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BACTERIAL QUALITY OF DIFFERENT BRANDS OF SACHET WATER SOLD IN FEDERAL UNIVERSITY OF TECHNOLOGY CAMPUS, IMO-STATE, NIGERIA

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ABSTRACT

Drinking water regulations require that potable water for human consumption be free from human disease-causing bacteria and specific indicator bacteria such as coliforms and E. coli. Under total asepsis and using standard procedures bacterial analysis of the Six (6) brands sachet of water produced from FUTO campus were done. The different brands of sachet water analysed were devoid of coliforms and E. coli which indicates that the laboratories for the production of these sachet water to a good extent are kept in good conditions that do not encourage bacteria growth. However, after 72hrs micro-organisms grew on all the sachet water samples except in malyn sachet. Results of total bacteria content of the water samples showed that malyn sachet water has the lowest with 27 x 10^{-1} cfu/ml and Aljonlife sachet water had the highest with 328 x 10^{-1} cfu/ml. *Bacillus subtilis* and *Staphylococcus epidermis* were detected. This is of public health significance. National Agency for Food and Drugs Administration and Control (NAFDAC) should embark upon routine unannounced checks, monitoring the production processes of sachet water by their producers. Also random testing of market samples will be a good way of detecting whether the water quality is meeting the required standards.

KEYWORDS: Indicator bacteria; Sachet water; total asepsis; total bacterial count; standard procedures; public health significance

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INTRODUCTION

Water is a transparent fluid which forms the world's streams, lakes, oceans and rain, and is the major constituent of the fluids of living things[1]. Due to lack of adequate access to drinking water, humans tend to use sources contaminated with disease vectors and pathogens or unacceptable levels of toxins or suspended solids. Drinking or using such water in food preparation leads to wide spread of acute and chronic illnesses, which as dysentery, diarrhoea, typhoid fever, cholera, and other diseases such are major cause of death and misery in many countries[2]. Reduction of water borne diseases is a major public health goal in developing countries[3]. The threat of such disease transmission becomes more serious as the population density increases and more sewage pollutes public water supplies, carrying with it human intestinal pathogens[4].

Coliform bacteria describe a group of enteric bacteria that include as *Escherichia Coli, Klebsiella*, species and *Enterobacterer* species[5]. They are gram negative, facultative anaerobes and non spring rods that may be motile or not which ferments lactose with the production of acid and gas when incubated at 37^{o}C [6]. Detection of coliforms is used as an indicator of sanitary quality of drinking water or as a general indicator of sanitary condition in the food-processing environment. However, Escherichia coli is the most preferred faecal coliform used in assaying water quality. It also does not grow and reproduce in the environment. As a result, it is considered to be the species of coliform bacteria that is the best indicator of faecal pollution [6]. They also indicate the possible presence of pathogenic bacteria, viruses and protozoans[7].

The quest for safe drinking water in developing countries over the years using Nigeria as a case study has led to the commercial production of drinking water in easy to open 50-60ml polyethylene bags known as sachet water also known as pure water. In Federal University of Technology Owerri (FUTO), notwithstanding the provision of potable water by the school via man-power boreholes and pipe borne tap water, which are mainly located at the hostel premises. The sources of drinking water are apparently inadequate to provide water for the whole school. Especially provision of drinking water in academic areas such as offices, schools and lecture halls located away from the hostel has been a big challenge for the staff and students. As an alternative to help bridge the gap of inadequacy of safe drinking water, sachet water with low cost price readily became an available alternative for water provision in the school campus. Sachet water although easy to serve and the price is affordable, complains abound on its purity, quality control of its standard and other health concerns.

This paper is aimed at creating awareness to the teeming populace of FUTO on the state of affairs of the sachet water industries with respect to purity safety, and fitness for human consumption.

MATERIALS AND METHODS

Sample collection

Six (6) different brands of sachet water, three (3) samples each were randomly bought from cafeterias, eating places and mini shops in Federal University of Technology (FUTO). Hence a total of eighteen (18) samples of sachet water were assembled. The samples were collected in good conditions (for instance, there was no visible opening on the sachet bag). The samples were taken to the laboratory within 1hr of collection and were held refrigerated at 50^{0}C until examined.

Bacteriological analysis under total asepsis and using standard 1ml of each water sample was aseptically transferred into well labeled plastic disposable Petri dishes. 20ml of sterile molten agar (Nutrient Agar, Sabouraud Dextrose Agar and McConkey Agar) cooled to 45^{0}c was aseptically poured into the plates and mixed by swirling method to attain a uniform mixture. The plates were allowed to solidify on the bench. Nutrient agar plates were inverted and incubated in the incubator at 37^{0}c for 24hrs, 48hrs and 72hrs. Sabouraud dextrose agar plates were incubated at room temperature for four days while McConkey Agar were inverted and incubated at 37^{0}c for 48hrs. Representative colonies of the bacterial isolates were purified, characterized and identified based on their cultural, morphological and biochemical properties as described by Cowan[8].

RESULTS

Results for analyses of Coliforms in water samples (Table 1) reveal that all the samples were negative for coliforms.

Table 1: Results for analyses of coliforms in water samples

S/N	Sample	Growth after incubation Macconkey Agar		
		24hrs	48hrs	72hrs
1	Wilnelly	- Ve	- Ve	- Ve
2	Prephil	- Ve	- Ve	- Ve
3	Apex	- Ve	- Ve	- Ve
4	Hephzzy	- Ve	- Ve	- Ve
5	Alijonlife	- Ve	- Ve	- Ve
6	Mayln	- Ve	- Ve	- Ve

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Results using nutrient agar and sabouraud dextrose agar (Table 2). Water samples incubated with nutrient agar showed growth with the exception of Malyn brand which still turned out negative after 72hrs. Sabouraud dextrose agar inoculated with the water samples were collected for 4days and all the samples turned out negative as could be seen from Table 2.

Results of total bacterial count (Table 2), for nutrient agar (NA), Malyn sachet water had no count, the lowest from the plates was prephil sachet water with 27 x 10^{-1} cfu/ml and the highest was aljonlife sachet water with 328 x 10^{-1} cfu/ml. Sabouraud Dextrose Agar (SDA) cultured plates had no count.

Table 2: Results of bacterial analysis of the water samples using nutrient agar and Sabouraud Dextrose Agar

GROWTH AFTER INCUBATION

		NA			SDA			
	24	48hrs	72hrs	96hrs	24	48hrs	72hrs	96hrs
1	Wilnelly	-ve	-ve	+ve	-ve	-ve	-ve	-ve
2	Prephil	-ve	-ve	+ve	-ve	-ve	-ve	-ve
3	Apex	-ve	-ve	+ve	-ve	-ve	-ve	-ve
4	Hephzzy	-ve	-ve	+ve	-ve	-ve	-ve	-ve
5	Aljonlife	-ve	-ve	+ve	-ve	-ve	-ve	-ve
6	Mayln	-ve	-ve	-ve	-ve	-ve	-ve	-ve

NA= nutrient agar SDA = sabouraud agar

Dextrose Agar (SDA) cultured plates had no count.

Table 3: Results of total bacteria count of the water samples.

TOTAL BACTERIA COUNT

S/N	SAMPLES	NA	SDA
1	Wilnelly	252 x10^{-1}cfu/ml	No count
2	Prephil	27 x 10^{-1} cfu/ml	No count
3	Apex	134 x 10^{-1} cfu/ml	No count
4	Hephzzy	140 x 10^{-1} cfu/ml	No count
5	Aljonlife	328 x 10^{-1} cfu/ml	No count
6	Malyn	No count	No count

DISCUSSION

Drinking water regulations require that potable water for human consumption be free from human disease-causing bacteria and specific indicator bacteria that are indicative of pathogens such as coliforms and *E. coli*. The brands of sachet water analyzed were devoid of coliforms and *E. coli* which indicate that the laboratories for the production of these sachet water to a good extent are kept in good conditions that do not encourage bacteria growth. This result tallied with Ajayi [9], when they worked on packaged water in Abeokuta. None of the water samples tested showed coliform counts indicating adequacy of treatment for microbiological safety for drinking purposes. However, after 72hrs, micro-organisms grew on all the sachet water samples except in malyn sachet water which was devoid of micro-organisms. This may be as a result of poor hygiene practices or carelessness of workers at the production site.

Bacillus subtilis were dictated to be found in Wilnelly, Prephil, Hepzzy and Aljolife sacket water. This bacterium is only known to cause disease in severely immune – compromised patients, and can conversely be used as a probiotic in healthy individuals. It rarely causes food poisoning[10]. Staphycoccus epidermidis was suspected to be found in Apex, Hephzzy and Aljonife sachet water. Infections caused by *Staphylococcus epidermidis* include endocarditis, cerebrospinal fluid shunt infections, peritoneal dialysis, *bacteraenia* etc [10].

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CONCLUSION AND RECOMMENDATION

This study has shown that the microbiological parameter of the different brands of sachet drinking water solid in FUTO met world health organization standards for coliforms and *E. coli*. However after 72hrs *Bacillus subtilis* and *Staphylococcus epidermidis* were dictated in some of the water samples. Continuous check on the quality analysis of these brands of sachet water from time to time is needful to ensure that standards are always met.

National Agency for Food and Drugs Administration and Control (NAFDAC) should embark upon on routine unannounced check, monitoring the production processes of the sachet water by their producers. These producers must adopt strict hygiene practices. The random testing of market samples will be a good way of detecting whether the water quality is meeting the required standards.

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