

# Identification of Fungal Growth from the Internal Organs of Preserved Human Cadavers

Sambasivarao Yaragalla<sup>1,\*</sup>, Amruta Rajput<sup>2,\*</sup>

<sup>1</sup>Microbiology, Spartan Health Sciences University, Community Health and Research Centre of Spartan, St. Lucia

<sup>2</sup>Anatomy, Spartan Health Sciences University, St. Lucia, Caribbean

\*Corresponding author: [siva@spartanmed.org](mailto:siva@spartanmed.org)

**Abstract** Cadavers remain a principal teaching & research tool for anatomists and microbiologists. Infectious pathogens in preserved cadavers that present particular risks include Bacteria, Viruses and Prions such as Mycobacterium, hepatitis B and C, HIV and encephalopathies [2,4,11]. It is often claimed that 10% formalin fixatives are effective in inactivation of these agents. The purpose of this study is to determine if anatomy preserved cadavers fixed in a formalin solution and internal organs are a possible source of introduction of microorganisms into the anatomy laboratory. Routinely preserved cadavers were sampled include Spinal cord, Brain and Lung. Using conventional microbiologic culture and identification methods, the research group was able to successfully recover and identify a variety of organisms from all samples includes surface and internal organs. Three different fungal species, Trichophyton spp, Aspergillus spp and Penicillium spp, were isolated from internal organs of preserved cadaver. The results indicate that preserved cadavers processed with 10% buffered formalin have viable organisms on their surfaces and internal organs that can be a source of contamination. In this brief review, we describe the infectious pathogens that can be detected in preserved internal organs from the cadavers and suggest safety guidelines including airborne precautions for the protection of all who handle and visit cadavers against infectious hazards in the anatomy lab. The results of this research support the use for further analysis to prevent infectious diseases in Anatomy lab who handle preserved cadavers and dissect internal organs.

**Keywords:** Cadavers, research methods, contamination, cadaver dissection, medical curriculum, gross anatomy, infection, mycobacterium, hepatitis, AIDS, HIV, prion

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## 1. Introduction

Like all other occupations, being a member of an anatomy department has its own risks. The potential infection hazard of human cadavers is one of them. Cadavers are the main studying materials of anatomists [1]. Cadavers remain teaching tool for instructor and students, but may pose infection hazards to people who handle them, include pathologists, nurses, mortuary attendants, embalmers, funeral directors and members of the emergency services. All of these are potentially at risk of exposure to pathogenic microorganisms Such as fungi, bacteria and viruses. Infectious pathogens in the cadavers that present particular risks include Mycobacterium tuberculosis, hepatitis B and C viruses, HIV, Trichophyton, Aspergillus, Candida, Penicillium and prions that cause transmissible spongiform encephalopathies [2,4,11]. Specific safety precautions are necessary to avoid accidental disease transmission from cadavers before and during dissection and to decontaminate the local environment afterward. The purpose of this study is to draw attention to the infective agents that can be detected in fixed human cadavers of surface and internal organs and to suggest

safety guidelines especially air borne precautions for the protection of all who dissect cadavers. Finally, dissection laboratory directors must stay up to date on the most recent literature in the field to help ensure the safety of all educators, researchers, and students to prevent infections.

## 2. Materials and Methods

### 2.1. Sample Collection

The preserved 10% buffered formalin cadaver samples were obtained using sterile methods and standard precautions from the spinal cord, brain and lung. The Institutional Review Board has approved this study. After collection, each sample was used to inoculate 2 different media; Nutrient Agar and Sabourauds Dextrose Agar (SDA) from Carolina biological, USA.

### 2.2. Culture

Each sample was placed on Nutrient Agar and SDA with the addition of chloramphenicol to suppress bacterial growth. Agar samples were incubated at 37°C, colony growth was checked daily.

### 2.3. Colonial Morphology

The fungi growth was observed based on  
 The basic shape of the colony circular, filamentous, etc.  
 Size the diameter of the colony.  
 Surface - the surface of the colony appearance smooth, glistening, rough, wrinkled, or dull.  
 Color - (pigmentation) - white, gray and black etc.

### 2.4. Microscopical Identification of the Isolated Fungi

All isolate were stained by lacto phenol cotton blue and identify by the presence of:  
 Fungal hyphae (branched filaments) making up a mycelium  
 Conidiophores  
 Conidiospores  
 Phialospore  
 Fungi were identified by comparing micrographic characteristic of fungi to stander mycology text book.

### 3. Results

Three fungi were isolated that's includes penicillium, Trichophyton and aspergillus (Table 1 and Figure 1- Figure 5). All the samples were cultured in department of microbiology using Nutrient agar media to see the bacterial growth and sabouraud's dextrose agar (SDA) media for fungal growth. The results of all the samples from the dissected spinal cord, brain and lung of the preserved cadaver were negative in nutrient agar culture and there is no bacterial growth. But the sample from the dissected spinal cord, brain and lung of the preserved cadaver were positive for fungal growth.

Table 1. The results of all Cadaver sample on Nutrient Agar and SDA

S.No	Sample from the cadaver	Bacterial growth on Nutrient agar	Fungal growth on SDA	Fungi Isolated
1	Spinal cord	Negative	Positive	Penicillium
2	Brain	Negative	Positive	Trichophyton
3	Lung	Negative	Positive	Aspergillus

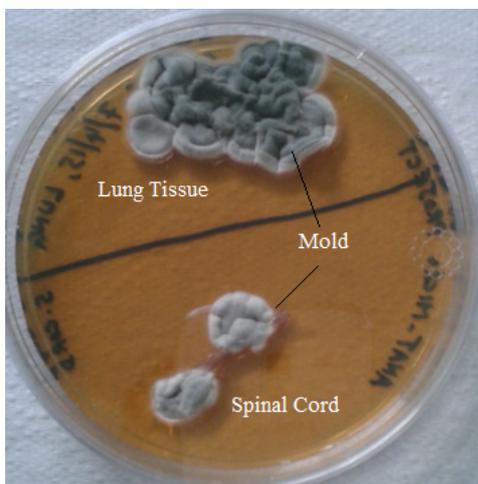


Figure 1. Fungal growth on SDA

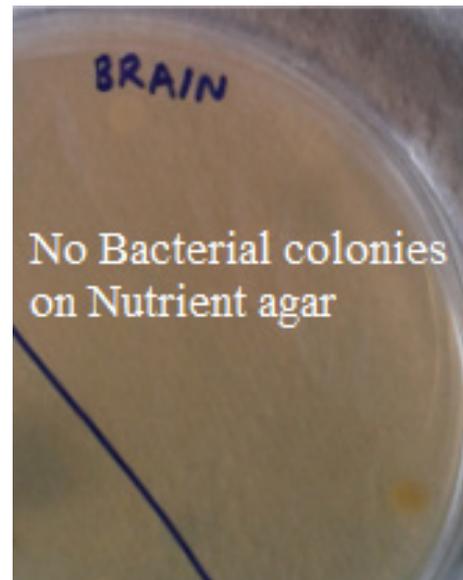


Figure 2. Bacterial growth on Nutrient Agar

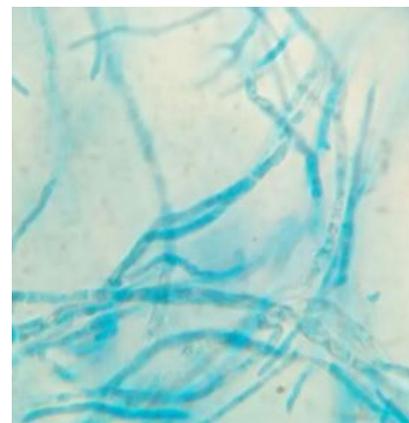


Figure 3. Mass of hyphae, Trichophyton spp

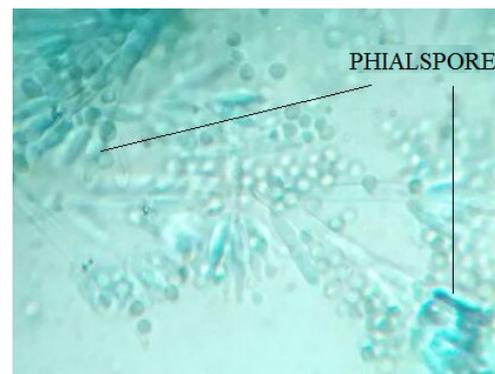


Figure 4. Conidiospores and Filaments, Aspergillus

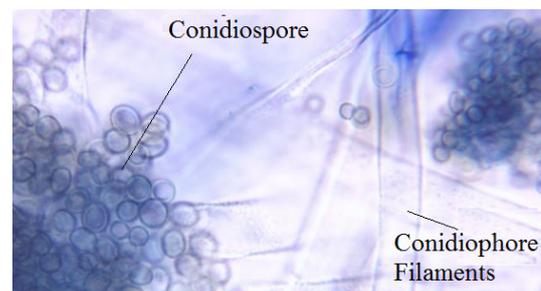


Figure 5. Phialospore, Penicillium

## 4. Discussion

The goal of this study was to determine if microorganisms could be recovered from cadavers used by medical students. In this research study, not only the surfaces of the cadavers were examined for the presence of viable microorganism's also internal organs which harbor potentially harmful infectious agents from when the person was alive. Three different fungal colonies identified as *Trichophyton* spp, *Penicillium* spp and *Aspergillus* spp, the source of this strain from internal organs of cadaver itself.

The presence of fungus in one of the sample is noteworthy which has to be studied further. This is a microorganism transmitted by air and causes opportunistic pneumonia.

In summary, there were viable fungus on surfaces and internal organs of all tested preserved cadavers before medical students handled them. This is of concern because students and anatomists across the world may be exposed to potentially pathogenic organisms every time they work with a cadaver. It has been suggested that the examined preservation and disinfecting technique is inadequate to eradicate all microorganisms. Universal precautions to prevent dissemination of organisms from cadavers must be put in place in all anatomy laboratories.

Our current findings raise the need for continued investigation of the role of anatomy cadavers in dissemination of pathogenic organisms for both surface and internal organs. Evaluation of the persistence of pathogenic organisms in cadavers is important for developing protocols for the safe use of cadavers in medical and research institutions.

## 5. Conclusion

Three different types of fungus identify as *Penicillium*, *Trichophyton* and *Aspergillus* from human internal organs from the formalin preserved Cadavers. The potential infection hazard from human preserved internal organs of cadavers is one of the risks of being a member of an anatomy department. Special care must be taken to reduce risks to a minimum. Safe working conditions for handling cadavers can be provided through proper education, use of protective clothing, and practice of hygienic measures including air borne precautions. Although following the recommendations mentioned can reduce the risk of

infectious hazards of cadavers, vaccination of all who handle cadavers against hepatitis B and *M. tuberculosis* [8] is another important precaution that should not be missed. Finally, dissection laboratory directors must stay up to date on the most recent literature in the field to help ensure the safety of all educators, researchers, and students to prevent infection from internal organs of cadaver.

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