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Contamination Of Sachet Water Produced Within Industrial Area Of Ikeja, Lagos Nigeria.

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Abstract

Industries produce a lot of pollutants and effluent which have effects on the quality of earth water. The effect of these pollutants and industrial effluent in sachet water produced in industrial area of Ikeja was studied. This was done by assessing the physical parameters and inorganic constituents. Six samples of sachet water produced within Ikeja were randomly purchased from the open market and were examined in the course of the study. Results obtained showed that the samples were odorless and tasteless. The turbidity varied between 0.11 to 0.91NTU. The conductivity ranged from 309 to 642µs, while pH ranged from 4.96 to 6.5. It was observed that the sachet water samples were acidic and high in calcium and magnesium ions probably due to the discharged from the industries.

Keywords: Effluent, Industry, Pollutants, Sachet water.

1. Introduction.

Majority of the world's population, especially in most parts of Africa and Asia, do not have access to safe drinking water with about 6 million children dying daily as a result of waterborne diseases linked to scarcity of safe drinking water or sanitation (TWAS, 2002). WHO (2004)

Sachet water is widely consumed by over 70% of Nigerians due to its availability and affordability without much interest in the purity and safety of these sachet water. Sachet water factory spring up on daily bases across the state due to the viability of the business. Unfortunately some of these factories are situated in industrial area where effluents are released into the ground and thus contaminate ground water which is the main water source for the production of sachet water. Pollutants are also released into the air that get dissolved in rain and sip into the ground.

The most serious source of pollution of water is contamination by human waste from latrines and septic tanks resulting in increased levels of microorganisms, including pathogens. Other likely sources of contamination include runoffs, agrochemicals such as pesticides and nitrates used on farm lands and industrial effluents. Seepage from effluent bearing surface water would readily contaminate water source located close to the surface water.

Water bodies are known to be the primary means of disposal of waste especially from industries close to them (Adekunle et al 2008). Ikeja is an industrial area in Lagos with most of the companies emitting toxic substances into the air and effluents into the soil. Sangodoyin (1991) showed that effluents discharge alters the physical,

chemical and biological nature of receiving water body. Some of these effluents contain heavy metals and small amounts of these heavy metals are common in our environment, diet, and the air. They are actually necessary for good health, but large amounts of any of them may cause acute or chronic toxicity (poisoning). Heavy metals cannot be degraded or destroyed and as such they are hazardous because they tend to bio accumulate.

Heavy metals can enter water supply by industrial and consumer waste, or even from acidic rain breaking down soils and releasing heavy metals into streams, lakes, rivers, and groundwater. Once in the body they do damage on the cellular level by causing dangerous free radicals production. The damage that they cause on the cellular level can result into cancer and many other diseases. Heavy metal toxicity can also result in damaged or reduced mental and central nervous function, lower energy levels, and damage to blood composition, lungs, kidneys, liver, and other vital organs. The heavy metals that we focus on (lead, cobalt, chromium, zinc and copper) cause damage to the intestinal tract. Repeated long-term contact with some metals or their compounds may even cause cancer (International Occupational Safety and Health Information Centre 1999).

If unrecognized or inappropriately treated, toxicity can result in significant illness and reduced quality of life (Ferner 2001). Conversely, in developing countries like Nigeria, many have died from heavy metal toxicity; largely owing to ignorance and negligence on the part of the Government.

Symptoms indicative of acute toxicity is not difficult to recognize because the symptoms are usually severe, rapid in onset, and associated with a known exposure or ingestion (Ferner 2001): cramping, nausea, and vomiting; pain; sweating; headaches; difficulty in breathing; impaired cognitive, motor, and language skills; mania; and convulsions. The symptoms of toxicity resulting from chronic exposure (impaired cognitive, motor, and language skills; learning difficulties; nervousness and emotional instability; and insomnia, nausea, lethargy, and feeling ill) are also easily recognized; however, they are much more difficult to associate with their cause. Symptoms of chronic exposure are very similar to symptoms of other health conditions and often develop slowly over months or even years. Sometimes the symptoms of chronic exposure actually abate over time, leading the person to postpone seeking medical attention, thinking the symptoms are related to something else. Amitai Y. et al 1991 have established that several cases of paediatric lead poisoning have been documented. Roberts 1991 also documented that Lead accounts for most of the cases of paediatric heavy metal poisoning (Roberts 1999). Water from deep ground water may have fallen as rain many years ago, however soil and rock layers naturally filter the ground water to a high degree of clarity and often requires no additional treatment other than adding chlorine or chloramines as secondary disinfectants. Such water may emerge as springs, or may be extracted from boreholes or wells. Deep ground water is generally of very high bacteriological quality (i.e. pathogenic bacteria or the pathogenic protozoa are typically absent), but the water may be rich in dissolved solids, especially carbonates and sulphate of calcium and magnesium. There may be a requirement to reduce the iron or manganese content of this water to make it acceptable for drinking, cooking, and laundry. Where groundwater recharge is practised (a process in which river water is injected into an aquifer to store the water in times of plenty so that it is available in times of drought), water for domestic use may require additional treatment depending on applicable state and federal regulations. Nigeria has her regulations on portable water.

2. Materials and Methods.

Sachet water whose factories were situated in Ikeja area of Lagos were purchased from the open market and used in the study. Water samples were collected into clean sterile 250ml sampling bottles as described by WHO (1997). The pH, colors, turbidity, temperature, total Hardness, calcium hardness, magnesium hardness, chloride and conductivity were determined.

3. Results

The physical characteristics of the sachet water samples are shown on Table 1. This revealed that the physical characteristics of the samples were within acceptable limits. Table 2 showed the inorganic parameters of the water sample.

Table 1 This table shows the physical parameters of the sachet water.

parameters	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F	WHO STANDARDS
pH @ 20^{o}C	5.92	5.80	5.84	6.50	5.31	4.96	6.50-8.5
Odor	-	-	-	-	-	-	Unobjectionable
Taste	-	-	-	-	-	-	Unobjectionable
Temperature 0 Celsius	28	28	28	28	27	27	-
Turbidity (NTU)	0.11	0.15	0.21	0.20	0.91	0.81	5.0

From the above table all the six samples were colorless and odorless and tasteless. The pH ranged between 4.96-6.50 which is below the minimal limit of 6.50. The turbidities for the six samples ranged between 0.11-0.91 NTU which are within the specification.

Table 2 shows inorganic constituents

parameter	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F	WHO STANDARDS
Chloride (Cl) mg/L	109	178	183	155	230	222	200
Chromium (Cr6+) mg/L	0.21	0.14	0.10	0.13	0.15	0.17	0.05
Cobalt	1.6	1.4	1.3	1.3	1.6	1.5	
Conductivity µS/cm	309	504	642	631	400	456	900
Copper (Cu+2) mg/L	1.31	1.30	1.31	1.31	1.35	1.30	2.0
Hardness (calcium)mg/L	12.01	7.21	4.81	11.61	5.60	8.01	NS
Hardness (magnesium)	4.396	2.64	1.76	4.25	2.05	2.93	NS
Hardness (total)	30	18.02	12.01	29.03	14.01	20.02	100

Magnesium +2 mg/L	0.10	0.10	0.10	O.10	0.10	0.10	20
Iron (Fe+2) mg/L	0.2	0.2	0.2	0.1	0.2	0.1	1
Lead (Pb) mg/L	0.054	0.08	0.06	0.05	0.09	0.07	0.01
pH	5.92	5.80	5.84	6.5	5.31	4.96	7.0-8.9
Sodium (Na) mg/L	131	135	121	188	155	145	
Zinc (Zn) mg/L	4.11	4.01	4.03	4.03	4.21	4.16	0.01

4. Discussion

The water samples A-F was observed to be colorless, odorless and tasteless. The values obtained for conductivity for all the samples ranged from 309-642 µS/cm which is less than the WHO highest desirable standard of 900 µS/cm. All samples were acidic ranging from ph 4.96-5.92. This was below the WHO highest desirable standard of 7.0-8.9 for pH.

The study also showed high level of lead (Pb) in all the samples with a range of 0.05-0.09mg/L with highest desirable WHO standard being 0.01mg/L.

The level of zinc (Zn) was very high in all the samples ranging from 4.01-4.21 with WHO desirable standard being 0.01mg/L however these values obtained for zinc was within the standard organization of Nigeria value for 5.0mg/L.

The values obtained for chromium was also high with a range of 0.10-0.17mg/L and the highest desirable WHO standard being 0.05mg/L. The values for copper were also high from 1.30-1.35mg/L which was above the WHO standard of 0.05mg/L.

Sodium ion was within the normal range for sample A-C but was high for sample D, E and F. Chloride ion was also high for sample E and F but normal for Sample A-D.

Magnesium ion was normal for the entire samples studied.

5. Conclusion.

Most people do not fully understand the real dangers of heavy metal poisons and just how common they are in our modern world.

The study showed that all the sachet water samples were acidic, it also showed high level of heavy metals (Chromium, lead and zinc) which would accumulate in the body after long term consumption sample E and F showed high level of chloride.

This situation could have been due to industrial activities in this region for decades. Fortunately, steps can be taken to understand and minimize such threats through education, prevention, and treatment that will help to lessen acute and chronic negative impact on health.

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