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ANTIBIOTIC SUSCEPTIBILITY PROFILES OF BACTERIA ISOLATED FROM MINING PONDS IN BASSA AND JOS SOUTH LOCAL GOVERNMENT AREAS OF PLATEAU STATE

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ABSTRACT

The antibiotic susceptibility profiles of bacteria isolated from some mining ponds in Bassa and Jos South Local Government areas of Plateau State Nigeria, were determined in this study. A total of 180 water samples were collected from two Local Government Areas in wet and dry seasons.All bacteria isolated were subjected to colonial, microscopic and biochemical characterization. Bacteria isolated from the ponds were *Escherichia coli, Salmonella typhi, Vibrio cholerea, Proteus vulgaris, Yersinia enterocolitica, Shigella dysenteriae, Bacillus subtilis,* and *Salmonella enteritidis*. The isolates were tested against Gentamicin, Agumentin, Ciprofloxacin, Niacin, Pefloxacin Streptomycin, Septrin, Oflaxacin, Penicillin and Cephalosporin. Antibiogram of bacterial isolates revealed that *Bacillus subtilis* and *Salmonella* species were the most susceptible. Strains of *E. coli* however, were most resistant to the antibiotic tested. Generally ciprofloxacin, augmentin, oflaxacin, and gentamicin were the most active against the test organisms. The results of this study revealed that water from mining ponds could be a source of antibiotic resistant bacterial species.

Keywords: Antibiotic, bacteria, antibiogram, susceptible, resistant, mining ponds.

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INTRODUCTION

Antibiotic resistance has become a major public health issue and its presence in waste water, surface water, and drinking water is well documented (Patoli *et al.*, 2010) The hazard associated with the pathogenicity of microbes is aggravated by its ability to resist destruction by antibiotics (WHO, 2004). The occurrence of these multidrug-resistant bacteria especially *Escherichia coli* strains in the water supplies may cause transmission of resistance genes to other bacteria present in the water sources (Xi *et al.*, 2009; Patoli *et al.*, 2010). Antibiotic resistant organisms are found almost everywhere (Pappas, 2014), this study was aimed at assessing the antibiotic susceptibility profiles of the bacteria isolated from some mining ponds in Bassa and Jos South Local Government Areas of Plateau State.

MATERIALS AND METHODS

Collection of water sample

A total of 180 water samples were collected from ten mining ponds from Jos South and Bassa Local Government Area by 'grab' method.

Characterization and Identification of Bacterial Isolates

Bacteria were isolated following the schemes of Cheesbrough (2006). The bacterial isolates were identified by comparing their characteristics with those of known data (Holt *et al.*, 1998).

Antibiotic Susceptibility Test

The antibiotics used were Erythromycin (Ery) 15/lg; Ciprofloxacin (Cip) 5/lg; Cotrimoxazole (Cot), 10/lg; Pefloxacin (Pef) 10/lg; Gentamicin (Gen) 10/lg; Ceftriazone (Cef) 5/lg; Chloramphenicol (Chl) 30/lg; Streptomycin (Str) 10/lg; Ofloxacin (Ofl) 30/lg; Amoxicillin (Amx) 25/lg; Augmentin (Aug) 30/lg; Nitrofurantoin (Nit) 25/lg and Tetracycline (Tet) 30/lg. All antibiotic disks used were supplied by Oxoid Ltd (Basingstoke, Hampshire, England) (Bahiru *et al.*, 2013).

Standardization and testing of Bacteria Isolated for Antibiotics Sensitivity

Standardization and testing of the degree of sensitivity of the isolates from water sample to a range of antimicrobial drugs were carried out using methods of Bahiru *et al.* (2013).

RESULTS

Occurrence of bacteria in mining ponds

As shown in Table 1a total of 8 bacteria were isolated from tin mining ponds. The results obtained showed that *E. coli* had the highest frequency of occurrence (18.94%) while *Proteus vulgaris* had the least frequency of occurrence (8.24 %).Generally, the profile showed that highest number of bacteria was isolated from Mista-Ali, followed by Buji-Yelwa with Topp as the least contaminated tin mining pond.

Susceptibility profile of bacterial isolates

The susceptibility profile of bacterial isolates to commonly used antibiotics is presented in Table 2. The results showed that *Bacillus subtilis* was the most susceptible to all the antibiotics used and *Escherichia coli* (6.1%) was the least. Susceptibility profile showed that oflaxacin (Ofx) was the most active (15%) against the test bacteria followed by ciprofloxacin (Cpx) and gentamycin with 14.7% each, penicillin was the most inactive. Species of *Salmonella*, *Shigella* and *Vibrio* were completely (100%) susceptible to oflaxacin (Ofx). However, *Escherichia coli* was completely resistance to augumentin (Au), niacin (Na), septrin (Sxt) and penicillin (pn).

DISCUSSION

The bacterial species isolated from water showed high levels of antibiotic susceptibility to gentamycin, Augmentin, oflaxacin, whereas more resistance to penicillin. Susceptibility of bacteria species from water environment to oflaxacin agreed with the work of Odeyemi and Omotoso (2016). Similarly, Idowu *et al.* (2013) recorded bacteria susceptibility to ofloxacin during their study on the pollution status of Calabar River.

Contrary, antibiograms of the major enteric pathogens isolated from water in rural community in Cross River State, Southern Nigeria revealed resistance to preferred drugs such as gentamicin, chloramphenical and amikacin (Ikpeme *et al.*, 2011). However, erthromycin (25%) and nalidixic acid (37.50%) had been reported to exhibit low resistance percentages for the isolates (Ikpeme *et al.*, 2011). High resistance of *E. coli* to antimicrobial agents tested was observed in this study. Similar to our study, *E. coli* strains were isolated from water that showed high resistance for Augmentin, streptomycin, penicillin and niacin and were resistant to more than one antibiotic (Sharma and Rai, 2012).

The marked susceptibility of strains of *Salmonella* and *Shigella* to Augmentin, ciprofloxacin, pefloxacin gentamycin and oflaxacin as shown in the present study is in contrast with the findings of Alonso *et al.* (1999) working on rivers in the United States. Interestingly, enteropathogens, namely, *Salmonella*

typhi (88.8%), *Salmonella paratyphi A* (90%), and *Shigella sonnei* (100%) from natural sources of water were found to be fairly sensitive to the antibiotics tested (Shubra *et al.,* 2014). This indicated that, there can be horizontal gene transfer between microorganisms occurring spontaneously in nature (Harakeh *et al.,* 2006).

Table 1. Frequency of Occurrence of Bacterial species in Water from Mining Ponds in Bassa and Jos South Local Government Areas

Pond Location	Occurrence(%) of Bacteria species								Total
	Escherichia coli	*Salmonella typhi*	*Salmonellae nteritidis*	*Vibrio cholerae*	*Proteusv ulgaris*	*Yersiniaenteroc olitica*	*Bacillussu btilis*	*Shigelladyse nteriae*	
Mista Ali	20(30.00)	5(7.20)	10(15.00)	15(21.70)	-	4(5.70)	15(21.70)	-	69(14.53)
Malempe	15(25.40)	5(8.50)	5(8.50)	12(20.30)	3(5.00)	4(6.70)	10(16.90)	5(9.60)	59(12.4)
Rufam Gwamna	10(19.20)	5(9.60)	10(19.20)	8(15.40)	7(13.50)	2(3.80)	10(19.20)	-	52(10.9)
Buji Yelwa	10(16.10)	10(16.10)	5(8.10)	5(8.10)	5(8.10)	10(16.10)	10(16.10)	7(11.20)	62(13.1)
Kwang	5(13.10)	5(13.10)	5(13.10)	10(26.30)	-	5(13.10)	5(13.10)	3(7.90)	38(8.0)
Du Kwang	5(12.50)	5(12.50)	5(12.50)	5(12.50)	5(12.50)	5(12.50)	5(12.50)	5(12.50)	40(8.4)
Topp	-	-	-	-	5(2.50)	5(2.50)	5(2.50)	5(2.50)	20(4.2)
GuraTopp	5(14.30)	5(14.30)	-	5(14.30)	5(14.30)	5(14.30)	5(14.30)	5(14.30)	35(7.4)
Doruwa	10(21.20)	5(10.60)	5(10.60)	5(10.60)	5(10.60)	-	10(21.20)	7(14.90)	47(9.9)
Zawan	10(18.90)	5(9.40)	5(9.40)	5(9.40)	5(9.40)	5(9.40)	10(18.90)	8(15.1)	53 (11.2)
Total	90(18.94)	50(10.53)	50(10.53)	70(14.74)	40(8.42)	45(9.47)	85(17.89)	45(9.47)	475

-: no occurrence

Table 2. Antibiotic Susceptibility Profile of Bacterial isolates from Mining Ponds in Bassa and Jos South Local Government Areas

Isolate	No. of Isolates	Occurrence (%)/Bacterial species										Total
		CN	AU	CPX	NA	PEF	S	SXT	OFX	PN	CEP	
E. coli	90	5(4.5)	0(0.0)	85(76.5)	0(0.0)	2(18.0)	0(0.0)	5(4.5)	75(67.0)	0(0.0)	10(9.0)	182(6.1)
S. typhi	50	45(90.0)	50(100.0)	50(100.0)	45(90.0)	50(100.0)	40(80.0)	25(50.0)	50(100.0)	45(90.0)	45(90.0)	445(15.0)
Salmonella enteritidis	50	50(100)	40(80.0)	45(90.0)	40(80.0)	45(90.0)	45(90.0)	40(80.0)	50(100.0)	40 (80.0)	40(80.0)	435(14.7)
Vibrio cholera	70	60(90)	65(95.0)	60(90.0)	45(50.0)	10(10.0)	5(5.0)	10(10.0)	70(100.0)	60(80.0)	55(75.0)	440(14.8)
P.vulgaris	40	5(12.50)	30(75.0)	35(90.0)	30(75.0)	10(25.0)	5(12.5)	40(100.0)	35(90.0)	0(0.0)	5(12.50)	195(6.6)
Yersinia enterocolitica	45	40(90.0)	45(100.0)	40(90.0)	45(100.0)	40(90.0)	45(100.0)	35(75.0)	40(90.0)	40(90.0)	35(75.0)	407(13.7)
B. subtilis	85	50(60.0)	50(60.0)	80(90.0)	30(35.0)	65(70.0)	70(80.0)	65(70.0)	80(90.0)	10(2.0)	65(70.0)	565(19.0)
Shigella. dysenteriae	45	40(90.0)	35(70.0)	40(90.0)	25(60.0)	15(30.0)	10(15.0)	30(65.0)	45(100.0)	20(35.0)	35(70.0)	295(9.9)
Total	475	435(14.7)	315(10.6)	435(14.7)	260(8.8)	237(8.0)	220(7.4)	250(8.4)	445(15.0)	215(7.3)	290(9.8)	2964

CN-Gentamicin, AU-Agumentin, CPX-Ciprofloxacin, NA- Niacin, PEF-Pefloxacin S-Streptomycin, SXT-Septrin, OFX-Oflaxacin, PN-Penicillin, CEP- Cephalosporin

CONCLUSION

Antibiograms of bacterial isolates associated with tin mining ponds revealed low susceptibility especially for *Escherichia coli,* to the antibiotics tested. Therefore, water from mining ponds could be a source of antibiotic resistant bacterial species.

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