RENSAIR

March 2021

REPORT BY THE DANISH TECHNOLOGICAL INSTITUTE

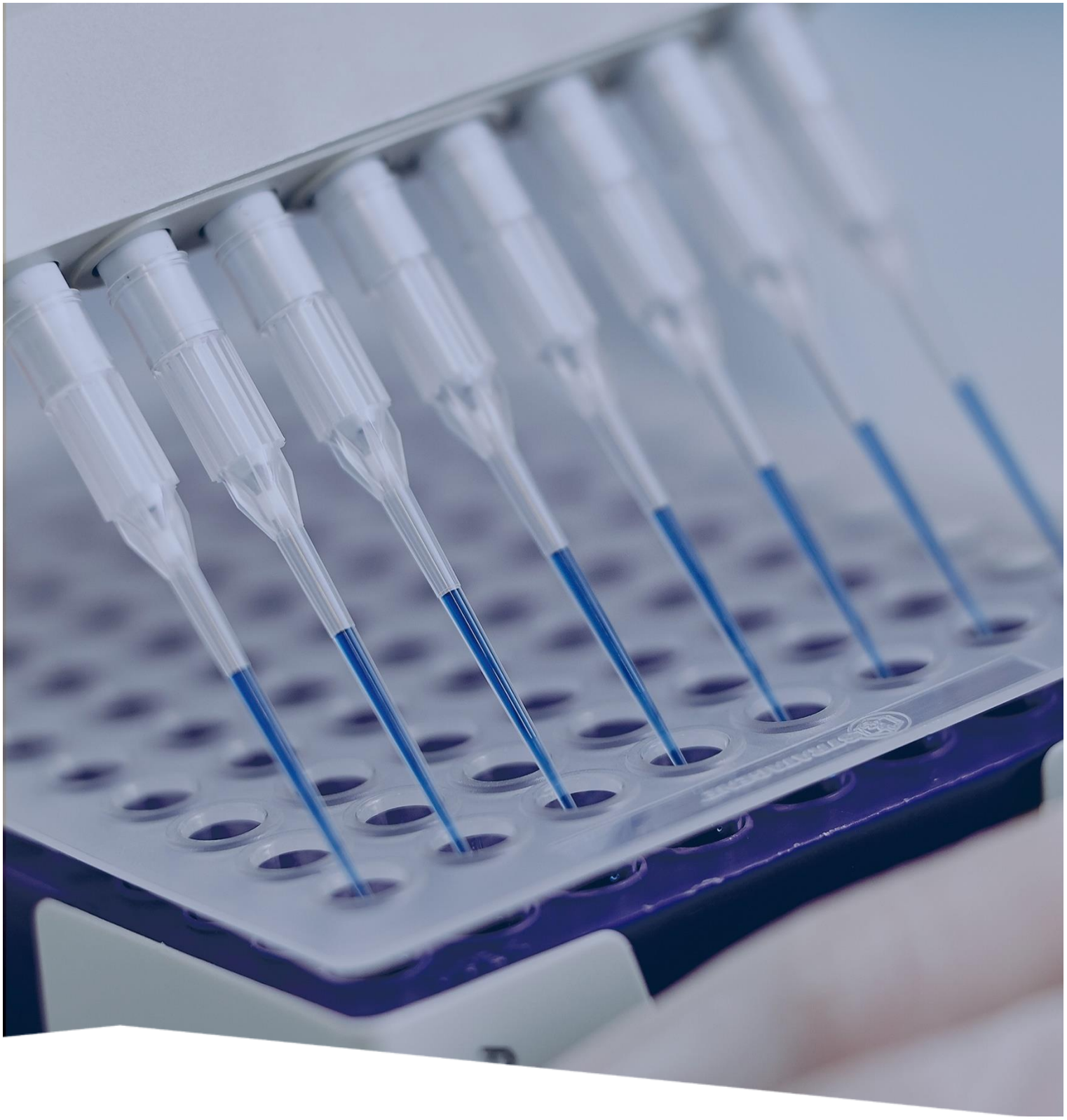
The following report is written by Stig Koust Hansen, Ph.D, Consultant at the Danish Technological Institute (DTI) about Rensair air cleaning technology. The DTI is a leading research and technology institute with 70 laboratories and 1,000 specialists.
It works in close consultation with 800 research and development partners.

The objective of the test was to determine the virucidal activity of the unit's UVC photolysis system. The result was that the concentration of viable MS2 virus that could be recovered from inside the HEPA filter after use was below the detection limit for the analysis, thereby demonstrating wholesale destruction of the virus.

Kind regards

Christian Hendriksen
Co-Founder and CEO
Rensair

rensair.com



Report no. 967704_2

Inactivation of MS2 bacteriophages on HEPA Filter

Rensair

DANISH
TECHNOLOGICAL
INSTITUTE

DANISH
TECHNOLOGICAL
INSTITUTE

Inactivation of MS2 bacteriophages on HEPA Filter

Rensair

Prepared for:
Rensair
90 High Holborn
London, WC1V 6LJ
UK

Prepared by:
Teknologisk Institut
Kongsvang Allé 29
8000 Aarhus C
Environmental Technology

March 2021
Author: Stig Koust Hansen, Ph.D., Consultant,
+45 7220 1151, stko@dti.dk

Quality Assurance: Maj Frederiksen, Ph.D., Consultant,
+45 7220 1480, mafr@dti.dk

Assignment Description

The purpose of the test is to determine the virucidal activity of the air purifiers UV-C photolysis system. Virus is captured in the HEPA filter of the device as the device removes aerosolized MS2 bacteriophages from the air, whereafter the virus is exposed to the UV-C light inside the device. The test is designed to examine if virus remains viable on the filter following removal from the air.

The MS2 bacteriophage is chosen as virus surrogate as this is a recognized RNA and non-enveloped model virus, that furthermore is robust enough to survive aerosolization and air sampling.

Conclusion

The test showed that the concentration of viable MS2 virus that could be recovered from the inside of the HEPA-filter after use were below the detection limit for the analysis (150 PFU/sample). Thus, demonstrating an efficient UV treatment system.

The virucidal activity cannot be further quantified as, the initial load of MS2 on the filter is unknown, however the concentration of viable airborne virus in the test chamber was 9.5×10^8 PFU/m^3 at the start of the test and below 3.0×10^3 PFU/m^3 after operating the air purifier for 30 minutes. The reduction of airborne virus in the test chamber during the 30 minutes is mainly attributed to filtration by the air purifier, with a smaller contribution from natural decay.

Method and Materials

The air purifier is placed in a test chamber (20m^3) containing airborne MS2 virus and switched on. The virus is assumed to be captured in the HEPA-filter of the device (and to a lesser degree deposited inside the test chamber due to a natural decay). The air purifier is active for 30 minutes, before switched off and the HEPA filter removed from the device. Subsequently, the inside of HEPA-filter is swabbed using a sponge stick and the number of viable MS2 is evaluated.

Sampling was conducted as a real double determination.

Details on aerosolization of MS2 and the method used for assessing the reduction rate of culturable airborne viruses by the air purifier is presented in report 967704_1.

The room is cleaned thoroughly and heavily ventilated using clean air prior to the test.

The relative humidity in the test chamber during testing was 50 ± 10 %RH and temperature was 21 °C ± 0.5 °C

To examine the recovery rate for MS2 virus dried unto the HEPA-filter, a positive control and a negative control were made using extra identical HEPA-filters.

Positive control
100 µl MS2 virus suspension was added to the inside of the HEPA-filter by adding drops of each 10 µl. After drying unto the HEPA-filter the inside of the HEPA-filter was swabbed.

Method validation
The method validation was conducted to ensure that the MS2 virus was not inactivated by the recovery procedure in the laboratory.

100 µl MS2 virus suspension was added to the swab which was subsequently transferred to 10 mL of SM-buffer in a stomach bag and homogenized for 30 sec.

Analysis method:
The MS2 samples were analyzed according to Danish Technological Institute's method: MIA-216.

Figure 1: Left) Device under test – Rensair. Right) HEPA-filter removed from device.

DANISH
TECHNOLOGICAL
INSTITUTE

Experimental conditions for inactivation of MS2 virus on HEPA-filter

Test organism:	MS2 bacteriophage, ATCC 15597-B1
Host organism for MS-2:	Escherichia coli, ATCC 15597
Growth conditions for enumeration of pfu:	Coliform agar at 37±2°C for 18-24 h
Growth conditions for host organism:	First on TSA plates and then in TSB at 250 rpm. at 37±2°C for 20-24 h.
Sampling and dilution solution:	SM-buffer
Swab:	3M™ Sponge Stick, Dry
Recovery method:	Homogenization of the Sponge Stick in SM-buffer using a Stomacher for 30 sec.
Test suspension for positive control and method validation:	SM buffer with $3.3 \cdot 10^7$ pfu/mL

Results

The concentration of active MS2 recovered from the HEPA filter after use in test is shown in Table 1. The detection limit is defined as 150 PFU/sample.

Table 1: The concentration of active MS2 for the Natural decay and the Product test. The concentration is calculated as the average of dublicates.

Sample	PFU/sample
Sample 1	Below Detection Limit (< 150 PFU/sample)
Sample 2	Below Detection Limit (< 150 PFU/sample)

The positive control showed a recovery rate of 58% and the negative control was below detection limit. According to the method validation MS2 virus was not inactivated by the recovery procedure in the laboratory.

RENSAIR

For additional information
please visit rensair.com or
email contact@rensair.com