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Antibiotic Sensitivity Pattern of *Escherichia coli* Isolated from Water Obtained from Wells in Akure Metropolis

V.O. Oyetayo, F.C. Akharaiyi and M. Oghumah
Department of Microbiology, Federal University of Technology, Akure, Nigeria

Abstract: Water samples sourced from wells in Akure metropolis was analyzed to determine the *E. coli* counts. Out of the 12 water samples randomly obtained, 58.33% were observed to be laden with *E. coli*. The *E. coli* counts ranged between 10-59 cfu mL^{-1} which was well above WHO recommended value of no *E. coli* in 100 mL. The study also revealed that *E. coli* isolates from the wells have different antibiotic sensitivity pattern. The isolates obtained from Araromi and FUTA junction were less sensitive to the antibiotics while isolates from Ilesa garage and rescue hostel were more sensitive to the different antibiotics. The isolates were found to be more sensitive to norfloxacin (100%, gentamycin (100%, ciprofloxacin (100%), chloramphenicol (85.71%) and teramycin (71.43%).

Key words: Antibiotics, sensitivity, *E. coli*, resistance

INTRODUCTION

The earth is considered a wet planet with about 70% of it composed of water. Despite the abundance of water, portable fresh water meant for human consumption is still inaccessible to humans especially in developing countries. In the South West of Nigeria, most towns and villages source their water from wells. Water intended for human consumption .;must be free from organisms and from concentrations of chemical substances that may be a hazard to health (WHO, 1971). The organism most commonly used as indicators of microbial pollution, are *E. coli* and the coliform groups as a whole (WHO, 1971). Most strains of *E. coli* live as commensals, many are opportunistic pathogens of humans and animals. *E. coli* and several related species of bacteria found in faeces can be the cause of serious infections of the gastrointestinal tract (Fuerst, 1983). Non-intestinal *E. coli* that may cause diarrhea are enterotoxigenic, which may cause travelers diarrhea; enteroinvasive, resembling shigellosis; or enteropathogenic, which cause infant diarrhea (Fuerst, 1983).

Cases of gastroenteritis as a result of bacterial etiological agents are usually treated with antibiotics. Several reports worldwide show that bacterial isolates are resistant to antibiotics, particularly in developing countries (Lamikanra and Okeke, 1997; Hart and Kariuki, 1998). The major mechanism by which bacteria become resistant to antibiotics is through acquisition of R-plasmid. *E. coli* exist in large numbers in the intestinal flora, indicating tremendous potential for plasmid dissemination (Fuerst, 1983). The discharge of human and animal faecal material into the environment had led to the distribution of drug resistant bacterial in the sewage and surface water where exchange of R-plasmids can occur under certain physico-chemical and biological conditions (Anonymous, 1978). One of the means of spreading drug resistant bacteria is through contamination of water meant for human consuption. In Akure, the State capital of Ondo State, Nigeria, water for human consumption is mostly from wells. The water from these wells is usually contaminated by surface water especially during rainy season. The present study was therefore aimed at determining the antibiotic sensitivity of *E. coli* isolated from water obtained from wells in different locations within Akure metropolis.

Corresponding Author: V.O. Oyetayo, Department of Microbiology, Federal University of Technology, Akure, Nigeria

MATERIALS AND METHODS

Collection of Well Water Samples

A total of 12 water samples were randomly sampled from different locations within Akure metropolis. The samples were collected into sterile containers and were immediately transported to the laboratory of the Department of Microbiology, Federal University of Technology, Akure, for analysis.

Microbial Analysis

Primary culture was done on Nutrient agar (LAB M) for the enumeration of total viable count. Eosin Methylene Blue (EMB) agar (LAB M) was used for detection and isolation of pathogenic enterobactericiaea. Colonial, morphological and biochemical tests were performed for confirmation of the identity of *E. coli* isolates.

Antibiotic Sensitivity Test

The sensitivity of *E. coli* isolates to different antibiotics was performed by employing the Mulltor sensitivity discs (Alternative laboratories,). The disc contain the following antibiotics: norfloxacin, gentamycin, ciprofloxacin, chloramphenicol, teramycin, nalidicic acid, cefuxime, ampicillin, augumentin and nitrofuranton. The discs were picked with sterile forcept and placed on the surface of the solidified Nutrient agar that had earlier been seeded with the *E. coli* isolates.

RESULTS

The Total Viable Counts (TVC) obtained in the water samples sourced from wells ranged between 35-170 cfu mL^{-1} (Table 1). The highest TVC (170 cfu mL^{-1}) was obtained in well water sampled from

Table 1: Total viable counts (cfu mL^{-1}) in water obtained from wells in akure metropolis

Site of sample collection	Total viable counts*
Araromi	1.5×10^2
Alejolowo	1.7×10^2
Aba	35
Ilesha garage	58
Oyemekun	65
FUTA junction	1.5×10^2
Rescue hostel	1.5×10^2
Bakery, peace avanue	67
Westend, FUTA gate	1.2×10^2
Ondo road	1.1×10^2
Isikan	90
Igboyegun	1.1×10^2

*Values are means of three replicates

Table 2: *E. coli* counts in water obtained from wells in akure metropolis

Site of sample collection	*E. coli* count (cfu mL^{-1})*	Occurrence (%)
Araromi	38	24.67
Alejolowo	59	35.76
Aba	0	0.00
Ilesha garage	20	34.48
Oyemekun	10	15.34
FUTA junction	38	25.00
Rescue hostel	18	12.00
Bakery, peace avanue	13	19.40
Westend, FUTA gate	0	0.00
Ondo road	0	0.00
Isikan	0	0.00
Igboyegun	0	0.00

*Values are means of three replicates

Table 3: Antibiotic sensitivity pattern of *E. coli* isolated from water obtained from wells in akure metropolis

Site of sample collection	NB	GN	CIP	C	T	NA	CF	AG	N	AM
Araromi	++	++	++	-	-	-	-	-	-	-
Alejolowo	++	+	++	++	++	+	-	-	-	-
Ilessa garage	++	+	++	++	++	+	+	++	-	-
Oyemekun	++	++	++	+	+	-	-	-	-	-
FUTA junction	++	++	++	+	-	-	-	-	-	-
Rescue hostel	++	++	++	+	++	++	-	+	-	-
FUTA	++	++	++	+	+	+	-	-	-	-
Bakery, peace Avenue										
(%) of sensitivity of isolates to antibiotic	100	100	100	85.71	71.43	57.14	14.29	28.51	0	0

NB: Norfloxacin (10 μg); GN: Gentamicin (10 μg); CIP: Ciprofloxacin (5 μg); C: Chloramphenicol (10 μg); T: Teramycin (5 μg); NA: Nalidixic acid (30 μg); CF: Cefuroxime (20 μg); AG: Augumetin (30 μg); Nitrofuraton (100 μg); A: Ampicillin (25 μg); ++: Zone of inhibition above 10 mm; +: Zone of inhibition below 10 mm; -: No inhibition

Alejolowo area while the lowest TVC (35 cfu mL^{-1}) was obtained from water sampled in Aba area of Akure. The occurrence of *E. coli* in the water samples obtained from the wells also reveals that water from well in Alejolowo has the highest occurrence (35.76%) (Table 2). The percentage occurrence of *E. coli* in water collected from the different wells is 58.33%. Table 3 show the antibiotic sensitivity pattern of *E. coli* isolated from well waters. The isolates show different sensitivity pattern to the antibiotics.

DISCUSSION

The greatest danger associated with drinking water is that it may recently have been contaminated by sewage or by human excrement (WHO, 1971). Well water is often subject to such contamination as a result of surface water that runs into it especially during rainy season. Drinking water in Akure metropolis is mostly sourced from wells; hence the possibility of contamination of well by surface water is very high. The microbial agent usually used as indicator of faecal contamination is *E. coli* (Fuerst, 1983). The results of the present study reveals that 58.33% of the water samples obtained from the wells have between 10.59 *E. coli* count per milliliter. This is higher than the *E. coli* count recommended by World Health Organization. WHO (1971) recommended that no water sample should contain *E. coli* in 100 mL.

The study also reveals that the *E. coli* isolates of water from the wells displayed different antibiotic sensitivity pattern. The isolates were found to be sensitive to norfloxacin (100%), gentamycin (100%), ciprofloxacin (100%), chloramphenicol (85.71%) and terramycin (71.43%); less sensitive to nalidizic acid (57.14%), augumentin (28.57%) and cefuroxime (14.29%) and not sensitive to nitrofuraton and ampicillin. Nazir *et al*. (2005) similarly observed that *E. coli* isolates obtained from river, pond, drain and tap waters in Bangladesh are sensitive to the following antibiotics: Ciprofloxacin, Chloramphenicol, Norfloxacillin and Tetracycline. The high incidence of multidrug resistance may presumably be due to indiscriminate use of antibiotics (Okeke *et al*., 1999). The release of this multidrug resistant *E. coli* through faecal materials can eventually lead to the saturation of the environment with antibiotic resistant strains (Jawetz, 1984). This will definitely be a dangerous trend; hence appropriate control measures should be put in place to guide against the spread of antibiotic resistant bacteria.

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