



Efficiency test report of Beewair system on Influenza H1N1 virus and human adenovirus type 5.



1. Forward

VirNext is the technology research platform of the **Virpath laboratory**, which hosts the **French National Reference centre for Influenza and respiratory viruses**.

VirNext is specialized in the evaluation of physical and biological technologies to decontaminate indoor air, surface and water.

Beewair Company asked the **VirPath laboratory** and its platform **VirNext** to evaluate the efficiency of an air cleaner system to decontaminate confined spaces which contain Influenza H1N1 viruses or human adenovirus type 5. The air treatment and decontamination Beewair BW60L system is composed of a tangential reactor which integrates DBD-Lyse modules including a global irradiation power of 70 Watts (UVc 254 nm) and a mean oxidation/mineralization capacity of 80 000 TeraRad.

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2. Methodology

The experimentation consists of the evaluation of the capacity of system developed by Beewair Company to decontaminate a confined space with microorganisms. This confined space was materialised by a nebulization chamber of 2,5m³ where an artificial atmosphere containing microorganisms can be generate with good reproducibility. These atmospheres were obtained with nebulization of viral concentrated solutions. Test samples were collected by suction of the total volume of chamber using the cyclonic movement (Coriolis, Bertin Technologies). During this harvesting step, the harvested viruses were resuspended in a collection buffer. In order to obtain UV doses in accordance with the technical characteristics of the air decontamination systems tested, UV lamps will be switched on 10 minutes before every decontamination step, in absence of function the integrated ventilators.

3. Evaluation of Beewair system efficiency

3.1 Experimental conditions

Date: June 16th, 2014 for adenovirus type 5 and June 20th, 2014 for Influenza H1N1 virus

Temperature: 20°C

Flow of Beewair system: 60m³/h

Functioning time:

Functioning time of system have been defined in order to evaluate decontamination efficacy on confined space after passage of 3 chamber volumes (450 seconds) and 8 chamber volumes (1200 seconds) for adenovirus and passage of 3 chamber volumes (450 seconds) and 6 chamber volumes (900 seconds) for Influenza virus.

Number of sample: 12 for each microorganism

Concentration of viral solution:

- *Influenza H1N1 virus* : 10⁶TCID₅₀/50µL
- *Adenovirus type 5* : 10⁸ TCID₅₀/50µL

Collection parameters: 10 minutes (2.5 m³) in 7 mL of collection medium (phosphate buffer)

Evaluation method:

- *Influenza:* The amount of infectious virus was determined by limit-dilution on MDCK (*Madin- Darby Canine Kidney*) cells, incubation at 37°C, 5% of CO₂ during 4 days.
- *Adenovirus:* The amount of infectious virus was determined by limit-dilution on A549 (*Carcinomic Human Alveolar Basal Epithelial*), incubation at 37°C, 5% of CO₂ during 7 days.

3.2 Results:

Adenovirus type 5 virus

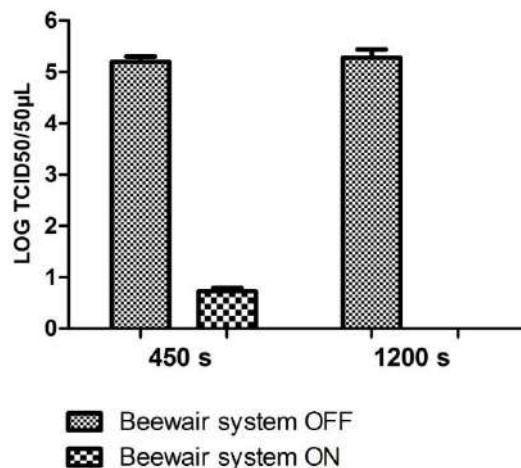


Figure 1: Evaluation of Beowair system on adenovirus

The collecting data allow to define decontamination efficiency of Beowair system of confined space with adenovirus *type 5*.

Reduction Log TCID₅₀/mL:

- 4.47 ± 0.06 Log for 450 s functioning time
- 5.28 ± 0.28 Log for 1200 s functioning time

H1N1 Influenza virus

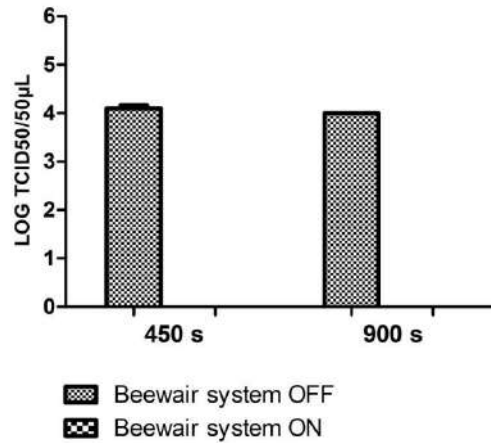


Figure 2 : Evaluation of Beewair system on Influenza H1N1 virus

The collecting data allow to define decontamination efficiency of Beewair system of confined space with Influenza H1N1.

Reduction Log TCID₅₀/mL:

- 4.10 ± 0.10 Log for 450 s functioning time
- 5.00 ± 0.00 Log for 900 s functioning time

Lyon June 26th, 2014

A. PROUST
Ingénieur R & D



V. MOULES
Responsable

