



National Institute of Industrial  
Technology and Engineering  
Lisbon/ Portugal

Testing Airfree efficiency in  
reducing airborne mold and  
bacteria in a 645.8 sq. ft. room.  
Reduction: Mold 96%, Bacteria 88%.

TESTS





Ministério da Economia e Inovação  
**INSTITUTO NACIONAL DE ENGENHARIA, TECNOLOGIA E INOVAÇÃO LP.**  
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*Pablo*

**Report Ref: 904 / 05**

**EFFICIENCY OF AIRFREE P AIR CLEANER ON THE REDUCTION OF  
AIRBORNE MICROORGANISMS IN CLOSED ENVIRONMENT.**

**AIM**

The main goal of this study was to verify an air cleaner (Airfree P) efficiency on the reduction of bacteria and fungi suspended in the air in closed environments. The study intended to analyze the airborne microbial charge in room 1070 of the Industrial Microbiology Laboratory of INETI, during the functioning period (36 days) of the referred device.

**METHODOLOGY**

**Protocol**

The device was installed in room 1070 of the Industrial Microbiology Laboratory (LMI) after 11 days of regular utilization without any kind of cleaning or disinfection. That room has an approximate area of 60 m<sup>2</sup> (645.8 sq ft) and is characterized as being a Molecular Biology laboratory. The average frequency to this room was 7 to 9 people per day.

The test had 54 days duration. The device was turned on November 4<sup>th</sup> 2005 and turned off December 9<sup>th</sup> 2005. The air sample collections were made all Monday and Friday.

One air sampler (Merck's MAS-100) was used for air sampling having samples been taken in 3 different points in the room. From each point, 100 liters of air were collected. The count of the microorganism in suspension in the air was done in 9 cm (3.5 ") diameter Petri dishes.

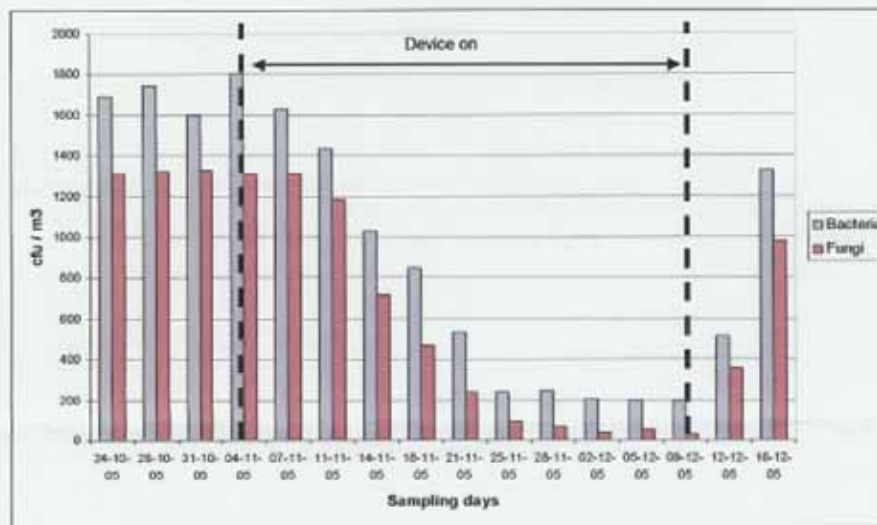
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For bacteria, Trypana Soya Agar (TSA) Oxoid culture medium in Petri dishes were used and Petri dishes were incubated at 30°C (86F) for 3 days. For fungi, Malt Extract Agar (MEA) Difco culture means in Petri dishes were used and Petri dishes were incubated at 25°C (77F) for 5 to 7 days. The results were expressed in **colonies forming unity (c.f.u.) of existing microorganisms per m<sup>3</sup>** of air in the room. Each value represents the arithmetic average of three samples.

## RESULTS

The results are presented on the graphic of figure 1:



**Figure 1.-** Effect of Airfree P sterilizer , on the maintenance of the microbial level in the air in the environment of room 1070 of LMI. Each point represents the average of 3 countings. The device was turned on November 4<sup>th</sup> 2005, after that day samples collection, and turned off on December 9<sup>th</sup> 2005.

Through **Figure 1**, it is verified that the device under study revealed a high efficiency in airborne microbial reduction.



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To better specify the study of the device efficiency, the percentage reduction values are stated in **Table 1 and 2.**

**Table 1.** The initial and final counts of airborne bacteria charges and its correspondent reduction percentage for the tested device.

<b>Initial Counting (cfu/m<sup>3</sup>) Average 2 readings</b>	<b>Final Counting (cfu/m<sup>3</sup>) Average 2 readings</b>	<b>Reduction (%)</b>
1700	200	88

**Table 2.** The initial and final counts of airborne fungi charges and its correspondent reduction percentage for the tested device.

<b>Initial Counting (cfu/m<sup>3</sup>) Average 2 readings</b>	<b>Final Counting (cfu/m<sup>3</sup>) Average 2 readings</b>	<b>Reduction (%)</b>
1318	50	96

The results testify and confirm the high efficiency in the reduction of bacteria and fungi in the environment air under the studied conditions.

Lisbon, December 28<sup>nd</sup> 2005

Head of LMI

Pablo Tavares Pereira



SGS Natec Institute  
Hamburgo/Germany

Testing Airfree efficiency in reducing airborne mold and bacteria in office rooms equipped with carpet and central air condition.  
Reduction: Mold 99%, Bacteria 99%.

TESTS







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C & M Representacoes, Lda., Lisboa, Portugal

By order of C & M Representacoes, Lda, Lisboa, Dr. Carlos Matias, of August, 2000 we executed during September to November 2000 air analyses in two different rooms of the NATEC Institut. These rooms are office rooms with normal equipment, with carpets and air condition, which is connected to a central air condition system that constantly carries possible contamination from rooms without Airfree to those 2 rooms being tested.

In each of the rooms, which are of ca. 30 m<sup>3</sup>, it has been installed an Airfree Air Sterilizer, which is manufactured under license of U.S. Patent 5,874,050 of 23/02/199. Concerning the technical installation we acted according to the polyglot prospectus which had been put at our disposal, called „Airfree Air Sterilizer“.

During 6 weeks which the apparatus was running in the two rooms, it has been determined at the beginning and at the end of each week the total colony count respectivel yeasts and moulds, with petri-dishes (1/2 h. opening for sedimentation) as well as with an airsampler of RCS.

#### Results:

The results have been stated according to each room on two different pages and also with graphic, and they are showing that from the beginning of installing a continuous reduction, especially of the total colony count, can be observed, whereas these values are stated especially at examination of the airsampler per m<sup>3</sup>.

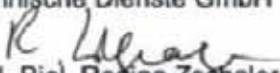
After 6 weeks of continuous running of the Airfree Air Sterilizer the apparatus has been stopped, and for further 4 weeks the air in both rooms has been examined with both methods. The results are showing that after stopping of the Airfree Air Sterilizer the total colony count, but also the number of moulds, in the air of the rooms clearly increased.

#### Summary:

Due to the obtained results it can be confirmed a microbiological improvement of the air in rooms under continuous running of the Airfree Air Sterilizer.

Hamburg, 15<sup>th</sup> November, 2000

NATEC Institut  
für naturwissenschaftlich-  
technische Dienste GmbH

  
Dipl.-Biol. Regina Zschaler

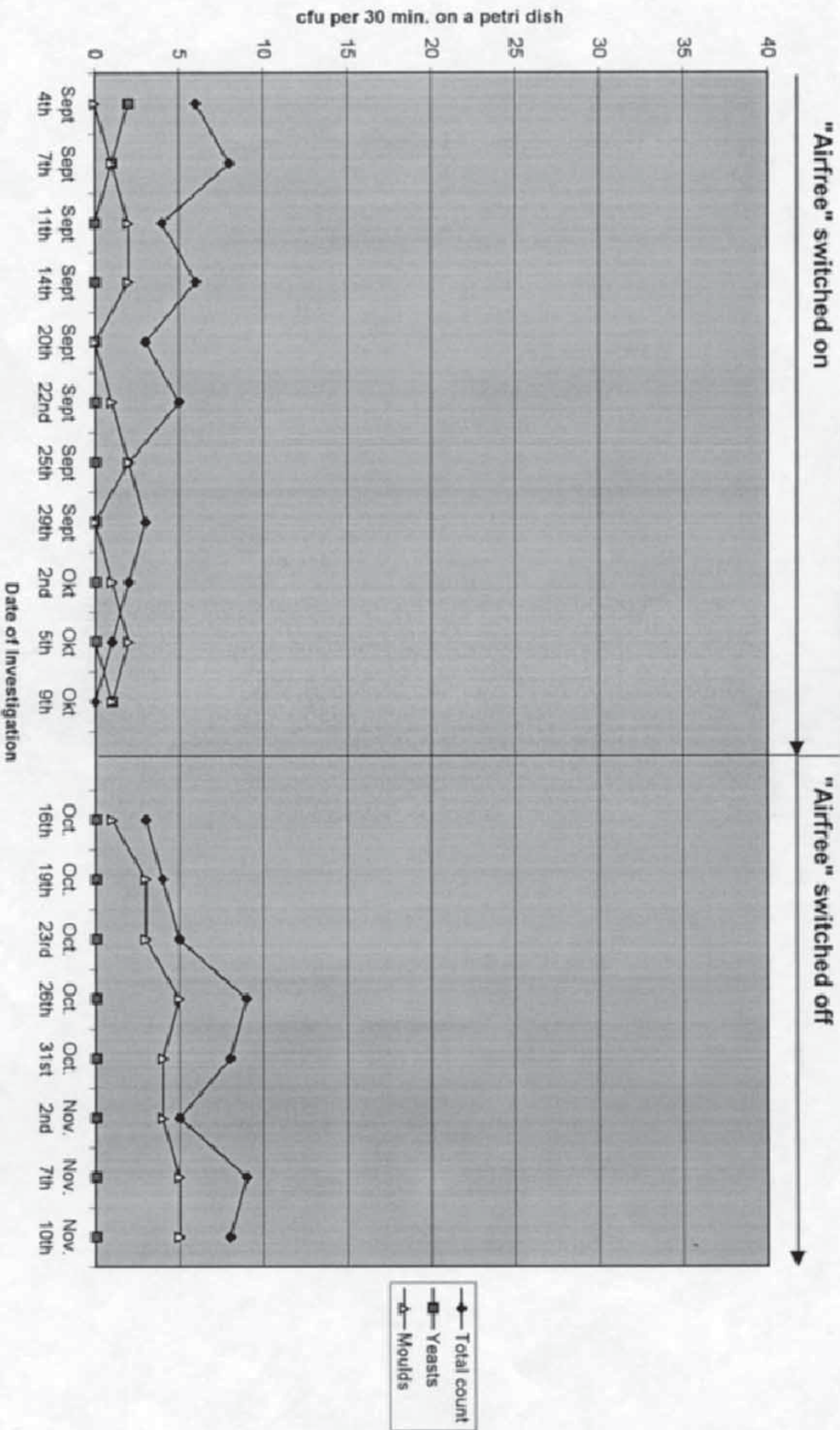


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**Test-Report M00-04990 / Room No. 11**



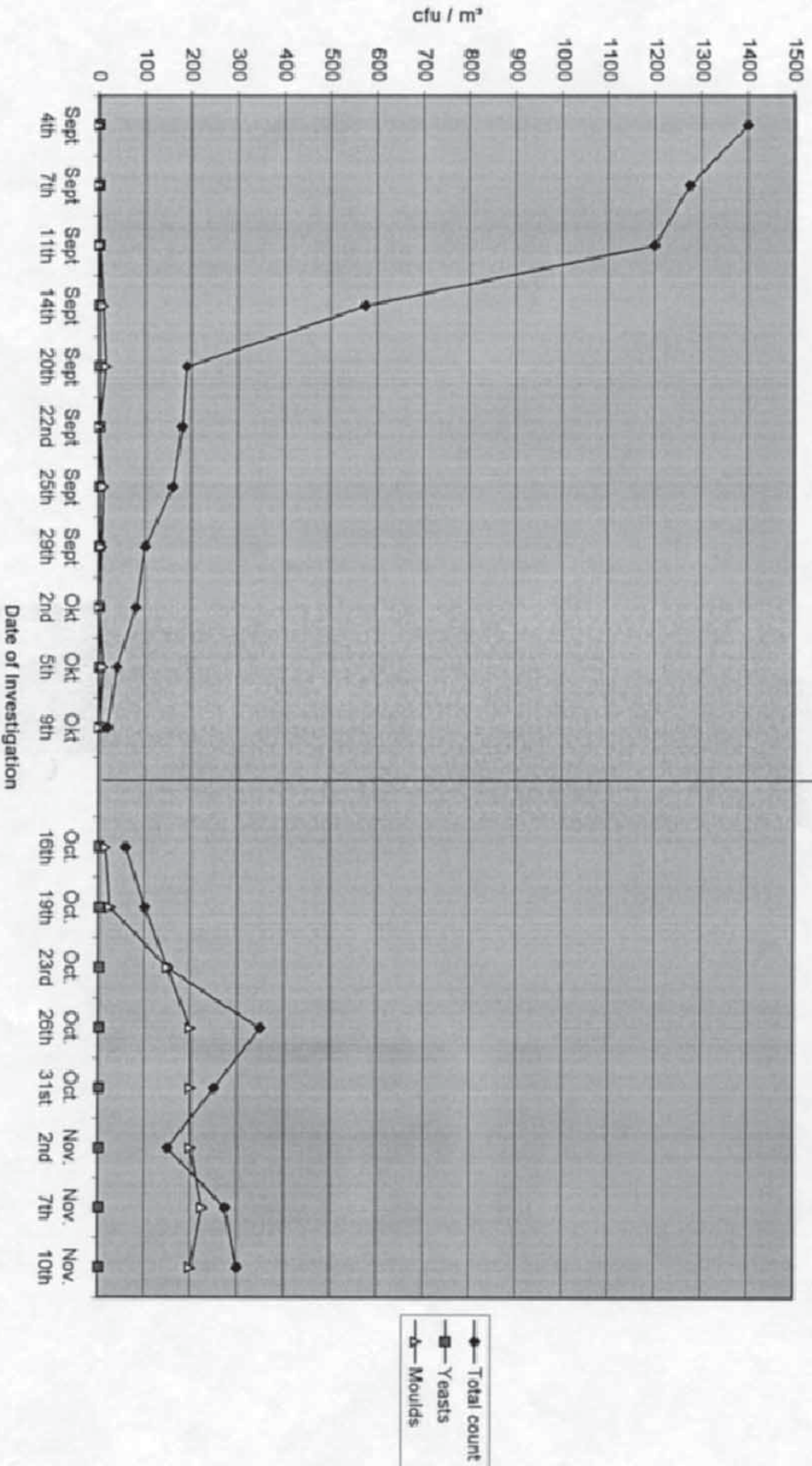




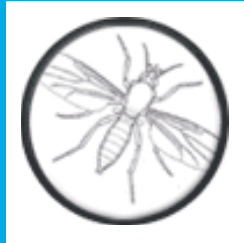
### Test-Report M00-04990 / Room No. 11

"Airfree" switched on

"Airfree" switched off







**Insect R & D Limited  
Cambridge/UK**

Testing Airfree efficiency in reducing  
dust mite allergens (Derp1).

Reduction: 70,68% to 96% in Dust Mites  
Allergens (Derp1).

# TESTS



# Insect R&D Limited

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Incorporating

Medical Entomology  
Centre

Report on the effectiveness of the Airfree air steriliser manufactured under license of US Patent 5874050 at reducing the levels of Der p 1 (A major house dust mite allergen) on allergen placed within it for varying lengths of time.

Phase 1

Report No. Air/Mit/All/1

Compiled by

Toby C Wilkinson

A handwritten signature in dark ink, appearing to read 'Toby C Wilkinson', written over the printed name.

June 2005

This report consist of 7 numbered pages of which this is the first

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### **Disclaimer**

The results described in this report were generated *in vitro*. The samples tested were accepted in good faith that they were representative of the intended final formulation(s)/ product(s) and the test methods employed were used on the understanding that they were the most appropriate available at the time the tests were agreed. As such the results should be taken only as an indication of the potential for activity of the formulations or products under test. These results cannot be considered as confirmation that a formulation or product will work in a clinical or field application. Evidence for such activity can only be obtained from properly constructed and executed clinical or field trials.

### **Use of this report**

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## Aim

The aim of these experiments was to assess the effectiveness of the Airfree device at reducing the levels of Der p 1 (A major house dust mite allergen) in allergen placed within it for varying lengths of time.

## Materials and methods

House dust mite allergen, derived from colonies of the house dust mite *Dermatophagoides pteronyssinus*, maintained by Insect Research and Development Ltd was placed into the centre of the incinerator for 1, 5 and 300 seconds using a probe. All of the experiments were conducted in a controlled climate chamber set to 25°C and 75% RH. The probe was constructed from straight metal wire measuring 120 mm with a diameter of 0.75 mm, a 5mm by 10 mm strip of autoclave tape was wrapped around the wire leaving an exposed surface of 2mm by 10mm. Approximately 0.001 grams of frozen culture containing high levels of allergen was placed onto this surface, calculations in the results section will take this variation into account. The incinerator was placed in the upright position and turned on for 24 hrs prior to the addition of the probes. The allergen was placed into the centre of the incinerator, through a small hole made in the grill at the bottom for 1, 5 and 300 seconds (see figure 1), 3 replicates were conducted at each time interval and 3 control replicates were carried out at each time interval with the Airfree device switched off so the incinerator was at room temperature (25°C). The incinerator was 13 cm long so the tip of the probe was placed 7cm within it, in the central hole. The centre of the autoclave tap was inline with the centre of the incinerator.

After being placed in the incinerator the autoclave tape was gently removed from the wire and placed into a 25ml water tight container containing 5ml of dust extraction buffer (0.125M ammonium hydrogen carbonate buffer + 0.1% sodium azide). The container containing the allergen and dust extraction buffer was spun with a blood rotator for 1 hour. 1ml of liquid from each arena was then transferred to labelled Eppendorf tubes using a micro-pipette, and centrifuged at 6000rpm for 5 minutes. The supernatant liquid (0.2 ml) was removed from each Eppendorf tube and transferred to a new, labelled Eppendorf tube, after this the tubes were frozen until they were analysed for Der p 1.

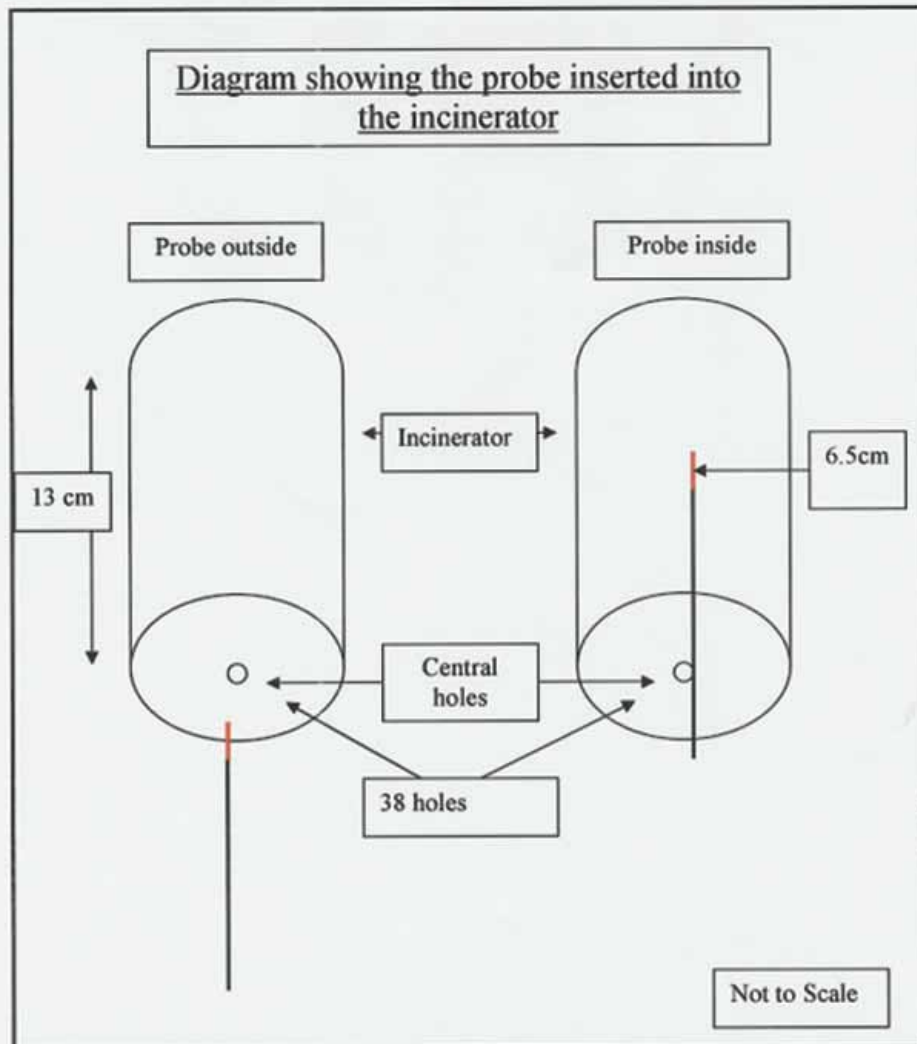


Fig 1: Diagram showing probe being inserted into the incinerator.



### **Results (corrected)**

<b>Exp/Control</b>	<b>Mean ng Der p 1</b>	<b>% Reduction</b>
5 min exposure	6.82	97.95
5 min control	332.47	
5 second exposure	31.03	93.45
5 second control	473.47	
1 second exposure	169.66	70.60
1 second control	577	

Table 1: Results

### **Results and discussion**

The results indicate that the Airfree device has the potential to control the airborne house dust mite allergen Der p 1 extremely well. After just one second, the time which air/ airborne allergens are thought to remain in the incinerator, the Airfree device was able to reduce the amount of the house dust mite allergen Der p 1 by an average (mean) of 70.6%. In the field the airborne allergen may be denatured even more as quite a lot of allergen was placed on the probe, some of the allergen on the probe may therefore have shielded the allergen beneath it from the heat. It was interesting to see that the longer the control samples were placed within the incubator the less allergen was detected on them, as the incubator was switched off it is likely that this reduction was caused by some of the allergen being rubbed off the probe. Longer exposure periods with the incinerator switched on resulted in higher % reductions in allergen concentrations when compared to the control, this indicates that repeated exposure to the incinerator would reduce the amount of allergen further, although more tests would need to be conducted to confirm this.



**SP Swedish National Testing  
and Research Institute**  
Testing Airfree efficiency indoor  
reducing ozone level.  
Reduction: 26% in Ozone.

# TESTS



# REPORT

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Datum / <i>Date</i>	Beteckning / <i>Reference</i>	Sida / <i>Page</i>
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## Measurements of ozone in the outlet of an AirFree air cleaner

### Item tested and test objective

The test object was an AirFree air sterilizer, labelled 230 V, 50 Hz, 400 mA, 46 W and serial no 53002309. According the client the AirFree unit is manufactured under license of U.S. Patent 5,874,050. The unit arrived to SP on February 27, 2001. The objective was to check for any change of ozone concentration in the air when passing through the test item. The test was performed on May 29, 2001. The test results apply only for the item tested.

### Test procedure

The test was carried out in a laboratory room at SP. The air cleaner was started two hours previous the ozone test. The ozone instrument used for measurements was a Dasibi UV-instrument, model 1003-PC, and newly calibrated. The background ozone level in the room was measured at the base of the Airfree unit and compared with concentrations at the air outlet on top of the unit. Ten readings were taken at both sampling points during 8 minutes respectively and the average for each point was calculated.

### Results

The average ozone reading was 19.5 ppb at the inlet and 14.4 ppb at the outlet.

### Summary

The ozone concentration was significantly lower (at 99 % certainty level) at the air outlet of the AirFree unit compared to the inlet. The reduction could, at the given test environment, be calculated to 26 %.

SP Swedish National Testing and Research Institute  
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