

Evaluation of Fungal Bioaerosols in the Operating Room of a Public Hospital in Paraguay

Evaluación de bioaerosoles fúngicos en ambientes hospitalarios mediante el análisis del microbioma por secuenciamiento del metagenoma

PINV 18-513 – CONACYT PARAGUAY – PROCIENCIA - FEEI

San Lorenzo – Paraguay
2021



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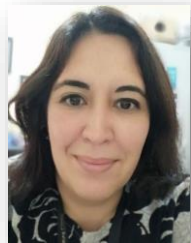
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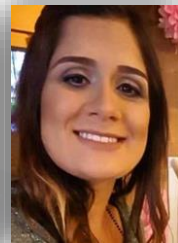
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INTRODUCTION

Fungi, bacteria, viruses, pollen, which are found in the form of particles suspended in the air are collectively called airborne biological pollutants or bioaerosols, they are an integral part of our ecological system and play an important role in it. (Gautam & Trivedi, 2020)



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INTRODUCTION

- Bioaerosols are present outside and introduced indoors by natural or mechanical ventilation. As grow indoors, human exposure is possible.
- Microbiological contamination of the hospital air may be due to overcrowding, inappropriate design of rooms, number of beds in each room and other factors.

(Gautam & Trivedi, 2020)

(Maldonado-Vega et al., 2014).



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INTRODUCTION



Why are bioaerosols important for human life?

Bioaerosols enter the human body by inhalation or by deposition in wounds.

Despite the defense mechanisms of the human body, these Bioaerosols could cause damage to health specially in immunocompromised people.

(Maldonado-Vega et al., 2014).



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OBJETIVE

This work evaluates the presence of bioaerosols in an operating room of a public hospital for cancer in Paraguay.



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METHODOLOGY

Sampling

From 11:00 AM to 13:00 PM. 90-mm petri dishes containing Potato dextrose agar chloramphenicol and Czapek agar chloramphenicol.

Between each sampling, the sampler was cleaning with 3% sodium hypochlorite and 70% ethanol.

Operating Room

Summer 2021
Cross-sectional descriptive
study

Sample collection (1)

Operating room was
cleaned with 3% sodium
hypochlorite.

Sample collection (2)

In addition to cleaning with
hypochlorite, the area was
disinfected with the
application of UV light for a
period of 30 minutes.



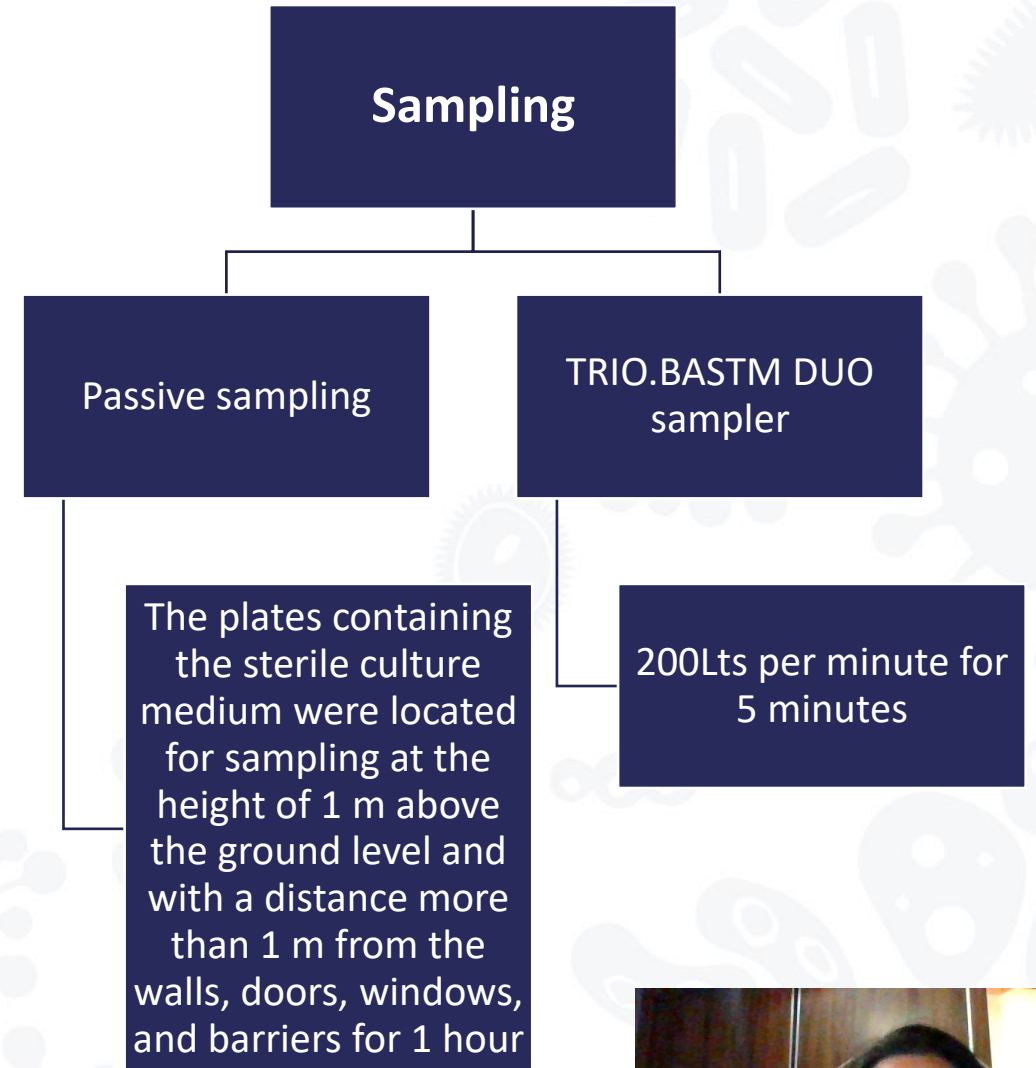
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METHODOLOGY



TRIO.BASTM DUO Sampler



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METHODOLOGY

- At the end of the incubation time, CFU (colony-forming unit), were counted and macro and micro morphologic characteristics were observed.
- CFU per m³ was calculated whit the formula:

$$\text{Number CFU/m}^3 = (\text{NC} * 1000) / (30 * \text{NU})$$

NC: number of colonies in plate NU: number of time units used in sampling

NTP 299: Método para el recuento de bacterias y hongos en aire. Ministerio del trabajo y asuntos sociales. España.



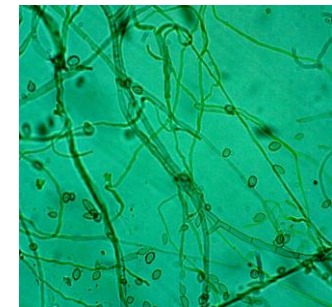
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METHODOLOGY

- An optical microscope with magnification of 100x was used to assess the shape and color of colonies and spores, vegetative hyphae, and sexual and asexual reproductive organs.
- The identification of genera was accomplished based on the taxonomic characters. The incidence of fungal genera present was calculated as a percentage of frequency.



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METHODOLOGY

- Statistical analysis. Descriptive statistics were calculated to describe the concentration of fungal aerosols. The normal distribution of data was analyzed using the Shapiro-Wilk test.
- Differences shown in the results were described using the tests of Kruskal- Wallis ($\alpha=0.05$).



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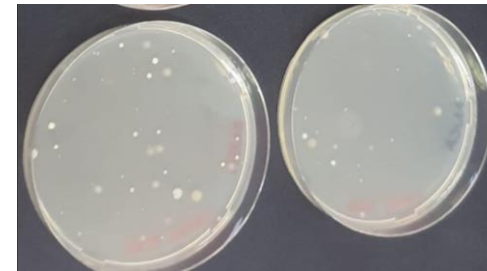


RESULTS

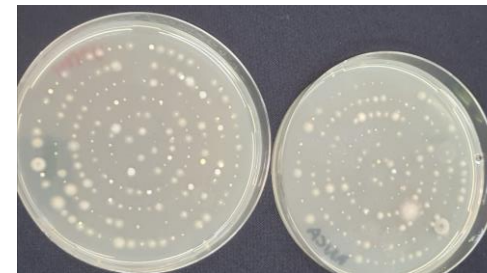
Table 1 show CFU present in the samples collected by the passive method was lower than those obtained by using the automatic collector. Significant differences were observed when comparing both methods of sample collection, observing a greater number of colonies in the samples taken with the TRIO.BASTM DUO collector.

Table 1. Descriptive statistics of the fungal bioaerosol concentrations CFUm⁻²h⁻¹ for passive sampling and CFUm³ for automatic sampler.

Sampling method	Min	Max	Median
Passive sampling	2	8	5
TRIO.BASTM TM DUO	79	154	125



1. Passive sampler



2. Automatic sampler



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RESULTS

Table 2. Descriptive statistics of the bacterial and fungal bioaerosol concentrations CFUm⁻²h⁻¹ for passive sampling and CFU m³ for automatic sampler with and without UV light

Treatment	Min	Max	Median
With UV	3	154	118.5
Without UV	2	141	43.5

Between the different treatments with UV light and without UV light, no significant differences were observed. The effectiveness of area sanitization using UV light is a process that is unsafe if a study of critical points and a manual disinfection on these points. This is all because UV light is nothing penetrating, UVC is extinguished when trying to penetrate a few microns of any material, so that everything that casts a shadow prevents its germicidal effect.

(De Andrés et al., 2020)



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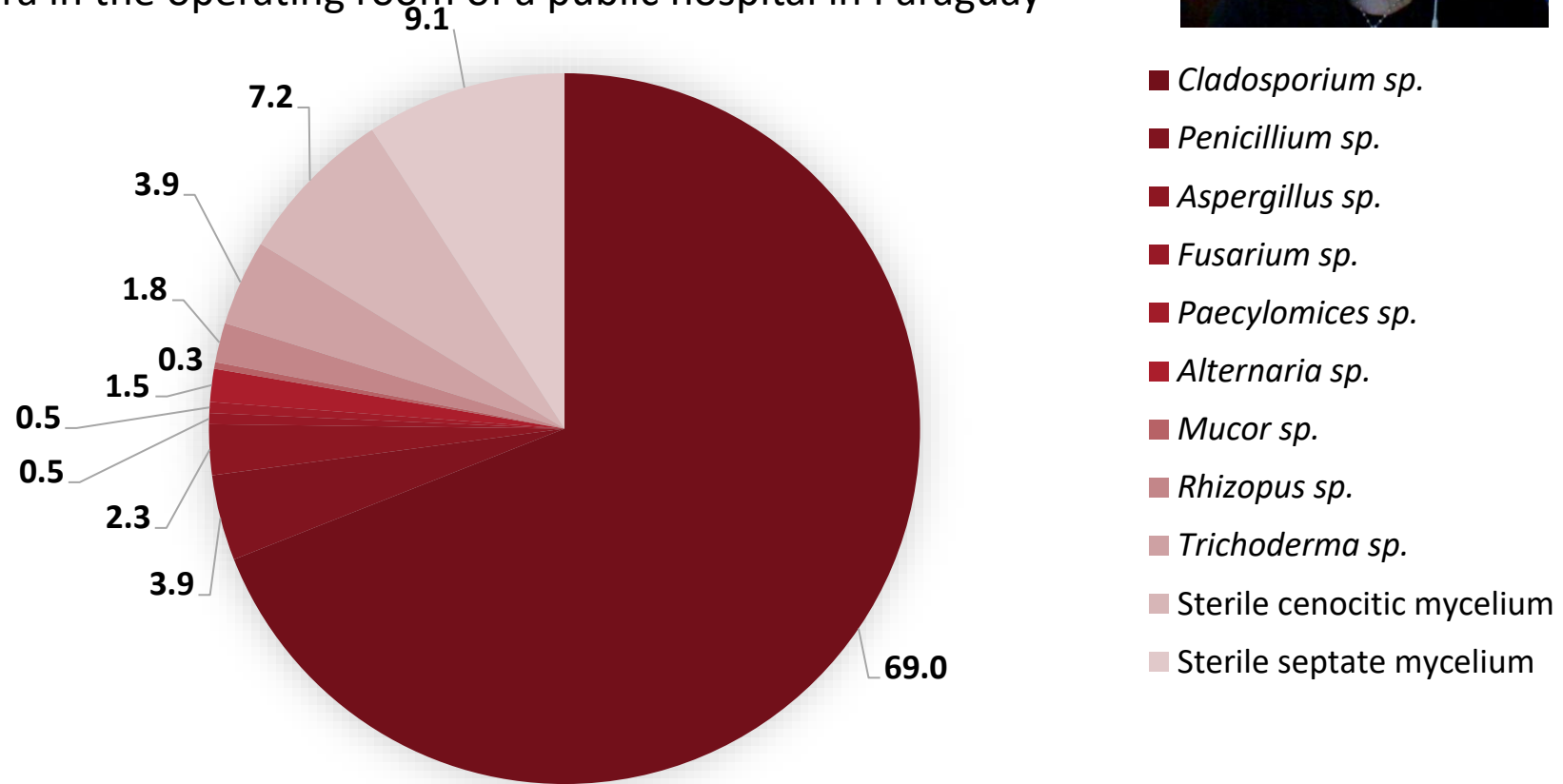
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RESULTS



Imagen 1. Frequency of fungal genera in the operating room of a public hospital in Paraguay



Regarding the genera of fungi present in the plates, the main one were: *Cladosporium spp.*, 69%, *Penicillium spp.*, 3.9%, *Aspergillus spp.*, 2.3%, *Fusarium spp.* 0.5%.

CONCLUSIONS

- The different genera of fungi identified in this work may have different pathogenicity's and ability to cause harm especially in immunocompromised patients such as users of the hospital under study.
- It is necessary to implement regular surveillance and strict measures that include air disinfection system, ventilation systems, using the high efficiency particulate air filters for high-risk rooms, window closing, entry and exit control doors, control among other aspects related to reducing the number of fungi present in the environment.



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THANK YOU!!!



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