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Research Protocol

Air Monitoring to Collect Covid-19 Virus

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Abstract

It is recognized by CDC [1] and WHO [2] that aerosol transmission in poorly ventilated indoor environments may play a significant role. The monitoring of indoor air environments by quantitative analysis will be an important tool to provide feedback for risk assessments of indoor environments.

These principles are important if a possible contamination by COVID-19 virus is expected.

The steps for a correct virus sampling from the air to be considered are the sampler flow rate, the sampling duration, the sampler position, the sampling collecting liquid, the sample storage, the sampling processing.

The analytical methods are based on DNA or RNA extraction.

The descripted air sampler is the results of the European NATO project EUCLID CEPA 13 "Protection of personnel against pathogenic micro-organisms via air sampling and rapid detection and identification".

Keywords: *Aerosol; CDC; CFU; Covid 19; Droplets; Pandemic; Rapid Analytical Methods; Risk Assessment; Susceptible Person; Virus; WHO*

Introduction

It is recognized by CDC [1] and WHO [2] that aerosol transmission in poorly ventilated indoor environments may play a significant role. The small aerosols or droplet nuclei stay longer in the air and travel further than the larger droplets (> 5 μm). If aerosols contain the virus in sufficient quantity a susceptible person could inhale them and become infected.

As more data about infectious dose becomes available the monitoring of indoor air environments by quantitative analysis will be an important tool to provide feedback for risk assessments of indoor environments.

Industries that are possibly involved in pandemic such as air travel, hospitality, theatre, convention centres and other businesses may benefit from aerosol testing for COVID-19 to re-assure the customers and audience.

Materials

Air sampler principle

The descripted air sampler is the results of the European NATO project EUCLID CEPA 13 "Protection of personnel against pathogenic micro-organisms via air sampling and rapid detection and identification".

The air is aspirated into the liquid inside a conic container. The viruses are separated from the air and concentrated in the liquid.

Air sampler characteristics

A sampler to be used for the virus collection is the AIRBIO ONE RAPID-VIRUS instrument. It is specifically designed for total pathogen surveillance of bacteria, fungi, yeast and viruses.

The instrument combines impact to agar with traditional colony forming unit (CFU) method and liquid collection to facilitate subsequent rapid analytical IDF steps post sampling.

The instrument has therefore two options:

1. To be used with the traditional impact on agar culture media plate (e.g.: Plate Count Agar, Sabouraud Dextrose Agar) to count the colonies (CFU) and
2. To be used for the collection in liquid (e.g.: Buffer Phosphate Solution) for subsequent rapid analytical identification steps by PCR, etc.

Figure 1: *Picture of Airbio virus.*

Safety

All the reported procedures should follow the GLSP (Good Laboratory Safety Practices) as indicated by the bio-safety officer.

Complete procedures

SAMPLE COLLECTION ON THE FIELD	SAMPLE TRANSFER TO LABORATORY	SAMPLE PROCESSING	SAMPLE ANALYSIS	FINAL RESULTS WITH Rapid Methods	DECONTAMINATION
For bacteria For Virus	Refrigerated temperature	Concentration	Qpcr, RT-qPCR, microarray	Results in hours	Autoclaving

Figure 2

The sampling time

The viruses are quite often present in the air at diluted concentration and therefore the aspiration time should be of several minutes with more than one cubic meter (1.000l.) of air.

The sampler positioning

It is necessary to evaluate the expected movements of air in the considered environment. The air sampler should be positioned on the trajectory of the room airflow.

In case of hospital, the suggested place is at about 1 meter from the bed and at the height of bed.

It is also suggested to start the sampling from a distance away from the patient and then progress toward closer positions.

Air flow rate

A high flow rate may degrade RNA virus during collection. It is therefore suggested an air flow not more than 100 l/minute.

The sampling collecting liquid

The most suggested collecting liquid for virus present in the aerosol is the Phosphate Buffer Saline (PBS) buffer. A possible alternative is the DMEM or MEM culture medium. If the aspiration time is quite long, it is suggested not the adoption of PBS to avoid that the salt concentration become too high.

The sample storage

The samples should be stored at 4°C for not more than 24 hours. The freezing could be considered for long term storage.

The sampling processing

A concentration step is requested by different protocols with a tangential flow filtration.

The analysis

The rapid microbiology techniques such qPCR, RT-qPCR microarrays and virus viability assay are the most used.

The decontamination

The aspirating parts (stainless steel connection to the command unit + the container) should be decontaminated after each test by autoclave. The suggested cycle is 125°C/20 minutes.

Another alternative is to use a 70% sterile ethanol immersion. This solution can also be used to treat the external parts of the sampler with a wet sponge.

Another possibility is to run the air sampler using the 70% sterile ethanol inside the container; the generated aerosol will decontaminate the system.

It is also possible the decontamination by hydrogen peroxide vapour.

Bibliography

1. https://www.cdc.gov/media/releases/2020/s1005-how-spread-covd.html
2. https://www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions

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