

Isolation and Identification of Microbes Associated With Mobile Phones in Durg District in Chhattisgarh Region, India

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Abstract: *The presence of microorganisms on mobile surface is well recognized but literature regarding it are still pouring in. This study was conducted to find out the common microbial population inhabiting mobile phones in several regions including rural and urban areas of Durg District, in Chhattisgarh, India. The surface of phones were swabbed with sterile sticks and immediately streaked on three plates each of Nutrient agar, Potato Dextrose Agar and Glucose yeast agar. The plates were incubated at 35 degree Celsius for bacterial growth and 25 degree Celsius for fungal growth. Following incubation the microbial colonies were isolated and identified and tabulated. This study highlights the need and importance of following proper hygiene habits of using phones as they prove to be potential transmission vehicles for microbial populations responsible for several diseases.*

I. Introduction

A mobile phone is an electronic device for personal telecommunication. Over the decade its use has increased rapidly from being rare and expensive pieces of equipment used primarily by the business elite, to a common low-cost personal item. Majority of the mobile phones are hand-held. In developed countries and in many developing countries, many childrens now own a personal mobile phone. With the advent of smart phones, the number of mobile phone users has increased to a large extent in India as well.

Due to the ease of using mobile phones and its added applications it is widely used by all strata of people and so we generally overlook the health hazards associated with it. It is a potential carrier of a number of microorganisms. Research has shown that the mobile phone could be a health hazard with tens of thousands of microbes living on each square inch of the phone.[1]

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. Microorganisms can be transferred from person to person or from inanimate objects (such as stethoscopes, bronchoscopes, pagers, ballpoint pens, hospital charts, computer keyboards, mobile phones and fixed telephones) to hands and vice versa.[15–18]

This study aimed at investigating bacterial contamination of the mobile phone to identify the microbes (both bacteria and fungus) regularly associated with mobile phones and their pathogenicity.

II. Literature Review

Research on the microbial population inhabiting mobile phones is not a new topic. It is a major area of concern and has attracted researchers all over the world. Similar studies have been conducted by Amira.H.A. and Al Abdahl. [12] They have isolated and identified some common microbial populations associated with mobile phones.

Staphylococci, particularly *S. 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. Staphylococci are also found regularly on clothes, bed linen, and other human environments.[2]

Staphylococcus aureus, a common bacterium found on the skin and in the noses of up to 25% of healthy people and animals can cause illnesses from pimples and boils to pneumonia and meningitis. The main reservoir of *S. aureus* is the hand from where it is introduced into food during preparation.[3] The hand serves as a major vehicle of transmission of various microbes including the enteric species.[4] After *Escherichia coli*, *E. aerogenes* is the member of the Enterobacteriaceae most often isolated in European clinical microbiology laboratories, accounting for ~3% of nosocomial infections in the United States.[7] *Pseudomonas aeruginosa* is a metabolically versatile γ -Proteobacterium, which inhabits terrestrial, aquatic, animal-, human-, and plant-host-associated environments.[8]

III. Materials And Methods

Samples were collected from the mobile phones for a period of 4 weeks duration during 1 August 2015 to 30 August 2015. Sample size consisted of 194 mobile phones from users in different areas of Durg District, Chhattisgarh region, India.

Sampling was done using sterile cotton swab sticks. The swab sticks were rubbed all over the surface of mobile phones and immediately streaked on three plates of Nutrient agar and Potato Dextrose agar, and Glucose yeast agar. The plates were incubated at 35°C for 48 hours and observed for growth and identified by staining methods and biochemical tests.

Morphological description of colonies, gram stain,[1,8] mobility tests and biochemical tests [9,10] were used for bacterial identification.

IV. Results And Discussions

Microbiological standards in hygiene are necessary for a healthy life. But deviations from hygiene may be found every where. It also depends on cultural and social differences in society. Also the personal habits of hygiene varies from person to person. This investigation confirms such a deviation, as a variety of microbes were found on mobile phones.

The research findings indicate that *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, *Micrococcus luteus*, and *Enterobacter aerogenes* and *Bacillus subtilis* are the main bacterial isolates frequently associated with mobile phones as shown in Table-1. These organisms may probably have found their way into the phone through the skin and from hand to hand. This is because the isolated bacteria are a subset of the normal microbiota of the skin as advanced by earlier researchers.[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. *Staphylococcus 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.

Table-1. Bacteria isolated from mobile phones in Durg

Bacterial isolates	Number (%)
<i>Staphylococcus aureus</i>	380 (52.7)
<i>Staphylococcus epidermidis</i>	123 (17 .06)
<i>Pseudomonas aeruginosa</i>	88 (12.2)
<i>Micrococcus luteus</i>	66 (9.1)
<i>Bacillus subtilis</i>	51(7.07)
<i>Enterobacter aerogenes</i>	13 (1.8)

The presence of the gram-negative rod, *Enterobacter aerogenes*, a member of the coliforms, indicates the possibility of the presence of faecal contamination on the mobile phone. Gram-negative sepsis is most commonly caused by *E coli*, *Klebsiella spp*, *Enterobacter spp* and *Pseudomonas aeruginosa*. [12] *Bacillus subtilis* with a 100% frequency of occurrence has been identified as an important organism in food spoilage.

Fungal sps –

Alternaria sps (28.0%), *Aspergillus Niger* (32.0%), *Cladosporium sp* (18.7%), *Penicillium spp.* (14.7%), *Aspergillus flavus* (5.34%), and *Aspergillus fumigates* (1.33%) were isolated and tabulated based on mycelia, colour and spores. These isolates can significantly influence food spoilage and food infection through the production of toxins.

Table-2. Fungi isolated from mobile phones in Durg

FUNGAL ISOLATES	NUMBER (%)
<i>Aspergillus niger</i>	24 (32.0)
<i>Alternaria sps</i>	21 (28.0)
<i>Cladosporium sps</i>	14 (18.7)
<i>Penicillium sps</i>	11 (14.7)
<i>Aspergillus flavus</i>	4 (5.34)
<i>Aspergillus fumigatus</i>	1 (1.34)

The results thus proves that mobile phones are potential carrier of many bacterial sps which can be potentially harmful causing minor infections to severe health hazards. If proper care and personal hygiene is not taken care of it could be vehicles for the transmission of biological weapons.

Innovations in mobile communication have led to better patient control of diseases; however, the increased use of mobile phones is seen against a background rise in the rate of nosocomial infections.

V. Conclusion

Users of mobile phones are found everywhere: in the market, the home, hospitals, and schools. They could therefore, be the cause of the spread of the infection in the community. Our results indicate that isolates were associated with various strata of society. Today, mobile phones are important equipment for physicians and other health workers. Since restrictions on the use of mobile phones by HP is not a practical solution, many researchers suggest that adherence to such infection control precautions as hand hygiene should be strict. In addition, people should be informed that these devices may be a source for transmission of hospital-acquired infections to and from the community. Further studies for the possible means of decontamination of mobile phones, such as the use of alcohol and/or disinfection tissues, should be found and employed everywhere.

Simple cleaning of computers and telephones with 70% isopropyl alcohol may decrease the bacterial load. Control measures are quite simple and can include engineering modifications, such as the use of hands-free mobile phones, surfaces that are easy to clean and disinfect, hand washing, and the wearing of gloves by the appropriate personnel.

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