TEST REPORT

LABORATORY ADDRESS:
Level 4, Block N & O, Faculty of Medicine, University of Malaya
50603 Kuala Lumpur.
Tel: +603-79676670 Email: tidrec@um.edu.my
Website: www.tidrec.com
HEAD OF LABORATORY: Sazaly Abu Bakar, Ph.D., FASc

TEST REPORT NO: TS4-0289		**DATE OF ISSUE: 12/10/2020**
CUSTOMER DETAILS		
NAME	Life3 Technology Pte Ltd	
ADDRESS	17 Kaki Buki Place, Singapore 416195	
CONTACT	Dr. Steve Siaw +6011-16850909	
SAMPLE & TEST INFORMATION		
JOB NO.	TS4-0289	
DATE RECEIVED	02.09.2020	
TEST PERFORMED	22.09.2020	
ENVIRONMENTAL CONDITIONS	Ambient Temperature: Store below 30°C Relative Humidity: NA	
TYPE OF SAMPLE	Quantum-Ion® Copper Ionic Series Sample delivered in liquid form in clear plastic bottle (500 ml) Active ingredients: Copper Ion Sample Colour: Blue	
SAMPLE ID.	Lot No: FRT/2020/01 MGF Date: 1/9/2020 EXP Date: 31/8/2022	
TEST METHOD (TM) *Please tick (√) at least one TM*	√	EN14476

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REPORT ON THE EFFICACY OF FUSION RESONANCE QUANTUM-ION® COPPER IONIC DISINFECTANT SPRAY AGAINST SARS- COV-2 (COVID-19) AN IN-VITRO SUSPENSION ASSAY ACCORDING TO EN14476 PROTOCOL

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EXECUTIVE SUMMARY

The Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray, was evaluated for its virucidal activity against the SARS-CoV-2, the virus that caused COVID-19 pandemic. The efficacy of Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray against SARS-CoV-2 was tested in a suspension assay in both clean and dirty conditions as per the European Standard EN14476. All tests were performed in a Biocontainment Level III Facility of the Tropical Infectious Diseases Research and Education Center (TIDREC), University of Malaya, Malaysia. All procedures strictly adhered to biosafety procedures and approved protocols. Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray when tested undiluted achieved >5 $\log_{10}$ reduction in virus titer for a 30s exposure in both clean and dirty conditions. These findings suggest that the Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray, can kill 99.99% SARS- CoV-2 in 1 min.

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EXPERIMENTAL CONDITION

Test period	22.09.2020 – 26.09.2020
Test temperature	21.0°C ± 1°C
Product test concentrations	2%
Contact times	Contact time: 1min, 5min & 10min; Coated: 2h (Post-spray)
Conditions	Clean conditions: 0.3 g/l BSA Dirty conditions: 3.0 g/l BSA + 3.0 ml/l human erythrocytes
Diluent for product test solution	Distilled water
Temperature of incubation	37°C ± 1°C, CO 2 incubator (5% CO2)
Virus	SARS-CoV-2
Virus: source	Tropical Infectious Disease Research & Education Centre (TIDREC), University of Malaya, Malaysia
Virus: number of passages	2
Cell line	Vero E6
Cell line: source	ATCC
Cell line: number of passages	Passages 22

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MATERIAL AND METHODS

Cells and viruses

The SARS-CoV-2 used was isolated, propagated and maintained in Vero E6 cells at TIDREC. The Vero E6 cells were cultured in DMEM (Gibco, Grand Island, NY, USA) supplemented with 10% FBS. The cells were maintained at 37°C with 5% CO2. Virus titers were determined by microtitration using the Vero E6 cells and expressed in $TCID_{50}$/mL. When cytopathic effects (CPE) were evident under the microscope, the supernatant was harvested, clarified by centrifugation and stored at -80°C until needed.

Viral kill time assay

The Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray was tested against SARS-CoV-2 in accordance to the European Standard EN14476:2013/FprA1:2015 protocol. The product was tested undiluted and at a 2-fold dilution under 2 different conditions; dirty condition (3.0 g/l BSA + 3 ml/l erythrocytes interfering substance) and clean conditions (0.3 g/l BSA interfering substance) at 1-minute contact time. The test assay comprised of 100 µl of interfering substance, 100 µl of virus suspension at concentration of 5.42×10^5 $TCID_{50}$/mL & 800 µl of Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray. After the specified contact time (1 min, 5min and 10min), virucidal activity of the product was suppressed by adding DMEM+ 2% FBS and then the mixture was diluted in 10-fold dilution in ice cold media (DMEM+ 2% FBS). This diluted virus media was added to the Vero E6 cells to determine $TCID_{50}$/mL. Virus controls for this test was distilled water in place of test product for both dirty and clean conditions. The cells were incubated for 72 hours till the CPE developed. A mixture of paraformaldehyde and crystal violet were used to fix and stain the infected cells. The virus titers were determined using the Spearman-Karber method and expressed as tissue culture infectious dose 50% (TCID50/ml). The virucidal activity was determined by the difference of the logarithmic titer of the virus control minus the logarithmic titer of the test virus (Δ log10 TCID50/ml). A reduction in virus titer of 4 $\log_{10}$ (corresponding to an inactivation of ≥ 99.99%) was necessary for claiming virucidal activity of the product.

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RESULTS

Product Suppression Assay

The product suppression assay was performed to accurately determine the activity of the test product at the given contact time. The activity was suppressed by adding cold DMEM+2% FBS, followed by serially diluting it 10-fold in cell culture medium. The suppression of product activity was assayed at 1 min exposure. Results from the suppression assay showed no difference in viral titers compared to controls (Table 1). This suggested that addition of cold media and serial dilution effectively suppresses the product activity, resulting in no reduction of the viral titers.

Table 1: Suppression of product activity

*Contact time (sec)	Interfering substance	Viral Titer [Control] ($TCID_{50}$/ml)	Viral Titer [After product suppression] ($TCID_{50}$/ml)	Difference in Viral Titre ($TCID_{50}$/ml)
60	clean conditions	5.4×10^5	No inhibition	0.00
60	dirty conditions	5.4×10^5	No inhibition	0.00

*Undiluted mixture

Virucidal activity of Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray

The Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray was tested against SARS-CoV-2 in accordance to the European Standard EN14476:2013/FprA1:2015. Manifestation of virus cytopathic effects in cell culture were determined by comparing the study product-treated groups against that of the water - treated controls. The SARS-CoV-2 titer in the control-treated samples under clean and dirty conditions, respectively, were at 5.42×10^5 $TCID_{50}$/ml. The Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray when tested neat achieved >5 $\log_{10}$ reduction in viral titers when exposed for 1min, 5min and 10min under both clean and dirty condition (Table 2).

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Table 2: Virucidal activity of Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray against SARS- CoV-2

Virus	The Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray	Log_{10} Reduction in viral titers compared to control					
SARS-CoV-2	Undiluted	Clean Condition			Dirty Condition		
		1min	3min	10min	1min	3min	10min
		>5.00	>5.00	>5.00	>5.00	>5.00	>5.00

SUMMARY

The virucidal efficacy of The Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray was tested against SARS-CoV-2 in a suspension assay following the European Standard EN144762013/FprA1:2015 protocol. The Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray when tested undiluted demonstrated potent and rapid virucidal activity of ≥5 log_{10} reduction of SARS-CoV-2 viral titer in 1 min in both clean and dirty conditions. The Fusion Resonance Quantum-Ion® Copper Ionic Disinfectant Spray, hence, can kill 99.99% SARS-CoV-2.

PREPARED BY:	APPROVED BY:
Name: Pouya Hassandarvish Position: Postdoctoral Research Fellow	Approved Signatory(ies): Sazaly Abu Bakar, Ph.D., FASc ☑ Teoh Boon Teong, Ph.D. ☐ Juraina Abd Jamil, MMedSc ☐
Date: October 09, 2020	Date: October 09, 2020

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About TIDREC

The Tropical Infectious Diseases Research and Education Center or TIDREC was established in 2008 to serves as a focal point for national and international collaborative research for academic institutions and research industries in Malaysia. The center was recognized as the Universiti Malaya Center of Excellence (UMCOE) in 2013 and in April 2019 was designated as the Ministry of Higher Education Higher Institution Center of Excellence (HICOE). The center houses the WHO Collaborating Centre for Arbovirus Reference & Research and the Tick Cells Biobank-Asia Outpost. The center is fully equipped with facility to train and undertake research including those involving highly virulent pathogens. In addition to teaching and research, TIDREC also offers services such as reference laboratory diagnostics, drug screening, and validation tests for diagnostic kits. TIDREC is also one of the centers designated by the Ministry of Health of Malaysia to perform the COVID-19 laboratory screening tests. TIDREC is an ISO9001 compliant organization of Universiti Malaya and subscribed to ISO 17025 for its testing services. TIDREC aspires to be an internationally recognized center of excellence in tropical infectious disease research and education that serves the health needs of global communities.

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Appendix

World Health Organization

Naming the coronavirus disease (COVID-19) and the virus that causes it

Official names have been announced for the virus responsible for COVID-19 (previously known as "2019 novel coronavirus") and the disease it causes. The official names are:

Disease

coronavirus disease
(COVID-19)

Virus

severe acute respiratory syndrome coronavirus 2
(SARS-CoV-2)

Source:
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it

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Appendix

TIDREC Biosafety Level 3 laboratory (BSL3)