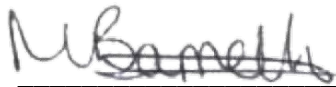


**Study Title:**  
**Measurement of antiviral activity on plastics and other non-porous surfaces**

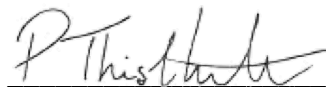
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The test results on this report refer only to the items tested as supplied by the customer. This report shall not be reproduced except in full and with written approval of Microbiological Solutions Ltd. All reports are archived for a minimum of 2 years. The sample will be retained for 1 month unless otherwise requested in writing.

**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.

**Coronavirus summary**

	<b>Feline coronavirus</b>	<b>COVID-19 (SARS—CoV2)</b>
<b>Realm</b>	Riboviria	Riboviria
<b>Order</b>	Nidovirales	Nidovirales
<b>Family</b>	Coronaviridae	Coronaviridae
<b>Genus</b>	Alphacoronavirus	Betacoronavirus
<b>Species</b>	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

Test information		Deviation
Name of Product	1) Ryno 2) Scorpio 3) Sovie	
Batch Number & Expiry Date	N/S	
Date of Delivery	26/03/2020	
Period of Analysis	27/03/2020-31/03/2020	
Manufacturer / Supplier	Pineapple contacts	
Storage Conditions	Ambient	
Appearance of the Product	1) Ryno – Multicoloured plastic tiles 2) Scorpio – Blue material 3) Sovie – White wood	
Test Concentrations	As supplied	
Test Temperature	20°C ± 1°C	
Temperature of Incubation	37°C ±1°C	
Identification of the Viral Strains:	Feline coronavirus, Strain Munich	1
Contact Times	24 hours	
Stability and Appearance During Test	No Change Observed	

**Deviations from Standard Method**

1 - The test surface was challenged against Feline coronavirus.  
 2 – No control material was supplied so samples were compared to glass slides.

All samples were visibly soiled upon receipt. In order to test with the required sterility, samples were wiped with 70% alcohol wipes and allowed to dry before testing.

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. Log recovery per surface is calculated and an average reduction given.

**Test Result Summary**

The test products received have received the following log reductions (resistance to growth) against Feline coronavirus:

- 1) Ryno – Multicoloured plastic tiles 0.65 log reduction
- 2) Scorpio – Blue material 0.58 log reduction
- 3) Sovie – White wood 0.45 log reduction

*See page 2 for outline of the test method and for raw data tables below for complete test results.*

**Summary**

Log recovery						
	1	2	3	Average	Log recovered per surface	
<b>Test 1</b>	2.92	3.04	3	2.99	<i>At</i>	4.99
<b>Test 2</b>	3.04	3.04	3.08	3.05	<i>At</i>	5.05
<b>Test 3</b>	3.17	3.25	3.13	3.18	<i>At</i>	5.18
<b>Control (t)</b>	3.66	3.83	3.42	3.64	<i>Ut</i>	5.64
<b>Control (0)</b>	5.29	5.71	6.13	5.71	<i>Uo</i>	7.71

Reduction test 1

Antiviral activity per surface ( <i>R</i> )
0.65
$R=(Ut-Uo)-(At-Uo)$

Reduction test 2

Antiviral activity per surface ( <i>R</i> )
0.58
$R=(Ut-Uo)-(At-Uo)$

Reduction test 3

Antiviral activity per surface ( <i>R</i> )
0.45
$R=(Ut-Uo)-(At-Uo)$

**Controls**

<b>Cytotoxicity (Test 1)</b>	Negative
<b>Cytotoxicity (Test 2)</b>	Negative
<b>Cytotoxicity (Test 3)</b>	Negative
<b>Cytotoxicity (Control)</b>	Negative

<b>Inactivation control</b>				
		<b>Log recovered</b>	<b>Difference</b>	<b>Valid</b>
<b>Test 1</b>	<i>St</i>	4.17	0.16	Y
<b>Test 2</b>	<i>St</i>	4.21	0.12	Y
<b>Test 3</b>	<i>St</i>	4.25	0.08	Y
<b>Control (Untreated)</b>	<i>Su</i>	4.29	0.04	Y
<b>Negative control</b>	<i>Sn</i>	4.33	N/A	Y

**Raw data**

Test 1								R1	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	1	1	2	2	1	1	0.33333333	0.222222	
-4	1	1	0	0	0	0	0.08333333	0.076389	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.42
n	8
SD50	-2.92
SE	0.21
xp	-2

Test 1								R2	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	2	2	3	1	1	1	0.41666667	0.243056	
-4	1	1	0	0	0	0	0.125	0.109375	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.54
n	8
SD50	-3.04
SE	0.22
xp	-2

Test 1								R3	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	2	2	2	1	1	1	0.375	0.234375	
-4	1	1	1	0	0	0	0.125	0.109375	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.50
n	8
SD50	-3.00
SE	0.22
xp	-2

**Raw data**

Test 2								R1	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	3	3	2	2	1	1	0.5	0.25	
-4	1	0	0	0	0	0	0.04166667	0.039931	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.54
n	8
SD50	-3.04
SE	0.20
xp	-2

Test 2								R2	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	3	3	1	1	1	1	0.41666667	0.243056	
-4	0	0	1	0	0	2	0.125	0.109375	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.54
n	8
SD50	-3.04
SE	0.22
xp	-2

Test 2								R3	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	3	3	2	2	2	2	0.54166667	0.248264	
-4	1	0	0	0	0	0	0.04166667	0.039931	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.58
n	8
SD50	-3.08
SE	0.20
xp	-2

**Raw data**

Test 3								R1	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	3	3	3	2	2	4	0.58333333	0.243056	
-4	1	1	0	0	0	0	0.08333333	0.076389	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.67
n	8
SD50	-3.17
SE	0.21
xp	-2

Test 3								R2	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	2	2	2	2	4	4	0.66666667	0.222222	
-4	1	1	0	0	0	0	0.08333333	0.076389	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.75
n	8
SD50	-3.25
SE	0.21
xp	-2

Test 3								R3	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	4	3	2	2	1	4	0.54166667	0.248264	
-4	1	1	0	0	0	0	0.08333333	0.076389	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.63
n	8
SD50	-3.13
SE	0.22
xp	-2



**Raw data**

Control (t)								R1	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	4	4	4	4	3	3	0.91666667	0.076389	
-4	1	1	0	0	2	2	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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	2.17
n	8
SD50	-3.67
SE	0.19
xp	-2

Control (t)								R2	
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	2	2	1	1	0	0	0.25	0.1875	
-5	1	1	0	0	0	0	0.08333333	0.076389	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.33
n	8
SD50	-3.83
SE	0.19
xp	-3

Control (t)								R3	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	1	0	
-3	3	3	3	3	4	1	0.70833333	0.206597	
-4	2	2	1	0	0	0	0.20833333	0.164931	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.92
n	8
SD50	-3.42
SE	0.23
xp	-2

**Raw data**

Control (0)								R1	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	4	1	0
-4	4	4	4	4	3	3	0.91666667	0.076389	
-5	3	3	3	4	2	1	0.66666667	0.222222	
-6	1	1	1	1	1	0	0.20833333	0.164931	
-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 <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	2.79
n	8
SD50	-5.29
SE	0.26
xp	-3

Control (0)								R2	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	4	1	0
-4	4	4	4	4	4	4	4	1	0
-5	4	4	3	3	3	3	0.83333333	0.138889	
-6	2	2	1	1	0	1	0.29166667	0.206597	
-7	1	1	0	0	0	0	0.08333333	0.076389	
-8	0	0	0	0	0	0	0	0	
-9	0	0	0	0	0	0	0	0	

Organism <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	2.21
n	8
SD50	-5.71
SE	0.25
xp	-4

Control (0)								R3	
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	4	1	0
-4	4	4	4	4	4	4	4	1	0
-5	4	4	3	3	4	4	0.91666667	0.076389	
-6	2	2	1	3	3	3	0.58333333	0.243056	
-7	1	1	0	0	1	0	0.125	0.109375	
-8	0	0	0	0	0	0	0	0	
-9	0	0	0	0	0	0	0	0	

Organism <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	2.63
n	8
SD50	-6.13
SE	0.25
xp	-4

**Raw data**

Interference Test									1
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	4	1	0
-4	3	3	3	2	2	1	0.58333333	0.243056	
-5	1	1	0	0	0	0	0.08333333	0.076389	
-6	0	0	0	0	0	0	0	0	0
-7	0	0	0	0	0	0	0	0	0
-8	0	0	0	0	0	0	0	0	0
-9	0	0	0	0	0	0	0	0	0

Organism <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.67
n	8
SD50	-4.17
SE	0.21
xp	-3

Interference Test									2
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	4	1	0
-4	2	2	1	3	3	2	0.54166667	0.248264	
-5	1	1	1	0	0	1	0.16666667	0.138889	
-6	0	0	0	0	0	0	0	0	0
-7	0	0	0	0	0	0	0	0	0
-8	0	0	0	0	0	0	0	0	0
-9	0	0	0	0	0	0	0	0	0

Organism <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.71
n	8
SD50	-4.21
SE	0.24
xp	-3

Interference Test									3
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	4	1	0
-4	3	3	2	1	2	1	0.5	0.25	
-5	1	1	2	2	0	0	0.25	0.1875	
-6	0	0	0	0	0	0	0	0	0
-7	0	0	0	0	0	0	0	0	0
-8	0	0	0	0	0	0	0	0	0
-9	0	0	0	0	0	0	0	0	0

Organism <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.75
n	8
SD50	-4.25
SE	0.25
xp	-3

**Raw data**

Interference Control									1
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	4	1	0
-4	4	3	3	3	2	1	0.66666667	0.222222	0
-5	1	1	1	0	0	0	0.125	0.109375	0
-6	0	0	0	0	0	0	0	0	0
-7	0	0	0	0	0	0	0	0	0
-8	0	0	0	0	0	0	0	0	0
-9	0	0	0	0	0	0	0	0	0

Organism <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.79
n	8
SD50	-4.29
SE	0.22
xp	-3

Interference Negative									2
Dilution	Counts						% CPE	p(1-p)	
-2	4	4	4	4	4	4	4	1	0
-3	4	4	4	4	4	4	4	1	0
-4	3	3	3	3	3	3	3	0.75	0.1875
-5	1	1	0	0	0	0	0.08333333	0.076389	0
-6	0	0	0	0	0	0	0	0	0
-7	0	0	0	0	0	0	0	0	0
-8	0	0	0	0	0	0	0	0	0
-9	0	0	0	0	0	0	0	0	0

Organism <i>Feline Coronavirus</i> Strain Munich	
d	1
sum px	1.83
n	8
SD50	-4.33
SE	0.19
xp	-3

**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

Sn Log of negative control  
Su log of untreated control  
St Log of test control

At Log of treated test  
Ut Log of untreated control at time  
Uo Log of untreated control at time 0  
R Log reduction