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To
Mr Y. Arvanitis
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RE: Evaluation of the **Healthway® EMF Air Cleane** in field conditions

According to your request dated 19/7/2008 and directed to the Mycology Laboratory of the University of Athens, the efficiency of the **Healthway® EMF Air Cleaner** air cleansing device was tested. The evaluation was conducted in field conditions[1] to check the clinical efficiency of the device, since it has been already successfully evaluated in indoor controlled-environment The device is FDA-approved by virtue of its results in withholding airborne bacteria *Serratia marcescens*), enteroviruses, airborne viruses (Coxsackie, Echoviruses, Adenoviruses), and spores of *Penicillium funiculosum* (ATCC 11797) [iri-environmentalsolutions.com]

Field test conditions

The current study was intended as complementary to the ones already conducted, in order to test the **Healthway® EMF Air Cleaner** in realistic conditions of increased airborne fungal spore load during the months of July and August 2008. The increased outdoors temperature (average 30^0C), relative humidity (av. 48%) and the strong wind factor during testing were actually furthering the quantity and the range of the airborne spores reaching indoor areas through malfunctioning air-conditioning system (wards) and open windows for approximately 2 h during midday in the clinical laboratory service rooms. Thus, the test was practically conducted in harsher conditions than the ones simulated in previous tests.

[1] Includes haematology/oncology hospital wards with confirmed increased load of fungal spores due to construction works in the vicinity of the hospital and working areas of clinical laboratory services.

Methods

A total of 4 independent samples of one cubic meter air were obtained by the «Air sampler RCS Biotest» in every inspected room, at different times during the day were carried out for quantitative counts and qualitative assessment of the fungal load. The inspected rooms included hospital wards of the National Health Care System and clinical laboratory services rooms in two healthcare institutions. Sampling was conducted during the day before the operation of the clean air system.

Re-sampling of the same sites was conducted after 24 h operation of the **Healthway® EMF Air Cleaner** under operation of the central air-conditioning system and with closed windows in the clinical laboratory services rooms and medical staff office (Table 1).

Results

The fungal load in the indoor areas sampled were over the recommended limits (Table 1) established by the recently revised WHO criteria (Table 2).

The fungal load per cubic meter of indoor air after 24 h continuous operation of the device was considerably reduced (Table 3, Fig 2A & 2B)

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Table 1. Fungal load per cubic meter of indoor air before operating the device.

Indoor area (m^2)		Quantitative results*	Qualittive results*
1.	Ward 1 (14 m^2)	825cfu/m^3	*Aspergillus flavus, Fusarium sp., Ulocladium sp., A. flavus, A. fumigatus, A. flavus, Syncephalastrum racemosum Penicillium sp.*
2.	Hospital corridor (40 m^2)	25 cfu/ m^3	*Alternaria tenuissima Aspergillus niger, Aspergillus ochraceus*
3.	Ward 2 (12 m^2)	3 cfu/ m^3	*A. niger, Alternaria sp., Cladosporium sp.*
4.	Clinical Laboratory Services room 1 (80 m^2)	125 cfu/ m^3	*A. fumigatus, Aureobasidium pullulans, Cryptococcus albidus*
5.	Ward 4 (20 m^2)	50 cfu/ m^3	*A. fumigatus, Phoma sp. A. flavus, A. ochraceus, Cryptococcus vishniacii,*
6.	Clinical Laboratory 2 Services room (54 m^2)	597 cfu/ m^3	*A. fumigatus, A. flavus, S. racemosum A. flavus Phoma sp.*
7.	Medical staff common Room (40 m^2)	688 cfu/ m^3	*S. racemosum, Penicillium spp. A. niger, Alternaria sp., A. tenuissima, A. fumigatus A. fumigatus, Aspergillus parasiticus, Alternaria alternata*

*****Quantitative and qualitative counts of allergenic, potentially pathogenic and toxinogenic fungi of public health importance.*

Table 2. World Health Organization air quality evaluation criteria (WHO 1990, 1999)

Results	Limits
Presence of (eg *A. fumigatus*) or mycotoxinogenic fungi (eg *Penicillium, Fusarium* spp., *A. flavus*)	Not Acceptable
Presence of a single fungal species, except *Cladosporium* & *Alternaria*	Acceptable <50 cfu/m^3
Multiple fungal species	Acceptable<150 cfu/ m^3
Multiple fungal species including Ascomycetes, Zygomycetes, yeasts etc (eg *Syncephalastrum, Ulocladium, A. parasiticus).*	Acceptable<500 cfu/ m^3

Table 3. Results after 24h continuous operation of the air-cleansing device in rooms 1-7 (Table 1).

Total cfu/ m^3 in each indoor site (1-7)	**Qualitative results**
0-2	*Cryptococcus albidus* *Cryptococcus amylolentus* *Phoma* sp. *Alternaria* spp. *Penicillium* spp.

After the 24h continuous operation of the air cleansing device in the inspected rooms the fungal load was qualitatively and quantitatively reduced to acceptable levels (Diag. 1)

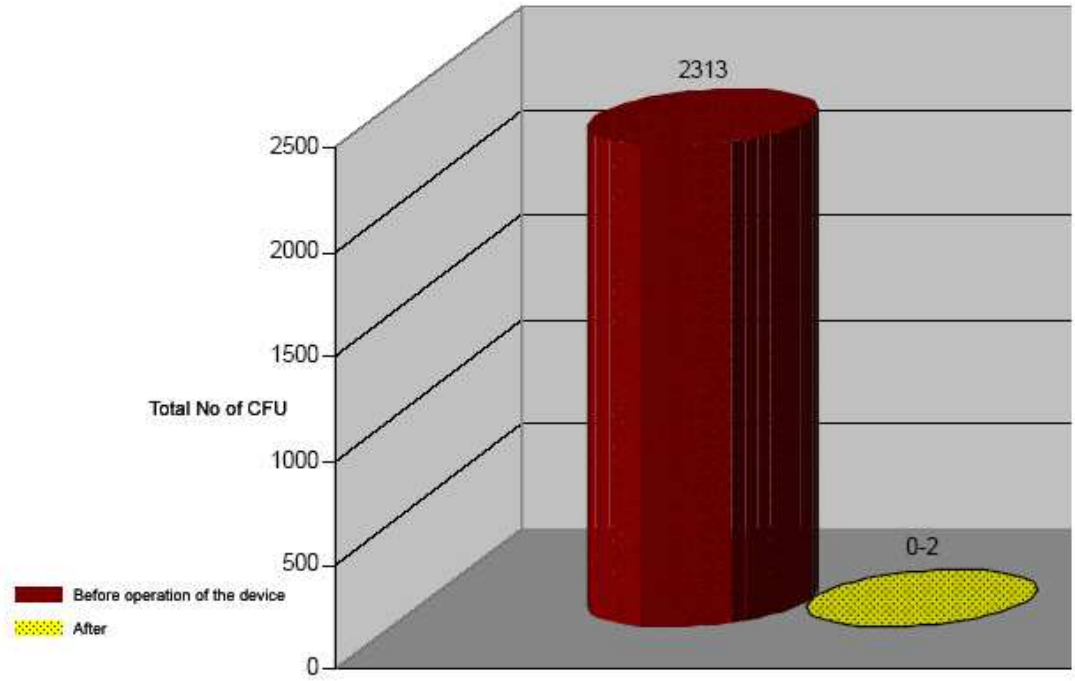

Fig 1. Bar-chart depicting the number of CFUs isolated before and after the 24h continuous operation of the device

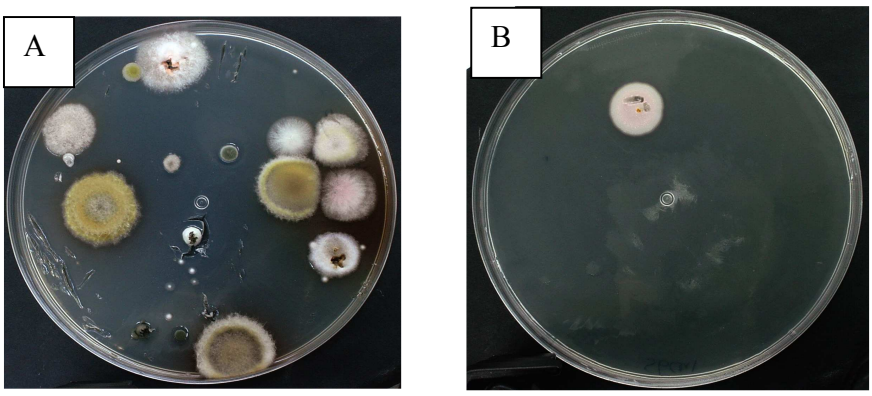

Fig 2. Indicative results for "before **(A)** and after (B)" the 24 h operation of the Healthway® EMF Air Cleaner at the same sampling spot.

Conclusion

The continuous 24 h operation of the portable air cleansing device Healthway® EMF Air Cleaner, FDA class II Medical Device lowered significantly ($p<0,001$) the fungal load of the indoor air in all tested sites. The device's output air flow was free of fungal spores.

The Investigator

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