



## Food & Health

### Survey of the microbial flora of a hospital environment in South-Western Nigeria

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#### Abstract

Eight strategic areas of the Ondo State Specialist Hospital, Akure, South-Western Nigeria, were sampled. Standard microbiological procedures were followed to investigate the types of bacteria and fungi that are present in the hospital environment. The following bacteria were isolated: *Staphylococcus aureus*, *Bacillus anthracis*, *Bacillus cereus*, *Pseudomonas aeruginosa*, *Streptococcus pyogenes*, *Streptococcus pneumoniae* and *Micrococcus luteus* but the most frequently encountered species was *Staphylococcus aureus*. It was found in all the areas sampled. The fungi isolated were *Neurospora crassa*, *Aspergillus fumigatus*, *Harknessia eucalypti*, *Mucor mucedo*, *Botrytis cinerea*, *Varicosporium elodeae* and *Rhizopus stolonifer*. *Neurospora crassa* was discovered to be the most frequently encountered fungus. Most of the organisms isolated are highly pathogenic and can seriously affect the health of workers and recuperating patients.

**Key words:** Bacteria, fungi, hospital environment, state of hygiene.

#### Introduction

Microorganisms are ubiquitous in their distribution, that is, they are found everywhere. Every infinitesimal crevice and nook of the corner is inhabited by them including the hospital environment where sick people are taken for treatment or go for advice on health related matters. Lowbury et al. <sup>1</sup> documented that a wide variety of microorganisms including virulent strains are likely to be found in hospitals where different people with different types of diseases with various pathogenic origin aggregate. These pathogenic microorganisms according to the write-up include large proportion of antibiotic-resistant bacteria. Van Demark and Batzing <sup>2</sup> also documented that the major artificial reservoir for pathogens is the hospital and that different areas of the hospital have different infection hazards. Therefore people that go to hospitals are prone to nosocomial infections, the magnitude of which is dependent on the level of hygiene of the hospital environment. Nosocomial infections can be serious and in some cases fatal <sup>3-7</sup>. Therefore, strict attention should be paid to reducing the microbial population of the hospital environment to barest minimum so that the place where people go to get well and promote life will not serve as an avenue which prolongs diseases and diminishes life. This study, therefore, was carried out to investigate the microbial load and types of microorganisms present in the hospital environment of Ondo State Specialist Hospital, Akure, to know the state of hygiene of the institution.

#### Materials and Methods

Prepared sterile nutrient potato dextrose and blood agar plates were taken to designated areas in the hospital environment. The designated areas are Out Patient Department (OPD), Female Medical Ward (FMD), Female Surgical Ward (FSW), Septic ward (SW), Operating Theatre (OT), Labor Ward (LW), Children's Ward (CW) and the Medical Laboratory (ML). The plates in duplicates were exposed for 10 min. and covered back before taken to the

Microbiology Laboratory for incubation. All the blood agar (BA) and nutrient agar (NA) plates were incubated at 37°C for 24 h. for the bacterial isolates, while the potato dextrose agar plates (PDA) were incubated at room temperature (28±2°C) for 72 h for the fungal isolates. Subculturing was done on fresh NA plates for isolation of pure colonies after the initial incubation. All the bacterial isolates were characterized according to Holt et al. <sup>8</sup>. Fungal identification was done according to Cheesbrough <sup>9</sup>.

#### Results

Seven different types of bacteria were isolated and identified from the hospital environment. The bacteria are *Pseudomonas aeruginosa*, *Streptococcus pyogenes*, *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Bacillus cereus*, *Bacillus anthracis* and *Micrococcus luteus*. *Staphylococcus aureus* was the most frequently encountered (31.25%) of the organisms. This was followed by *Bacillus cereus* and *Streptococcus pyogenes*, which have the same percentage of frequency of 18.75% each. They were followed by *Bacillus anthracis* with 12.5%. *Streptococcus pneumoniae*, *Micrococcus luteus* and *Pseudomonas aeruginosa* were least frequently encountered with equal percentage of 6.25% each. The result of the frequency of occurrence of the bacteria can be seen in Table 1. In addition to these, seven different fungi were isolated. These are *Neurospora crassa* (33.33%), *Aspergillus fumigatus*, *Botrytis cinerea*, *Harknessia eucalypti*, *Varicosporium elodeae*, *Mucor mucedo* and *Rhizopus stolonifer*; all these have an equal frequency of 11.11% (Table 2.). The different types from the different units of the hospital can be seen in Table 3.

#### Discussion

The result of this investigation has been able to show that the State Specialist Hospital, Akure, is heavily laden with

**Table 1.** The frequency of occurrence of the bacteria isolated from the hospital environment.

| Name of bacteria                | Frequency of occurrence (%) |
|---------------------------------|-----------------------------|
| <i>Staphylococcus aureus</i>    | 31.25                       |
| <i>Streptococcus pyogenes</i>   | 18.75                       |
| <i>Bacillus anthracis</i>       | 12.50                       |
| <i>Bacillus cereus</i>          | 18.75                       |
| <i>Pseudomonas aeruginosa</i>   | 6.25                        |
| <i>Streptococcus pneumoniae</i> | 6.25                        |
| <i>Micrococcus luteus</i>       | 6.25                        |

**Table 2.** The frequency of occurrence of the fungi isolated from the hospital environment.

| Species                      | Frequency of occurrence (%) |
|------------------------------|-----------------------------|
| <i>Neurospora crassa</i>     | 33.33                       |
| <i>Aspergillus fumigatus</i> | 11.11                       |
| <i>Botrytis cinerea</i>      | 11.11                       |
| <i>Harknessia eucalyptii</i> | 11.11                       |
| <i>Varicosporium elodeae</i> | 11.11                       |
| <i>Rhizopus stolonifer</i>   | 11.11                       |
| <i>Mucor mucedo</i>          | 11.11                       |

microorganisms. This is expected because sick people discharge infectious organisms into the environment through sneezing, coughing, talking, raising of dust and contact with hospital materials. These pathogens in most cases are responsible for nosocomial infections, which are rampant in hospitals and can lead to the death of patients. According to Putsep<sup>10</sup>, approximately one of every five thousand patients entering an American Hospital dies of an infection contracted in the hospital. The environment where patients are treated therefore has an important influence on the likelihood of such recovering or acquiring infections that may complicate their condition. Johnson<sup>11</sup> also said something along this line, that there cannot be health without a healthy environment. In essence, for patients to achieve their main purpose of going to the hospital, the hospital environment should possess a high level of hygiene in order to reduce the bacterial load. Some of the organisms isolated during the course of the investigation at the hospital have been reported to cause nosocomial infections. For example, in the United States, methicillin-resistant *Staphylococcus aureus* was discovered to be a major cause of nosocomial and commonly-acquired infections among which urine was detected to be the most common site of colonization<sup>5</sup>. *Staphylococcus aureus* was also reported to be the pathogen in nosocomial chronic osteomyelitis of long bone<sup>12</sup>. Surgical wound infection, another hospital-acquired infection is caused by *Pseudomonas aeruginosa*<sup>3,10</sup>. *Streptococcus pneumoniae* can cause pneumonia and *Bacillus anthracis* causes anthrax<sup>3</sup>. The presence of these organisms and the others isolated in the hospital wards shows that the level of hygiene is very low and that patients may likely suffer from serious nosocomial infections that may even cost them their lives. It is therefore been suggested that the hospital management should step up efforts in making sure that the hospital environment is rid of microorganisms from time to time or make sure the microbial load is kept to the barest minimum by observing sanitary measures.

**Table 3.** Microorganisms detected in different units of the hospital.

| Unit | Bacteria   | Fungi   |
|------|--|---|
| FSW  | <i>Pseudomonas aeruginosa</i><br><i>Streptococcus pyogenes</i><br><i>Staphylococcus aureus</i> | <i>Neurospora crassa</i>                                |
| FMW  | <i>Micrococcus luteus</i><br><i>Bacillus anthracis</i><br><i>Streptococcus pneumoniae</i>      | <i>Aspergillus fumigatus</i>                            |
| OPD  | <i>Streptococcus pyogenes</i>  | <i>Neurospora crassa</i>                                |
| SW   | <i>Staphylococcus aureus</i><br><i>Bacillus cereus</i>   | <i>Botrytis cinerea</i><br><i>Varicosporium elodeae</i> |
| OT   | <i>Staphylococcus aureus</i><br><i>Bacillus cereus</i>   | <i>Mucor mucedo</i>                                     |
| CW   | <i>Staphylococcus aureus</i><br><i>Bacillus cereus</i>   | <i>Rhizopus stolonifer</i>                              |
| LW   | <i>Staphylococcus aureus</i><br><i>Streptococcus pyogenes</i>                                  | <i>Neurospora crassa</i>                                |
| ML   | <i>Bacillus anthracis</i>  | <i>Harknessia eucalyptii</i>                            |

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