Test report of Dopair filtration system of ATA company: *Staphylococcus aureus* and *Enterococcus faecium.*

Summary

1. Scientific and technological background

VirNext is a technological platform of service and innovation with the aim to answer to scientific and technological needs of manufacturers in the fields of virology and microbiology. VirNext is specialized in the evaluation of physical, chemical and biological technologies for indoor air, surface and water decontamination.

ATA Company commissioned VirNext technological platform to evaluate the efficiency of the "Dopair/Room Dopair" indoor air purification system for the decontamination of Gram positive bacteria in confined space. This purification system is composed of a filter system.

Confined space indoor air favours exposition to chemical and biological harmful compounds; which can have a hard sanitary impact. Pollutants in confined space are known to be involved in respiratory deficiency, cardiovascular diseases, rhinitis, allergies and cancer. The nature of these pollutants depends on environmental confined spaces. For medical and paramedical sectors, the main biological pollutants are microorganisms, and notably Gram positive bacteria. They present an ovoid form of 0.5 at 2µm. They possess a peptidoglycan rich layer in cell wall. The main bacteria strains found in confined spaces are *Staphylococcus epidermidis, Staphylococcus aureus* MSSA/MRSA (Methicillin-sensitive or resistant), *Enterococcus faecium*, *Micrococcus, and Streptococcus pyogenes* and *pneumonia.* Altogether these bacteria are responsible of skin, mucocutaneous, urinary diseases, of peritonitis, of abscess, of toxic shocks, and nosocomial infections.

VirNext has developed experimental procedures in order to evaluate the efficiency of Room Dopair/Dopair filter system to decontaminate confined space. This confined space was contaminated with Gram positive bacteria: *Staphylococcus aureus* and *Enterococcus faecium*.

Caller:

ATA-Medical Company

Head of ATA-Medical : Pascal Mismaque (Président/CEO)

Test Laboratory:

Plateforme technologique privée VirNext, Faculté de médecine RTH Laennec 2ème étage,

7-11 rue Guillaume Paradin, 69372 Lyon cedex 08

Technical support : Anaïs Proust

2. Methodology

The experimental strategy consists of the evaluation of the capacity of "Room Dopair/Dopair" system, developed by ATA-Medical Company, to decontaminate a confined space with microorganisms. This confined space was materialised by a nebulization chamber with a volume of 2,5m^3 where an artificial atmosphere containing microorganisms can be generated. These atmospheres were obtained by nebulization of concentrated solutions containing the microorganisms. Test samples were harvested by suction of total volume of chamber using cyclonic movement (Coriolis, Bertin Technologies). During this suction, the harvested microorganisms were resuspended in a collection buffer.

3. Evaluation of purifier efficiency

3.1 Experimental conditions

Date: 30/01/2014*(Staphylococcus aureus)* and 18/02/2014 *(Enterococcus faecium)*

Temperature: 20°C

Flow of Room Dopair/Dopair filter system: 160m^3/h

Functioning time:

Functioning time of Room Dopair system has been defined in order to evaluate decontamination efficacy on confined space after passage of 5 chamber volumes (12.5m^3 in 5 minutes), 10 chamber volumes (25m^3 in 10 minutes), 20 chamber volumes (50m^3 in 20 minutes).

Number of sample 14 for each microorganism

Concentration of microorganism solutions:

- *Staphylococcus aureus* 10^8CFU/mL
- *Enterococcus faecium* 10^8 CFU/mL

Collection parameters: 10 minutes (2.5 m^3) in 8 mL of collection medium (phosphate buffer)

Evaluation method: seeding on PCA medium, incubation at 37°C during 24 hours then counting.

3.2 Results :

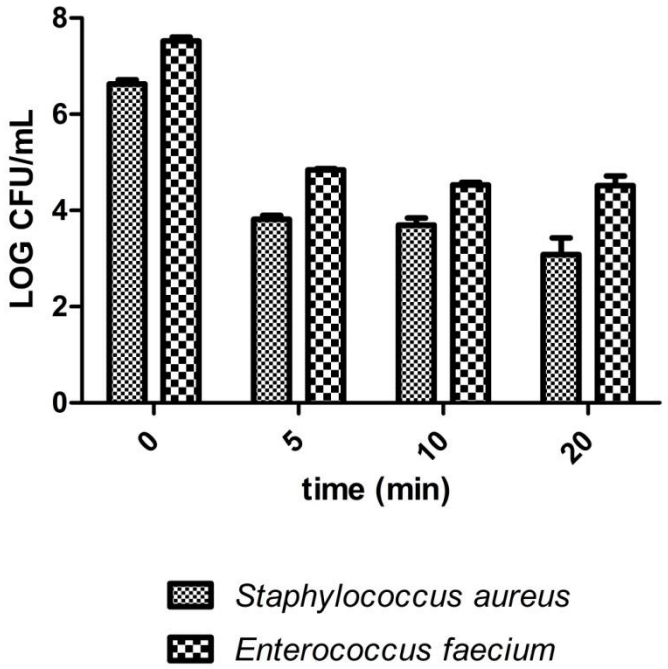

Figure 1: Evaluation of « Room Dopair » filter system on Gram positive bacteria: *Staphylococcus aureus* and *Enterococcus faecium*.

The collecting data allow to define the efficiency of the « Room Dopair » system on decontamination of confined space with Gram positive bacteria.

- Reduction Log CFU/mL *Staphylococcus aureus* :
  - 2,8 ± 0,1 Log in 5 minutes
  - 2,9 ± 0,2 Log in 10 minutes
  - 3,5 ± 0,4 Log in 20 minutes

- Reduction Log CFU/mL *Enterococcus faecium*:
  - 2,7 ± 0,1 Log in 5 minutes
  - 3,0 ± 0,1 Log in 10 minutes
  - 3,0 ± 0,2 Log in 20 minutes

3.3 Conclusion

The « Room Dopair/Dopair » system developed by ATA-Medical Company allows the decontamination of a confined space of a volume of 2.5m^3 in 5 minutes with efficiencies of 99.842% and 99.800% for *Staphylococcus aureus* and *Enterococcus faecium* respectively. The « Room Dopair/Dopair » filter system allows to decontaminate air of confined space containing Gram positive bacteria.

Lyon the 5 mars 2014,

A. PROUST
Ingénieur R & D

VIRNEXT
Faculté de médecine - 2ème étage
7 Rue Guillaume Paradin
69372 LYON Cedex 08

V. MOULES
Responsable

VIRNEXT
Faculté de médecine - 2ème étage
7 Rue Guillaume Paradin
69372 LYON Cedex 08

APPENDIX 1

Name	Parametres		Results CFU/mL	Counting a)																	
	Condition system	Numbres of passages		0,5		1		10-1		10-2		10-3		10-4		10-5		10-6		10-7	
14/JA/A/Sa/Control-	n.a	n.a	<1	0	0	0	0	0	0												
14/JA/A/Sa/Si	OFF	n.a	1,76E+08													184	177	16	11	2	4
14/JA/A/Sa/1	OFF	0	5,30E+06							unc	unc	unc	unc	47	59	5	2				
14/JA/A/Sa/2	OFF	0	2,34E+06							unc	unc	258	200	25	31	3	3				
14/JA/A/Sa/3	OFF	0	5,55E+06							unc	unc	unc	unc	52	59	1	6				
14/JA/A/Sa/4	OFF	0	4,75E+06							unc	unc	unc	unc	43	52	2	1				
14/JA/A/Sa/5	ON	5	5,35E+03	unc	unc	unc	unc	47	60	6	1	0	2								
14/JA/A/Sa/6	ON	5	9,60E+03	unc	unc	unc	unc	98	94	0	1	0	0								
14/JA/A/Sa/7	ON	5	5,35E+03	unc	unc	unc	unc	62	45	8	5	1	1								
14/JA/A/Sa/8	ON	10	6,35E+03	unc	unc	unc	unc	53	74	9	3	2	1								
14/JA/A/Sa/9	ON	10	2,51E+03	unc	unc	unc	unc	78	64	7	11	1	1								
14/JA/A/Sa/10	ON	10	7,50E+03	unc	unc	unc	unc	78	72	8	12	1	0								
14/JA/A/Sa/11	ON	20	2,50E+02	46	45	23	27	9	5	0	0	0	0								
14/JA/A/Sa/12	ON	20	3,20E+03	unc	unc	unc	unc	30	34	1	3	0	1								
14/JA/A/Sa/13	ON	20	2,20E+03	unc	unc	115	100	19	25	1	0	0	1								

Table 1: Quantification of FCU/mL number of Gram positive bacteria: Staphylococcus aureus a) 0,5 at 10-7 dilution factor for the reading of bacterial colony, 0 : no colony, unc : uncountable, n.a : not applicable

Name	Parametres		Results CFU/mL	Counting a)																	
	Condition system	Numbres of passages		0,5		1		10-1		10-2		10-3		10-4		10-5		10-6		10-7	
14/F/A/Ef/Control -	n.a	n.a	<1	0	0	0	0														
14/F/A/Ef/Si	OFF	n.a	1,81E+08													184	166	25	23	7	3
14/F/A/Ef/1	OFF	0	1,91E+07							unc	unc	unc	unc	unc	191						
14/F/A/Ef/2	OFF	0	4,13E+07							unc	unc	unc	unc	415	410						
14/F/A/Ef/3	OFF	0	3,69E+07							unc	unc	unc	unc	371	366						
14/F/A/Ef/4	OFF	0	4,15E+07							unc	unc	unc	unc	450	380						
14/F/A/Ef/5	ON	5	6,05E+04	unc	unc	unc	unc	unc	unc	83	38	6	1								
14/F/A/Ef/6	ON	5	7,75E+04	unc	unc	unc	unc	unc	unc	79	76	9	7								
14/F/A/Ef/7	ON	5	7,05E+04	unc	unc	unc	unc	unc	unc	68	73	3	5								
14/F/A/Ef/8	ON	10	2,87E+04	unc	unc	unc	unc	unc	unc	25	25	3	0								
14/F/A/Ef/9	ON	10	4,30E+04	unc	unc	unc	unc	unc	unc	47	39	7	4								
14/F/A/Ef/10	ON	10	3,15E+04	unc	unc	unc	unc	unc	unc	29	34	2	7								
14/F/A/Ef/11	ON	20	6,85E+04	unc	unc	unc	unc	unc	unc	50	87										
14/F/A/Ef/12	ON	20	1,40E+04	unc	unc	unc	unc	unc	unc	17	11										
14/F/A/Ef/13	ON	20	3,60E+04	unc	unc	unc	unc	unc	unc	45	27										

Tableau 2: Quantification of FCU/mL number of Gram positive bacteria: Enterococcus faecium. a) 0,5 at 10-7 dilution factor for the reading of bacterial colony, 0 : no colony, unc : uncountable, n.a : not applicable

.