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## Abattoir operations and waste management in Nigeria: A review of challenges and prospects

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### **Abstract**

The poor state of our national abattoirs, meat processing plants, ineffective meat inspection service and the resultant risk of consuming unwholesome meat have been issues of public health and global environmental concerns. Abattoir inspection of live animals (ante-mortem) and the carcass (post-mortem) are crucial towards surveillance network for animal diseases and zoonoses as well as ensuring the suitability of meat and byproducts for their proposed use. The nations desire to achieve high level of food safety and quality of life may be a mirage if the current challenges militating against the establishment, operations and management of abattoirs are not given attention. This paper reviews the current state of the Nations abattoir operations and waste management and also discussed the challenges and prospects of the industry in respect of environmental quality and public health. The paper concludes that Local governments and private entrepreneurs should be encouraged to establish and manage abattoirs, slaughter houses and slabs nationwide for a more effective management.

*Keywords:* Abattoir operation, environment, public health, waste management, zoonotic diseases

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## Introduction

In Nigeria, the development and growth of livestock production has been on the increase and has guaranteed steady supply of food animals meant for slaughter and processing for human consumption. The poor state of abattoirs and meat processing plants; the ineffective meat inspection services and the resultant consumption of unwholesome meat by the public have become a major cause of concern to all stakeholders in the industry and general public. The nation's clamour, and indeed desire to achieve national self – sufficiency in food production, food security and food safety though noble one, is of little or no value if what ends up on consumer's table as dishes for consumption are unwholesome. Proper abattoir operation and management including efficient inspection of live animal (ante – mortem) and the carcass (post–mortem) are crucial towards surveillance network for animal diseases and zoonoses as well as ensuring suitability of meat and by products for their proposed use. The Fourth Schedule of the 1999 Constitution of Nigeria, subsection 1(e), states amongst others that the main functions of the Local Government Councils will be “establishment, maintenance and regulation of slaughter houses, markets, motor parks and public conveniences”. Unfortunately, the only interest most local government agencies have shown in this regard seems to be revenue collection from these establishments.

The upsurge in the prevalence of communicable and zoonotic diseases such as Tuberculosis, Cysticercosis, Trichinosis etc in our communities are additional pointers to the relevance of our abattoirs and slaughter houses as disease surveillance points. The numerous wastes produced by abattoir operation not only pose a significant challenge to effective environmental management but also are associated with decrease air quality of the environment, potential transferable antimicrobial resistance patterns, and several infectious agents that can be pathogenic to human. Published studies have documented a variety of contaminants, microbial agents and health effects in those occupationally or accidentally exposed to improperly managed abattoir waste (Adelegan, 2002; Adeyemo, 2002; Abiade et al 2006). These issues have provided groundwork for this review: to evaluate the poor state of abattoirs, possible public health effects and prospects for future management.

### Abattoir Establishment and Meat Hygiene in Nigeria

An abattoir is a special facility designed and licensed for receiving, holding, slaughtering and inspecting meat animals and meat products before release to the public (Alonge, 2005). Establishment and management of abattoirs and wastes in Nigeria have always been regarded as social services by all the three tiers of government. Each of these government authorities has for many years neglected its function and has been apathetic about taking over responsibilities. This development has resulted in deterioration of slaughter house, improper meat inspection, poor environmental hygiene and waste management and compromise of public interest. The slaughtering and handling of meat became generally poor. The slaughtering facilities where available decayed and were abandoned as a result of disuse and lack of maintenance. Our abattoirs and slaughter houses (where available) operate in sub – standard conditions. Media reports have shown that in some cases butchers clean their dressed carcass and tripes in nearby streams prone to

human and animal faecal contamination due to lack of water supply within the abattoir premises. The hostile attitude often shown by most of our butchers and meat processors to modernization and change, the future role of private practitioners and delineation of functions of the various professionals in the industry, all need to be critically examined and solution proffered. Our field investigation shows that there are about 30 abattoirs, 132 slaughter houses and 1,077 slaughter slabs in Nigeria with a total annual slaughter capacity of 14,127,868 animals, (see Table 1).

Historical records show that man has been concerned with the source and handling of his meat supply. Requirements, restrictions and taboos are made by man based on philosophies of diet, religious and ritual practices. Ancient Egypt has been reported to enact food edicts that banned pig (unclean), and cow (sacred) for human consumption (David west, 2002). In Rome, cattle markets and restaurants were reported to be under official control in 388 AD. Meat inspection practice was reported to have started in France in 1162 and in Germany in 1276 (David west, 2002). Although Veterinarians have been associated with meat control in Europe for a period of time, no active veterinary meat inspection and abattoir management existed until the large epidemics of trichinosis in Germany in 1860's. In America, the first meat inspection law was passed in 1706 (Fasanmi, 2002) and following requirements for international trade in meat products, stricter and more elaborate meat hygiene legislation was passed in 1889.

In Nigeria, however, there was no meat hygiene law in the colonial era although there was legislation on the inspection of hide and skins for export trade as early as 1942 in Northern Nigeria (David West, 2002). However active meat inspection and proper abattoir management started in Northern Nigeria, when their government had a vision for a flourishing export meat trade and prepared a code of practice for meat inspection in 1967. Meat hygiene legislation was passed by the State government in 1970's with the assistance of experts in Federal Department of livestock and Pest Control & Services (FDL & PCS) who prepared a draft model of state meat hygiene legislation (David West, 2002).

The existing edicts in various states of the federation were adopted from the models prepared by the FDL & PCS. The edicts deal with ante-mortem and post-mortem inspections, re – inspection through marketing to the consumer and condemnation and destruction of unfit animals. While in some states, the inspections concern both abattoirs and post- abattoir activities, in others inspection stops at the abattoir level only. These edicts paid less attention to adulteration, misrepresentation and abattoir waste management. There is absence of federal meat hygiene legislation and the flow of large quantities of uninspected fresh and frozen meat and meat products into the country is high and this development pose a serious health hazard to consumers.

### Challenges

Abattoir operation produces edible meat and waste. The quality of management of abattoirs and slaughter slabs, particularly, the adherence to standard practice of meat inspection and sanitation is a key to sound public health standard. An efficient abattoir operation and meat hygiene programme is a service for healthy living of the public. The benefits are human health improvement, animal

disease control, processing and retail net value, reduced spoilage and fraud and improved environmental hygiene. However, the handling of meat in Nigeria is generally unsatisfactory. Slaughtering is generally carried out on the floor and outside the abattoir by individual butchers, whose knowledge of hygiene is low. The slaughtering and processing facilities in the abattoirs are inadequate as there are no sewage or waste disposal systems, adequate clean water supplies and refrigeration.

In Nigeria, climatic elements pose serious challenges to abattoir operations as they encourage rapid deterioration of meat under conditions of high temperature and high humidity. According to Gourou (1961), the steady, high temperatures, the high humidity of the air, the many water surfaces fed by rains are necessary for the maintenance of pathogenic complexes in which man; insects and microbes are closely associated. Adejuwon (1978) writing on pests and diseases in Nigeria remarked that diseases due to poor sanitation are transmitted through people who do not obey simple rules of hygiene such as eating raw, exposed meat, food among others. High ambient temperatures, heavy fly and rodent infestations recorded in abattoirs encouraged the contamination of meat (Nwachukwu, 2006; Abiade Paul et al, 2006). Joseph (1999) in his investigations on cattle slaughtering and post-mortem handling practices in selected Nigerian cities, particularly reported absence of stunning and proper meat processing operations. When animals are slaughtered in places which are frequently polluted with blood and faecal materials, not protected from flies and rodents, meat produced thereof are prone to quick deterioration due to high level of bacterial contamination. Apart from compromised quality of meat, such meat may cause food poisoning and would be a source of infection to man. The above scenario reveals the state of affairs in most abattoirs in Nigeria, from Oko-oba abattoir in Lagos and Bodija abattoir in Ibadan, via Akwata abattoir in Enugu, Trans Amadi abattoir in Port Harcourt, Kawo abattoir in Kaduna and many others as contained in Table 2 and Fig 1.

Media reports showed that in Oko-oba abattoir in Lagos, Nigeria, lairages where cattle are supposed to be kept have been turned into living quarters, which is a very unhealthy development. Conveniences provided in the abattoirs for abattoir workers are now dysfunctional and illegally occupied by hoodlums. The unfortunate side of this however, is the practice whereby the operators of these public conveniences, instead of properly disposing the waste, flush the excreta into the nearby gutters and canal at Oko-oba. The resulting stench makes the environment unbearable. At Zoo town in Trans-Amadi, Port Harcourt, Nigeria, the abattoir wastes are reported to be channeled directly into river Okpoka, a tributary of the Bonny River (Odeyemi, 1991). Lack of price incentives for quality has been reported to be another contributory factor to meat mishandling. The unhygienic transportation is also approaching disaster level as carcasses are transported in boots of taxis, dirty pickup vans, motor cycles, carts and wheel barrows. Street hawking of meat in open head pans is increasing in many cities.

The 1999 Constitution of the Federal Republic of Nigeria places the responsibility of establishment, maintenance and regulation of slaughter houses under local government councils. This development has always conflicted with state meat edicts, which places meat hygiene and registration of abattoirs under the veterinary directorate of the State government. The local government

councils have no expertise, nor finance to implement a worthy and efficient meat hygiene programme. State governments on the other hand are apathetic about taking over responsibilities for abattoir establishments and management whose revenue base will go to the local government council who do not utilize the money to improve the environment and day to day running of such abattoirs. In most cases existing abattoir designs are obsolete and varied and without uniformity. Inconsistent government policies, poor level of funding and non-existence of insurance scheme for butchers are among the challenges. The net result is deterioration of slaughter houses, improper meat inspection and compromise of public interest. The numerous waste and microbial organisms produced during abattoir operation not only pose a significant challenge to effective environmental management but also are associated with decreased quality of life among animal and human population (Nwanta and Achi; 2002; Adeyemo, 2002; Callaway et al, 2004; Esona et al, 2004; Abiade et al, 2006). The common disease causing organisms reported by researchers in slaughter animals and abattoir wastes in Nigeria has been encapsulated in Table 3. The heaps of abattoir waste which abound in abattoir environment in Nigeria constitute serious environmental and public health hazards. The seriousness of environmental and health problems were further elucidated by the reports of the species of pathogenic bacteria isolated from the solid waste and effluents (Adetosoye, et al; 1976; Litchfield, 1980; Oboegbulem and Muogbo, 1981; Elder et al, 2000; Callaway et al, 2004; Abiade-Paul et al, 2006). Adeyemo (2002) in his paper, reported that waste generated as a result of abattoir operation in Nigeria is a source of embarrassment to the general public as conventional method for the disposal and management of animal waste, carcasses and manure as well as slaughter house and animal industry waste are now proving inadequate. Abattoir waste has been reported to contaminate and increase the level of nitrates in ground water and cause methaemoglobinaemia (Meadows, 1995). Reports also showed that abattoir waste piled up within the environment can cause pollution and subsequently produce methane gas that intensifies green house effect (Adeyemo, 2002). The waste could also be washed away by surface runoff to contaminate ground and surface waters including market places and streets (Meadow, 1995; Abiade- Paul et al, 2006). In Nigeria, the awareness of the waste pollution is low, thus pollution of natural and artificial waters and environment by these waste matters has continued to be one of the most important and complex challenges confronting public health authorities (Adelagan, 2002).

Poor meat safety can arise in various ways such as chemical (pesticides and antibiotics) residues deposition, disease in animals (zoonotic diseases) and most importantly by microbial contamination with pathogenic microbes and toxins (Oboegbulem and Muogbe, 1981; Winamo, 1992; Okolocha et al, 2002; Abiade et al, 2006). Microbial population is always in constant evolution, with infinite adaptive capacities towards conditions, that are used to control it, all making food safety perpetual issue. Ignorance concerning food safety measures provides potential for increased food borne diseases in man.

Prospects for Future Management of Abattoir Operations and Waste in Nigeria

The nation's recent clamour and commendable desire to achieve national self sufficiency in food production, food

security, food safety and improved quality of life cannot be realized on the present poor quality of abattoir operation and management. Media reports and spot visits to abattoirs in Nigeria, revealed that despite the deplorable state of the nation's abattoirs, the industry still generates a lot of revenues and employments for local government authorities and youths respectively, it also offers huge business opportunities to livestock traders, butchers, meat and meat by product sellers who are always seen every morning within the premises hustling for business. It is therefore pertinent that the challenges in the industry be addressed. In Nigeria, creation of consumer and butcher-awareness, the cleaning or proper management of abattoir environment and establishment of an efficient system is still our challenge. Safety and preservation of meat supply and slaughter environment will always be a crucial concern in feeding and maintaining quality of life for our growing world population. It is therefore hardly surprising that there is an increasing call for reform on the establishment, operation and management of abattoirs, with a view of bringing down production cost; improve on the management and meat quality. The current constitutional provision where the responsibility of establishing, maintenance and regulation of slaughter houses is placed under local government authorities should be reviewed. The desirability of entrusting the management of abattoir establishments to cooperative and municipal groups should be explored. An abattoir may be financed by private association such as, cooperatives under the administrative supervision of the public authority. The administrative and technical control should be separated since it would enable functions and responsibilities to be clearly defined.

The Veterinary inspector by virtue of his position as the technical and sanitary director of the abattoir is responsible for the control of establishment at every stage of operations so that he can exercise maximum supervision and intervene as rapidly as possible when required. Legislation must be enacted to describe approval for all establishment intended for use or in use at abattoirs and in all premises where meat or meat products are stored, processed and/or sold.

Deep rooted local customs and tastes as reported by Fasanmi, (2002) must be respected. Mere enactment of laws which will cause undue hardship to the local butchers, or high prices to the consumers, would be without effect and would be circumvented by such practices as adulteration and other outright evasions of the law. Gradual steps must be taken; the economics of the local situations must be kept paramount in mind, and the

necessity for education of the stakeholders and public being given attention desired. All national legislations tolerate the existence of private abattoirs or slaughter houses. However, Fasanmi, (2002) in his paper suggested that abattoirs should be publicly administered with a budget independent of the national or municipal administration as provision of abattoir is a social service. Tax revenues generated from abattoirs should be used exclusively to meet the cost of maintenance and operations, salaries and wages including social insurance payments made on behalf of employed personnel.

Refresher courses and Training-The-Trainer courses for abattoir managers, meat inspectors, butchers and meat traders should be routinely organized. Joint visitation of standard abattoirs by these personnel should be encouraged.

Abattoir designs in most states are obsolete, varied and lack uniformity. The design of such abattoirs should be changed to accommodate facilities for the operation and good management. Report has shown that FDL & PCS has already issued model designs for township abattoirs, rural slaughter houses and slabs to all states of the federation. This abattoir design must include the required facilities including water supply.

Local governments and private entrepreneurs should be encouraged to establish and effectively manage abattoirs, slaughter houses and slabs nationwide. We make this recommendation to be in consonance with the current drive of the Federal government of Nigeria position about the operations of public utilities, and more importantly because evidence abounds to show the success of such ventures. Draft copy of Meat Inspection and hygiene Act before the National Assembly must be quickly passed and signed into law for proper implementation and enforcement of the law by the governments and staff. This will ensure proper management of the abattoirs and efficient meat inspection and hygiene. Provision of waste disposal system such as incinerators and r direct connection of abattoir drainage system to the municipal sewage drainage system where available are highly recommended. Awareness on the use of abattoir waste (manure) for biogas production and subsequent use of slurry thereafter as fertilizer is also recommended as a means of disposal and management of abattoir waste.

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**Table 1:** Abattoirs, Slaughter Houses/Slabs and Annual Slaughter of Animals in Nigeria

State	Abattoirs	Slaughter		Annual Slaughter
		Houses	Slabs	
Abia	0	20	11	77075
Adamawa	1	4	66	119200
Akwa Ibom	0	1	25	25550
Anambra	0	2	68	35204
Bauchi	1	11	22	718060
Bayelsa	0	1	10	15000
Benue	0	2	38	485914
Borno	1	0	30	339450
Cross River	3	6	34	386157
Delta	0	7	28	341689
Ebonyi	0	17	10	14000

Edo	0	4	22	325128
Ekiti	0	0	24	116481
Enugu	1	14	30	33308
Gombe	0	1	11	417084
Imo	0	3	42	81750
Jigawa	0	0	48	589428
kaduna	3	2	46	487316
Kano	2	6	44	974613
Katsina	1	0	41	581385
Kebbi	0	1	21	516879
Kogi	0	3	21	574121
Kwara	0	1	16	285181
Lagos	2	0	78	1378716
Nasarawa	2	0	19	498743
Niger	3	10	30	684132
Ogun	1	1	28	104137
Ondo	1	1	28	91845
Osun	0	1	48	143164
Oyo	1	0	44	112609
Plateau	1	4	12	317175
Rivers	1	0	36	786741
Sokoto	1	0	38	689147
Taraba	1	2	13	420074
Yobe	1	0	21	589188
Zamfara	1	1	18	518184
FCT Abuja	1	6	10	254040
<b>Total</b>	<b>30</b>	<b>132</b>	<b>1077</b>	<b>14127868</b>

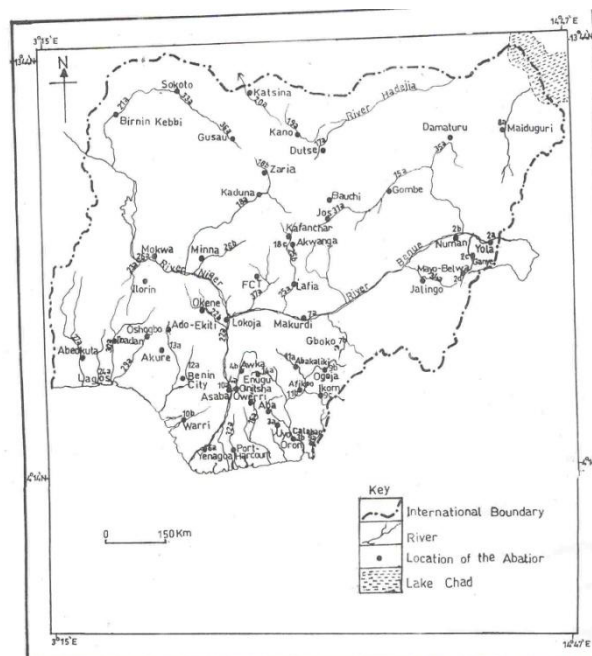
**Table 2:** Distribution of Abattoir/Slaughter houses and associated rivers by States in Nigeria

State	Towns/Cities	Rivers	River code
Abia	Aba	Ndiegoro	1a
	Umuahia	Achacha	1b
Adamawa	Yola	Benue	2a
	Mubi	Yedseram	2b
	Numan	Benue	2c
	Ganye	Deo	2d
	Mayobelwa	Mayobelwa	2e
Akwa Ibom	Uyo	Kwa Iboe	3a
	Oron	Cross River	3b
	Ikot Ekpene	Kwa Iboe	3c
Anambra	Onitsha	Niger	4a
	Awka	Iyi Agu	4b
Bauchi	Bauchi	Maje	5a
Bayelsa	Yenagoa	Seiviri	6a
	Imiringi	Creek	6b
Benue	Makurdi	Benue	7a
	Gboko	Konshisha	7b
Borno	Maidugiri	Goya Kyauwo	8a
Cross River	Calabar	Calabar river	9a
	Ogoja	Aya	9b
	Ikot	Cross river	9c
Delta	Asaba	Niger	10a
	Warri	Warri river	10b
Ebonyi	Abakaliki	Iyi Udene	11a
	Ezillo	Ebonyi	11b
	Afikpo	Cross River	11c
Edo	Benin	Ikpoba	12a
Ekiti	Ado Ekiti	Ogbesse	13a
Enugu	Enugu	Asata	14a
	Emene	Ekulu	14b
Gombe	Gombe	Gaji	15a
Imo	Owerri	Oramiriukwa	16a
Jigawa	Dutse	Dudurum	17a
Kaduna	Kaduna	Kaduna	18a

	Zaria	Kubani	18b
	Kafanchan	Made	18c
Kano	Old Kano	Watari	19a
	New Kano	Chalawa	19b
Katsina	Katsina	Ka	20a
Kebbi	Birnin Kebbi	Sokoto	21a
Kogi	Lokoja	Niger	22a
	Okene	Edion	22b
Kwara	Ilorin	Oshin	23a
Lagos	Oko-Oba	Creeks & Lagoon	24a
	Agege	Creeks & Lagoon	24b
Nasarawa	Lafia	Mada	25a
	Keffi	Daudau	25b
	Akwanga	Mada	25c
Niger	Mokwa	Niger	26a
	Minna	Chanchanga	26b
	Mopa	Niger	26c
Ogun	Abeokuta	Ogun	27a
Ondo	Akure	Ogbesse	28a
Osun	Oshogbo	Oshun	29a
Oyo	Ibadan	Ogunpa	30a
Plateau	Jos	Lere	31a
Rivers	Port Harcourt	Okpoka	32a
Sokoto	Sokoto	Sokoto	33a
Taraba	Jalingo	Nukkai	34a
Yobe	Damaturu	Anumma	35a
Zamfara	Gusau	Sokoto	36a
FCT	Garki	Jubi	37a
	Gwagwalada	Usuma	37b
	Kuje	Usuma	37c

**Table 3:** Disease causing organisms found in slaughter animals and abattoir wastes in Nigeria

Type	Source of organism		Reference
	Animal	Abattoir waste/effluent	
Bacteria		<i>Bacillus sp</i> , <i>Clastridium welchi</i> ( <i>Cl. perfringes</i> ), <i>Pseudomonas aeruginosa</i> , <i>Microccus luteus</i> , <i>Vibrio sp</i> , <i>Lactobacillus platinum</i>	Adesemoye <i>et al</i> , 2006.
Bacteria		<i>Staphylococcus sp.</i> , <i>Streptococcus sp.</i> , <i>Escherichia coli</i> . <i>Salmonella sp.</i> , <i>Proteus sp.</i> <i>Bacillus sp.</i>	Yakubu <i>et al</i> , 2007 Muoghalu and Omocho. 1997 Bikom <i>et al</i> , 2007
Bacteria	<i>Mycobacterium bovis</i> , <i>Mycobacterium tuberculosis</i>		
Fungi		<i>Aspergillus niger</i> , <i>Mucor sp.</i> , <i>Penicillium sp.</i> , <i>Saccarhomyces sp.</i> , <i>Fusarium sp</i>	Adesemoye <i>et al</i> , 2006
Bacteria	<i>Salmonella sp.</i>		Oboegbulem <i>et al</i> , 1981; Tabukun <i>et al</i> , 1996.
Helminthes	Hydatid cysts Cysticercus cysts		Opera M.N <i>et al</i> , 2006 Okolo M.I, 1986



**Fig. 1:** Distribution of Abattoir/Slaughter houses and associated rivers in Nigeria

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