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Environmental health impact of abattoir wastes in Ipata market, Ilorin, Nigeria.

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ABSTRACT: The bacterial flora associated with Ipata abattoir wastes including sludge, effluent, dung, etc. were enumerated and characterised. The total viable bacterial counts ranged between 5 x 10^9 and 5.4 x 10^9 cfu/ml/g with cow dung yielding the highest. The isolates classified as members of *Enterobacteriaceae* included *Escherichia coli, Klebsiella pneumoniae, Salmonella typhi, Shigella sonnei, Enterobacter aerogenes* and *Proteus mirabilis*. Others were identified as *Pseudomonas aeruginosa, Lactobacillus* sp., *Staphylococcus aureus* and *Bacillus anthracis*. The nature of the wastes generated at the abattoir during meat/carcass processing, their mode of disposal and the potential health risk as well as their environmental impacts are highlighted.

Key Words: Environmental health; Environmetal sanitation; Abattoir wastes.

Introduction

The abattoir is a public slaughterhouse and its wastes are defined as those unwanted residue of slaughtered animals (Richard, 1970). These include condemned meat and offal, obligatory confiscated tissues such as eyes, reproductive tract, gut, stomach and rumen content, gland hair, inedible fat and blood.

Though animal protein constitute a major ingredient in a balanced food complex, its fulfillment significantly depends on the manner of its handling, the environment of its preparation, the degree of its exposure and contamination before consumption. Unfortunately in this country, there has been a general neglect of the provision of meat delivery and processing facilities by policy makers who only see meat delivery as one of producing slaughter slabs. Compounding this is the low level of environmental awareness and education among ordinary Nigerians, as well as the near primitive technology used in meat slaughter and delivery.

Even though the Federal Environmental protection Decree (No. 58) provides for supervision, monitoring as well as prescription of standards for water and air quality and effluent, they are never enforced. Similarly, the World Health Organization (WHO) lays down some pattern of abattoir planning and operation in order to control the environmental hazard. Critical factors include abattoir site, provision of lairage, isolation building for diseased animals and hygienic slaughter slabs.

It is, however, unfortunate that in many existing abattoirs, including that of Ipata in Ilorin, these prescribed rules and regulations or precautionary measures are not strictly adhered to. The pattern of waste/effluent dosposal portends great danger to the health of the community and the environment.

The Ipata abattoir is located within a large market (Ipata) in the Ilorin metropolis. It is also within the catchment Basin of Asa River into which its effluents are finally discharged. The major operations include slaughter of cows, goats and sheep. It is equipped with slaughter halls, slabs and lairage but lacking isolation block for diseased animals. Water supplies are through municipal network that is erratic and hand dug wells. The objective of this study is to assess the impact of the wastes on the public health and the environment.

Materials and Methods

Sample Collection and Bacteriological Analysis

The nature and types of samples including description of sites at the abattoir are shown in Table 1. Effluent samples were collected in sterile 250 ml sampling bottles at sites while dung and sludge samples were taken into sterile beakers covered with aluminium foil. All samples were immediately taken to the laboratory for analysis. For enumeration of bacterial flora of samples the standard plate count (SPC) method preceeded by serial dilution was used. Yeast extract agar was used for enumeration; eosin methylene blue (EMB) and deoxycholate agar (DCA) were employed for enteric bacteria while mannitol salt agar (MSA) was employed for the isolation of *Staphylococcus*. All plates were incubated at $37^{o}C$ and final enumeration was completed after 48 hours. All bacterial isolates were sub-cultured for purity by biochemical characterization. Tentative identification was done as described by Bucchanan and Gibbon (1974).

Table 1: Nature of samples and sampling points at Ipata Abattoir.

Sample Number	Sampling Point	Nature of sample
1.	Drainage in cow slaughter slab.	Sludge from cow dung
2.	Slab of cow.	Swab of slab.
3.	Cow dung dumping site.	Cow dung.
4.	Well.	well water.
5.	Tap.	Tap water.
6.	Outside cow abattoir.	Abattoir effluent.
7.	Slab of goat.	Abattoir effluent.
8.	Combine drains (cow and goat)	Abattoir effluent.
9.	Abattoir drains after Ipake bridge.	Abattoir effluent.
10.	Drains from farmland and residence after Ipake bridge.	Abattoir effluent.
11.	Drain before discharge into Asa River.	Abattoir effluent.
12.	Asa River before effluent discharge into it.	River water.

Results

Table 2 shows the total viable counts of the sample types at different sampling points. It ranged from 5.0 x 10^9 to 54 x 10^9 cfu/ml (or per g for cow dung). Cow dung samples yielded the highest count (54 x 10^9 cfu/g) while the abattoir effluent just before discharging into Asa River had the least count (5.0 x 10^9 cfu/ml). A total of eleven bacterial species were isolated. These were differentiated into members of the family Enterobacteriaceae, Bacilliaceae and Lactic acid bacteria (Table 3). *Escherichia coli* was the most frequently isolated among the sampling points, followed by *Klebsiella pneumonia, Bacillus cereus, Proteus mirabilis* and *Staphylococcus aureus*. *Salmonella* sp.; *Shigella sonnei, Enterobacter aerogenes, Serratia* sp. and *Lactobacillus* sp. were also common to some sample types and sampling points.

Table 2: Total viable bacterial counts at sampling points.

Sample Number	Sampling Point	Bacterial count (cfu/ml or g) x 10^9.
1.	Drainage in cow slaughter slab.	5
2.	Slab of cow.	8
3.	Cow dung dumping site.	54
4.	Well.	17
5.	Tap.	14
6.	Outside cow abattoir.	41
7.	Slab of goat.	30
8.	Combine drains (cow and goat)	30
9.	Abattoir drains after Ipake bridge.	25
10.	Drains from farmland and residence after Ipake bridge.	38
11.	Drain before discharge into Asa River.	5
12.	Asa River before effluent discharge into it.	8

Discussion

Observations at the abattoir revealed that the processes of killing of animals, their skinning and evisceration were executed on filthy floors already soiled by numerous human feet and animal faeces. This was also confirmed by the results of bacteriological analysis. This agrees with the view of Gracey (1986) that contamination of meat in the abattoir is derived from animals entering it and that accumulation of faeces in lairage increases the possibility of carcass infections. The faeces that accumulate form mounts while the blood mixed with paunch and waste for sludge that often become breeding grounds for flies, rats and other carriers of infectious agents.

Operations at the abattoir have also been found to result in atmospheric fouling arising from smoke and soot generated by the burning of animal skins, preparation of hides and skin and de-fattening processes. The smoke is toxic and hence hazardous to the population around the environment. It can also lead to physical danger by way of explosion (Muoghalu and Omocho, 1997). Considering biological pollution arising from activities at the abattoir, it is not a surprise that members of the *Enterobacteriaceae* predominate the bacterial isolates.

Table 3: Distribution of bacterial isolates among samples.

Organisms	Sample Type											
	1	2	3	4	5	6	7	8	9	10	11	12
Eschericia coli	+	+	+	+	+	+	+	+	+	+	+	+
Bacillus cereus	+	–	+	+	+	–	+	+	–	–	–	–
Bacillus anthracis	–.	+	+	–	–	–	–	–	+	+	+	+
Klebsiella pneumonia	–	–	–	+	+	+	+	–	+	–	+	+
Staphyloccus aureus	+	+	–	+	–	–	–	–	+	–	–	–
Proteus mirabilis	+	–	+	–	–	–	+	–	–	–	–	–
Salmonella sp.	–	–	+	–	–	–	+	–	–	–	–	–
Shigella sonnei	–	–	+	–	–	+	–	–	–	–	–	–
Serratia sp.	–	–	+	–	–	+	+	–	–	–	–	–
Enterobacter aerogenes	–	–	–	–	–	–	–	–	+	–	+	–
Lactobacillus sp.	+	–	+	–	–	–	–	–	–	–	–	–

1 –Sludge; 2 – Swab; 3 – Cow dung; 4 – Well water; 5 – Tap water; 6 – Abattoir effluent;
7 – Effluent (Slab of goat); 8 – Effluent of joint; 9 – Effluent by Ipake bridge; 10 – Effluent by farm land;
11 – Effluent before discharging into Asa River; 12 – Effluent after discharging into Asa River.

This is significant as most disease agents in body washes are shed in faeces rather than urine. *E. coli, Listeria monocytogene* and *Salmonella* are more likely to be shed in animal manure than human faeces. These organisms including *Shigella* and beef tape worm often get concnetrated in sludge whose careless disposal may lead to pollution of water courses. In this abattoir, its effluents eventually discharge passively through ill-defines drains into Asa River. The public health significance of this lies in the emergence of infections such as salmonellosis, shigellosis, amoebic dysentery and hepatitis in the community. The utilization of abattoir wastes (sludge and effluent) which is a common practice to enhance crop and animal products, poses a serious risk. This, no doubt, improves plant growth and yield but also helps in the dissemination of plant pathogens and ensures the occurrence of farm infections associated with partially cooked vegetables.

Another area of possible impact of abattoir activities on the environment concerns drug therapy. The cross contamination between the abattoir wastes and river water through constant seeding of water by the abattoir effluents promotes transfer of drug resistance. This is important in view of the increasing use of antibiotics in animal husbandry (Olayemi, 1996).

In conclusion, it is ascertained that the wastes generated in the abattoir, particularly those that contain animal wastes, were found not only objectionable but also hazardous to the populace the abattoir serves. The land and river course (Asa River) is also a victim due to the unguarded disposal systems that operate in the abattoir. Transmission and dissemination of infectious agents are ensured through the use of the wastes for promoting plant growth. The results of this study confirm the abattoir as a health risk area and it is a challenge to the community on the need to maintain the abattoir and to ensure proper disposal of wastes.

References

Bucchanan, K. E. and Gibbons,N. E. (1974) Bergey's Manual of Determinative Bacteriology. 8th Edition. The Williams and Wilkins Co., Baltimore.

Gracey, J. C. (1986) Microbiological implication in handling, slaughter and dressing of meat animals. Adv. Food Res. 6, 160 – 161.

Muoghalu, L. N. and Omocho, V. (1997) Environmental health hazards resulting from Akwa abattoir. Env. Rev. 1, 37 – 50.

Olayemi, A. B. (1996) Antibiotic resistance among *Salmonella* isolates from hospital and cattle specimens in Zaria, Nigeria. Biosci. Res. Commun. 8(4), 411 – 416.

Richard, D. V. (1977) Policies for Solid Waste and Waste Management and Control. Churchill Livingstone Ltd., Edinburgh. p. 54.