Study Title:
Measurement of antiviral activity on plastics and other non-porous surfaces

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Scope

The standard describes the method for measuring antiviral activity on plastics and other non-porous surfaces of antiviral-treated products against specified viruses.

Outline of Test Method (Obligatory Test Conditions)

A test suspension of the virus is inoculated onto a test plastic surface and covered with a cover film. The surface is maintained at a specified temperature for a defined period. At the end of the contact time media is added to the surface of the plastic, and the surface is washed over to recover any remaining organism. The number of surviving organisms which can be recovered from the surface is determined quantitatively taking in to account the test surface size.

Test information		Deviation
Name of Product	Test: Shikkui Sora / Shirokabe Control reference: mold-resistant acrylic paint	
Batch Number & Expiry Date	N/S	
Date of Delivery	03/06/2020	
Period of Analysis		
Manufacturer / Supplier	Tagawa Sangyo Co. Ltd	
Storage Conditions	Ambient	
Appearance of the Product	White paint	
Neutralisation Method	Dilution/Filtration/Large volume plating method	
Product Diluent	Distilled water/Synthetic hard water	
Test Concentrations	As supplied	
Test Temperature	20°C ± 1°C	
Temperature of Incubation	37°C ±1°C	
Identification of the Viral Strains:	Feline corona virus, strain Munich	
Contact Times	15 mins, 30 mins, 60 mins and 120 mins	
Stability and Appearance During Test	No Change Observed	

Test Result Summary

The test product received has shown the following log reductions when tested under the condition stipulated in this report:
15 minutes – 0.08 (16.82%)
30 minutes - 0.35 (55.33%)
60 minutes – 1.03 (90.67%)
120 minutes - 1.36 (95.63%)

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

Test results

Cytotoxicity (Test)	Negative
Cytotoxicty (Control)	Negative

Inactivation control				
	Log recovered		**Difference**	**Valid**
Test	*St*	3.83	0.50	Y
Control (Untreated)	*Su*	3.96	0.37	Y
Negative control	*Sn*	4.33	N/A	N/A

15 MINUTES

Log recovery					
	1	**2**	**3**	**Average**	**Log recovered per surface**
Test	5.33	5.25	5.29	5.29	*At* 7.29
Control *(t)*	5.29	5.25	5.58	5.38	*Ut* 7.38
Control *(0)*	5.75	5.67	5.71	5.71	*Uo* 7.71

Antiviral activity per surface *(R)*
0.08
R=(Ut-Uo)-(At-Uo)

30 MINUTES

Log recovery						
	1	**2**	**3**	**Average**	**Log recovered per surface**	
Test	5.33	5.25	5.08	5.22	*At*	7.22
Control *(t)*	5.58	5.50	5.63	5.57	*Ut*	7.57
Control *(0)*	5.75	5.67	5.71	5.71	*Uo*	7.71

Antiviral activity per surface *(R)*
0.35
R=(Ut-Uo)-(At-Uo)

60 MINUTES

Log recovery						
	1	**2**	**3**	**Average**	**Log recovered per surface**	
Test	3.67	4.13	4.33	4.04	*At*	6.04
Control *(t)*	5.04	5.08	5.08	5.07	*Ut*	7.07
Control *(0)*	5.75	5.67	5.71	5.71	*Uo*	7.71

Antiviral activity per surface *(R)*
1.03
R=(Ut-Uo)-(At-Uo)

120 MINUTES

Log recovery						
	1	**2**	**3**	**Average**	**Log recovered per surface**	
Test	3.38	3.63	3.46	3.49	*At*	5.49
Control *(t)*	4.71	4.79	5.04	4.85	*Ut*	6.85
Control *(0)*	5.75	5.67	5.71	5.71	*Uo*	7.71

Antiviral activity per surface *(R)*
1.36
R=(Ut-Uo)-(At-Uo)

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

Calculation notes
All recovery and log reduction calculations were performed for TCID50 rather than plaque assays. Cytotoxicity of the test product was performed through adding 10ml of culture media and washing the surface, this solution was then added to cells in serial dilution and cytotoxicity calculated by TCID50.

Feline coronavirus comparison

	Feline coronavirus	COVID-19 (SARS-CoV2)
Realm	Riboviria	Riboviria
Order	Nidovirales	Nidovirales
Family	Coronaviridae	Coronaviridae
Genus	Alphacoronavirus	Betacoronavirus
Species	Alphacoronavirus 1	COVID-19

The members of the family Coronaviridae are enveloped and have a positive sense RNA genome. Coronaviruses have a distinct morphology with an outer 'corona' of embedded envelope spikes. These viruses cause a broad spectrum of animal and human disease.

Andrew M.Q. King, Michael J. Adams, Eric B. Carstens, and Elliot J. Lefkowitz 'Virus Taxonomy, Classification and Nomenclature of Viruses, Ninth Report of the International Committee on Taxonomy of Viruses' 2012 ISBN 9780123846846