# ASSESSMENT OF SLAUGHTER HOUSE WASTE IMPACTS ON THE DRY SEASON PHYSICOCHEMICAL PARAMETERS OF AKU STREAM

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## ABSTRACT

The effects of slaughter house waste on the physico-chemical content of Aku stream was studied by collecting triplicate samples from the five designated sampling stations and 150 meters apart from each stations. The mean values of biochemical oxygen demand (BOD) (7.23mg/L), Hardness (28.43mg/L), $SO_4^2$ (407 mg/L), $NO_3$ (575mg/L), $Ca^{2+}$ (46.30mg/L), $K^+$ (214.81mg/L), Zinc (6.48mg/L), pH (6.23), Total solids (0.13mg/L) were consistently higher than the values obtained from downstream and upstream sampling points. The same trend continued from temperature ($29^0$C), $Mg^+$ (2.19 mg/L), Cu (0.12mg/L). Two-way analysis of variance show significant difference in the five stations sampled at 5% level ($P<0.05$). The parameters analyzed did not fall into the World Health Organization standard of drinking water quality. Therefore, Lokpanta and its environs should be provided with alternative source of drinking water.

**Keywords**: Slaughter House Waste, Surface Water, Physicochemical Impact Assessment and Aku Stream

## INTRODUCTION

The management practice of abattoir in developing countries like ours is very poor; these have increased the pollution of surface and ground-waters from animal wastes which calls for environmental and health concern (Millard *et al.,* 1994). High loadings rate of sediment, nitrogen, phosphorus and even pathogens to soils and water can occur from animal operations, such as grazing and abattoir business (Besser *et al.,* 1993). Concentration of nitrogen in excess of 10mg/L in the nitrate ($NO_3$) form renders groundwater unsuitable for drinking. Phosphates could be transported with the sediment to lakes and streams where it's most significant effect is eutrophication (Clark, 1998). Animal wastes have been shown to be a source of microorganism pathogenic to humans (Howell *et al.,* 1996). When surface runoff or leaching occurs due to rainfall, contamination of water resource by enteric bacteria may result (Entry *et al.,* 1999). The same bodies of water are used for sources of drinking water or for recreational activities.

Apart from air-borne particulates which contain many trace elements derived from high temperature combustion sources, several industrial wastewaters are important contributors of trace metals in natural water. Toxic chemicals in effluents and thermal discharge kill aquatic organism and some bioaccumulate toxic substances which became bioconcentrated or biomagnified in the food chain having harmful effects on man (Oketola *et al.,* 2006).

The principal contaminants of water include suspended solids, biodegradable organics, pathogenic organisms and dissolved inorganic and heavy metals. Heavy metals gain access into the river system from both natural and anthropogenic sources and get distributed in water body, suspended solids and bed sediments during the course of their transportation. The major water pollutants arising from animal manures are oxygen demanding matter, plant nutrients and infectious agents, the effects of this pollution on water body vary from deterioration of water quality and changes in overall ecosystem (Olajire and Imeokparia, 2000).

Ebena *et al.,* (1999) observed from selected water sources in Calabar that physicochemical parameters like BODs, silica and pH were positively correlated with indicator like bacteria. Investigations were done on the streams in the Niger-Delta and the Lagos lagoon by Okoye, (1991), Kakuku and Osibanjo, (1992) respectively. They observed with the exception of iron, the concentration of most trace metals in surface waters are generally lower than the global average level for surface waters and the international drinking water standard.

We have two distinct seasons in Nigeria the dry and the rainy seasons. In the rainy seasons, large volumes of run-off waters enter the stream, delivering into the stream high fluxes of suspended solids, nutrients refuse dumps (Ugbogu, 2010). These high influxes of dirts increase the microbial, nitrate, phosphate and lignocellulose content of the stream (Ebena *et al.,* 1999).

In this study, the effect of abattoir waste on the physicochemical content of Aku stream was investigated to provide a general knowledge of the composition and changes in the dry season.

## MATERIALS AND METHODS

### The Study Area

The study area is located $N05^{0}58.186^{1}$ $E007^{0}$ 26.758 and $N05^{0}$ $58.183^{1}$ $E007^{0}26.765^{1.}$ Aku stream is the central focus of this study and it's located between Lokpanta-Lekwesi in Abia State Nigeria. The abattoir has a slaughtering houses containing slab where cows, rams, goats, pigs and dogs are slaughtered. Aku stream is about 850 mitres away from the abattoir but water used for washing, cooking and domestic activities in their mini-market are fetched from Aku stream.

### Methods

Water samples was taken from five (5) sampling stations with sterile polyvenyl chloride (PVC) plastic water bottles in the five designated sampling points during the dry season. Sterilization of the bottles was done using an ionizing chamber with gama rays. The pH and temperature was taken in-situ with Hanna electronic pH meters (Hanna instruments, H18915AtE, Singapore) and thermometer.

Total solids and dissolved solids were determined gravimetrically according to James, (1995). Electrical conductivity was determined by waterra groundwater monitoring equipment (Hanna pH/EC/TDS/Temperature parameter analyzer). Total hardness was determined by measuring the concentration of the individual cations. Biological oxygen demand was determined by oxygen balance difference titrimetric method by

APHA, (1992). Ion's was determined according to Holderness, (1986) respectively. Heavy metals were determined by the Atomic Absorption Spectrophotometry (AAS), according to James, (1995). Minerals were also gotten by subjecting them to acid digestion as described by James, (1995).

## RESULTS AND DISCUSSION

Table 1 showed the physicochemical parameters of Aku stream analyzed during the dry season. The colour and odour was colourless and odourless in all the sampling stations except in the abattoir that was cloudy and offensive which is indicating pollution from abattoir waste as reported by FEPA, (1991).

**Table I: Dry Season Physicochemical Characteristics of Aku Stream**

| Test Parameters | $UP_1$ | $UP_2$ | AB | $DS_1$ | $D_2$ |
|---|---|---|---|---|---|
| Temperature ($O^0C$) | 25.6 | 25.7 | 29.0 | 25.0 | 25.0 |
| Colour | Colourless | Colourless | Cloudy | Colourless | Colourless |
| Odour | Odourless | Odourless | Offensive | Odourless | Odourless |
| Dissolved solids | 0.06 | 0.16 | 0.12 | 0.17 | 0.11 |
| pH | 6.43 | 6.29 | 5.70 | 6.35 | 6.90 |
| BOD | 2.8 | 3.0 | 8.90 | 6.50 | 3.6 |
| Hardness ($CaCO_3$ mg/L) | 24.90 | 24.30 | 28.23 | 18.30 | 14.60 |
| Total solids (%) | 0.76 | 0.85 | 2.3 | 1.21 | 0.54 |
| Electrical conductivity | 0.13 | 0.13 | 0.15 | 0.12 | 0.12 |

**Table 2: Dry Season Ion Content of Aku Stream (Mg/L)**

| Parameters | $UP_1$ | $UP_2$ | AB | $DS_1$ | $DS_2$ |
|---|---|---|---|---|---|
| $NH_3^+$ | 0.3 | 0.37 | 1.43 | 0.96 | 0.32 |
| $SO_4^{2}$ | 266 | 430 | 416 | 414 | 323 |
| $NO_3^-$ | 281 | 312 | 586 | 422 | 317 |
| $PO_3^{2-}$ | 18.3 | 36.30 | 36.40 | 34.32 | 34.33 |

**Table 3: Dry Season Mineral Content of Aku Stream (Mg/L)**

| Parameters | $UP_1$ | $UP_2$ | AB | $DS_1$ | $DS_2$ |
|---|---|---|---|---|---|
| Ca | 22.43 | 15.84 | 42.70 | 22.69 | 13.44 |
| Mg | 0.67 | 2.43 | 2.41 | 2.55 | 1.83 |
| K | 18.67 | 46.43 | 220.50 | 115.90 | 46.25 |
| Na | 206.90 | 208.21 | 208.30 | 182.65 | 161.40 |

**Table 4: Dry Season Heavy Metal Content of Aku Stream (Mg/L)**

| Parameters | $UP_1$ | $UP_2$ | AB | $DS_1$ | $DS_2$ |
|---|---|---|---|---|---|
| Pb | 0.03 | 0.03 | 0.09 | 0.07 | 0.04 |
| Fe | 0.83 | 0.97 | 0.89 | 0.85 | 0.85 |
| Zn | 3.81 | 6.81 | 6.41 | 4.21 | 4.23 |
| Cu | 0.19 | 0.25 | 0.26 | 0.22 | 0.19 |
| As | - | 0.03 | 0.07 | 0.02 | 0.02 |

The temperature show significant difference in all the sampling stations but very high $29^0$C in the abattoir indicating much stress from the animal waste which is in tandem with the work of Ekhaise and Anyasi, 2005. They reported that temperature difference at any particular habitat is affected by weather and the extent of shade from direct sunlight.

The average mean level of dissolved solids, pH, calcium carbonate ($CaCO_3$), magnesium, calcium, zinc, copper, and manganese were below the World Health Organization Standard (WHO, 2003). Biochemical oxygen demand, sulphates, nitrate, lead, iron and arsenic were higher than the World Health Organization Standard and United States Environmental Protection Agency (USEPA, 2007).

The most important measure of water quality is the dissolved oxygen, which varies slightly in Aku stream. The variations may be attributed to oxygen consumption by aerobic organisms due to increase in oxygen demanding wastes (Emongor *et al.,* 2005). Biological activities influence the concentration of oxygen in water in addition to the weather and changes in the physical factors. The cloudy colour and offensive odour of the point source of effluent discharge was diluted down the stream due to water flow. The reduction of electrical conductivity in the downstream I and II could be as a result of the effect of dilution and removal of soluble salts by biological utilization (Ekhaise and Anyansi, 2005).

In the level of heavy metals examined, lowest value of lead was observed and zinc was the highest in all the stations sampled when compared to other heavy metals. The low level of some heavy metals may be attributed to spatial dilution along the Aku stream. Significant difference also exist in each station at $P<0.05\%$. These results of heavy metals are similar to the work of Odakuma and Abah (2003) from the New Calabar River but varied greatly in source and level of heavy metal concentrations.

Children are heavily at risk in the accumulation of the heavy metals in food, milk and contact (Hanninen *et al.,* 1979).

## RECOMMENDATION

- It is important that such streams, rivers lakes near abattoir should be monitored and adequately treated for residential users.
- The health of aquatic environment is very important, alternative waste disposal should be put in place.
- The use of Aku stream for domestic activities and washing of meat products should stop.

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