



# Italian Society for Applied Microbiology

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## APPLICATION NOTE

### BEST PRACTICES FOR MICROBIAL AIR MONITORING FOOD, DAIRY, FRUIT WAREHOUSE, SUPERMARKET PREMISES

#### ABSTRACT

The regular and programmed monitoring of the air quality in the food, dairy, supermarket companies is imperative to guarantee the quality of their production and the health of operators and customers.

The possibility to have a small set of specific simple instrumentation gives the goal to have the results in short times for immediate correction action in case of contamination.

One of the important reasons of the monitoring is the control of the HVAC (Heating Ventilation Air Conditioning) System. A contaminated air could produce a risk of shorter self-life for the products and health risk for operators and customers.

The material that is requested for the monitoring is simple: an air sampler with table incubator and a culture plate. The protocol to follow for the test and result interpretation is based on the comparison between the outside and inside air.

The culture plates used for the air can be also used for the monitoring of the hands of workers with the purpose of their hygienic education.

#### KEY WORDS

Air sampler, Bacterial count, Colonies (CFU), Disinfection, HVAC (Heating, Ventilation Air Conditioning System), Incubator, Mould count, Ready to use culture plates.

#### INTRODUCTION

Food, dairy, fruit warehouse, supermarket have the possibility to have their local simplest Q.C. lab. The advantages are the immediate action in case of air contamination by bacteria and fungi to avoid a possible shortest self-life of the products, to demonstrate their responsibility in front

of the customers and suppliers, to educate the staff to a correct hygiene practice, to show to the competent authorities their commitment for the citizen health.

One of the important reasons of the monitoring is the control of the HVAC (Heating Ventilation Air Conditioning) System. A contaminated air could produce a risk of shorter self-life for the products and health risk for operators and customers. The test can be performed by Q.C. personnel without necessarily having a specific microbiological preparation but a simple introduction.

### **MATERIAL**

- Air sampler
- Table incubator
- Ready to use culture plates
- Ready to use sterile aspirating head
- Disinfectant spray



### **PROTOCOL**

#### **Air sampler position**

The air sampler should be used in different places:

- A. Outside the premises, close at the point where the air is aspirated by the HVAC system;
- B. Inside the premises in front of the outlets of the air from the HVAC. The air sampler should be placed on the trajectory of the air flow.



#### **Type of culture plates**

Tripticase Soy Agar (TSA) for total bacterial count

Sabouraud Dextrose Agar (SDA) for moulds



### **Number of culture plates**

It is suggested to use 3 culture plates for each position and made an average result.

### **Volume of aspirated air**

The volume should be 200 – 300 litres.



Daily Shift head

### **Time of sampling**

Three different times: at the moment of switch on, during the day, at the end before the switch off of the HVAC System.

### **Culture plate handling**

The culture plate containing the nutrient agar is introduced in the aspirating chamber of the air sampler. The sterile aspirating head is applied to the aspirating chamber.

### **Sampler operation**

The operator programs the volume of air to be aspirated and switch on the instrument. At the end of aspiration an alarm alert that the culture plate is ready to be transferred to the incubator. If it is necessary to transfer the culture plate, they should be stored at 4°C. The air sampler is decontaminated after each sampling cycle by 70% ethanol spray.

### **Samples incubation (temperature-time)**

32°C / 24-48 hours for bacteria 25°C-30°C / 72 hours for moulds



### **CFU (Colony Forming Unit) colonies count on agar culture plates**

Enumeration of the colonies that appears on the surface of nutrient agar medium at the end of incubation time. The values should be referred to 1.000 litres of air (1 cubic meter = CM).

### **REPORT**

Results of Outside air (HVAC Inlet)

<b>DATE</b>	<b>SAMPLING HOUR</b>	<b>VOLUME OF ASPIRATED AIR</b>

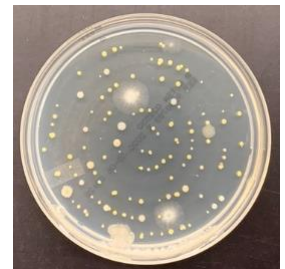
<b>1</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>CFU/plate</b>			
<b>CFU/1CM</b>			
<b>Average</b>			
<b>Total Average</b>			

Results of Inside air (HVAC outlets)

DATE		SAMPLING HOUR			VOLUME OF ASPIRATED AIR		
<b>2</b>	<b>D</b>	<b>E</b>			<b>F</b>		
CFU/plate							
CFU/1CM							
Average							
Total Average							

**Result interpretation**

The average of number of colonies counted on the culture plates used outside the premises are compared with the average of the culture plates used inside the premises. The contamination of the inside should not higher than outside. If inside values are higher, the HVAC system must be cleaned and disinfected. The HEPA filter of the system (if used) should be replaced or at least cleaned.



**REFERENCES**

WHO – World Health Organization

GOOD MANUFACTURING PRACTICES FOR HEATING, VENTILATION AND AIR-CONDITIONING SYSTEMS

[https://www.who.int/medicines/areas/quality\\_safety/quality\\_assurance/HVAC\\_Part2\\_QAS18-759-15022018.pdf?ua=1](https://www.who.int/medicines/areas/quality_safety/quality_assurance/HVAC_Part2_QAS18-759-15022018.pdf?ua=1)