

AIR LAB CONTROL

REPORT Air purification system assay

REPORT N°180727-FELLOWES / V1

COSTUMER

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FROM

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I. CONCLUSIONS

A. CONCLUSIONS

1. AERAMAX PRO AM IIIS SYSTEM ASSAY

Assay	Biological pollution level* /Reference value	Efficiency
Assay FEL-A <i>Staphylococcus aureus</i> Air volume: 45 m ³ Theoretical circulation of biological pollutants: 18 Time: 13min and 42s	very high+ 2.2 .10E ⁴ CFU / m ³	99.919 %
Assay FEL-B <i>Aspergillus fumigatus</i> Air volume: 45 m ³ Theoretical circulation of biological pollutants: 18 Time: 13min and 42s	very high+ 4.4 .10E ⁴ CFU / m ³	99.925 %
Assay FEL-C Norovirus Air volume: 45 m ³ Theoretical circulation of biological pollutants: 18 Time: 13min and 42s	very high+ 1.2 .10E ⁴ TCID ₅₀ / m ³	98.534 %

*Biological pollution level (indoor)

Very low : < 5.10^{E1} CFU/m³ air (Bacteria, virus) and < 2.5.10^{E1} CFU/m³ air (Mold)
Low : < 10^{E2} CFU/m³ air and < 10^{E2} CFU/m³ air (Mold)
Intermediate: < 5.10^{E2} CFU/m³ air (Bacteria, virus) and < 5.10^{E2} CFU/m³ air (Mold)
High: < 2.10^{E3} CFU/m³ air (Bacteria, virus) and < 2.10^{E3} CFU/m³ air (Mold)
Very high: > 2.10^{E3} CFU/m³ air (Bacteria, virus) and > 2.10^{E3} CFU/m³ air (Mold)
Very high+: > 10^{E4} CFU/m³ air (Bacteria, virus) and > 10^{E4} CFU/m³ air (Mold)

The **AERAMAX PRO AM IIIS** developed by **FELLOWES** Company leads to an effective inactivation of ***staphylococcus aureus*** with a 3.10 decimal log CFU/m³ reduction upon passage of 18 chamber air volumes ie 13min and 42s of functioning time corresponding to a decontamination efficiency of **99.919%**

The **AERAMAX PRO AM IIIS** developed by **FELLOWES** Company leads to an effective inactivation of ***aspergillus fumigatus*** with a 3.13 decimal log CFU/m³ reduction upon passage of 18 chamber air volumes ie 13min and 42s of functioning time corresponding to a decontamination efficiency of **99.925%**

The **AERAMAX PRO AM IIIS** developed by **FELLOWES** Company leads to an effective inactivation of **norovirus** with a 1.84 decimal log CFU/m³ reduction upon passage of 18 chamber air volumes ie 13min and 42s of functioning time corresponding to a decontamination efficiency of **98.534%**

SUMMARY

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II. INTRODUCTION

B. DOCUMENTS

FELLOWES Company asked Air Lab Control Company to evaluate the efficiency of the air cleaner **AERAMAX PRO AM IIIS system**. Assays were realized with artificial atmosphere containing calibrated quantities of *staphylococcus aureus*, *aspergillus fumigatus* or norovirus (un-enveloped enteric viral strain) in a nebulization chamber.

Quote :

VM-1804-032/18-D V3

III. RESUME

Laboratory evaluation of the efficiency of air **AERAMAX PRO AM IIIS** purification system (FELLOWES) to decontaminate a confined space containing biological pollutants.

Biological pollutant:

- staphylococcus aureus*
- aspergillus fumigatus*
- norovirus

Biological pollution level: very high+ ($> 10^4$ microorganisms / m³ air)

IV. EXPERIMENTAL CONDITIONS

1. METHODOLOGY

The experiment consisted in the evaluation of the capacity of the **AERAMAX PRO AM IIIS** system to decontaminate a confined space containing microorganisms. This confined space was materialized by a nebulization chamber of 2.5m³ where an artificial atmosphere containing infectious microorganisms can be generated with good reproducibility. These contaminated atmospheres are obtained by nebulization of calibrated viral solutions. Test samples were collected by suction of the total volume of the chamber by using cyclonic movement.

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2. TECHNICAL PARAMETERS

AERAMAX PRO AM IIIS

- Serial number: AM IIIS 180126 AA 0001598
- Alimentation: 220-240V-0.9A
- Consumption: 11 W

3. PARAMETERS

- Date : 18/07/04 and 18/07/19
 - Temperature : 20°C
 - Particular level : ISO 7
 - Biological Pollutants : microorganisms.
 - Assay FEL-A: *staphylocoque aureus* (ref : ST0012-5)
 - Assay FEL-B: *aspergillus fumigatus* (ref : AF0051-3)
 - Assay FEL-B: norovirus (ref : NMV008-2)
 - Virus quantification :
 - End point titration assay with RAW cells, incubation time for 3 days at 37°C, 5% CO₂.
 - Bacteria/mold quantification:
 - Serial dilutions on agar specific media
 - Biological pollution (artificial atmosphere): artificial atmospheres have been generated with 4 nebulizers (NSF 6 jet CN25, BGI, USA) (Air pressure 1.7 bars, 24.6 psig) for 10min.
 - Volume of confined space: 2.5m³
 - Functioning time (190 m³/h, V₃):
 - Assay FEL-A: 13min and 42s* corresponding to 45m³ air volume (18 chamber volume)
 - Assay FEL-B: 13min and 42s* corresponding to 45m³ air volume (18 chamber volume)
 - Assay FEL-C: 13min and 42s* corresponding to 45m³ air volume (18 chamber volume)
- *: functioning time including a period of 30s for air flow stability

V. RÉSULTS

1. CONTROL

Biological pollutant: *staphylococcus aureus*

-Solution of nebulization: $1.15 \cdot 10^7$ CFU / mL

-Level of artificial biological pollution: very high+ ($> 10^4$ CFU / m³ air)

Assay FEL-A: **$2.20 \cdot 10^4$ CFU / m³ air (4.34 Log₁₀ CFU / m³ air)**

Biological pollutant: *aspergillus fumigatus*

-Solution of nebulization: $1.7 \cdot 10^6$ CFU / mL

-Level of artificial biological pollution: very high+ ($> 10^4$ CFU / m³ air)

Assay FEL-B: **$4.41 \cdot 10^4$ CFU / m³ air (4.64 Log₁₀ CFU / m³ air)**

Biological pollutant: norovirus

-Solution of nebulization: $1.3 \cdot 10^8$ TCID₅₀ / mL

-Level of artificial biological pollution: very high+ ($> 10^4$ CFU / m³ air)

Assay FEL-C: **$1.18 \cdot 10^4$ TCID₅₀ / m³ air (4.07 Log₁₀ TCID₅₀ / m³ air)**

These values were used as reference for the determination of **AERAMAX PRO AM IIIS** system efficiency.

Impact of the purification system (ventilator and surface) on the artificial atmosphere: control not realized.

2. AERAMAX PRO AM IIIS SYSTEM EFFICIENCY

Air volume: 45 m³

Theoretical circulation of biological pollutants: 18

Functioning time: 13min and 42s

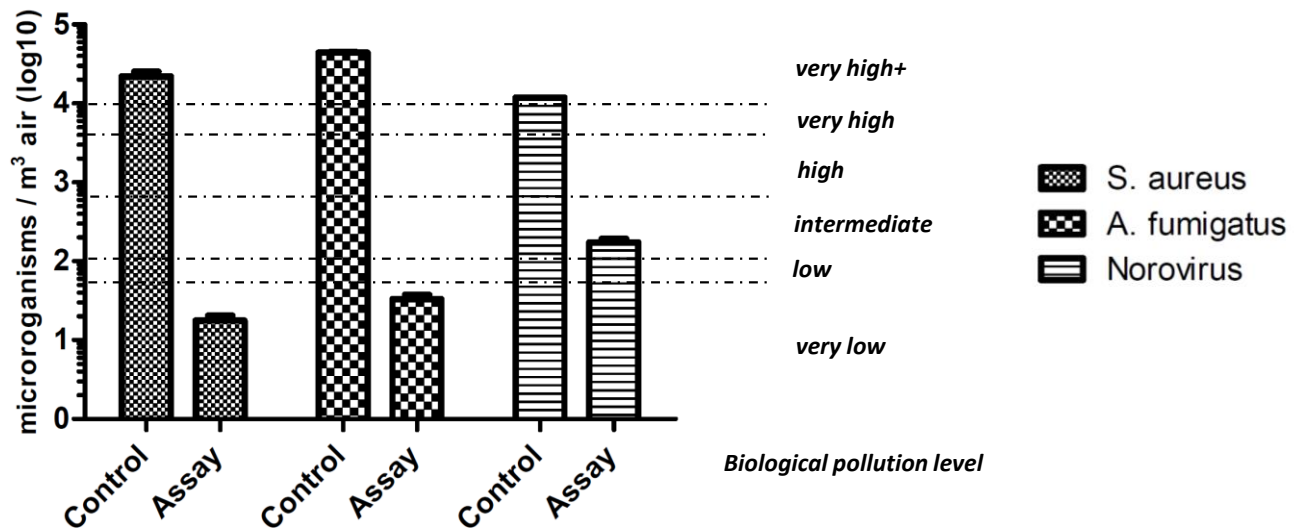


Figure 1. Efficiency of AERAMAX PRO AM IIIS system after 13min and 42s functioning time corresponding to 18 theoretical circulation of chamber biological pollutants.

Assay FEL-A: *staphylococcus aureus*

Level of biological pollution:

Before treatment: $2.20 \cdot 10^4$ CFU / m³ (4.34 Log₁₀ CFU / m³ air)

After treatment: $1.78 \cdot 10^1$ CFU / m³ (1.24 Log₁₀ CFU / m³ air)

Impact of the treatment on the biological pollution: $3.10 \log_{10}$ CFU / m³

Efficiency: 99.919 %

Assay FEL-B: *aspergillus fumigatus*

Before treatment: $4.41 \cdot 10^4$ CFU / m³ air (4.64 Log₁₀ CFU / m³ air)

After treatment: $3.30 \cdot 10^1$ CFU / m³ air (1.51 Log₁₀ CFU / m³ air)

Impact of the treatment on the biological pollution: $3.13 \log_{10}$ CFU / m³

Efficiency: 99.925 %

Assay FEL-C: norovirus

Before treatment: **1.18 10^E4 TCID₅₀ / m³ air (4.07 Log₁₀ TCID₅₀ / m³ air)**

After treatment: **1.73 10^E2 TCID₅₀ / m³ air (2.23 Log₁₀ TCID₅₀ / m³ air)**

Impact of the treatment on the biological pollution: **1.84 log₁₀ CFU / m³**

Efficiency: **98.534 %**