

Study Title:

Quantitative suspension test for evaluation of virucidal activity in the medical area (Phase 2 Step1)

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The sample will be retained for 1 month unless otherwise requested in writing.



BS EN 14476:2013+A2:2019

Scope

The standard method BS EN 14476 describes a test method and the minimum requirements for virucidal activity of a chemical disinfectant and antiseptic products that form a homogenous physically stable preparation when diluted with hard water – or in the case of ready to use products that are not diluted when applied, - with water. Products can only be tested at a concentration of 80% (97% with a modified method for special cases) as some dilution is always produced by adding the test organisms and interfering substances. This European Standard applies to products that are used in the medical area in the fields of hygienic handrub, hygienic handwash, instrument disinfection by immersion, surface disinfection by wiping, spraying, flooding or other means and textile disinfection.

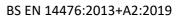
This European standard applies to areas and situations where disinfection is medically indicated. Such indication occurs in patient care, for example: In hospitals, in community medical facilities and in dental institutions or in clinics of schools, of kindergartens and of nursing homes, and may occur in the workplace and in the home. It may also include services such as laundries and kitchens supplying products directly for patients.

Outline of Test Method (Obligatory Test Conditions)

A sample of the test product is diluted in synthetic hard water in products diluted at point of use or water in the case of ready to use products is added to a test suspension of viruses in a solution of interfering substance. The mixture is maintained at one of the temperatures and contact times specified in the standard. At the end of this contact time, an aliquot is taken; the virucidal action in this portion is immediately suppressed by a validated method (dilutions of the sample in ice-cold cell maintenance medium). The dilutions are transferred into cell culture units either using monolayer or cell suspension. Infectivity tests are done either by plaque test or quantal tests. After incubation, the titres of infectivity are calculated according to Spearman and Käber or by plaque counting. Reduction of virus infectivity is calculated from differences of lg virus titres before (virus control) and after treatment with the product. The standard minimum spectrum of test organisms is Poliovirus, Adenovirus and Murine Norovirus.

Acceptance Criteria

The product when tested as above shall demonstrate at least a $4 \log_{10}$ reduction against the test virus. The test is deemed valid where all control requirements are met.





	Test information	Deviation
Name of Product	Germ Free24	
Batch Number & Expiry Date	Exp May 2023 Batch – ZHLGF0769	
Date of Delivery	05/03/2020	
Period of Analysis	12/03/2020-16/03/2020	
Manufacturer / Supplier	Zoono UK &Europe	
Storage Conditions	Ambient	
Appearance of the Product	Colourless liquid	
Neutralisation Method	Dilution	
Product Diluent	Distilled water	
Test Concentrations	Neat (80%), Mid-range (50%), Non active (0.1%)	
Experimental Conditions	Clean	
Interfering Substance	Clean 0.3g/l Bovine Albumin	
Test Temperature	20°C ± 1°C	
Temperature of Incubation	37°C ±1°C for 72hrs	
Identification of the Bacterial Strains:	Feline coronavirus, Strain Munich	1
Contact Times	1 minutes <u>+</u> 10 s	
Stability and Appearance During Test	No Change Observed	

Deviations from Standard Method

1 – the product was tested against nonstandard organism Feline coronavirus; therefore reference inactivation controls were not performed.

Test Result Summary

The test product has achieved a 4.38 log reduction against Feline coronavirus, when tested under the conditions stipulated in this report, at a concentration of neat.

See page 2 for acceptance criteria and raw data tables below for complete test results.



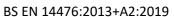
BS EN 14476:2013+A2:2019

Summary

Controls						
Conditions	SOLUTION PROVIDERS	Concentration	Contact time	log TCID50	log reduction	Control validation
Virus control (water)		N/A	1 minutes	7.88	N/A	Validated
Cytotoxicity (product)		Neat	N/A	2.67	N/A	Validated
Product supression control	_	Neat	Neat	7.71	0.17	Validated

SOLUTION PROVIDERS					
Interference controls					
Condition	Concentration	Contact time	log TCID50	Log difference	Control validation
Interference control (untreated)	Neat	N/A	8.96	N/A	N/A
Interference control (treated)	Neat	N/A	8.58	0.38	Validated

Test Results					
Condition	Concentration	Contact time	log TCID50	log reduction	Pass/Fail
Test product	Neat	1 minutes	3.50	4.38	Pass
Test product	50%	1 minutes	4.25	3.63	Fail
Test product	0.10%	1 minutes	7.63	0.25	Fail





Raw data

Virus cont	rol (water))		Contact ti	me	1 minutes		
Dilution	Counts						% CPE	p(1-p)
-2	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	1	0
-4	4	4	4	4	4	4	1	0
-5	4	4	4	4	4	4	1	0
-6	4	4	4	4	4	4	1	0
-7	4	3	2	2	4	4	0.79166667	0.164931
-8	1	1	2	2	2	3	0.45833333	0.248264
-9	1	1	1	0	0	0	0.125	0.109375

Organism	Feline Coron	avirus
	Strain Munic	h
d	1	
sum px	2.38	
n	8	
SD50	-7.88	
SE	0.27	
хр	-6	

	Neat	n	ncentratio	Product co	Cytotoxicity (product)			
p(1-p)	% CPE						Counts	Dilution
0	1	4	4	4	4	4	4	-2
0.138889	0.16666667	1	0	0	1	1	1	-3
0	0	0	0	0	0	0	0	-4
0	0	0	0	0	0	0	0	-5
0	0	0	0	0	0	0	0	-6
0	0	0	0	0	0	0	0	-7
0	0	0	0	0	0	0	0	-8
0	0	0	0	0	0	0	0	-9

Organism	Feline Coronavirus
	Strain Munich
d	1
sum px	1.17
n	8
SD50	-2.6 <mark>7</mark>
SE	0.14
хр	-2

Product supression control				Product concentration			Neat	
Dilution	Counts						% CPE	p(1-p)
-2	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	1	0
-4	4	4	4	4	4	4	1	0
-5	4	4	4	4	4	4	1	0
-6	4	4	4	4	4	4	1	0
-7	4	4	4	3	2	2	0.79166667	0.164931
-8	1	1	1	2	1	1	0.29166667	0.206597
-9	1	1	1	0	0	0	0.125	0.109375
						•	•	

Organism	Feline Coronavirus
	Strain Munich
d	1
sum px	2.21
n	8
SD50	-7.71
SE	0.26
хр	-6

	Neat	on	ncentratio	Product co	Interference control (untreated)			
p(1-p)	% CPE						Counts	Dilution
0	1	4	4	4	4	4	4	-1
0	1	4	4	4	4	4	4	-2
0	1	4	4	4	4	4	4	-3
0	1	4	4	4	4	4	4	-4
0	1	4	4	4	4	4	4	-5
0	1	4	4	4	4	4	4	-6
0	1	4	4	4	4	4	4	-7
0.164931	0.79166667	4	3	3	3	3	3	-8
0.248264	0.54166667	3	2	2	2	2	2	-9
0.109375	0.125	0	0	0	1	1	1	-10

Organism	Feline Coronavirus
	Strain Munich
d	1
sum px	2.4583
n	10
SD50	-8.958
SE	0.241
хр	-7

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Raw data

Interferer	nce control	(treated)		Product co	oncentratio	Neat		
Dilution	Counts						% CPE	p(1-p)
-1	4	4	4	4	4	4	1	0
-2	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	1	0
-4	4	4	4	4	4	4	1	0
-5	4	4	4	4	4	4	1	0
-6	4	4	4	4	4	4	1	0
-7	4	4	4	4	4	4	1	0
-8	3	3	3	2	2	3	0.66666667	0.222222
-9	2	2	2	1	1	1	0.375	0.234375
-10	0	0	0	0	1	0	0.04166667	0.039931

Organism	navirus	
	Strain Muni	ich
d	1	
sum px	2.0833	
n	10	
SD50	-8.583	
SE	0.2349	
хр	-7	

Test product		Product concentration			Neat	eat Contact time		
Dilution	Counts						% CPE	p(1-p)
-2	4	4	4	4	4	4	1	0
-3	3	3	3	3	3	3	0.75	0.1875
-4	1	1	1	1	1	1	0.25	0.1875
-5	0	0	0	0	0	0	0	0
-6	0	0	0	0	0	0	0	0
-7	0	0	0	0	0	0	0	0
-8	0	0	0	0	0	0	0	0
-9	0	0	0	0	0	0	0	0

Organism	Feline Coronavirus
	Strain Munich
d	1
sum px	2.00
n	8
SD50	-3.50
SE	0.23
хр	-2

Test product		Product co	oncentratio	n	50%	50% Contact time		
Dilution	Counts						% CPE	p(1-p)
-2	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	1	0
-4	3	3	2	2	2	2	0.58333333	0.243056
-5	1	1	1	1	0	0	0.16666667	0.138889
-6	0	0	0	0	0	0	0	0
-7	0	0	0	0	0	0	0	0
-8	0	0	0	0	0	0	0	0
-9	0	0	0	0	0	0	0	0

Organism	Feline Coronavirus
	Strain Munich
d	1
sum px	1.75
n	8
SD50	-4.25
SE	0.23
·	
xn	-3

Test product		Product concentration			0.10%	Contact time		1 minutes
Dilution	Counts						% CPE	p(1-p)
-2	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	1	0
-4	4	4	4	4	4	4	1	0
-5	4	4	4	4	4	4	1	0
-6	4	4	4	2	4	4	0.91666667	0.076389
-7	3	3	3	4	2	2	0.70833333	0.206597
-8	1	1	2	2	2	2	0.41666667	0.243056
-9	1	1	0	0	0	0	0.08333333	0.076389

Organism	Feline Coronavirus	
	Strain Munich	
d	1	
sum px	3.13	
n	8	
SD50	-7.63	
SE	0.29	
хр	-5	



BS EN 14476:2013+A2:2019

KEY

CPE Cytopathic effect

Counts 0-4 indicating degree of cytopathic effect

0 = No effect, 1 = 25% CPE, 2 = 50% CPE, 3 = 75% CPE, 4 = 100% CPE

d Dilution factor (log)

Sum px Sum of % CPE from the highest dilution showing 100% CPE to the lowest dilution assessed.

n Number of dilutions

SD50 Dilution showing 50% of the end point according to Spearman-Kärber method

SE Standard error

xp Lowest dilution showing 100% CPE

TCID50 Titre causing 50% of the end point according to Spearman-Kärber

PASS = lg R greater than or equal to 4

FAIL = lg R less than 4

> greater than ≥ equal to or greater than < less than ≤ equal to or less than

Calculation notes

In cases where the highest dilution assessed has not shown 100% CPE, the value has been calculated assuming the dilution above this would give 100% CPE and the corresponding value has been assigned as <x.

The standard requires the product suppression control to show a <0.5 log reduction in viral titre. In cases where the product has failed to achieve the required 4 log reduction, but the product suppression control shows a >0.5 log reduction the result has been deemed as valid for fail as the consequence of inadequate suppression would be a partially extended contact time which would generate false positives, but not false negatives.

A similar approach has been taken in regards to the cytotoxicity controls. The standard requires a 4-log difference between the cytotoxicity level and the viral titre. In cases where this is not obtained, but the log reduction observed by the product is within the difference between the cytotoxicity levels and the viral titre the result is deemed acceptable for a fail as there will be no impact on the determination of efficacy.