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Some Microbiological Characteristics of Water from Arinta Water Falls in Ipole- Iloro Ekiti, Nigeria

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Six samples of water along the channel of Arinta Water Falls in Ipole- Iloro Ekiti, Nigeria were evaluated for microbiological parameters. Sites of sample collection were six (M_1-M_6) and a distance of 0-477cm in the channel. The most probable coliform number (MPN) ranged from 17-1600 and all the samples contained *Escherichia coli*. The presence of both high MPN and *E.coli* made the samples unsuitable for potability unless chemically treated.

Key words: Arinta Water Falls, microbiological evaluation, water unpotable.

A scary picture of access to safe drinking water has been unveiled. In Nigeria, the 2004 National Demographic and Health Survey (NDHS) showed that 55 million Nigerians or 42 percent of the population lack access to improved water supply sources. Poor water is the major cause of diarrhoea, typhoid fever and other water-borne diseases says President, Board of Trustees of the Society for Family Health (SHF)[1]. It was noted that a survey in 2001 conducted by the National Planning Commission with the support of UNICEF, estimated that only 29 percent of villages has access to hygienic water[1].

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Clean, safe water is a critical component in fostering good health for all mankind. The United Nations has underscored its importance by earmarking as one of the Millennium Development Goals (MDGs) the reduction by half of the present number of people worldwide who lack access to safe drinking water by 2015[1].

As a potential carrier of pathogenic microorganisms, water can endanger health and life[2]. Pathogens which cause infections of the intestinal tract namely typhoid, paratyphoid fevers, dysentery, cholera and enteric viruses are most frequently transmitted through water. The organisms that cause these diseases are present in the faeces or urine of an infected person and when discharged, may enter a body of water that ultimately serves as a source of drinking water. Furthermore, prevalence of animal faeces, soil run-off, refuses and other dangerous substances cause frequent contamination of many commonly used water sources, such as rivers, wells, streams and ponds. This explains why most of the naturally occurring water is not potable enough for human consumption[3]. In Nigeria, two million children die every year from disease caused by

drinking unsafe water and about 72 million people do not have access to clean potable water[1].

Natural water supplies, particularly streams and rivers are likely to be polluted with domestic, agricultural and industrial wastes which become unfit for drinking once it contains human sewage, animal waste and chemical waste[3]. Many bacteria are found in water, most of which are of no sanitary significance. While few pathogenic microorganisms may be tolerable in a water supply, the presence of specific indicator organisms signals that a given water source might be contaminated with pathogens[4].

This report concerns some microbiological studies in the Arinta Water Falls stream located in Ipole- Iloro Ekiti, Ekiti State, Nigeria. The description of the Arinta Water Falls location had earlier been reported[5]. In the report, the mineral composition of soil, plants, water and total bacteria count and some physico-chemical characteristics from Arinta Water Falls were evaluated[5]. The present report is on the evaluation of the microbiological characteristics of the Arinta Water Falls stream, Ipole-Iloro Ekiti, Nigeria.

MATERIAL AND METHODS

Collection of samples

Six different samples of water were collected along the sampling sites (at intervals) which lied along the course of the stream. Details of interval of sample collections are shown in Table 1.

Water samples were collected with clean, sterile one litre wide- mouthed plastic bottles previously leached with 1:1 HCl. The bottles were fitted with screw caps and the stopper and neck of the bottle were protected with aluminium foil. Bottles were rinsed with appropriate sample before being filled. Appropriate labels are shown in Table 1.The work was carried out under aseptic techniques. The water samples were stored in the refrigerator until analysed.

EXPERIMENTAL

The most probable number of coliform per 100ml of the water samples were determined using a procedure as described by Olutiola *et al.* [6] and Harrigan and McCance[7]. Isolation of enteric bacteria was carried out on Eosin Methylene Blue agar (EMB). The bacterial isolates were identified as described by Barrow and Fetthan[8].

RESULTS AND DISCUSSION

Table 1 shows the distances of water sample collections. The distance ran from 0.0 meter (where the water falls down) and 477cm

Table 1. Sampling sites of water from Arinta Water Falls

Sampling sites designation	Distance (cm)
M_1	0
M_2	77
M_3	231
M_4	308
M_5	462
M_6	477

Table 2. Most probable coliform number (MPN) in Arinta Water Fall samples

Sample	Quantity of water per tube Number of tubesused 10ml	2.5ml 5 1.0ml	1.0ml 5 0.1ml	MPN
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
M_1	AG[a] -[b] AG AG -	- - AG - -	AG - AG - -	17
M_2	AG AG - - AG	AG - - - AG	- AG - - -	17
M_3	AG AG AG AGAG	AG AG AG AGAG	AG AG AG - AG	1600
M_4	AG - AG AG AG	- AG AG - AG	- - - - AG	35
M_5	AG AG AG AGAG	- AG - - -	- - - AG -	45
M_6	- AG AG AG AG	AG AG AG AGAG	AG AG - - -	55

[a] Acid/gas production. [b] No acid/gas production.

where the water channel broke into two channels. Total number of sample was six. The site of sample collection was determined by the ease of collection.

Coliform count per 100ml of water sample from Arinta Water Falls stream ranged between 17 to 1600 (Table 2).Water samples M_1 and sample M_3 showed the highest coliform count. Water samples M_4, M_5 and M_6 have coliform count of 35, 45 and 55 respectively. Increase in coliform count might be due to the gradual rate of decomposition of organic materials as the stream flows down the fall. From our previous report, M_3 had the highest level of nitrate (4.4 ppm) and second highest level of phosphate (6.4 ppm) whereas M_1, M_2, M_4, M_5 and M_6 had one of the two parameters low or not detected[5] .According to Geldriech *et al.*[9] drinkable water must not contain more than one coliform per 100ml (MPN).However, the WHO[10] standards says MPN in potable water must be zero. Therefore the water sample does not meet the acceptable standard for potable water. This indicates that the water needs further treatment to meet human consumption.

The presence of *E. coli* indicates faecal contamination which may be attributed to both human and animals defaecating around or along the flowing line of the stream. This is in correlation with Stukel *et al.*[11] who reported that variety of water borne disease outbreaks have been attributed to untreated groundwater containing pathogenic forms of bacteria, viruses, or eucaryotic organisms.

Table 3. Sugar fermentation test[a] and gram staining results

Parameter	Samples					
	M_1	M_2	M_3	M_4	M_5	M_6
Gram staining	-ve	-ve	-ve	-ve	-ve	-ve
Glucose fermentation	+ve	+ve	+ve	+ve	+ve	+ve
Galactose fermentation	+ve	+ve	-ve	+ve	-ve	-ve
Starch fermentation	+ve	+ve	-ve	+ve	-ve	-ve
Fructose fermentation	+ve	+ve	+ve	+ve	-ve	-ve
Lactose fermentation	+ve	+ve	+ve	+ve	+ve	-ve
Maltose fermentation	+ve	+ve	+ve	+ve	+ve	+ve
Mannitol fermentation	+ve	+ve	-ve	+ve	+ve	+ve

[a] After 24 h; +ve (fermenter); -ve (non-fermenter).
Not shown here: All microorganisms in the water samples were catalase positive, oxidase positive and coagulase negative.

Table 4. Results of confirmed tests for the presence of *Escherichia coli*

Sample	2.5ml					1.0ml					0.1ml				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
M_1	+a	+a	-b	-b	+a	+a	+a	+a	-b	-b					
M_2		-b	-b	-b			-b		-b						
M_3		+a		+a				-b							
M_4	+a	-b	-b	+a							+a		-b		
M_5	-b	-b	+a			-b	-b	-b	+a			+a			
M_6				+a			+a								

+a = *E.coli;* -b = *Aerobacter aerogenes.*

CONCLUSIONS

This report shows the need for the treatment of Arinta Water Falls stream chemically before drinking it. Human faecal waste should also not be allowed anywhere near the water. There is also the need for the state government to provide potable water for the people of Ipole-Iloro Ekiti, Nigeria to avoid the consequences of drinking contaminated water.

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