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

Mbajiuka Chinedu1 Onuoha Stephen2 and Ugah Uchenna3

1Department of Microbiology, College of Natural Sciences, Michael Okpara University of Agriculture Umudike

2Department of Biological Sciences, Faculty of Science and Technology Federal University Ndufu-Alike Ikwo

3Department of Medical Biochemistry, Faculty of Basic Medical Sciences, Federal University Ndufu-Alike Ikwo

Corresponding author: E-mail: ugahuchennaiyioku@gmail.com; Mobile: +2347062154353

**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 commuinication 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.

[Mbajiuka ChineduOnuoha Stephenand Ugah Uchenna. **Micro-Organisms Associated With The Use Of Commercial Mobile Phones In Umudike, Ikwuano Local Government Area Of Abia State, Nigeria.** *N Y Sci J* 2014;7(7):74-77]. (ISSN: 1554-0200). <http://www.sciencepub.net/newyork>. 11

**Keywords**: Micro-Organism; Commercial; Mobile Phone; Local; Nigeria

**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 Houpis, [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*, diphtheriods, coliform, methicilin 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 37oC 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 37oC. This pure colony obtained were then inoculated into a slant culture in a bijou 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, Aspergilus fumigatus, Mucor spp* and *Penicillium spp* respectively.

**Table 1:** **Morphological characteristics of bacterial isolates**

**Form *Staphylococcus aureus Escherichia coli Enterobacter spp Strepyococcus spp***

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, *Aspergillus niger*

Blackish conidia, Ascopores

Produced

Blue green colonies Septate branched, mycelium, *Penicillium spp*

with conidiophores

Grey green colonies Septate branched, mycelium, *Aspergillus fumigatus*

Grey green conidia, ascospores

Present

Brownish colonies Cottony surface, non-septate *Rhizopus spp*

Chlamydophores

Greyish brown Broad hyphae, non- septate *Mucor spp*

Sporangiophores

**Table 3: Biochemical characteristics of bacteria isolates**

**Catalase Coagulase Methyl red Voges proskauer Citrate Indole Motility Sugar fermentation test org.**

**test test test test test test test Lac.**

**Glu. Suc. Mann.**

**+ + + - - - - - + +**

 **- *S. aureus***

**+ - + - - + + +**

 **+ - + *Escherichia coli***

**- - - + - - +**

 **+ + + *Enterobacter spp***

**- + + - - - + + + -**

 **+ *Streptococcus spp***

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.

**References**

* 1. Ulyseas, M. (2008). "Of Cigarettes and Cellphones". *Http//The Bali Times.com*. (Accessed May, 2014).
	2. Bellis, J. and Houpis, G. (2007). Competition Issues in the Development of M-Transactions Systems. In Vodafone policy paper series, no. 6, *The Transformational Potential of M-Transactions.*50:13-2.
	3. Patterson, S. (2004). Personal telephone networks: A typology and two empirical studies. *Journal of Broadcasting & Electronic Media, 40*(1), 45-60.
	4. Nwadike, I., (2007). GSM made easy. Solution to every GSM problem. Sammypet publishers Lagos.10.
	5. Johnson, B. M.; Miltenberger, R. G.; Knudson, P.; Egemo-Helm, K.; Kelso, P.; Jostad, C., and Langley, L. (2006). A preliminary evaluation of two behavioral skills training procedures for teaching abduction-prevention skills to schoolchildren. *Journal of Applied Behavior Analysis.* 3:25-34.
	6. Ogg, M. (2008) "Clinical Issues." Association of Operating Room Nurses. *Asociation of* *Operating Room Nurses Journal* 87(3):626.
	7. Brady, R.; Wasson, R.; Stirling, A.; McAllister, I., and Damani, N.N., (2006).. Is your phone bugged? The incidence of bacteria known to cause nosocomial infection in healthcare workers mobile phones. *Jounal of Hospital Infection.* 62: 123-125.
	8. Hidron, A,I.; Edwards, J.R. and Patel, J., (2008). "NHSN annual update: antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006-2007". *Infecion Control and Hospital Epidemiology.* 29 (11): 996–1011.
	9. Pugh, A. M. (2006). "Health & Wellness: Cell Phones Breed Staph and Other Bacteria: The Petri dish in your pocket" *Associated Content Publishers*. 2:4-5.
	10. Rogers, B.A. (2009) "Cell Phones, Staph and Superbugs and My Sick Child". *Http//dailymail/co.uk/sciencetech*. (Accessed 1st May, 2014).
	11. Ekrakene, T. and Igeleke, C. L., (2007). Microorganism associated with public mobile phones along Benin- Sapele express way. *Journal of Applied* *Sciences Research*, 3: 2009-2012.
	12. Okpalla, J.; Onyeneto, T.C., and Obi, R. O. (2011). Isolation And Characterization Of Microorganisms Associated With Commercially Used Cell Phones In Ihiala Local Government Area Of Anambra State. *Natural and applied science journal.* 12(1).
	13. Roth, R. and Jenner W., (1998). Microbial ecology of the skin. *Annual Review in Microbiology.* 42: 441-464*.*
	14. Onochie CC., Anyim C., Alo M.N., Onwa N.C., Okonkwo E.C., and Afiukwa F.N (2013). Bacteriologic examination of computer keyboards and mouse devices and their susceptibility patterns to disinfectants. *American Journal of Microbiology,* 4(1): 9 – 19.
	15. Pommerville, J.C. 2004. Microbiology: Then and Now in Alcamo’s Fundamentals of Microbiology, *Sudbury MA: Jones and Bartlett* *Publishers*. 1-13.
	16. Miller, J. (2009). *Http//The bali Times,com.* *FOX News*. Retrieved 30 June 2014.
	17. Flavia P. C.; Marilene da S. C. and Francisco C. N. (2001). *Isolation of filamentous fungi from public telephones of the metropolitan region of the city of Recife, Pe, Brazil*. 3:45-47.

7/5/2014