Evaluation of Bacteria Obtained from Private Well Water within Akungba-Akoko

Adeoyo, O.R.1* and J.O. Omaku1

1Department of Microbiology, Adekunle Ajasin University, P.M.B. 001, Akungba-Akoko, Ondo State, Nigeria.

*Corresponding author:
O.R. Adeoyo
Department of Microbiology,
Adekunle Ajasin University, P.M.B. 001,
Akungba-Akoko, Ondo State,
Nigeria.
Email: olusegun.adeoyo@aaua.edu.ng

ABSTRACT
Availability of potable water is important for healthy living. Domestic water is usually supplied to homes through private wells, boreholes and public water companies. This study aimed at evaluating bacteria from private well water samples which serves as a major water source in the study area (Akungba-Akoko). Samples were subjected to total bacterial and coliform counts using nutrient agar and eosin-methylene blue (EMB) respectively. All isolates were identified based on their morphological and biochemical characteristics. This was followed by antibiotics sensitivity test (AST). The result showed that total bacterial count ranged from 4.0 × 10^3 CFU/mL to 22.5 × 10^3 CFU/mL while total coliform count ranged from 1.0 × 10^0 CFU/mL to 7 × 10^0 CFU/mL. Gram positive bacteria belonging to the following genera; Bacillus, Corynebacterium, Enterococcus, Micrococcus, and Staphylococcus were obtained, while Gram negative bacteria include; Alcaligenes, Campylobacter, Citrobacter, Enterobacter, Escherichia, Klebsiella, Pseudomonas and Salmonella. Enterobacter and Pseudomonas had the highest percentages of occurrence of 15%. P. pseudomallei had the highest sensitivity to ofloxacin (23 mm), followed by P. fluorescens (22 mm) and C. freundii (22 mm) while B. subtilis was susceptible to ciprofloxacin, erythromycin, levofloxacin. The result showed high level of bacterial contamination in all samples tested. The coliform count of all water samples exceeded the recommended level of zero. Hence, there is the need for proper wells water maintenance, control and improve hygienic practices by the households and individuals to help solve the risk of disease outbreak.

INTRODUCTION
Water supplied to public by water companies is safe to drink and does not pose health risk. Water of good drinking quality is of basic importance to human physiology as well as indispensable to man’s continued existence. It is usually treated to make sure it is free from germs before supplying to homes [1]. Lack of safe drinking water is a threat to public health and well-being of the people and exposes them to risk of water borne diseases such as diarrhoea and dysentery as well as chemical intoxication [2, 3]. Water serves as a natural medium for the growth of microorganisms. Safe water is an indispensable resource that is becoming increasingly due to increase in world’s population [4]. The growth of microorganisms in water depends on amount of available mineral nutrients and the dissolved oxygen. It has been estimated that between 1.1 and 2.6 billion people lack access to clean water and adequate sanitation respectively [2, 5]. In 1997, WHO reported about 40% deaths in developing countries occur due to infection from water related diseases [6, 7]. Well water is one of the common water supply sources and it is often unpolluted as a result of restricted movement of pollutants in the soil profile [7]. Many communities in Nigeria depend on well water as their major source of water supply [8].

Specific groups of microorganisms are used as indicator organisms to determine the level of pot-ability or level of purity. Similarly, there are some environmental factors that influence the distribution patterns of these organism are the coliform bacteria. The presence of E. coli in drinking water indicates presence of coliform contaminant [9]. When fecal coliforms (e.g., E. coli) are found in water sample, it indicates contamination by human or animal waste. E. coli can cause nausea, diarrhoea, and it is commonly associated with food poisoning. Fecal coliforms can be found in wells through direct discharge of waste from mammals and birds, agricultural and human sources [10]. This could also happen due cracks in the well or to nearness to wooded areas, pastures, feedlots, septic tanks, and sewage plants [11]. Also, in developing countries 1.1 billion people still defecate in
Physical parameters such as pH, temperature, colour, and odour

RESULTS

Water sanitation and hygiene interventions prevent intestinal parasitic infections, and these infections have synergistic effects with malnutrition [13]. Various studies have documented how access to safe water, sanitation and adequate hygiene can predict child growth and malnutrition [14, 15, 16]. Water sanitation facilities need to be accompanied by proper hygiene can predict child growth and malnutrition [14, 15, 16]. Various studies have demonstrated that poor water quality has a significant impact on the health of the population, particularly children [13]. Therefore, the study period.

Identification of bacterial isolates

Cultural, morphological and biochemical characteristics of each isolate on agar media were determined [19, 20, 21]. The results were compared with those in Bergey’s manual of determinative bacteriology [22].

Antibiotic sensitivity test

The agar plate was allowed to stand for 1 h before applying antibiotics sensitivity disc, each disc was applied aseptically and was lightly pressed down so the disk can make contact with the surface of agar. The plates were then incubated at 37°C for 24 h. Result was observed by measuring the zone of inhibition of each disk as resistant, intermediate and susceptible [23].

RESULTS

Physical parameters such as pH, temperature, colour, and odour of samples were measured. The value of the samples indicated that the pH and temperature for all samples collected ranged from pH 6.9 to 8.0 and temperature 28 to 32°C. All the water samples collected were clear except well water collected from Akungba (1 and 2) and all water samples were odorless (Table 1). After incubation for 24 h at 37°C, colonies formed on the nutrient agar plates were counted. IBK2 had the highest bacterial count while PS2 and IBK1 had the lowest bacterial count. For coliform count, colonies formed on EMB agar plates were counted after incubation for 24 h at 37°C (Table 1). A total of 20 bacterial species belonging to 13 genera were obtained, 14 were Gram-negative and 6 were Gram-positive bacteria (Tables 2 and 3). Enterobacter and Pseudomonas had the highest percentages of occurrence of 15% (Table 2). Table 2 shows antibiotic susceptibility pattern. P. pseudomallei had the highest sensitivity to ofloxacin (23 mm), followed by P. fluorescens (22 mm) and C. freundii (22 mm). Similarly, C. freundii (22 mm) was sensitive to perflloxacin, P. putida was sensitive to streptomycin (tricladophorin/sulfamethoxazole) and K. oxytoca was sensitive to gentamycin (23 mm). Among Gram-positive bacteria, B. subtilis was susceptible to ciprofloxacin, erythromycin, levofloxacin and gentamicin while most of the isolates were resistant to ampiclox, rifampicin, amoxacin, streptomycin, norfloxacin, and chloramphenicol except S. aureus, and M. luteus was susceptible to only ciprofloxacin (21 mm). E. faecalis had intermediate activity against ciprofloxacin (20 mm), erythromycin (20 mm), levofloxacin (19 mm), and gentamicin (17 mm) (Table 3).

MATERIALS AND METHODS

Sample collection

Six well water samples were collected randomly in Akunba-Akoko, Ondo State, Nigeria. Sterile bottles were tied with a strong string to a piece of metal of about 450 g. Bottles caps were aseptically removed and the weighted bottle was lowered into the well to a depth of about 10-20 cm. Each bottle was brought out and covered with a screw cap ensuring no air bubbles inside. Samples were immediately transported in an ice-pact container to the laboratory of Department of Microbiology, Adekunle Ajasin University, Akungba-Akoko and stored at 4°C throughout the study period.

Physicochemical parameters, bacterial and coliform counts

Temperature and pH of the well water samples was measured using a thermometer a pH meter respectively. Total bacterial count in water samples was estimated by adding 1 mL of each sample collection

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This agreed with the report of Efuntoye and Apanpa [28], such as diarrhoea [26, 27].

The microbiological analysis of well water is important to detect and evaluate pathogenic organism especially those causing diarrhea which constitute health hazard in water. This study serves as a guide to monitor and protect well water sources in the study area. Also, presences of some bacterial species indicated the presence of contaminants which may be linked to human activities in such an environment; these include surface run-off of the water. Therefore, other and related studies are needed to be carried out to understand the extent of water contamination and prevention.

**CONCLUSION**

Microbiological analysis of well water samples in the present study showed a high level of bacterial contamination. The coliform count exceeded acceptable limit which makes the water unfit for consumption and related use. Also, bacteria isolated from the various samples were mostly enteric organisms and potential pathogens of public health concern. There is the need for proper well water maintenance, environmental sanitation around the well areas and improved hygienic practices by every household and individual to help reduce the risk of disease outbreak. Therefore, it is recommended that well water in the study area should be well managed and treated properly before drinking. Enforcement of sanitary laws and further research should be done. Finally, appropriate agencies should embark on rapid enlightenment campaign to educate the populace living in Akungba-Akoko on the effects of consuming contaminated water and how to prevent contamination.

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**CONFLICT OF INTEREST**

Authors declared no conflict of interest.

**REFERENCES**


