Cell Phone: A Medium of Transmission of Bacterial Pathogens

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Abstract: The present study aimed at isolating bacteria from cell phone. A total of 150 samples were collected from the cell phones of the volunteers in the university premises, commercial centres, hospital personnel (doctors and nurses) and hospitalized patients. Organism encountered include: *Escherichia coli*, (28.2%), *Pseudomonas aeruginosa* (22.6%), *Klebsiella* sp (14.5%), *Serratia* sp (13.7), *Staphylococcus aureus* (12.9%) and *Proteus vulgaris* (8.1%). Antibiotic susceptibility test carried out on the isolated organisms using agar diffusion method show that all the isolates were resistant to augment in while resistance to common antibiotics tested was equally high. *E. coli* and *P. aeruginosa* which were the predominant organisms were equally the most resistant against the antibiotic tested. Multiple antibiotic resistance was observed among the isolates. All the isolates were resistant to more than three antibiotics. This revealed that cell phone may have notable role in the transmission of multidrug resistant nosocomial pathogens.
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Introduction

The reservoir of any organism, which may be animate or inanimate objects, in the epidemiology of any bacterial disease is very important (Daniel *et al*., 2002). The pathogens live and or multiply in the reservoir on which their survival depends. Pathogens live on fomites. Many epidemiological studies have confirmed that many contaminated surfaces played a major role in the spread of infectious diseases (Hendley *et al*., 1997; Noble, 2001).

The usage of cell phone in Nigeria started on 27th August, 2000. The number of subscribers has since increased greatly to more than forty millions in more than eight service providers (Nwadige, 2007). Cell phone has been identified as one of the media by which bacterial pathogens could be transmitted (Austin *et al*., 1999). These pathogens passed from contaminated hand and skin of the users to another user. Through that there is exchange of flora between the users. Cell phone of doctors and other health care workers carry nosocomial pathogens which cause every form of skin infections to meningitides (Butz *et al*., 1993).

Cell phones are more problematic compared to other stationary objects (fomites) in that they facilitate inter- and inter wards (and possibly inter facility) transmission (Bures *et al*., 2000) and very difficult to rid of pathogens. The use of cell phones is now global. Either in hospitals and outside, the use of cell phone is the same.

The carriage of multi-drug resistant pathogens by cell phones and their roles in the transmission of pathogens were investigated.

Materials and Methods

Cell phones of University lecturers (9), undergraduate students (86), health care personnel (11), patients (4) and commercial users (40) were swab with sterile cotton swabs. The cotton swabs were transferred immediately to the laboratory with one hour of collection to prevent dryness. The samples were cultured on Monnitol Salt Agar (Oxoid), Eosine Methylene Blue Agar (Oxoid), Cysteine Lactose Electrolyte Deficient Agar (Oxoid) and Nutrient Agar (Oxoid).

The isolate were purified and characterized using the methods of Fawole and Oso (2001) and Olutiola *et al*. (2004). The pure isolates were characterized using the methods of Holt *et al*. (1994). The standard method of CLSI (2005) was used to determine the antibiotic resistance of the isolates.

The antibiotic sensitivity of the isolates was determined by the disk diffusion method on Mueller-Hilton agar. The following antibiotics (Difco) augmentin (3 µg), nitrofuratoin (30 µg), cotrimoxazole (25µg), Nalidixic acid (30 µg), ofloxacillin (5 µg), ciprofloxacin (5µg), perfloxacin (5 µg), amoxicillin (25 µg) gentamicin (10µg), and tetracycline (10µg) were tested against the isolates. The inoculum was standardized by adjusting its density to equal the turbidity of a barium sulphate (BaSO4) which is the 0.5 McFarland turbidity standard, and incubated at 35^{o}C for 18 h. The diameter of the zone of clearance (including the diameter of the disk) was measured to the nearest whole millimeter and interpreted on the basis of CLSI guideline (CLSI, 2005).

Results and Discussion

Out of the 150 phones screened in this study, 124 showed bacterial growth. Using the Bergey's Manual of Determinative Bacteriology (Holt *et al*., 1994), the organisms recovered belong to six genera namely *Staphylococcus aureus, Serratia* sp, *Escherichia coli, Pseudomonas aeruginosa, Klebsiella* sp, and *Proteus vulgaris*. The recovery rate ranges between 8.1% and 32.0% (Table 1). The organisms were consistently isolated from the environment and humans. The roles of these organisms in both nosocomial and community-acquired infections have been stressed (Topley *et al*., 2003; Walther *et al*., 2005).

According to Table 2, *S. aureus* was recovered in all the cell phone sampled while *Proteus vulgaris* showed the least consistency. Commercial phones had the largest variety of bacteria. This may be as a result of multiple usage and long time of exposure to the environment. The surface of the patients' phones carries more pathogenic bacteria than the ear piece. Nurses' phones carry the least array of bacteria.

This result shows the frequency of the use and exposure of cell phones to environmental microbes on the hand and skin of the users. This result is in agreement with the findings of Rusin *et al*., (2000). This is another mean by which pathogens from the hands of health care workers can be transmitted to the both the sick and healthy individuals. (Ferroni *et al*., 2000).

E. coli, Serratia sp, *Pseudomonas aeruginosa* and *Staphylococcus aureus* were most frequently encountered organisms among hospitalized individuals in that order. *Staphylococcus aureus* and *E. coli* were most frequently isolated organisms followed by *Pseudomonas aeruginosa* and

Klebsiella spp (Monath, 1999; East *et al*., 2001)

Table 3 shows the susceptibility of recovered organisms varied. All the isolates were susceptible to ofloxacillin while resistance to pefloxacin ranged between 8.1% (in *Klebsiella* sp) and 16.1% (in *E. coli*). Resistance to gentamicin, cotrimozazole, and tetracycline ranged between 75 and 83%. This is in consonance with previous findings (Isaacs *et al*., 1998). With the exception to ofloxacin resistance to other fluoroquinlone indicates the increasing tendency as reported previously (Sule and Olusanya, 2000).

Mobile phones have become veritable reservoirs of pathogens as they touch faces, ears, lips and hands of different users of different health conditions. 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.

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Table 1: Occurrence of bacterial pathogens in cell phones

Isolates	Number recovered	Percentage (%)
E. coli	35	28.2
P. aeruginosa	28	22.6
Klebsiella sp	18	14.5
Serratia sp	17	13.7
S. aureus	16	32.9
Proteus vulgaris	10	8.1

Table 2: Prevalence of bacterial pathogen in cell phones

Isolates	Ear Piece					Surface				
	Commercial	Private	patients	Nurses	Doctor	Commercial	Private	patients	Nurses	Doctor
E. coli	++	++	++	++	++	+	++	++	-	++
P. aeruginosa	+++	++	-	++	-	++	-	++	++	-
Klebsiella sp	+	++	++	+	++	-	++	+++	++	++
Serratia sp	++	-	++	-	-	+	++	-	-	++
S. aureus	+++	+	++	+	++	++	++	++	++	-
Proteus vulgaris	++	-	-	-	-	++	+++	++	-	++

Table 3: Percentage incidence of antibiotic resistance among bacteria isolated from cell phones.

Isolates	AUG	NIT	GEN	COT	OFL	AMX	CPX	TET	PFX	NAL
E. coli	28.2	25.6	16.9	21.8	0	20.9	19.1	25.0	16.1	21.8
P. aeruginosa	14.5	20.9	16.9	16.9	0	20.9	13.7	18.5	15.3	14.5
Klebsiella sp	13.7	13.7	12.9	13.7	0	12.9	8.1	12.9	8.1	12.1
Serratia spp	8.1	14.5	8.9	12.9	0	14.5	12.9	9.5	11.3	12.1
S. aureus	22.6	12.1	12.1	9.0	0	11.3	5.6	8.9	11.3	12.1
Proteus vulgaris	8.1	14.5	8.3	12.9	0	14.5	8.1	8.1	11.3	14.5

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