

# Preliminary Investigations On The Physio-Chemical And Microbiological Analysis Of Water From Streams Used For Drinking In Owo Local Government Area Of Ondo State.

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## Abstract

Physical, chemical and microbiological analyses were used to determine the wholesomeness status of seven stream waters used for drinking in Owo. The study revealed that the water were wholesome from chemical analysis point of view while three out of the streams met the WHO recommendation for taste, odour, appearance turbidity and total dissolved solids. Microbiological analysis showed that all the samples had viable count of bacteria above 100cfu/ml, all positive for coliform, *E. coli* and bacterial strains such as *Pseudomonas aureginosa*, *Proteus vulgaris*, *Salmonella ssp*, *Shigella ssp* *Streptococcus faecalis*, *klebsiella pneumonia* were isolated in the water samples.

## INTRODUCTION

The potential of water to harbour microbial pathogens and causing subsequent illness is well documented for both developed and developing countries (Wright et al, 2004). Water like air is one of the most indispensable compounds in life. Water of good drinking quality is of basic importance to human physiology and man's continued existence depends very much on its availability (Nwosu and Ogueke, 2004). It is a universal solvent with supplies from wells, springs, rivers, boreholes, lakes, streams, etc. During passage through the ground it dissolves minerals in rocks, collects suspended and particulate matter particularly organic as well as pathogenic microorganisms from faecal matters. Majority of rural water sources for drinking are still the traditional ones that are dams, wells, rivers, streams, ponds which might harbour waterborne and vector borne diseases (Fenwick, 2006). Water has been associated with transmission of waterborne disease such as diarrhea, cholera, typhoid fever, river blindness among others (Oyeku, 1998). These and other factors make the raw water unfit for drinking without treatment (Raymond, 1992). The extent of treatment needed therefore is determined by the quality of the raw water source (Macrea et al, 1993).

Federal Ministry of Health gave a statistics in 1994 that only about 30% of Nigerian have access to potable water (Dada & Ntukekpo, 1997) while in the same year, United Nations

estimated that 1.2 billion people lacked access to potable water world wide (Oyeku et al; 2001). Stream water is one of the major sources of water for human consumption and domestic uses in Owo Local Government Area of Ondo State, Nigeria. These streams are not potable, and to monitor palatability and safety of this water, the physio-chemical and microbiology analyses must be assessed to see their conformity with regulatory standards. This work serves as preliminary assessment for careful evaluation for physicochemical and microbiological analysis of the streams and hope that the result will provide informative update on the quality of water from these sources in line with World Health Organization (WHO) standards adopted by National Agency For Food Drug Administration and Control (NAFDAC) in Nigeria.

## MATERIALS AND METHODS

**Collection of Samples:** Samples of water from seven streams were selected in Owo L.G.A of Ondo State, Nigeria. The streams were: Obukele, Ijasan, Ogbara, Otapete, Omisadu, Aruwajoye and White house streams flowing around the Owo metropolis.

**Sampling Procedure:** One gap sample was taken manually at each selected stream. The procedure entailed dipping a sterile plastic container into the stream and filling it. Care was taken that no air was let into the sample. The samples

were transported immediately to the Microbiology laboratory of Food Science and Technology department, Rufus Giwa Polytechnic, Owo in iced parked for the analyses.

**Preparation of Culture Media:** The media used for the research work: Nutrient agar, Nutrient broth, Eosin methylene blue, lactose broth, MacConkey, agar, yeast extract, Salmonella-Shigella agar were prepared according to specification from the manufacturer.

**Physico-Chemical Analysis:** Parameters such as appearance, odour, color, taste, PH, total acidity, turbidity were determined using the methods of Edema et al; (2001).

**Microbial Analysis:** The water samples were analyzed bacteriologically for coliform group using multiple tube fermentation technique of Uzuegbu & Eke (2001) and total viable count of bacteria using membrane filtration method of Talaro (2002).

**Characterization and Identification of Isolates:** These were done to species level based on appearance, cultural, morphological, and physiological characteristics with reference to Berger's Manual (Krieg,1984). Biochemical behavior patterns of the isolates were also determined according to the methods described by Fawole & Oso (1995).

## RESULTS AND DISCUSSION

The results of the physical analysis of the water from the seven streams were shown in table1. Analysis for the taste showed that water samples from White house, Ijasan and Ogbara streams had a good taste. This is different from the report of Edema et al (2001) where samples of drinking water in Abeokuta that were analyzed had offensive odour and taste. Also all the streams except the three mentioned earlier did not meet the recommended standard for appearance, odour, turbidity and total dissolved solids. All the water collected were colourless, this parameter depend largely on the time of collection. Table 2 showed the result of chemical and microbiological analyses of the stream waters. It was found out that all the samples met the recommended standard for  $P^H$ , total acidity and hardness. This implies that the streams are wholesome from the chemical point of view.

Result of microbiological analysis showed the presence of coliforms, pathogenic and non coliforms, heterotrophic bacteria including opportunistic pathogens such as

*Pseudomonas aureginosa* *Proteus vulgaris*, *Aeromonas* spp, *Acinetobacter* spp. The presence of these organisms is an indication of contamination of these waters. It is important to note that coliform bacteria are widely found in nature and do not necessarily indicate faecal pollution(Binnie,2002).All the samples were above the WHO Standard of 100cfu/ml being adopted by NAFDAC in Nigeria (WHO, 1996). All the water samples were positive for coliform groups (*Enterobacter* sp and *E. coli*). No yeast/ mould was detected which corroborate the work of Edema et al (2001) that all the water samples in Abeokuta did not meet the microbiological standard set by WHO. The presence of coliform group and *E.coli* is chiefly due to faecal contamination and it is an indication of the likely presence of other pathogenic bacteria like *Salmonella* spp, *Shigella* spp and *Streptococcus* spp which are capable of causing very serious diseases. Talaro (2002) reported that the presence of coliform in water comes from the pollution of water with human excrement. Apantaku et al; (1998) also noted that perhaps the greatest danger associated with drinking water is contamination by human faeces. This singular reason renders the streams unfit for human consumption without proper sterilization. The study deduced that the stream from white house has the best quality even though it does not meet the WHO standards, but with proper sterilization methods it may be considered for human consumption.

## CONCLUSION AND RECOMMENDATION

With the physio-chemical qualities of the streams they are only suitable for agricultural uses while microbiologically the streams are unsafe and unsuitable for domestic use. Consumption of the water will expose the consumer to waterborne disease. There is urgent need for awareness to be created about the present situation of these streams to alert consumers on the need for further treatment of these water before they can be used for drinking and other domestic uses.

**Figure 1**

**TABLE 1: PHYSICAL ANALYSIS OF STREAMS IN OWO PROVINCE OF NIGERIA**

Parameters	WHO STANDARD	Odukele	Ijasan	Ogbara	Otapete	Omisodu	Anuagboye	White house
Appearance	Clear	Not clear	Clear	Clear	Not clear	Not clear	Not clear	Clear
Odour	Odourless	Offensive Odour	Odourless	Odourless	Foul odour	Foul odour	Foul odour	Odourless
Taste	Tasteless	Foul taste	Tasteless	Tasteless	Foul taste	Foul taste	Foul taste	Tasteless
Colour		COLOURLESS		COLOURLESS		COLOURLESS		
Turbidity (NTU)	5	6	4	3	6	6	6	2
Total dissolved solid (mg/l)	200	242.0	111.7	120.1	232.0	266.2	213.4	90.2

**Figure 2**

**TABLE 2: CHEMICAL AND MICROBIOLOGICAL ANALYSIS OF STREAM IN OWO PROVINCE OF NIGERIA**

Parameters	WHO STANDARD	Obutele	Ilesan	Ogbara	Otapete	Omsodu	Anuwajoye	White house
<b>CHEMICAL</b>		<b>CHARACTERISTICS</b>						
pH	6.6 – 8.5	7.3	6.7	6.9	7.1	7.2	7.4	6.8
Total Acidity	NOT DETECTED							
Total Hardness (mgCaCO <sub>3</sub> /l)	100	58.7	46	64.5	86.3	88	60.3	30.1
<b>MICROBIOLOGICAL</b>		<b>CHARACTERISTICS</b>						
Total plate count	100	184	132	147	210	166	186	117
Coliform count	0	7	8	7	8	7	5	4
E.coli	0	5	4	4	5	6	4	3
Yeast/mould Count	0	NOT	ISOLATED					

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