

A.S.L. SALERNO 1  
P.O. "UMBERTO I"  
NOCERA INFERIORE

# THE MONITORING OF AMBIENT AIR

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From the beginning of this century it was known what a medical device was when it was called "an organisation with medical-social character", in order to assure to the people a complete medical assistance without disregarding its function of bio-social research centre. Therefore, the hospital is certainly a therapy-rehabilitation device, however we may not forget that often the patients recovered in this structure, especially those who are immune-depressive, may become affected by airborne infections (4-5). In fact, often happens that a lot of patients recovered in hospitals become affected by infections that they didn't have at the moment of recovering. In these last decades the airborne infections have received special attention as they are a

serious security problem not only for the surgeon but also for the patient (1-2). In particular, the risk of contamination is higher in the operation rooms, in the reanimation depts., in the labs, in the infective diseases depts., etc. Although the best solution is prevention, it's absolutely necessary to sterilising the air, the surfaces and the equipment to use.

## SCOPE OF THE RESEARCH

The scope of the research is to evaluate the effectiveness of a device which decontaminates an airborne infected environment by continuously destroying the bacterial charge. Therefore there have been

made periodic controls in the first operation room of the emergency dept. in the hospital Umberto I° of Nocera Inferiore, of which one control was made after a decontamination with chemical aids at the end of the day and another control after a second use of the a.m. device. The two results have been compared with each other.

## MATERIAL AND METHODS

In the first O.R. of the emergency dept. two “Sterilite Ariane 250” devices of the company “AB Medica s.r.l.” have been installed to two opposite walls. The devices have been installed 50 cm from the floor as by the producer’s instructions. The Sterilite Ariane 250 device is equipped with 4 UVC germicidal lamps (3-6-7-8), meaning radiations with a wave length of 260 nm, which stop the capacity of reproducing micro-organism by altering the chromosome structure (11). The ambient air has been aspirated through an opening at the bottom with 3 fans and conveyed to two optical labyrinths. In the first optical labyrinth the air has been conveyed in a strong germicide radiation area which inactivates the micro-organism. Passing through the second optical labyrinth the purified air is being released into the ambient through the upper opening. In this way the bacterial charge in the area will be continuously low and the germicide radiations will remain trapped inside the device.

The device is able to capture 280 m<sup>3</sup> air/hour. For a period of six days there has been carried out a daily sampling in order to evaluate the decontamination system in the used area, with the “Ariane 250” equipment activated and not activated in a functioning O.R. and in a not functioning O.R.. In this room of 140 m<sup>3</sup> there were taken into consideration two test points (at the left of the operation table and at the right) and two different hours during the same day.

Each test has been carried out with the sampler “SAS SUPER 90” which aspiration surfaces have been previously decontaminated

with alcohol. The SAS SUPER 90 aspirates the air at constant speed for a defined period through a cover with small holes. The laminar airflow is conveyed to a plate with the nutritive ground of “Plate Cout Agar”. After sampling the plate has being transferred in a 37° C thermostat for 48 hours. After this incubation period the micro-organism become visible at sight and may be counted in order to evaluate the contamination level of the examined air. The number of colonies counted on each plate have been taken into consideration and reported to a cubic meter of air (UFC) in order to count the number of micro-organism.

Considering that the volume of air aspirated by the sampler SAS SUPER 90 is of 90 litres per minute, the obtained value will be transformed by a simple proportion using a special conversion table of statistic probabilities, which permits to obtain the most probable quantity of micro-organism per cubic meter of air.

The proportion to enable the counting of the UFC number per cubic meter of air is indicated by the value of Pr, obtained by division of each cubic meter of air with the quantity of air aspirated by SAS, which means in this case 300 l/s.

$$\begin{aligned} & \text{Pr. 1 cubic meter} \\ \text{N° of UFC x cubic of air} &= \text{-----} \\ & \text{air aspirated by SAS} \\ & \text{(300 l/s)} \end{aligned}$$

## CONCLUSIONS

In the tables you may notice that the results of the microbiological monitoring show an irregular aerobic contamination during the day; a significant increase of the bacterial charge has been revealed during the operations while there results no significant difference between the test carried at the right side of the operation table and the one at the left ( $P = 0,45$ ). Comparing the two graphics obtained from the previous tables (without Sterilite, with Sterilite) you may notice an improvement of the microbic conditions of the tested environment, statistically significant  $P < 0,001$ . In fact, after the use of Sterilite, considering that the limit of sterility of the operation rooms corresponds to a value between 15 and 30 UFC/cubic meter, you may well notice that those values are much higher in absence of the air purifying device.

The values in table 2 instead indicate that the tested device is able to reduce the contamination of the air in the room in which it is installed.

Obviously it is necessary to follow up exactly the instruction of the producer, maintaining closed doors and windows and above all not to forget to activate Sterilite at least one hour prior the use of the room.

Following up these instructions the results may also be better than the ones indicated as limit by the producer (5 UFC/cubic meter), as a reduction of the bacterial charge of more than 90% can be achieved.

As may be noticed in table 3 these norms have not been respected on 28/10/1997, which meant an increase of the bacterial charge. The device does not use chemical substances, it reduces the frequent treatments of disinfecting the ambient and it does not produce ozone.

Various tests have been carried out in clinical institutes and there where no collateral effects on human tissues (10-11), as

the germicide radiation remains captured inside the device.

Therefore it is possible to use radiations of high intensity continuously also in presence of people.

In table 1 are indicated the values of bacterial charge revealed in absence of Sterilite. In table 2 are indicated the values of bacterial charge revealed in presence of Sterilite. In table 3 are indicated the values of bacterial charge revealed in presence of Sterilite, but unexplainably switched off at 09.30h.

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