



## Isolation and Identification of Bacteria from effluent of Abattoir in Minna, Niger State, Nigeria

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### ABSTRACT

Isolation and identification of bacteria from effluent of abattoir was investigated. Bacteria count was done using pour plate technique. Isolation and identification of bacteria was carried out by plating on Blood and Mac Conkey agar after subjecting the pure isolates to series of biochemical tests. The result of the bacteria count from the four samplings are as follows; Sample A:  $1.40 \times 10^6$  cfu/mg to  $1.32 \times 10^8$  cfu/mg. Sample B:  $1.50 \times 10^6$  cfu/mg to  $1.38 \times 10^8$  cfu/mg. Sample C:  $1.32 \times 10^6$  cfu/mg to  $1.08 \times 10^8$  cfu/mg. Sample D:  $1.58 \times 10^6$  cfu/mg to  $1.16 \times 10^8$  cfu/mg. Bacteria isolates and their corresponding percentages includes; *Escherichia coli* 14(12%), *Bacillus* sp 15(13%), *Pseudomonas* sp 3(2%), *Staphylococcus aureus* 12(10%), *Salmonella* sp 15(13%), *Vibrio* sp 15(13%), *Klebsiella* sp 3(2%), *Enterococcus* sp 12(10%), *Acinetobacter mallei* 5(4%), *Elavobacterium* sp 3(2%), *Alcaligenes faecalis* 3(2%), *Listeria monocytogenes* 11(9%), *Clostridium* sp 4(3%), *Versinia* sp 3(2%), and *Proteus* sp 1(1%). The outcome of this research suggests that the water used to wash the slaughtering tables and floors in abattoir is most likely contaminated by these organisms in the effluent. Consequently, the release of untreated abattoir effluent into water bodies could lead to the outbreak of water borne diseases, and may have detrimental effect on aquatic life, which could cause bacterial food poisoning.

**Keywords:** Identification, Bacteria, Effluent, Abattoir

### INTRODUCTION

Meat is a fleshy material of the body obtained by slaughtering healthy animals. It is a major source of proteins, vitamins and minerals to most people of the world.

As it is the important source of nutrients due to favourable intrinsic factors, it is an ideal culture media for the growth of different types of micro-organism including bacteria and fungi. In the practice of slaughtering, the main sources of microorganisms are exteriors of the animal and the intestinal tract (Oguejiofor and Chan, 2010). Recently approved "humane" methods of slaughtering, mechanical, chemical and electrical have little effect on contamination, but each method is followed by sticking and bleeding, which introduced contamination (Nwanta *et al.*, 2010).

The Nature and level of microbial contamination in meat have greatly affected public health storage life and the type of spoilage of meat. The most important pathogens associated with meat includes *Salmonella* sp, *Staphylococcus aureus*,

*Escherichia coli*, *Clostridium perfringens*, *Campylobacter jejuni*, *Listeria monocytogenes*, *Versinia enterocolitica* and *Aeromonas hydrophila* (Oguejiofor and Chan, 2010).

The management and operation of abattoir, slaughter houses and waste in Nigeria have dependably been viewed as social administrations by the three-tiers of government (Nwanta *et al.*, 2010). Each of these administration experts has been unconcerned about assuming control over the obligations of abattoir.

Some states have even leased out their abattoir, slaughter houses to individuals and private organizations with little or no knowledge of

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abattoir management. The local government collects revenue without ploughing back the money to improve the environment (Cadmus *et al.*, 2008).

Slaughtering and handling of animals in Nigeria abattoir are done on the bare floor where evisceration and processing of guts are carried out (Okoli, 2006). Slaughter houses floor and environment are heavily contaminated by workers' dirty boot, animal faeces and urine (Okoli, 2006). Abattoir operation could be exceptionally gainful to man; in that it gives meat for human consumption, still it can be extremely risky to public wellbeing on regard to the waste it creates (Meadows, 2007). Recent studies have demonstrated that zoonoses from abattoir waste are yet to be controlled in more than 80% public abattoirs in Minna. Diseases like pneumonia, diarrhea, typhoid fever, asthma and respiratory diseases were seen to be associated with abattoir exercises (Bello and Oyedemi, 2009).

Waste water from abattoir contains blood, manure, hair, fat feather and bone with BOD and TS levels as high as 8000mg/l and 800mg/l respectively (Encarta Encyclopedia Standard, 2005). Different investigations on abattoir effluents have been associated with soil contamination and hazard in aquatic environments in Nigeria (Kusumaningrum, 2003). The release of untreated abattoir effluent into water bodies is a public health issue, since a few inhabitants drink and utilize such water without treatment e.g boiling.

This could lead to the outbreak of water borne diseases, such as cholera, typhoid and diarrhea. Enteric pathogens introduced into water bodies as a result of influents from animal butchering pollutes ground water (Lowel *et al.*, 2001).

## METHODOLOGY

### Study Area

This study was carried out in Minna. Minna is about 5000 square kilometers, accessible through minor and major road. Minna town lies on latitude 9° 30'N and 6° 3'E in Niger State, Nigeria. The abattoir is situated in an area called Tayi village along Bosso road, Minna. It is developed in a way that can suit 3-4 butchering at a time. The abattoir is divided into 3 segments which are the slaughtering segment, the handling segment (skin and bone removal, skin burning) and waste dumping site.

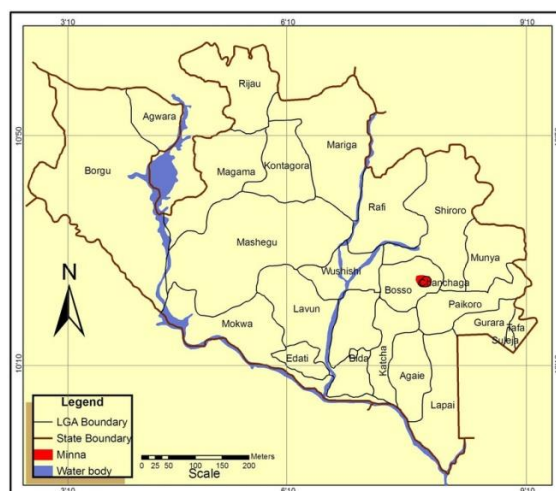


Fig. 1: Map of Niger State Showing Minna

### Sample Collection

100mls of abattoir effluents were collected from entering points at different intervals (two weeks) for two months for isolation and identification of bacteria. The samples were collected in sterile wide mouthed containers. The samples were accurately labeled indicating the date of sample collection and the investigation required. The samples were then taken to the microbiology laboratory, Ibrahim Badamasi Babangida University Lapai for analysis.

### Total Bacteria Count

After sample collection, 1ml of stock solution (i.e 100ml of the effluent Sample) was placed onto a known volume of normal saline (9ml). This produced 10ml of the dilute solution. The dilute solution has 1ml of extract (10ml) producing a 10-fold dilution, which is the amount of stock solution in each 1ml of the diluted solution, i.e 0.1ml. The process was repeated as many times up to  $10^{-10}$  dilution. One (1)ml of the dilution factors  $10^{-7}$  and  $10^{-8}$  were transferred using sterile syringe and needle into sterile Petri dishes in duplicate. Sterile molten nutrient agar was added to the Petri-dishes, the plates were incubated at 37°C for 24 hours. After incubation, bacteria colonies arising from each sample were counted using colony counter. The average count was expressed in colony forming unit per mg (cfu/mg), (Cheesbrough, 2006).

### Isolation of Bacteria

Colonies observed from each plate were aseptically sub-cultured using sterile wire loop onto MacConkey and Blood agar plates via streaking method and incubated at 37°C for 24 hours.

### Identification of Bacteria

- Distinct colonies from the total bacteria count plate were sub-cultured for onto MacConkey and Blood agar plates for the isolation of pure colonies from the effluent.
- The MacConkey and Blood agar plates were incubated at 37°C for 24 hours.
- After this incubation, colonies were picked for Gram staining and subjection to series of biochemical tests for identification of bacteria from the abattoir effluent.
- These biochemical tests include; Catalase, Coagulase, Indole, Methyl-red, Voges proskauer, citrate utilization, Sugar fermentation e.t.c (Cheesbrough, 2006).

### RESULTS

Bacterial colony count from all the four samplings demonstrates sample contamination. In sample A, the count ranged from  $1.40 \times 10^6$  cfu/mg to  $1.32 \times 10^8$  cfu/mg, Sample B ranged from  $1.50 \times 10^6$  to  $1.38 \times 10^8$  cfu/mg, Sample C ranged from  $1.32 \times 10^6$  to  $1.08 \times 10^8$  cfu/mg, while Sample D ranged from  $1.58 \times 10^6$  to  $1.16 \times 10^8$  cfu/mg as seen in Table 1.

Table 2 indicated some bacteria isolated from abattoir effluent, the total number and the corresponding percentages of occurrence of these bacteria. *Bacillus subtilis*, *Salmonella* sp and *Vibro* sp, are the most predominant organisms isolated from abattoir effluent, which is followed by *Escherichia coli* *Staphylococcus aureus*, *Enterococcus* sp and *Listeria monocytogenes*. Other organisms occurred at lower percentage.

Table 1: Bacterial count of all effluent samples analyzed (cfu/mg).

Sample	Dilution Factor	Number of Colony	Bacteria/Count in cfu/mg
Sample A	$10^{-4}$	140	$1.40 \times 10^6$
	$10^{-5}$	132	$1.32 \times 10^7$
	$10^{-6}$	130	$1.30 \times 10^8$
Sample B	$10^{-4}$	143	$1.43 \times 10^7$
	$10^{-5}$	138	$1.38 \times 10^8$
	$10^{-6}$	132	$1.32 \times 10^6$
Sample C	$10^{-4}$	132	$1.32 \times 10^6$
	$10^{-5}$	122	$1.22 \times 10^7$
	$10^{-6}$	108	$1.08 \times 10^8$
Sample D	$10^{-4}$	158	$1.58 \times 10^6$
	$10^{-5}$	133	$1.33 \times 10^7$
	$10^{-6}$	116	$1.16 \times 10^8$

Table 2: Percentage (%) of occurrence of Bacteria isolated from Abattoir Effluent.

S/N	Test Organism	Number of Isolates	% of Incidence.
1.	<i>Bacillus subtilis</i>	15	13
2.	<i>Salmonella</i> sp.	15	15
3.	<i>Vibro</i> sp.	15	13
4.	<i>Escherichia coli</i>	14	12
5.	<i>Staphylococcus aureus</i>	12	10
6.	<i>Enterococcus</i> sp.	12	10
7.	<i>Listeria monocytogenes</i>	11	9
8.	<i>Acinebacter mallei</i>	5	4
9.	<i>Clostridium</i> sp.	4	3
10.	<i>Micrococcus</i> sp	3	2
11.	<i>Flavobacterium</i> sp	3	2
12.	<i>Alcaligenes faecalis</i>	3	2
13.	<i>Pseudomonas aeruginosa</i>	3	2
14.	<i>Yersinia</i> sp.	3	2
15.	<i>Klebsiella</i> sp	3	2
16.	<i>Proteus</i> sp	1	1
Total		115	100

## DISCUSSION

From the study carried out, it was revealed that the abattoir effluent discharged into the environment have a negative impact on the water body. The foul odour of all samples in the research were like those reported by Coker *et al.* (2001). High bacterial count in the abattoir waste water is due to the rich protein substance of the blood which provides a good medium for microbial growth. The total viable count (TVC) across the sample ranged from  $1.32 \times 10^6$ cfu/mg to  $1.38 \times 10^8$ cfu/mg, this demonstrates that the samples have been contaminated due to the release of untreated wastes from the abattoir onto the water body (river). Untreated effluent from the abattoir being washed into the river could prompt the presentation and multiplication of enteric pathogenic organisms resulting to gastrointestinal infections when consumed (Rabah,2008). Microorganisms exhaust broken down oxygen in water, and these organisms multiply rapidly due to high organic matter content which could result in septic condition lethal to aquatic fauna (Abiola, 2009). The presence of *Salmonella* sp among the bacteria isolated in this study is similar to the findings of Abiade-Paul *et al*

(2006) from samples collected at different points along the collecting channels of the effluents. The prevalence of *Salmonella*sp recorded in this study was lower than 25% prevalence as reported by Amaechi and Ezeronye (2006) from swab samples collected from slaughtering tables, wash-hand basins and the floor in the abattoir environment at Umuahia, Abia State. The level of contamination in Minna abattoir could be as a result of high number of cattle from different ranches slaughtered per day and poor sanitary practices associated with the environment. Consumption of such contaminated food may result in food poisoning (Okolocha *et al.*, 2002; Abiade-Paul *et al.*, 2006; Nwanta *et al.*, 2010; Oguejiofor and Chan, 2010). The level of contamination by bacteria could be reduced by applying hazard analysis critical control point (HACCP) procedures to minimize the presence of these contaminants. Operators should be given adequate training and supervision to ensure appropriate cleaning and maintenance of sanitary standards to eliminate cross-contamination (Kusumaningrum *et al.*, 2003).

## Conclusion

The result obtained from this investigation demonstrates that the effluents from the abattoir surpassed the farthest point for effluents released into water bodies set up by Environmental Protection Agency (EPA) along these lines causing contamination of water bodies and threatening human and aquatic life.

## REFERENCES

- Abiade-Paul, Kene I.C and Chah K.F (2006) *Occurance and antibiogram of Salmonella in effluent from Nsukka Municipal abattoir Nigeria Veterinary Journal*, 1: 48 -5
- Abiola S.S (2009) "Assessment of Abattior and slaughter slabs operation in Oyo State" *Nigerian Journal of Animal production*, Vol 5,: 54-62.
- Amaechi N and Ezeronye, O. U (2006); Occurance of Salmonella Species in slaughtered healthy swine and abattoir environment of Umuahia, Abia State Nigeria. *Journal of Animal and Vetenary. Advances*, 5(4): 289 – 293.
- Bello, Y.O and Oyedemi D.T.A (2009). The impact of Abattoir activities and management in Residential Neighbourhoods. A case study of Ogbomoso Nigeria. *Journal of Social Science*,19(2): 121 – 127.
- Cadmus, S.I.B, Adesokan, H.K and Awosanya A.E.J (2008) public health issues and observation made during meat inspection and Bodija Municipal Abattoir, Ibadan Nigeria. *Nigerian Veterinary Journal*,28(2): 43 -47.
- Cheesebrough M. (2000:2006) *Distinct Laboratory Practice 2<sup>nd</sup> Ed.* Biochemical test and identification of bacteria. Cambridge University press *United Kingdom*, 146 – 157pp.
- Coker A.O Olugasa B.O and Adeyemi A.O (2001) Abattior waste quality in southwestern Nigeria in Scott R. (Edited) *People and systems published by water Engineering and development centre (WEDC) loughborough University, United Kingdom*, 329 – 331pp
- Kusumaningrum, H.D, Riboldi G, Hazeleger W.C and Beumer R.R (2003). Survival of food borne pathogens Vol. 67. No 1 on stainless steel surfaces and cross contamination to foods. *Intl. Journal for food Microbiology*,85: 227 – 236.
- Lowe, D.E, Steen, RWJ and Beattie, VE (2001), The effect of floor type systems on the performance cleanliness, carcass composition and meat quality of housed finishing beef cattle livest prod. *Sci*, 69: 33-42.
- Meadows, J.H (2007). *Livestock Legacy; Environmental health perspective*, 103(12): 1096-1100.
- Nwanta, J.A, Onunkwo J.I and Ezenduka E.V (2010) Analysis of *Nsukka Metropolitan Abattoir* solid wastes and its bacterial contents in south Eastern Nigeria; Public health Implication *Archives of Environmental and occupational health*,21 – 26pp
- Oguejiofor and Chah K.F (2010).Incidence of *E .coli* 0157 infection in Abattior Animals at *Nsukka, Nigeria. Animal Science reporter*,Vol 4, issue 3:45-49.
- Okoli, C. G (2006) *Environmental and public Health* issues of Animal food products Delivery system in Imo state Nigeria, *Online Journal of Health and Applied Sciences*. Vol. 5, Issue 2: 86-94.
- Okolocha E.C, Umoh J.U and Raji K.B (2002).The environmental and microbial food contamination, A public Health perspective. In proceedings of the first *National Conference of Environment Health Society of Nigeria Zaria*,381 – 387pp.
- Rabah, A.B (2008) "Assessment of Physio-chemical and Microbiological qualities of Abattoir waste water Sokoto, Nigeria" *NigerianJournal of Basic and Applied Sciences*, Vol. 16, No. 2: 149 – 154.