ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ / UNIVERSITY OF PATRAS
ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ / MEDICAL SCHOOL
ΕΡΓΑΣΤΗΡΙΟ ΥΓΙΕΙΝΗΣ / DEPARTMENT OF PUBLIC HEALTH
Κτίριο Ιατρικής/Medical Building, ΠΑΤΡΑ/PATRA, 26504
 Tel/Fax:(+) 30 2610 969876, 2610997935
http://www.iwaterfood.gr , e-mail: info@iwaterfood.gr

iwaterfood

Use of Sterionizer TM as COVID19 virus removal

Participants

- Coronavirus Research Group (http://www.coronavirus-greece.gr/)
- Iwaterfood laboratories (www.iwaterfood.gr)
- Afram Tech LTD Israel (www.frank-group.co.il)

Timetable of the contract: 31/5/2020-31/10/2020

Third report

Date: 07/08/2020

Legal Notice

The contents of this report should not be disclosed to the public without a written acknowledgment from the participants. The presented verification is limited to the tested samples in this report and therefore does not verify the quality of the product in its entirety.

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ / UNIVERSITY OF PATRAS
ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ / MEDICAL SCHOOL
ΕΡΓΑΣΤΗΡΙΟ ΥΓΙΕΙΝΗΣ / DEPARTMENT OF PUBLIC HEALTH
Κτίριο Ιατρικής/Medical Building, ΠΑΤΡΑ/PATRA, 26504
 Tel/Fax:(+) 30 2610 969876, 2610997935
http://www.iwaterfood.gr , e-mail: info@iwaterfood.gr

iwaterfood

Aim of the test

To investigate the removal of airborne *COVID-19 virus* by the device Sterionizer TM.

Testing organization

- Iwaterfood.gr
- Medical School, University of Patras

Test device and condition

Test sample: Sterionizer TM
Experiment condition: Device-ON, Device-OFF
Operation time: 10, 30, 60 minutes

Test virus

SARS COVID-2 isolated by clinical samples provided by General University Hospital of Patras, Pathology Unit.

Test condition

1) Test chamber

A schematic representation of test chamber is shown in Figure. The glass test chamber (400 mm x 400 mm x 1000 mm, approx. 0.2 m^3) has been put into biological safety cabinet. The test device, the nebulator and fan were put in the test chamber (see figure 1)

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ / UNIVERSITY OF PATRAS
ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ / MEDICAL SCHOOL
ΕΡΓΑΣΤΗΡΙΟ ΥΓΙΕΙΝΗΣ / DEPARTMENT OF PUBLIC HEALTH
Κτίριο Ιατρικής/Medical Building, ΠΑΤΡΑ/PATRA, 26504
Tel/Fax:(+) 30 2610 969876, 2610997935
http://www.iwaterfood.gr , e-mail: info@iwaterfood.gr

Figure 1

Test virus

Oropharyngeal samples, after significant delay and difficulty due to lack of samples, have been received in the lab. Their number of Genome copies have been enumerated with Real Time PCR using Institute Pasteur standard protocol. The positive samples after their enumeration contained from $1x10^6$ to $1,1 X 10^7$ coronavirus particles.

Real time PCR enumeration

Quantification experiments have been done using Real Time PCR protocols provided by Institute Pasteur.

Operation procedure

The viral suspensions have been placed into the chamber (0.25 m^3) by using compressor-type nebulizer (OMRON, NE) into the test chamber at an air flow ratio of approximately 0.3mL/min.

According to the test procedure, the virus containing aerosols were nebulized for 20 minutes into the test chamber. One minute after nebulizing, the viral aerosols

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ / UNIVERSITY OF PATRAS
ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ / MEDICAL SCHOOL
ΕΡΓΑΣΤΗΡΙΟ ΥΓΙΕΙΝΗΣ / DEPARTMENT OF PUBLIC HEALTH
Κτίριο Ιατρικής/Medical Building, ΠΑΤΡΑ/PATRA, 26504
Tel/Fax:(+) 30 2610 969876, 2610997935
http://www.iwaterfood.gr , e-mail: info@iwaterfood.gr

were collected as a sample at starting time point (the presence of airborne virus at the zero time) and put Sterionizer device into operation. The aerosol was collected at 20 minutes. As a test condition of control, the same test was carried out without operating the device.

Operation	**Equipment**	**Sampling time (min)**												
		5	10	15	20	25	0	5	10	15	20	25	30	
Virus splay	Nebuliser													
Device+fan	Sterionizer													
Collect the air	Sampling machine				*						*		*	

***:** *Sampling*

Sterionizer working conditions

The Sterionizer has been working for 20 and 30 minutes in full capacity.

Sampling

The sampling was made with 150 lt air per sample two times.

The protocol applied was the following:

Testing day

Control experiment

- *Take 1.1 X 10^7 COVID/ml*
- *Add 4 ml H_20 and 20 µl. Final concentration 1.1 X 10^5 COVID/ml*
- *Nebulate for 20 min*
- *Air Sampling (positive sample)*
- *Detect by Real Time PCR*

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ / UNIVERSITY OF PATRAS
ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ / MEDICAL SCHOOL
ΕΡΓΑΣΤΗΡΙΟ ΥΓΙΕΙΝΗΣ / DEPARTMENT OF PUBLIC HEALTH
Κτίριο Ιατρικής/Medical Building, ΠΑΤΡΑ/PATRA, 26504
Tel/Fax:(+) 30 2610 969876, 2610997935
http://www.iwaterfood.gr , e-mail: info@iwaterfood.gr

Main experiment

- *Take 1.1 X 10^7 COVID/ml*
- *Add 4 ml H_20 and 20 μl. Final concentration 1.1 X 10^5 COVID/ml*
- *Nebulate virus for 20 min*
- *Deionize for 20 and 30 min*
- *Sample 150lt two times*
- *Detection by Real Time PCR*

Preliminary Results

The experiment has been performed using 20 and 30 minutes of Sterionizer function. After all cases, an air sample was taken and transferred into Petri dishes with low melting agarose which will trap the viruses. Viruses were eluted and analyzed by Real Time PCR.

	Sample	Sample characteristics	Sample 1 (CT)	Sample 2 (CT)	Mean Ct value	Virus Genome Copies/ml	Decrease
Control	PCR POS control	*Virus positive*	22,62	23.15	22.88	1,5x10^5	NA
	Positive control in filter	*Virus positive in filter*	30.48	30.49	30.49	7x10^4	NA
	Virus nebulated	*20 min nebulator*	32.5	32.8	32.6	*3,5x10^4*	NA
	NEG PCR	H_20	Negative	Negative	Negative	ND	NA
Main experiment	IS52	*20 min nebulator* + **30 min Sterionizer**	To be confirmed	NoCT	NoCT	Negative (Not detected)	100%
	IS53	*20 min nebulator* + **20 min Sterionizer**	To be confirmed	To be confirmed	To be confirmed	Negative Not detected (to be confirmed)	90% (due to 21/8)
	IS54	*20 min nebulator* + **10 min Sterionizer**	Not done	Not done	Not done	Not done	due to 21/8
	IS55	*20 min nebulator* + **5 min Sterionizer**	Not done	Not done	Not done	Not done	due to 21/8

ND: Not detected, NA: Not applicable

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ / UNIVERSITY OF PATRAS
ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ / MEDICAL SCHOOL
ΕΡΓΑΣΤΗΡΙΟ ΥΓΙΕΙΝΗΣ / DEPARTMENT OF PUBLIC HEALTH
Κτίριο Ιατρικής/Medical Building, ΠΑΤΡΑ/PATRA, 26504
Tel/Fax:(+) 30 2610 969876, 2610997935
http://www.iwaterfood.gr , e-mail: info@iwaterfood.gr

Amplification Plots

Israel_first_trial_RIO, Quantitative PCR, 07-20-2020, 14Hr 41Min.mxp

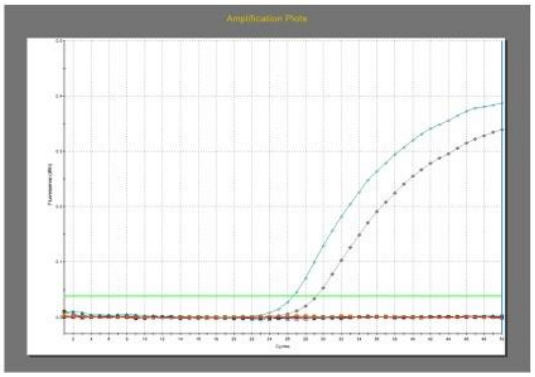
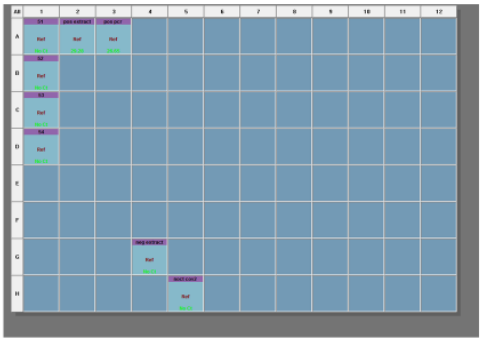


Plate Sample Values

Israel_first_trial_RIO, Quantitative PCR, 07-20-2020, 14Hr 41Min.mxp



Conclusions

After preliminary experiments, there was no detection of coronaviruses in air sample of the chamber after 30 min and significant decrease after 20 min. More repeated experiments will be needed to confirm these preliminary results and confirm statistically robust results.

These preliminary results show that Sterionizer device functioning in 30 min and in 20 min, has a positive role on decontamination of COVID 19 from the air.

Next steps

The experiment will be repeated three more times and in different times 5, 10 and 20 min. The analytical results will be delivered in a later time during the contract duration.

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ / UNIVERSITY OF PATRAS
ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ / MEDICAL SCHOOL
ΕΡΓΑΣΤΗΡΙΟ ΥΓΙΕΙΝΗΣ / DEPARTMENT OF PUBLIC HEALTH
Κτίριο Ιατρικής/Medical Building, ΠΑΤΡΑ/PATRA, 26504
Tel/Fax:(+) 30 2610 969876, 2610997935
http://www.iwaterfood.gr , e-mail: info@iwaterfood.gr

iwaterfood

Questions to be answered

1. What concentration do you have in the experiment?

Answered in the report

2. What is the size of the drops that fly in the air?

As the nebulator produces is 3μm

3. What is the comparative experiment?

Positive sample included COVID 5x10^5 without the application of Steriοinizer

4. How much virus is there at first in the drops?

5 X 10^5 after nebulator function

5. How much virus is left after 1 minute? After 2 minutes?

It has not tested yet. It will be tested after 10/30 minutes and this will follow

Research team

A. Vantarakis, Professor, Iwaterfood, University of Patras

C. Kotsalou, Biologist, Iwaterfood, University of Patras

Z. Kotsiri, Biologist, Iwaterfood, University of Patras

A. Vantarakis
Professor of Public Health

Apostolos Vantarkis

Digitally signed by Apostolos Vantarakis
Date: 2020.08.07 19:34:28 +03'00'