Isolation and Identification of Bacteria from Mobile Phones

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Abstract

Mobile phones are dispensable accessories in social life but are normally not cleaned properly. Therefore, they serve as a reservoir of bacterial and may cause nosocomial infections. Constant handling of the phone by different users exposes it to an array of microorganisms, and makes it a good carrier for microbes, especially those associated with the skin resulting in the spread of different microorganisms from user to user. With this in mind, the government arts college (paramakudi) is selected to observe the prevalence of organisms amongst the cell phones of the population and isolate and identify a group of potentially disease causing organism. Total 100 mobile samples included in this study for isolation of bacteria. 92% of the cell phones were found to be contaminated with bacteria. Out of the isolated colonies, with help of biochemical characterization the result shows that among 100 mobile phone samples 50.7% contain Staphylococcus spp, 13.2% found in Bacillus, 11% contain Streptococcus spp, and 14.1% found to contain pseudomonas were isolated and identified. So, it is found that microbial population is due to usage of cell phone during eating, in the washroom, sharing with other person ,while being sick had more potentially pathogenic microorganisms that the normal participants. Daily cleaning of cell phone with any commercially available cleansing agent such as 70% ethanol, hand sanitizer even commonly available liquid hand wash were recommended for microbes free cell phone with personal hygiene

Key words: Mobile phones, Nosocomial Infection, Cleansing agent, Bacteria, Personal hygiene, Hand sanitizer, Decontamination
Introduction

A mobile phone is a long range, portable electronic device for personal telecommunication. Aside the standard voice function of a mobile phone, a mobile phone can support many additional services such as SMS for text messaging, email, pocket switching for access to the internet, and MMS for sending and receiving photos and video [1]. At present, Ethiopia has the fastest growth rate of mobile phone subscribers from different parts of the world. The use of mobile phones by individuals may serve as a potential vehicle for the spread of pathogenic microorganisms [2]. A mobile phone can spread infectious diseases by its frequent contact with hands. Microorganisms are living things which are found everywhere including the environment and the human body. They are present in major part of the ecosystem. In these environments they live either freely or as parasites [3]. Human body harbor a number of microbes including several species of bacteria, viruses, fungi and protozoa. The sites where bacteria are found include skin (staphylococci and bacteroides), Oropharynx (streptococci, anaerobes), large intestine (Enteric bacilli) and vagina (lactobacilli) [4]. This study was carried out to gain insight into the isolation and characterization of bacteria which is found in mobile phone due to poor personal hand hygiene and could be of potential health risk of our society.

Materials and Methods

Collection of Sample:

A total of 100 mobile samples from government Arts College (paramakudi) students and staffs were included in this study. Mobile phones of students and staffs were randomly sampled by taking written and oral consents from all the participants included in this study. The samples were collected aseptically using sterile cotton-tipped applicators which were immersed in 0.85% sterilized normal saline solution (NSS). All the collected samples are being analyzed and screened in accordance with the previously reported method (Sepehri et al., 2009). The mobile phone is first held with the aid of sterile gloves. Sterile cotton swab moistened with the sterile (0.85%) normal saline solution is rotated over the surface of both sides of the mobile phone. The cotton swabs are transferred immediately to the laboratory with one hour of collection to prevent dryness. Sampled mobile phone swab was streaked onto nutrient agar. The inoculated plates are then incubated aerobically in an inverted position at 37 °C for 48 hours. The plates are then
observed for the presence of isolated colonies and selected colonies were again sub-cultured on nutrient agar in Petri-plates to isolate pure culture. After isolating pure cultures, bacterial isolates are further identified and characterized by Gram staining, PEA Agar, Mac-Conkey agar and biochemical tests [5]. Biochemical tests are performed on pure culture for final identification of the isolates on the basis of their biochemical reaction.

**Culture of Bacteria**

Isolation and identification of bacteria using different culture media, following as

**Nutrient Agar (NA):**

Nutrient Agar is used for the cultivation of microbes supporting the growth of a wide range of non-fastidious organisms. Nutrient agar is popular because it can grow a variety of types of bacteria and fungi, and contains many nutrients needed for the bacterial growth.

**Eosin Methylene Blue Agar (EMB):**

This media can differentiate among lactose fermenters and lactose non-fermenters bacteria. In case of lactose fermenters such as E. coli, the colonies will be blue/black in color with a metallic green sheen and for lactose non-fermenters colorless, transparent colonies will be obtained. Other coliform such as Enterobacteraerogenes can also ferment lactose and grow on EMB media. They will give thick mucoid pink colored colonies.

**Blood Agar (BA)**

Blood Agar (BA) is an enriched medium used to culture those bacteria or microbes that do not grow easily. Such bacteria are called fastidious as they demand a special, enriched nutritional environment compared to the routine bacteria. Blood Agar is used to grow a wide range of pathogens particularly those that are more difficult to grow such as Haemophilus influenzae, Streptococcus pneumoniae and Neisseria species.

**Tetrathionionate Broth**

Allow medium to adjust to room temperature. Add 0.2Ml of Tetrathionante Iodine-iodine solution (Dalynn BT34) to each tube just prior to inoculation. Inoculate the Tetrathionante Broth with the specimen (approximately 1g or 1Ml of solid or liquid sample per tube). Incubate the tubes with
loose caps for 24 hours at 35 c. subculture onto a selective and differential media such as SS or XLD agar to isolate potential salmonella colonies.

Sample Analysis

The collected samples were processed to identify the bacteria in the sample. The following processing techniques were applied: Culture technique, Gram staining, Biochemical tests.

Biochemical Analysis of Bacteria

Identification of bacteria was done by using different biochemical tests. These tests were based on the gram stain reaction of bacterial strains. Tests include catalase test, urease test, indole test, triple sugar iron reactions, methyl red test, voges proskauer test [6].

Results and Discussion

Collection of Samples

A total of 100 mobile phone samples randomly collected from students and staffs in government Arts College (paramakudi)

Cotton Swab

The collected the 100 mobile phone samples are swabbed the cotton balls. Sterile cotton swab moistened with the sterile (0.85%) normal saline solution was rotated over the surface of both sides of the mobile phone. The cotton swabs were transferred immediately to the laboratory with one hour of collection to prevent dryness. Sampled mobile phone swab was streaked onto nutrient agar.

Culture Preparation

There are a number of procedures available for the isolation of bacteria from mixed culture. But the initial and the most simpler method of isolation is spread plating on solid agar medium. The purpose of spreading is to isolate individual bacteria.
Isolation of Bacteria

The inoculated plates were incubated aerobically in an inverted position at 37°C for 24 hours. The plates were then observed for the presence of isolated colonies and selected colonies were again sub-cultured on nutrient agar in Petri-plates to isolate pure culture.

GRAM STAINING:

Figure -1 Gram positive – bacillus

Figure -2 Gram negative – bacillus

Figure -3 Gram positive- cocci

Figure -4 Gram positive-salmonella
After isolating pure cultures, bacterial isolates were further identified and characterized by Gram staining. Staining helps in the identification of the organism’s morphology and cell arrangement it was the first step towards identification of bacteria in the culture (Figure: 1-10).
Table 1

<table>
<thead>
<tr>
<th>Suspected organisms</th>
<th>Gram Staining</th>
<th>Reaction</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus ssp.</td>
<td>Positive</td>
<td>Cocci in cluster</td>
<td></td>
</tr>
<tr>
<td>Bacillus</td>
<td>Positive</td>
<td>Long rods</td>
<td></td>
</tr>
<tr>
<td>E.coli</td>
<td>Negative</td>
<td>Short rods</td>
<td></td>
</tr>
<tr>
<td>Solmonella</td>
<td>Negative</td>
<td>Rod</td>
<td></td>
</tr>
<tr>
<td>Streptococcus</td>
<td></td>
<td>Cocci</td>
<td></td>
</tr>
<tr>
<td>Pseudomonas</td>
<td>Negative</td>
<td>Rod</td>
<td></td>
</tr>
</tbody>
</table>

BIOCHEMICAL TEST

Biochemical tests were performed on pure culture for final identification of the isolates on the basis of their biochemical reaction.

Table 2

<table>
<thead>
<tr>
<th>S.n o</th>
<th>Biochemical test</th>
<th>Staphylococcus ssp.</th>
<th>E.coli</th>
<th>Bacillus</th>
<th>Solmonella</th>
<th>Streptococcus</th>
<th>Pseudomonas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Indole test</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>2</td>
<td>Methyl red test</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>3</td>
<td>Vogus proskauer test</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Variable</td>
<td>Positive</td>
</tr>
<tr>
<td>4</td>
<td>Citrate utilization test</td>
<td>Positive</td>
<td>Negative</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>5</td>
<td>Triple sugar</td>
<td>Yellow/yello</td>
<td>Yellow,</td>
<td>Yellow,</td>
<td>Alk/A</td>
<td>Yello/red</td>
<td>Alk/Alk</td>
</tr>
<tr>
<td>test</td>
<td>yellow</td>
<td>red</td>
<td>Positive</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
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<td>----------</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urease test</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starch hydrolyzed test</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catalase test</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion**

The results showed that mobile phones were contaminated with different types of bacteria mentioned above. Therefore, due to personal nature of individuals and proximity to the sensitive part of our bodies in usage such as faces, ears, lips, and hands of users could become veritable reservoirs of pathogens that could result in infections. *Bacillus subtilis* with a 100% frequency of occurrence has been identified as an important organism in food spoilage. This undoubtedly contributes a great deal to food spoilage and the contamination of food if food is prepared or eaten with infected hands.

**Reference**

1. Al-Abdalall AH. Isolation and identification of microbes associated with mobile phones in Dammam in eastern Saudi Arabia.


