

Micro-Organisms Associated With The Use Of Commercial Mobile Phones In Umudike, Ikwuano Local Government Area Of Abia State, Nigeria.

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Abstract: A total of 300 commercially used cell phones were randomly collected and sampled from four towns within Ikwuano local government. The sample areas were within the university, university gate, Umuariaga junction and Amaba junction to isolate the micro-organisms. A sterile swab stick which was moistened with sterile normal saline was used to rob over the entire surface, earpiece and the keypad areas of the mobile phone. The specimens were cultured onto different media and observed for the presence of bacteria and fungi using nutrient agar, MacConkey agar, Eosine Methylene Blue agar and sabouraud dextrose agar respectively. Micro-organisms recovered and identified include *Staphylococcus aureus*, *Escherichia coli*, *Enterobacter spp*, *Aspergillus niger*, *Penicillium spp*, *Streptococcus spp*, *Rhizopus spp*, *Mucor spp*. Factors which are responsible for the high levels of contamination include the environment, hygiene of the users and improper handling practices. These mobile phones aside its usage as a means of communication could also serve as a means of transmission of both pathogenic and non-pathogenic organisms which has health implications. Personal hygiene and sanitation such as handwashing and the use of antimicrobial wipes to clean the phones could serve as a means to reduce the incidence of microbial transmission at commercial call centres. The study reveals the need for good handling practice of commercial cell phones by the users.

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Introduction

According to Ulysea, [1], A mobile phone also known as a cellular phone and a hand phone is a device that can make and receive telephone calls over a radio link while moving around a wide geographical area. It does so by connecting to a cellular network provided by a mobile phone operator allowing access to the public phone network. It is a long range portable electronic device for personal telecommunication over long distance.

Bellis and Houppis, [2] described the mobile phone as cellular because the system uses many base stations to divide a service area into multiple cells. These multiple cells are being transferred from one base station to another base station as a user travels from one cell to cell. The first handheld mobile phone was demonstrated by Martin cooper of Motorola in 1973 when he made a call to his rival, Joel Engel, bell labs head of research. Bell laboratory introduced the idea of cellular communication in 1947 with the police car technology [2]. The first mobile telephone call made from a car occurred at st. Louis, Miss our USA in June 17 1946 using the bell's system mobile telephone service. Until the late 1980's, most mobile were sufficiently large in that they were permanently installed in vehicles as car phones but with the

advancing technological trend most of the mobile phones produced now are hand held. Cellular phones are wireless equipments used for sending communications used for sending sound or human voice through air. They send long range communications that are usually impractical and impossible to implement with the use of wires [3].

According to Nwadike, [4], the global system for mobile communication (GSM) was established in 1982 in Europe with a view of providing and improving communication network. The usage of cell phone in Nigeria commenced in 2000. since then, the number of subscribers has been on the increase, cutting among villages and cities in the country. At present, Africa has the largest growth rate of cellular subscribers in the world with African market expanding nearly twice as fast as the Asian market. The availability of prepaid or pay as you go services where the users or subscriber do not have to wait or queue for a long times, has helped influence this growth all over the world [1].

According to a research done by Johnson and his colleagues [5], Mobile phone could be contaminated by our hands, human skin, bags, pockets, environment, through food particles which could lead to chronic or mild diseases. These micro organisms from their source of contamination are usually normal flora that can

cause opportunistic disease. While Ogg, [6] stated that 80% of infections are spread through the hands other objects which are always in contact with phones. Mobile phone has been seen to be contaminated because of the negligence of the users to its hygiene. This should be seen as so because heat generated by our phones create a conducive environment for micro-organisms to thrive in [7]. The constant handling of mobile phones by different users gives a venue for different types of micro-organisms to thrive in which range from those found in the hands, skins and the phones themselves. Other factors which could increase the number of micro-organisms found on them include the call centre location and the number of people who make calls per day. The dependence of human race on this convenience of mobile phone has gone on the increase which makes the repercussion of cell phone sanitation to be a very serious problem [8]. Ten thousands of bacteria live in one inch of a mobile phone including staphylococcus [9].

According to a study conducted by Ogg, [6] in a health care organization in Ireland, micro-organisms associated with mobile phones include *staphylococcus specie*, *micrococcus specie*, *bacillus specie*, methicillin-sensitive *staphylococcus aureus*, diphtheroids, coliform, methicillin resistant *streptococcus viridians* [6]. The face is the point of entry of these micro-organisms which makes people sick and reacts to the entry of such micro-organisms because they are pressed against the face of users [10]. This study aimed at determining the rate of contamination of commercial cell phones within the university environment.

Materials And Methods

Study Area

The study was conducted in Michael Okpara University of Agriculture, Umudike Abia State, Nigeria.

Ethical Clearance

The consent and permission of the phone owners were sought for and obtained before specimen collection and the consenting phone owners were assured of the confidentiality of the information obtained from the study. The samples were collected from commercial business centers within the area of study that is the within the university, university gate, Umuariaga and Amaba all within Umudike.

Specimen Collection

Sterile swab sticks were immersed in sterile normal saline and then used to swab the phones at the earpiece, mouthpiece, keypad, and the sides to ensure that microorganisms on the phone adhere to the swab sticks appropriately [11] and then placed in sterile sealable plastic bags and immediately transported to laboratory. A total of 300 specimens were collected.

Inoculation and Isolation

The specimens were inoculated onto nutrient agar, MacConkey agar and Eosine Methylene Blue agar and incubated at 37°C for 24 – 48 hours. Specimens were also inoculated onto Sabouraud dextrose agar and incubated at room temperature for 72 hours.

Colonies isolated from the different medias were sub-cultured into another plate containing nutrient agar to obtain a pure colony of the organism and incubation was done at 37°C. This pure colony obtained were then inoculated into a slant culture in a bijoux bottle and kept as stock culture.

Identification and characterization of the isolates

Identification and characterization of the isolates was done on the basis of cultural appearance of organism, colonial morphology, differential and selective media and also by biochemical test. Fungi were identified according to appearance, mycelia, spores, and colour according to lactophenol cotton blue test. After Gram staining, biochemical tests that were performed include; catalase, coagulase, motility, indole, citrate utilization, methyl red, voges-proskauer and sugar fermentation tests.

Result

Four bacteria were isolated from the specimen. They are; *Staphylococcus aureus*, *Escherichia coli*, *Enterobacter spp* and *Streptococcus spp*. The fungi that was isolated are; *Aspergillus niger*, *Aspergillus fumigatus*, *Penicillium spp* and *Mucor spp*. the morphological characteristics of the bacteria and fungal isolates are presented in table 1 and 2 below. The biochemical properties of the bacteria isolates are presented in table 3.

Out of 300 samples analyzed, a total of 127 (42.33%) bacteria isolates and 93 (31%) fungal isolates were obtained. Among this, 77, 23, 8 and 19 were *S. aureus*, *E.coli*, *Enterobacter spp* and *Streptococcus spp* respectively. The frequency of fungal isolates were 45, 18, 13, and 17 for *Aspergillus niger*, *Aspergillus fumigatus*, *Mucor spp* and *Penicillium spp* respectively.

Table 1: Morphological characteristics of bacterial isolates

Form	<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>	<i>Enterobacter spp</i>	<i>Streptococcus spp</i>
Elevation	Circular	Circular	Circular	Circular
Edge	Convex	Raised	Flat	Convex
Colour	Cream	pink	white	Cream
Surface	Smooth	Smooth	Smooth	Smooth

Table 2: Morphological characteristics of fungi isolates

Colony description	Morphological characteristics	organism
Black colonies	Septate branched, mycelium, Blackish conidia, Ascospores Produced	<i>Aspergillus niger</i>
Blue green colonies	Septate branched, mycelium, with conidiophores	<i>Penicillium spp</i>
Grey green colonies	Septate branched, mycelium, Grey green conidia, ascospores Present	<i>Aspergillus fumigatus</i>
Brownish colonies	Cottony surface, non-septate Chlamydoophores	<i>Rhizopus spp</i>
Greyish brown	Broad hyphae, non-septate Sporangioophores	<i>Mucor spp</i>

Table 3: Biochemical characteristics of bacteria isolates

Catalase test	Coagulase test	Methyl red test	Voges proskauer test	Citrate test	Indole test	Motility test	Sugar fermentation test	org. Lac.
Glu.	Suc.	Mann.						
+	+	+	-	-	-	-	-	+
-								
+	-	+		-	-	+	+	+
+	-	+	<i>Escherichia coli</i>					
-	-	-		+	-	-		+
+	+	+	<i>Enterobacter spp</i>					
-	+	+		-	-	-	+	+
+			<i>Streptococcus spp</i>					-

Key:

+ represents positive reaction

- represents negative reaction

Lac. Represents lactose

Glu. Represents Glucose

Suc. Represents Sucrose

Mann. Represents Mannitol

Org. Represents organism

Discussion

This study has revealed that most commercial cell phones are contaminated with various bacteria such as *Staphylococcus aureus*, *Escherichia coli*, *Enterobacter spp* and *Streptococcus spp*. these bacteria have also been isolated by other studies conducted within the geographical area [11],[12]. Organisms like *S. aureus* and *E. coli* are mostly associated with the skin as normal flora [13].

The result from this study showed a high prevalence of contaminated commercial cell phones (42.33%). This is comparable to a higher prevalence of 59.2% obtained from a study conducted in Ebonyi State University campus among commercial computer keyboards [14]. The high prevalence of isolates obtained from this study could be attributed to factors such as contaminated hands or money, unsanitary habits and high level of illiteracy. The public health

importance is that many people make use of the commercial cell phone.

The presence of *Staphylococcus aureus* leads to food poisoning, toxic shock syndrome, skin infection and several respiratory tract infections [15]. Another organism which was prevalent was *Escherichia coli*. It can be found in the intestinal tract. They are a member of the coliform whose presence on the mobile phone could be as a result of fecal contamination. This fecal contamination could be as a result of the users who had not washed their hands after visiting the toilets or even contacts with contaminated hands. According to Miller, [16] it was reported that human hands harbor different types of enteric microbes which has the ability to survive for a very long time on our hands and can act as a vector of various types of infection. *E.coli* has also been implicated as the causative agent of urinary tract infection and gastrointestinal infections also known as

gastroenteritis. High prevalence of *E.coli* could also be attributed to the poor awareness on the essence of hand washing and also the poor sanitation associated with the users of these commercial mobile phones along the area of study.

The reoccurring presence of the fungal isolates of *Aspergillus niger*, *Penicillium spp* showed that the environment around which the commercial mobile phone dealers operate are contaminated with fungal spores. This is so because fungi adapt to the environment faster than the bacteria making use of their spores. When they attach themselves to phones, they cause infections like Aspergillosis, when they get into food from their users they cause food intoxication and food spoilage and when they get into drinking water cause their contamination [17]. The public health implication is that when immunocompromised individuals make use of the commercial cell phones and become infected, it may result in serious adverse health effects.

Conclusion

The overall implication of this result is that the mobile phone which was made to be used as a means of easy and accessible communication by many is now becoming a means by which transmission of infection can be made. The consequence of this is threat to human lives, hence the need for educating the public on personal hygiene and good handling practice.

We recommend that practices which promote good hygiene such as hand washing should be encouraged among phone users. Also, disinfectants should be used to clean commercial phones at regular intervals to reduce the microbial load to the barest minimum.

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