsbl; 63, 645–655 (2020). https://doi.org/10.1007/s00103-020-03115-w
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INSTRUMENT DISINFECTION

Introductory Remarks

Instrument disinfectants presently denote disinfectants used for *immersion (manual disinfection)*. VAH lists products with a minimum activity spectrum of bactericidal and yeasticidal *(C. albicans)* efficacy tested as per the "Requirements and Methods for VAH Certification of Chemical Disinfection Procedures" and pertinent amendments and updates of the test methods [1]. Efficacy against *A. brasiliensis* (fungicidal), *M. terrae* (tuberculocidal) and *M. avium* (mycobactericidal) can be additionally claimed.

The methodology in the "Requirements and Methods" [1] is in accordance with the European Standards. For efficacy testing, the results of quantitative suspension tests and of tests conducted under simulated-use conditions (contaminated frosted glass germ carriers as a model for medical devices) with low and/or high organic challenge have to be presented for the test organisms against which the product is claimed to be active.

Explanatory Notes on the Test Methodology

Bacteria and Fungi/Yeasts

1. The following preliminary tests must be conducted as an orientational guide for certification of products for instrument disinfection:

– Determination of bacteriostatic and yeaststatic activity as well as of suitable neutralising agents (Method 7) (not for *M. terrae, M. avium, A. brasiliensis*).
– Determination of bactericidal and yeasticidal activity in the qualitative suspension test (Method 8) (not for *M. terrae, M. avium, A. brasiliensis*).

2. The following tests are obligatory:

– *Phase 2/Step 1*: Determination of bactericidal and yeasticidal activity in the quantitative suspension test (Method 9).
Under clean and/or dirty conditions, the test product must reduce the number of the test bacteria of *S. aureus, E. hirae, P. aeruginosa, P. mirabilis*, E. coli** (*if this proved to be more resistant in the qualitative suspensions test than *P. aeruginosa* or if no qualitative suspension test is carried out) within the specified contact times (5, 15, 30 or 60 min) at 20 °C by at least 5 lg levels as well as of *C. albicans* by at least 4 lg levels. The test organisms *M. terrae, M. avium, A. brasiliensis,* which can be tested as an optional, additional claim, must be reduced by at least 4 lg.
– *Phase 2/Step 2:* Determination of bactericidal and yeasticidal activity under simulated-use conditions (Method 15).
> Two series of tests must be run in each case.
> Please consult **Table 5** for the requirements addressed to this test procedure.

Thus, each product listed has demonstrated efficacy against bacteria and yeasts (C. albicans).

Listing of Virucidal Properties

(For more detailed information, please refer to the General Preface)

As stated in the VAH Communication No. 3/2010 [5], the VAH Disinfectants Commission decided to assess the virucidal effectiveness of products on the basis of test protocols and expert reports, if the manufacturer applied for certification of virucidal effectiveness. Details of the certification process are specified in a VAH Communication from 2018 [6] and the updated requirements of VAH certification as of 1 November 2021 [1].

The concentration-contact time ratios for *activity against enveloped viruses* and *virucidal activity against enveloped and non-enveloped viruses* are listed in a separate row for the respective product, if applicable. Independent of the concentration-contact ratio recommended for activity against viruses in the experts reports, the values listed for bactericidal activity must be considered as the minimum requirement for actual use. Therefore, the virucidal activity values stated in the VAH List are never below the ones for bactericidal activity.

Products with information on virucidal activity in the VAH List were subjected to a conformity assessment procedure on the basis of at least one manufacturer-independent expert report with the pertinent test protocols corresponding to the current test methods [4–8] by independent experts of the Disinfectants Commission. The test protocols and expert reports have to comply with the requirements published by VAH [3].

The following tests are obligatory:

Determination of the virucidal activity against enveloped viruses and against enveloped as well as non-enveloped viruses (high level virucidal) in the the quantitative suspension test (Methods according to guidelines DVV/RKI 2005, 2008 or 2015 [4, 5, 6]) or EN 14476 [7].

Determination of the virucidal activity in the carrier test simulating use-conditions according to EN 17111 [8].

The product to be tested must reduce the titre of the test organisms listed in **Tables 6 and 7** under the prescribed conditions within the requisite contact time(s) and temperature(s) by at least 4 lg.

The simulated-use tests shall be performed in all cases in two independent test runs:

1st Test run: 2 test surfaces per concentration-contact time ratio, reference test, cytotoxicity control and virus control,

2nd Test run: 2 test surfaces per concentration-contact time ratio, reference test, cytotoxicity control and virus control.

In the second test run for processes ≥ 40 °C only the most resistant test virus from the first test run has to be tested.

References

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Field of application	Organic Load/ Contamination	Contact Times	Required Reduction
Instrument disinfection	*Clean conditions* 0.03 % albumin and/or *Dirty conditions* 0.3 % albumin and 0.3 % sheep erythrocytes	5 min 15 min 30 min 60 min	5 lg for bacteria 4 lg for *C. albicans* *Optional*: 4 lg for mycobacteria 4 lg for *A. brasiliensis* 4 lg for viruses

Table 5: Test conditions and required reduction (R) for instrument disinfectants in the quantitative suspension test and under simulated-use conditions.

Table 6: Test conditions for virucidal activity for instrument disinfectants in quantitative suspension tests.

Activity Spectrum	Test Organisms	Test Method	Interfering Substance[1]/ Test Concentrations[2]	Test Temperature [°C]	Contact Times[3] [min]
Active against enveloped viruses*	Vacciniavirus BVDV[4]	DVV/RKI [4, 5, 6] or EN 14476 [7][5]	Clean or dirty conditions/ use concentration[2]	20 ± 1	1, 5, 15, 30, 60
Active against enveloped and non-enveloped viruses (virucidal activity) < 40 °C	Poliovirus Adenovirus Norovirus SV 40	DVV/RKI [4, 5, 6] or EN 14476 [7][5]	Clean or dirty conditions/ use concentration[2]	20 ± 1 up to < 40 ± 1	
Active against enveloped and non-enveloped viruses (virucidal activity) ≥ 40 °C	Parvovirus	DVV/RKI [4, 5 bzw. 6] oder DIN EN 14476 [7][5]	Clean or dirty conditions/ use concentration[2]	≥ 40 ± 1 up to ≤ 70 ± 1	

* Tests for products intended for precleaning with a combined cleaner/disinfectant must include proof that no protein-fixing properties are exhibited, using a suitable method (such as amido black staining).
[1] The interfering substance based on DVV/RKI is 10 % FCS (fetal calf serum) and distilled water or, based on EN 14476, clean conditions with 0.3 % BSA (bovine serum albumin). The test with 3% BSA and 3% sheep erythrocytes is considered to be a test under dirty conditions.
[2] At least two concentrations (use concentration and one that is ineffective) must be tested to determine the efficacy limits (chapter 5).
[3] The contact times are specified in the test methods and should not be longer than 60 min. At least two contact times must be tested.
[4] Additionally for products with oxidative activity.
[5] Test reports based on the prEN version of EN 14476:2013 remain valid.

Table 7: Test conditions for virucidal activity for instrument disinfectants in tests simulating use-conditions.

Activity Spectrum	Test Organisms	Test Method	Interfering Substance[1]/ Test Concentrations[2]	Test Temperature [°C]	Contact Times[3] [min]
Active against enveloped viruses	Vacciniavirus	EN 17111 [8][4]	Clean or dirty conditions/ use concentration[2]	20 ± 1	1, 5, 15, 30, 60
Active against enveloped and non-enveloped viruses (virucidal activity) < 40 °C	Adenovirus Norovirus SV 40	EN 17111 [8][4]	Clean or dirty conditions/ use concentration[2]	20 ± 1 up to < 40 ± 1	
Active against enveloped and non-enveloped viruses (virucidal activity) ≥ 40 °C	Parovirus	EN 17111 [8][4]	Clean or dirty conditions/ use concentration[2]	≥ 40 ± 1 up to ≤ 70 ± 1	

* Tests for products intended for precleaning with a combined cleaners/disinfectant must include proof that no protein-fixing properties are exhibited, using a suitable method (such as amido black staining).
[1] The interfering substance in accordance with EN 17111 is 0.3 % BSA (bovine serum albumin) for clean conditions. The test with 3% BSA and 3% sheep erythrocytes is considered to be a test under dirty conditions.
[2] At least two concentrations (use concentration and one that is ineffective) must be tested to determine the efficacy limits.
[3] The contact times are specified in the test methods and should not be longer than 60 min. Apart from the contact time to be certified the next shorter contact time has to be tested in the first test run. In the second test run the claimed concentration-contact time is confirmed with 2 test surfaces.
[4] Test reports based on the prEN version of EN 14476:2013 remain valid.

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7. EN 14476:2013+A2:2019. Chemical disinfectants and antiseptics. Quantitative suspension test for the evaluation of virucidal activity in the medical area. Test method and requirements (Phase 2/Step 1)
8. EN 17111:2018. Chemical disinfectants and antiseptics. Quantitative carrier test for the evaluation of virucidal activity for instruments used in the medical area. Test method and requirements (phase 2, step 2)

LINEN (TEXTILE) DISINFECTION

Introductory Remarks

The VAH List of certified products contains chemical-thermal single-chamber processes. In addition, chemical textile disinfectants for immersion may be listed (see 1.). All disinfection procedures ≥60 °C are bactericidal, yeasticidal and tuberculocidal and were tested in quantitative suspension tests as well as in tests conducted under simulated-use conditions.

Explanatory Notes on the Test Methodology

1. Chemical Textile Disinfection

Immersion Procedure (Method 16)

A procedure is deemed effective if in the working dilution at 13 °C the test organisms were inactivated on the test carriers within a maximum of 4–12 h [1, 2].

2. Chemical-thermal Textile Disinfection

(with mechanical action in a washing machine (Method 17) [1, 2]

Bacteria and Fungi

1. For certification of processes at temperatures 30° to < 60 °C, the following preliminary tests must be carried out as an orientational guide:

– Determination of bacteriostatic and yeaststatic (*C. albicans*) activity as well as of suitable neutralising agents (Method 7) (not for *M. terrae, M. avium, A. brasiliensis*).
– Determination of bactericidal and yeasticidal (*C. albicans*) activity in the qualitative suspension test (Method 8) (not for *M. terrae, M. avium, A. brasiliensis*).

2. The following tests are obligatory for processes 30° to < 60 °C:

– *Phase 2/Step 1*: Determination of bactericidal and yeasticidal (*C. albicans*) activity in the quantitative suspension test (Method 9).
Using a low (procedures with prewash) or high organic challenge (procedures without prewash), the test product must reduce the numbers of the test organisms *S. aureus, E. hirae, P. aeruginosa, P. mirabilis** and *E. coli** (*if these had proved to be more resistant than *P. aeruginosa* or if a qualitative suspension test is lacking) within the specified contact times (10, 15 or 20 min) at the process temperature by at least 5 lg as well as of *C. albicans* by at least 4 lg.
The microorganisms *M. terrae and M. avium* which can be tested as an optional efficacy claim must be reduced by at least 4 lg.
– *Phase 2/ Step 2*: Testing textile disinfection procedures at temperatures 30 °C to < 60 °C (Method 17.1) [1, 2].
A chemical-thermal textile disinfection procedure (single-chamber process) is deemed effective if it reduces the test organisms (*S. aureus, E. hirae, E. coli,* and *P. aeruginosa*) on the test receptacles by more than 7 lg (*C. albicans*, 6 lg, *A. brasiliensis* (optional), 6 lg, and *M. terrae* and/or *M. avium* (optional), by 7 lg) by using the recommended dosage, contact time and temperature as well as the specified liquor ratio. Nor should any microorganisms be detected in 100 mL washing solution after completion of the disinfection phase.
Thus, each product listed for procedures between 30 °C and < 60 °C has demonstrated efficacy against bacteria and yeasts (C. albicans).

3. The following tests are obligatory for processes ≥ 60 to 70 °C:

– *Phase 2/Step 1*: Determination of bactericidal and yeasticidal (*C. albicans*) activity in the quantitative suspension test at indicated process temperature (Method 9).
Using a low (procedures with prewash) or high organic challenge (procedures without prewash), the test product must reduce the colony count of the test bacterium *E. faecium* within the specified contact times (10, 15 or 20 min) at the indicated process temperature by at least 5 lg.
– *Phase 2/Step 2*: Testing linen disinfection procedures at temperatures ≥ 60 °C to 70 °C (Method 17.2) [1,3].
A chemical-thermal textile disinfection procedure (single-chamber process) is deemed effective if it reduces *E. faecium* in the test receptacles by more than 7 lg within the specified time by using the recommended dosage, contact time and temperature as well as the specified liquor ratio.
Nor should any microorganisms be detected in 100 mL washing solution after completion of disinfection phase.

As a result of the chemical and thermal resistance of E. faecium each product listed for disinfection procedures between ≥ 60 °C to 70 °C has demonstrated efficacy against bacteria and yeasts (C. albicans), mycobacteria, M. tuberculosis and fungi.

Listing of Virucidal Properties

(For more detailed information, please refer to the General Preface)

According to the VAH Communication No. 3/2010 [4], the VAH Disinfectant Commission decided to conduct a conformity assessment of virucidal effectiveness according to the test reports and test protocols and include virucidal properties in the VAH List of Disinfectants. For textile disinfectants *virucidal* activity (active against enveloped and non-eneloped viruses) may be claimed.

The concentration-contact time ratios for *virucidal* activity are listed in a separate row for the respective product. Independent of the concentration-contact ratio recommended for activity against viruses in the experts reports, the values listed for bactericidal activity must be considered as the minimum requirement for actual use. Therefore, the virucidal activity values stated in the VAH List are never below the ones for bactericidal activity. Products with information on virucidal activity in the VAH List were subjected to a conformity assessment procedure by independent experts of the Disinfectants Commission on the basis of at least one manufacturer-independent expert report and test protocol [4–7]. The test protocols and experts reports must comply with the VAH requirements on virucidal efficacy [4].

The following tests are obligatory:

Determination of virucidal activity (against enveloped as well as non-enveloped viruses (high level)) in the the quantitative suspension test according to EN 14476 [5]. The complete procedure (i.e. all process parameters in one test) at 20 °C ± 1 °C and at the intended process temperature have to be tested. The virus titre also has to be determined at 20 °C ± 1 °C and at the intended process temperature. Moreover, a test with peracetic acid as reference has to be performed, or, alternatively, tests according to DVV/RKI 2008, chapters 5.1 and 7.7 [6], may be accepted for proof of the quality of the test viruses (control with ph value of the laundry process at 20 °C and process temperature).

The product to be tested has to reduce the titre of the test viruses listed in **Table 8** at the specified conditions within the intended contact time(s) and test temperature by at least 4 lg.

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For further information, please visit the VAH website
https://vah-online.de/en/expertise

Translated from:

Desinfektionsmittel-Kommission im VAH (Hrsg.). Desinfektionsmittel-Liste des VAH. Stand 1.9.2022. Wiesbaden: mhp Verlag, 2022.

Table 8: Test conditions for virucidal activity of textile disinfectants in the quantitative suspension test.

Activity Spectrum	Test Organism	Test Method	Interfering Substance[1]/ Test Concentrations[2]	Test Temperature [°C]	Contact Times [min]
Virucidal activity	Murine Parvovirus (MVM)[3]	EN 14476, controls according to DVV/RKI	Clean or dirty conditions/ see footnote[2]	≥ 30 ± 1 to ≤ 70 ± 1	5, 10, 15, 20

[1] According to EN 14476 the test with 3% BSA and 3% sheep erythrocytes is considered to be a test under dirty conditions. Clean conditions correspond to 0.3 BSA and may only be used for testing procedures including prewash.
[2] At least two concentrations (use concentration and one that is ineffective) must be tested to determine the efficacy limits (chapter 5).
[3] Test reports with the bovine parvo virus remain valid, if they meet the requirements stated here.