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Report no.: 210458-FR

Lille, 19. April 2021.

Attention to :
Mr. Mathieu SACHOUX
Société Abiotec

Report no.: 210458-FR

EXAMINATION: Evaluation of efficiency of air purification system at disinfection process due to corona virus contamination.
Experiment of five-minute working period against human Corona virus strain 229E (HCoV-229E).

The present examination results only apply to the examined equipment.

The report covers 5 pages.

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Laboratory representative

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Summary

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I- Conditions of experiment

- Date of experiment : 9-19th April 2021.
- Length of disinfection : 5 minutes
- Virus strain : 229E (HCoV-229E) human Corona virus
- Infection environment : DMEM + glutamax, 1 % antibiotics, 2 % SVF
- Cells lineage : Huh-7 cells, DMEM + glutamax, 1 % antibiotics, 10 % SVF
- Conditions of incubation : 6-7 days at 33 °C 5 % CO_2
- Method of virus concentration : Amicon Ultra-15 centrifugal filter unit
- Method of titration : Spearman- Kärber Log $TCID_{50}$
- Number of repetitions : 3

- Medical nebulizer : Respironics (Philips)
- Air bio-collector : Coriolis µ (Bertin Technologies), 150 l/min
- Collector liquid : 15ml phosphate buffered saline + 0,005 % Tween 20

- Equipment: Airocide type GCS 25
    - Prototype ON: UV lamps on + ventilation on
    - Prototype OFF: equipment turned off completely

II- Principles

The experiment was carried out inside a Security 3 level Microbiological Post, in a hermetically sealed room of 540 litres (0,54 m3). During the experiment there was no airflow in order to avoid that the filters of the room capture the particles of the aerosol.

The particles infected with the given virus concentration were placed in aerosol form into this hermetically sealed room. The infected air was ventilated through the decontamination chamber of the air purification equipment. Following this, the air sampling devices were turned on to take samples of the air. The air samples were placed in a liquid in order to determine the quantity of surviving viruses. The efficiency of the system was evaluated by the logarithmic reduction of the virus population in the air.

To create the aerosol particles a medical nebulizer (Respironics, Philips) was used. This equipment is used to administer medication via inhalation, thus it creates particles that are below the inhalable fraction that represents the situation of the virus risk. A nebulising chamber was connected to the equipment containing the virus suspension in a phosphate buffered saline (PBS).

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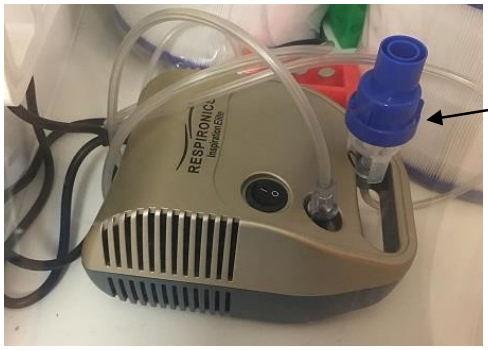

The air sampling was made using a Coriolis µ (Bertin Technologies) equipment, that collected the air samples and with cyclonic movement placed the samples into a flask containing 15ml PBS (phosphate buffered saline + 0,005 % Tween 20. The virus particles in the air were re-suspended in this collector liquid. Sampling was made by 150 l/min air suction. The air sample collected by the Amicon® was concentrated to increase the limit of analytical detection.

Two types of examination were carried out:
- Reference examination: with the equipment turned out.
- Decontamination examination: ventilation turned on with the air purification technology turned on (UV lamps).

The difference between the quantities of virus at the two different examinations helped to determine the efficiency of the decontamination process. The „passive" physical loss of virus was also observed in the reference examination such as the subsidence of virus particles during the stress of aerosol dosage, collection etc. Both conditions were tested 3 times. At each repetition a new collection flask was used.

The 3 pieces of equipment (nebulisation, decontamination and collector) were used after one another: first the nebulizer for 150 seconds, then the air purification system for 5 minutes, and finally the collector for 5 minutes.

The infectious virus content was determined using the Spearman-Kärber method according to the standard NF EN 14476+A2 (2019. July), and expressed in Tissue Culture Infective Dose 50% ($TCID_{50}$).

At the end of each experiment day the room was completely decontaminated. Following that the room was ventilated prior to the next experiment.

III- Results - Decontamination

Table 1. : The quantity of nebulised and collected virus ($TCID_{50}$)

	Experiment without disinfection process		Experiment with disinfection process	
Length of time	**Quantity of nebulised virus**	**Quantity of collected virus**	**Quantity of nebulised virus**	**Quantity of collected virus**
5 minutes	$2{,}1 \times 10^6$	$1{,}0 \times 10^5$	$8{,}8 \times 10^6$	$4{,}2 \times 10^3$
	$2{,}1 \times 10^6$	$1{,}8 \times 10^5$	$8{,}8 \times 10^6$	$1{,}3 \times 10^3$
	$2{,}1 \times 10^6$	$1{,}0 \times 10^5$	$8{,}8 \times 10^6$	$1{,}8 \times 10^3$

The results represent the difference between the quantity of nebulised and collected virus expressed in Log $TCID_{50}$ during each experiment.

Table 2. : The loss of virus observed during the experiments (Log $TCID_{50}$)

	Experiment without disinfection process		Experiment with disinfection process	
Length of time	**Difference between nebulisation and collection**	**Average**	**Difference between nebulisation and collection**	**Average**
5 minutes	1,3	1,2	3,3	3,6
	1,1		3,8	
	1,3		3,7	

The additional loss of virus in connection with the presence and work of the air purification system is **2,4 Log $TCID_{50}$**.

IV- Conclusion

Following the 5-minute use of the Airocide GCS25 air purification system distributed by Abiotec, the air purification equipment eliminated **99,58% of the present human Coronavirus 229E** in a room of 0,54 m^3.

End of report