



Laboratory
of **Viruses** Contaminants
of **Water** and **Food**



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VIRUS TEST REPORT

Evaluation of the efficiency of the air disinfection unit WADU-02, WELLIS (Wellis Co., Ltd.) against Coxsackievirus B5

REPORT No. 20180711

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Applicant: ShenZhen Caleb Technology Ltd.

Address of Applicant: 2nd Floor, No. 11 Road , 1 Jinyuan Road Heao Community Henggang
Street Longgang District, Shenzhen City, P.R China

Product evaluation

Product Description: Air Disinfection Purifier

Model number: WADU-02

Brand: WELLIS

Manufacturer: Wellis Co., Ltd.

Issue date: 11/07/2018

Summary

The effectiveness of the WELLIS WADU-02 air disinfection purifier for the disinfection of Coxsackievirus B5 (CBV5) was evaluated. The inactivation of the virus caused by the evaluated equipment was quantified by testing viral suspensions on glass surfaces exposed to the disinfection unit inside a box, at room temperature. The viral inactivation along time was tested in triplicate both at wet and dry conditions and viral titers were determined by plaque assay. The disinfection treatment has shown to significantly reduce the concentration of CBV5. The inactivation in wet samples was of more than 4 logarithms (99,99%) in 2 hours and more than 5 logarithms (99,999%) after 4 hours when compared to the non-treated controls. When viral suspensions were dried on the glass surfaces, the effectiveness of WELLIS WADU-02 was also significant although the treatment produced lower reduction levels compared to the viruses in wet conditions. Viral reductions between 99,42 and 99,99% in 4 hours in relation to the non-treated controls were observed for dried viral suspensions on the surfaces.

Experimental procedure

Many different enterovirus have been associated to important pathologies in humans as hand, foot and mouth disease and infections of the central nervous system. Coxsackievirus B5 (CVB5) is the virus selected for testing the disinfection effectiveness of the air disinfection unit Wellis WADU-02, based on existing data suggesting resistance to free chlorine, the association with hand, foot and mouth disease and the likelihood of presence in higher numbers in water with fecal contamination.

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The tests were performed in one box (0,38m x 0,38m x 0,38m high) located into a safety cabinet at room temperature. The air disinfection device is located inside the box.

Twelve small pieces of glass contaminated with ten 10 μ l drops each (total 100 μ l viral suspension per sample) of a viral suspension (10^8 PFU/ml of Coxsackievirus B5 cultured in BGM cells and suspended in PBS) were placed inside this box (Figure 1).

For the experiments with dried viruses, the glass pieces with the viral suspensions were flow dried for 1 hour at the safety cabinet before the disinfection experiments. Equivalent numbers of glass pieces contaminated with the virus suspension were located out of the box to be used as controls in each experiment.

All tests were done with three replicates per each treatment time and condition. The viruses were recovered from the glass surfaces in PBS buffer and the number of infectious viral particles was quantified by plaque forming units (PFU) in BGM cells (Figure 2).

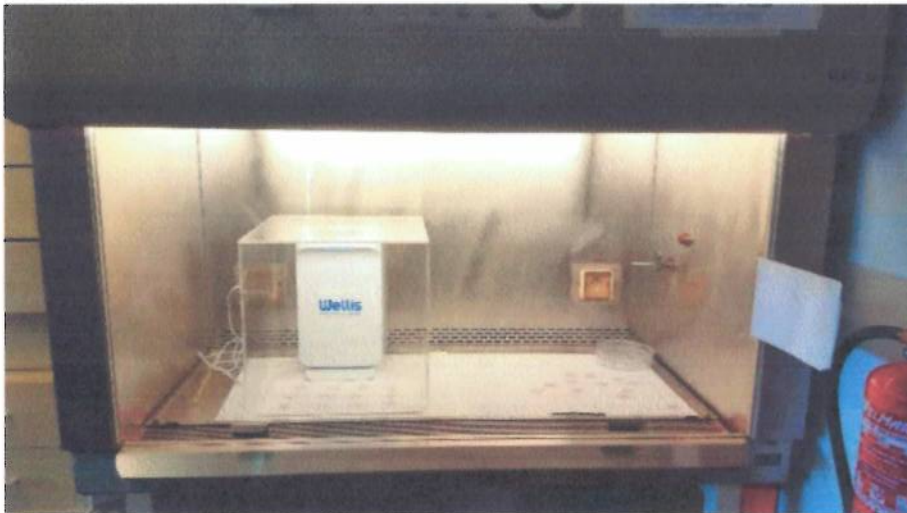


Figure 1. Experimental conditions of the assays

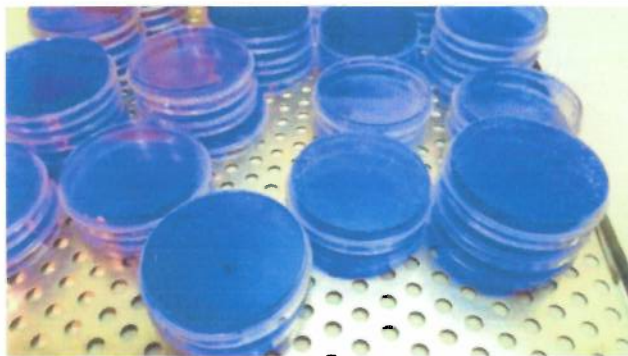


Figure 2. Quantification of infectious CBV5 by PFU in BGM cells

Results

The results of the evaluation of the effectiveness of inactivation of wet CVB5 suspensions using the air disinfection purifier are shown in Table 1.

Two experiments were performed to test the disinfection efficiency against dried viral suspensions and the results are shown in Tables 2 and 3.

Table 1. Inactivation of CVB5 in wet suspensions by WELLIS WADU-02 air disinfection purifier

	No treatment		Air disinfection treatment
	Viruses PFU/ml (mean)	Viruses PFU/ml (mean)	Reduction Test-control (%)
WET	Time 0	3,80x10 ⁸	3,80x10 ⁸
	30min	4,10x10 ⁷	2,42x10 ⁷ 40,97
	1h	1,33x10 ⁷	2,78x10 ⁶ 79,09
	2h	2,17x10 ⁶	7,67x10 ¹ 99,99
	4h	5,27x10 ⁵	ND >99,999

ND: Non detected

Table 2. Inactivation of CVB5 in dried suspensions by WELLIS WADU-02 air disinfection purifier

	No treatment		Air disinfection unit treatment
	Viruses PFU/ml (mean)	Viruses PFU/ml (mean)	Reduction Test-control (%)
DRY	Time 0	9,87x10 ⁵	9,87x10 ⁵
	30min	1,67x10 ⁵	1,00x10 ⁴ 94,01
	1h	1,23x10 ⁵	1,07x10 ⁴ 91,30
	2h	4,47x10 ⁴	5,47x10 ² 98,77
	4h	1,20x10 ⁴	6,90x10 ¹ 99,42



Table 3. Inactivation of CVB5 in dried suspensions by WELLIS WADU-02 air disinfection purifier in one and two hours of treatment

		No treatment	Air disinfection unit treatment	
		Viruses PFU/ml (mean)	Viruses PFU/ml (mean)	Reduction Test-control (%)
DRY	Time 0	1,53 x10 ⁶	1,53x10 ⁶	
	2h	4,77x10 ⁵	2,97x10 ³	99,39
	4h	2,27x10 ⁵	1,97x10 ¹	99,99

Conclusion

WELLIS WADU-02 air disinfection purifier considerably reduced the numbers of CVB5 contaminating surfaces in liquid drops with reductions in the number of infectious viruses compared to the controls higher than 99.99% after 2 hours of treatment and more than 99.999% after 4 hours. The efficiency of WELLIS WADU-02 on viruses in liquid droplets in air receiving equivalent doses could be expected to be at least equivalent.

The effectiveness of WELLIS WADU-02 for the disinfection of CVB5 dried on glass surfaces is also significant although it shows lower reduction levels compared to wet conditions. Reductions between 99,42 and 99,99% after 4 hours, in relation to the non-treated controls, are observed for dried viral suspensions.

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