SOME PATHOGENIC MICROORGANISMS STUDY OF THE OGBOBA CREEK IN WILBERFORCE ISLAND, BAYELSA STATE – NIGERIA

***[1]AGHOGHOVWIA, O .A., SIKPI, E. & [2]ODJEGBAB .O.**

[1]Department of Fisheries and Aquatic Studies/ Animal Science, Niger Delta University, Wilberforce Island, Bayelsa State.

[2]Department of Agricultural Economics and Extension/ Rural Development, Niger Delta University, Wilberforce Island, Bayelsa State.

Abstract:
Pathogenic study of some Micro-organisms from Ogboba Creek which transverses the Niger Delta University (NDU) main campus was carried out. Three sampling stations were selected based on the anthropogenic characteristics that obtain in the respective site from which water sample were collected in plastic bottles bimonthly consecutively for 3 months. Laboratory analysis was done using description of Walley and Hawkes. Data generated showed that highest coli form count (14 CFU/100ml) was obtained in sampling, station I (SS I) while the least was documented at SS III. Both E Coli and Salmonella however had their highest values (157.33 and 92.00 CFU/100ml) for the respective microorganisms in SS III while they equally recorded the least values (78.00 and 64.67 CFU/100ml) respectively in SS 1. Guidelines of statutory bodies (WHO and FEPA) show that the strains of E coli (157) obtained in this study have the capacity to cause illness. The statute is that Salmonella and E Coli (0157) should not be present in any water as they may render the water unfit for human use in any way. The values of micro organisms recorded in this research have therefore portrayed the Ogboba Creek as fallen short of safe standard. This suggests that the Ogboba Creek water is polluted. Measures should be put in place to checkmate the anthropogenic activities that entrenched pollutants into the study area, in order to forestall outbreak of epidemic in the locality.

Keywords: Ogboba Creek, Microorganisms, *E coli*, *Salmonella enterica*, Pollutants, Coliform.

Introduction:

The presence of any foreign substance (organic, radiological or biological) in water which tends to degrade the quality as to constitute hazard and loss of its usefulness is termed pollution (U.S. Public Health Service Commissioned Corps, 2015). In developing countries like Nigeria untreated waste waters are discharged usually directly into creeks, rivers and streams (Asonye *et al*., 2007). The Ogboba Creek like other aquatic environments serves as a reservoir directly or indirectly of wastes or toxicants of various kinds from the immediate surrounding (Brennan, 2008 and Adam, 2001). The opportunity cost of alternative source of waste management in developing countries is what made the natural water bodies a ready deposition (Longe, and Omole, 2008). Unfortunately, it is fatalistic unlike what many people assume that water bodies have unlimited capacity for pollutant assimilation (Chima *et al*., 2010). Pollution tends to be unequivocally more intense in smaller rivers and tidal creeks such as the likes of Ogboba where dilution is less effective. Moreover, it is more likely than not for impact of pollution build up to result to making such water bodies lifeless. The EPA (E.P.A 2006) reported that Bogota and Lapaz Rivers of Ireland were perfect examples of water bodies that have somewhat became lifeless as a result of effluent deposition by man on their banks and watershed.

One of the most frequent types of contaminations in communities of developing countries is faecal pollution from different sources notably from livestock and humans (Fjellheim and Raddum, 2007). The size and shape of pathogenic micro organisms, their surface density, properties and biological activities set them apart, from other contaminants which are transported in surface and subsurface water environment (Lingireddy, 2002). The concentrations of micro-biological contamination indicator organisms observed in ground and surface water, are a function of the contamination source active at that moment (Hynes, 2004). The largest number of faecal *coli form* and faecal streptococci is always present in manure (Walley, and Hawkes, 2003). Hence the presence of either of these microbes in a surface water sample is strong evidence of faecal contamination. The presence of coliform bacteria in water does not necessary indicate water contamination by faecal waste, but the presence of faecal coli form in water may indicate contamination by human sewage or animal dropping (British Columbia Ground water Asso. 2007).The most serious water pollution in terms of human health worldwide, are pathogenic organisms such as Pseudomonas and Salmonella (Cummingham, 2005). This study determined the levels Pathogenic Escherichia coli and Salmonela Encrerica in the Ogboba Creek

Study Area:

The Ogboba Creek is a tidal fresh water creek which has its source from the Nun River at Aya-Ogbo Compound in Amassoma. It runs through the

Ogbodo land via the Amassoma community. The creek continues through the Aforo swamp and turns to Ogborilatei swamp (Ogoibiri Community) and finds its root back to the Nun River at Ikoki-Ama compound Amassoma. Before the establishment of the Niger Delta University (NDU), the Ogboba Creek was used for timbre transportation from adjoining lands and swamps enroute the main (Nun) river. The Ogboba Creek deepest point is about 4m during the rainy/flood period and between 2.8 – 3m deep after flood. The Creek flows through middle of the Niger Delta University (NDU) situated in Southern Ijaw Local Government Area in Bayelsa State Nigeria on latitude 2^0 3^lN and longitude $5^0$$16^l$E.

Materials and Methods

Sampling Stations:

Four sampling stations were chosen in this study based on the kind of activities alongside the effluent deposited at the 4 respective designated stationsj. The sampling stations are on the NDU premises while one which serves as the control is outside the campus at the creek source which served as comparative reference point.

Sampling Station I (SSI):

This is the part of the stretch of the Creek that runs through cropping layout and the Animal husbandry Section (poultry, Piggery, Rabbitry, Cattle, Sheep and goat ranches) of the NDU Teaching and Research Farm. This point of the study receives directly (and first hand) the wash outs of herbicides, insecticides, hormones, and dung's/droppings of animals either through flooding, a drift, or directly. The distance between this station I and SS II is about 80m.

Sampling Station II (SS II):

This is the point of the study where the bridge that links the entrance point of NDU encompassing the faculties of Arts, Science Education and Agriculture to the main faculty and the new site. The station receives directly the sewage waters/effluent of the NDU female hostel as well as those of main administration building that are well connected to the drain channels this station about 120m away from the station I.

Sampling Station III (SS III)

Notable features of this station are NDU Canteen popularly known as Beans Up as well as Laundry characterized by dumping of refuse including remnants food and sewage from washing of food vendors/snacks and dry cleaners. It is about 200m away from the station II.

Sampling Station IV:

This station is situated upstream at the source of Ogboba creek where it is fed by the Nun River. There are basically no human activity at this point.

Sample Collection:

The creek water samples were collected in triplicates from the respective 3 stations monthly between July and August 2015 using plastic bottles which were washed with detergent and rinsed with distilled water and soaked with overnight with dilute nitric acid to remove impurities. The samples were immediately taken to the NDU Laboratory for analysis on each occasion.

Analysis of Samples/Equipments:

Equipment used in the analysis of the pathological E. coli and Salmonella includes Autoclaves, incubator, balance, water distillation apparatus, hose and container, test tubes, racks, media preparation equipments, gas burner and culture tubes. Preparation of media and dilution water for confirmatory analysis was done according to methods described by Walley and Hawkes (2003).

Statistical Analysis:

Data generated were analyzed using the analysis of variance (ANOVA), while the person coefficient was applied to establish a relationship between the parameter.

Results and Data Presentation:

The highest (148 CFU/100ml) and lowest (77 CFU/100ml) coli form numbers were recorded in the station I and III respectively (Table 1). The colony forming units for presumptive total coli form counts of the water, samples obtained at the 3 sampling stations were indication of gross contamination. Equally too, the E coli species were observed to be present at all stations of the study. The colony count ranged between 7-1 with stations 3 and 1 bearing the highest (157.3 CFU/100ml) and lowest (78.00 CFU/100ml) count of 6 – 1 respectively. Although Salmonella and E. coli species were also present in all the samples collected in the study the levels of those obtained at the two stations for both Salmonella and E coli were however in direct opposite of those of coli form. The highest value of Salmonella (92 CFU / 100ml) was recorded in station III while the lowest (64.67 CFU/100ml) was obtained at station I. The study revealed that none of the three pathogenic microorganisms were detected in the SS 4. This is a clear indication that the stations I, II and III are implicated for all values documented at the respective stations. The continuous human and material waste discharged into the creek explains the high values of indicator species recorded. The wide spread

occurrence of pathogenic species in the Ogboba Creek as well as the high concentration of indicator coli form species is also another pointer to a high level of biological pollution. This is intensified by the various anthropogenic activities around the study area which include animal waste droppings/ dungs, sewage deposition from NDU hostels, e.t.c. The Pearson coefficient test was applied to establish a relationship between the parameters. Indicator species showed significant correlation with the pathogenic species both at P< 0.01 and P < 0.05 respectively. There is also statistical significant difference (P<0.05) between water samples obtained from the 4 sampling stations.

TABLE 1: Showing Pathogenic Microorganisms Detected in the Ogboba Creek-Wilberforce Island

	Microorganisms (CFU/100ML)		
Sampling stations	**Coliform**	**Salmonella enterica**	**Escherichi coli**
I	148.00 ± 0.65a	64.67 ± 0.13b	78.00 ± 0.05 b
II	83.00 ± 0.26b	81.33 ± 0.32b	130.33 ± 0.43a
III	77.00 ± 0.21b	92.00 ± 0.38a	157.33 ± 0.69a
IV	N.D	N.D	N.D

N.D: - Not detected. Mean ± SEM in the same column with different superscript differs (P < 0.05) significantly

Discussion:

The highest coli form bacteria count (148 CFU/100m) of the study was obtained in sampling station I. this outcome is however not unexpected owing to the fact that the site receives continually animal dung/droppings from the NDU faculty of Agriculture Teaching and Research farm unit. This findings is in line with the submission of Tortora (Tortora, 2010; Vogt, and Dippold, 2005; Cdc, 2016; Walley, and Hawkes, 2003 respectively. The largest number of faecal coli forms bacteria and faecal streptococci is always present in manure and expelled into the environment with it (Reid *et al*., 2011). The presence of coliform bacteria in water does not necessarily indicate water contamination by faecal wastes. However the various levels of faecal coli form obtained in this study may indicate recent contamination by animal droppings which could contain other bacteria, viruses or disease causing organisms (Reid *et al*., 2011; Hudault *et al*., 2001).

The station II was another source of pollutant entry to the study area which has ensured the prevalent levels. All three biological contaminants (*Coli form, Salmonella enterica and E coli*) detected in the Ogboba Creek pose imminent danger to food contamination (Vogt, and Dippold, 2005). Aghoghovwia *et al.*, 2015 had earlier implicated this sampling station as a pollutant entry point that conveys sewage of the NDU female hostel into the Ogboba Creek. Unlike chemical contaminants there are relatively few microbial standards that exist (Ingledew, and Poole, 1984). It does appear that most strains of E Coli bacteria are harmless; but certain strains such as 0157 (obtained at sampling stations in this study) may cause illness. Generally the Samonella and E Coli 0157 and H7 present in any known quantity may render water unfit for domestic use (WHO, 1985 and FEPA, 1999). This implies therefore that the water of the study area is polluted except those of the upstream which had no human interference. These norms and lawful limits were created to ensure the safety of food/water and their quality.

Conclusion:

The Ogboba creek is an important source of quite a range of aquatic products (fin/ shell fish) which are either consumed locally by fishers or sold in on major markets within Bayelsa State. The creek water at stations I – III supports irrigation of crops notably vegetables which are equally sold within and outside the university community. The import of this study is particularly nervy, as data generated shows that its water does not meet WHO (1985) and FEPA (1999) standards for domestic water use in all micro-organisms tested. The products obtainable from the Ogboba creek at the implicated portions may have also contracted the micro organisms as shown in this study. The colony forming units for the presumptive total coli form count of the water samples were in ranges indicating gross contamination. There is need for environmental and health education at all levels of the society with all stakeholders in the study area, on the implications of reckless channeling of wastes/effluents into the Ogboba creek. Enlightenment campaign must be done. This should include the need for proper disposal of such wastes to prevent imminent danger of possible outbreak of epidemic in the samples obtained at the sampling station as well. The findings of the study could have a far reaching implication of various kinds. It is

imperative therefore for the Bayelsa State government, the NDU management and indeed all stakeholders to put on notice and take precautionary actions to protect lives of people especially those in the immediate environment.

References:

Adam, T.K.S (2001). Regional Hydrological. Research perspective in the Niger Delta *Jn Hydrological Science 46 African Water Journal.*

Aghoghovwia, O.A., Aguoru, C.M and Elijah E.I. (2015). Toxicity of domestic Effluents on Clarias gariepinus fingerlings. *Journal of Advances in Biology and Biotechnology 4(4) 1-6, 2015.*

Asonye, C.C, Okolie, N.P, Okenwa; E.E & Wuanyanwu U.G. (2007). Some physic-chemical characteristics and heavy metal profiles of Nigeria Rivers, streams and waterways. *African Journal of Biotechnology 6(5) 617-624.*

Brennan. A. (2008). Environmental Ethics. The Stanford Encyclopedia of Philosophy . Retrieved Jan. 25 2015 @ http://plato. Stanford. Edu/entries/ethics-environmental/.

British Columbia Ground water Asso. (2007). Water stewardship Information Series, Total, Faecal & E Coli bacteria in Ground water. Retrieved Jan. 25, 2013 @ *http://www.env.gor.bc.ca/wsd/plan Protecl Sustain groundwater/library/ground fact sheet/pdfs/*.

Cdc (2016) National Centre for Emerging and Zoonotic Infectious Diseases.

Chima, G.N., Nwaugo, V.O., & Ezekwe I.C. (2010) Impacts of Rock Quarrying on Akwukwuo Tributary of Ivo River in Ishigy Ebonyi State, NGieria. Journal of Applied Environmental Sci. 6(2) 68 – 73.

Cummingham, W.P (2005). Environmental Science A global concern (8.ed) New York: Mc RGaw Hill.

E.P.A (2006). Water Framework Directive Monitoring Programme. Version. 1. 2006. Prepared to meet the Requirements of EU Water Framework Directive (2000/60/EC) and National Regulations Implementing the water Framework Directive (S.I. n. 722 of 2003) and National Regulations implementing the Nitrates Directive (S.I.N. 788 of 2005) Environmental Protection Agency, Ireland.

Federal Environmental Protection Agency (FEPA) (1999). Guidelines and Standards for Environmental Pollution control in Nigeria, Ministry of Environment, Lagos, Nigeria, 1991.

Fjellheim A and Raddum, G.G (2007). Recovery of acid sensitive species of Ephemeroptera, Plecoptera and Tricoptera after liming in River Audna after liming. Environmental Pollution, 78 (1-3), 173 – 178).

Hudault, S; Guignot J; Servin A.L (2001). Escherichia coli strains colonizing the gastrointestinal tract, Protect germ free mice against Salmonella typhinurium infection Gut 49 (1): 47-55: doi:10; 1136/gut 49. 1.47 PMC 281544. PMID 6127606.

Hynes, H.B.N (2004) A key to adults and nymphs of British Stone flies (plecoptera. Freshwater Biological Asso. Sci. Pub. 17 Retrieved April 21 (2015)@ http// www. Amozon.co.uk/Adults. Nymphs – British stoneflies Plecoptera/dp090386282.

Ingledew, W.J and Poole, R.K (1984). the Respiratory chains of *Escherichia coli.* Microbiological Reviews 48(3): 222-71. PMC 373010 PMID 6387427.

Lingireddy, S. (Ed.) (2002). Control of microorganisms in drinking water. Reston virgin. American society of Civil Engineers.

Longe, E.O and Omole, D.O (2008). Analysis if Pollution Status of River Illo, Ota, Nigeria. The Environmentalist, 28,4.

Reid, G, Howard, J., Gan, B.S. (2011). Can bacteria interference Prevent Infection? *Trends in Microbiology 9(9)* : 424 – 428 dio:10.1016/S0966-842X(01) 02132-1. PMID 11553454.

Abc Tortora, G. (2010). Microbiology. An introduction, San Francisco, C.A. Benjamin Cummings Pp 85-87, 161,165, ISBN 0-321-55007-2.

U.S. Public Health Service Commissioned Corps. U.S. Department of Health and Human Services Retrieved May 23 2015.

Vogt, R L., Dippold, L (2005). *Echerichia coli* 0157HT outbreak associated with consumption of ground beef June-July 2002. *Public Health Reports 120 (2) 174-8. PMC 1497708 PMID 15842149.*

Walley, W.J. and Hawkes, H.A (2003). A Computer-based Reprisal of Biological Monitoring Working Party Scores using data from the 1990 River Quality Survey of England and Wales.

World Health Organization [WHO] (1985). Guidelines for Drinking Water Quality (ii). Health Criteria and supporting information WHO, Geneva Pp:130.