

Research article

Isolation and identification of bacteria isolated from different parts of cell phones

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ABSTRACT

Personal mobile phone is part of human accessories and used in every moment. The high bacterial contamination is the main source for many pathogenic disorders. In general the rate of bacterial contamination in mobile phone: 100%. The bacterial percentages of isolation frequency and occurrence were *Staphylococcus aureus* (5%), *Staphylococcus epidermidis* (84%), *Bacillus spp.* (30%), *Escherichia coli* (43%) and *Proteus spp.* (11%). The results indicate that *Staphylococcus epidermidis* is dominant bacteria associated with mobile phones, due to direct contact with the human skin.

Keywords: Bacterial isolates, Hygienic sanitation, Mobile phones.

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INTRODUCTION

Microbiological standards in hygiene are necessary for a healthy life. However, practices that shift from normal standards of hygiene have been observed in both the developing and developed world. This investigation confirms such a deviation, as a variety of bacteria were found on mobile phones. Mobile phones have become an integral and indispensable part of daily life. In many countries, mobile phones outnumber landline telephones. Most adult and many children now own mobile phones. At present, Asia has the fastest growth rate of cellular phone subscribers in the world. A mobile phone can spread infectious diseases by its frequent contact with hands [1]. Tagoe *et al* (2011) have reported that the result that pathogenic bacteria are present on approximately 40% of mobile phones belonging to patients

in a hospital, and on approximately 20% of mobile phones belonging to hospital staff [2]. Microbiologists say that the combination of constant handling with the heat generated by the phones creates a prime breeding ground for many microorganisms that are normally found on the skin. Staphylococci, particularly *Staphylococcus epidermidis* are members of the normal flora of the human skin, respiratory and gastrointestinal tracts. Nasal carriage of *S. aureus* occurs in 20-50% of human beings [3]. *S. aureus*, a common bacterium found on the skin pneumonia and meningitis, and is a close relative of methicillin resistant *S. aureus* (MRSA). The main reservoir of *S. aureus* is the hand from where it is introduced into food during preparation [4]. The hand serves and in the noses of up to 25% of healthy people and ani-



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mals can cause illnesses from pimples and boils to as a major vehicle of transmission of various Microbes including the enteric species [5]. *Proteus mirabilis* is one of the most common Gram-negative pathogens encountered in clinical specimens. It can cause a variety of community- or hospital-acquired infections, including those of the urinary tract, respiratory tract, wounds and burns, bacteraemia, neonatal meningococcal meningitis, empyema and osteomyelitis [6]. This study was aimed to isolation and identification of bacteria from personal mobile phones also to study the rate of bacterial contamination in it.

MATERIALS AND METHODS

Sample Collection

The samples were collected from the mobile phones of 100 devices during four weeks period from students of AL-Esraa College University, Baghdad, Iraq. A sterile cotton swabs were moistened with sterile saline and rotated over mobile phones and streaked immediately on plates of Nutrient agar, mannitol salt agar, blood agar and MacConkey agar. The plates were prepared according to the manufacturer instructions and incubated aerobically in inverted position at 37 °C for 48 h. and observed for growth and colonial morphology of the isolates.

Bacterial identification

Colonial morphology description, gram stain, biochemical tests (IMVIC (Indole, Methyl red, Vogas Proskauer and citrate) tests, Urease Test, Catalase Test, and Oxidase Test) were conducted to identify of isolated microorganisms.

RESULTS AND DISCUSSION

Microbiological standards in hygiene are necessary for a healthy life. It is not uncommon, however, to observe practices that deviate from normal standards of hygiene in both the developing and the developed world. This investigation confirms such a deviation, as a variety of microbes were found on mobile phones [3].

After incubation period, the Bacterial isolates were identified by gram staining and biochemical tests. Single colonies were selected from each cultured sample and employed for identification. The results of microbial isolation and identification through colonial morphology description, gram staining and biochemical tests are shown in table 1.

In the present study, the rate of bacterial contamination was 100%, these result is agreeing with previous study [7], It was found that the rate of bacterial contamination of mobile phones was 100%, and disagree with other previous studies [8,9], they mentioned the rate of bacterial contamination were 80% and 82.5%, respectively. The result of the present study showed the

contamination of students' mobile phones with different microbial isolates. *S. aureus*, *S. epidermidis*, *Bacillus* spp., *E. coli*, *Proteus* spp., *Aspergillus niger*, *Penicillium* spp., *Alternaria* spp. are the main microbial isolates frequently associated with mobile phones as shown in table 1. This is because the isolated bacteria are a subset of the normal microbiota of the skin as advanced by earlier researchers [10].

Table 1. Microorganisms isolated from mobile phones. Total personal mobile phones n= 100

Microbial isolates	Prevalence rate (%)
<i>Staphylococcus aureus</i>	54 %
<i>Staphylococcus epidermidis</i>	84 %
<i>Bacillus</i> spp.	30 %
<i>Escherichia coli</i>	43 %
<i>Proteus</i> spp.	11 %

Frequent handling by many users with different hygiene profiles producing regular skin contact with the phones may have resulted in the frequency and the degree of population of the isolates. This has many health implications. *S. aureus* is known to cause illnesses ranging from pimples and boils to pneumonia and meningitis, a scenario supported by the high population of colony isolates [3]. Karabay et al. (2007) found that most of the organisms isolated were skin flora. However, 16.7% of the samples were positive for pathogens known to be associated with nosocomial transmission, such as *S. aureus* [11]. Other investigators reported that telephones, intercoms, dictaphones and bedpan flusher handles may be contaminated with potentially pathogenic bacteria. The pathogenesis of *S. epidermidis* in device associated infections mostly relies on the potential of the bacterium to adhere to the device surface. Mobile phones have become veritable reservoirs of pathogens as they touch faces, ears, lips and hands of different users of different health conditions [9]. Gholamreza et al. reported that *S. epidermidis* was the most commonly cultured microorganism isolated from mobile phones. *S. epidermidis* and other coagulase negative staphylococci (CoNS) have emerged as major causative agents of nosocomial infections [12]. These organisms, which constitute the main component of the normal skin and mucosal microflora, are particularly responsible for catheter and other medical device related infections [13].

The presence of gram-negative bacteria, such as *E. coli* indicates to the fecal contamination of mobile phones. Gram negative sepsis caused by *E. coli* and *Proteus* spp. It has also been advanced that the endotoxin or lipopolysaccharide (LPS) produced by members of this group has been implicated as a primary initiator of the pathogenesis of septic shock [14]. *Bacillus* spp. was identified as an important organism in food spoilage [15]. The widespread isolation of *Bacillus* spp. confirms the ubiquitous nature of *Bacillus* spp. giving it greater

colonization ability as well as the ability of its spores to resist environmental changes [2]. Therefore, on the basis of present and previous studies, it can be concluded that *Bacillus* spp. are the major flora of mobile phones. This infection could be reduced through identification, and control of predisposing factors, education and microbial surveillance. Most people do not understand the inherent danger in sharing phones. Sharing phones undoubtedly means cross sharing. Effective means of disinfecting cell phone should be established to reduce its potential biological hazards [16]. The contaminated mobile phones are veritable reservoir for many pathogenic diseases that caused by pathogenic bacteria. The results of present study are conclusive evidence for prevalence of bacterial pathogenicity, due to the sharing of mobile phones and sensitive parts of our bodies in contact with it such as faces, hands and ears. The personal hygienic sanitation is required for decontamination mobile phones such hands cleaning and washing when mobile phone is used.

Conflict of interest

The authors declare that they have no conflict of interests.

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