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Research Article

Antibiotic Susceptibility Patterns of *Salmonella* Sp. Isolated From Cattle Dungs and Slaughter Slabs, Ile-Ife, Osun State

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ABSTRACT

Introduction: Bacteria of the genus Salmonella are significant food safety concern in many parts of the world, especially in developing countries like Nigeria.

Materials and methods: A total of Sixty-seven (67) samples were obtained from different abattoirs in all the four local government Areas in Ile-Ife. Samples collected from the different abattoirs include; slaughter slab and swab of freshly killed cow dung, with the aim of isolating and determining *Salmonella* species. The samples were transported into the microbiological laboratory and isolated according to conventional, cultural and serological methods, alongside further biochemical test was also carried out.

Result: Out of the 67 samples, 21 were positive for *Salmonella*. The antibiotic susceptibility pattern of theisolates was subjected to 7 routinely prescribed antibiotics namely; chloramphenicol, ciprofloxacin, amoxicillin, Augmentin, gentamycin, pefloxacin, streptomycin.

Conclusion: This study confirms the presence of multi-drug resistant *Salmonella* species in cattle dung and slaughter slab at the abattoirs in Ile-Ife, Osun state Nigeria. Proper hygiene methods should be encouraged in the study area. To prevent cross infection between the meat vendors and the consumers.

Keywords: *Salmonella*; Infections; Antibiotic resistant; Antibiotics; Abattoir

INTRODUCTION

The demand and consumption of animal products such as meat (especially raw meat) is high in particular and in the country in general. Nevertheless, reports on the hygienic status abattoir and butcher shops are fragmented because no comparable data are available regarding the assessment of food safety practice, food-borne diseases, and microbial load of meat in the abattoir and butcher shops of the study area. Top among hygiene slaughter challenges in developing countries, including Nigeria, is the lack of necessary infrastructure that enhances hygiene processing such as potable water supply, drainage, and proper waste disposal facilities [1-3].

This is exacerbated by poor knowledge, unhygienic methods of slaughter and processing activities among slaughterhouse personnel as well as government's lack of political will to enforce hygiene slaughter and meat inspection laws in slaughterhouses. In most Nigeria slaughterhouses, activities such as slaughter, flaying, carcass splitting, and intestinal evisceration are usually performed on the floor resulting in profound contamination of the floor and carcasses with feces. Livestock feces are heavily populated with Enterobacteriaceae, which are commensal flora of the gastrointestinal tract.

They are always present in the slaughterhouse environment, and being harbored and shed by animals and slaughterhouse personnel, are the most common contaminating aerobic bacteria in slaughterhouses. *Salmonella* is a zoonotic foodborne pathogen and the etiologic agent of salmonellosis. The emergence of antimicrobial resistant *Salmonella* recovered from meat products has become a source of major concern. Pathogens are reported to inflict more serious damage when they are antimicrobial-resistant. Resistance results in longer stay in hospital as well as

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increased cost and less effective chemotherapy that may become toxic to the patient. Infections due to resistant Salmonella are reported to result in increase in morbidity and mortality, especially in immune compromised patients.

Obviously, the presence of resistant *Salmonella* in meat is a threat to public health. Salmonellae resist drugs through enzymatic degradation, alteration of site of actions, blocking cell permeability, efflux pumps, and horizontal transfer of resistant genes. Drug-resistant *Salmonella* are capable of transmitting antibacterial resistance genes to other bacteria, thereby maintaining the dissemination of antimicrobial resistance among bacteria in the food chain. In Nigeria, multidrug-resistant *Salmonella* spp. has been isolated from various sources: Water, farm produce and environment, abattoir environment poultry [4-6].

In this study, we investigated the antibiotic susceptibility patterns of *Salmonella* sp. isolated from cattle dungs and slaughter slabs, ile-Ife, osun state.

MATERIALS AND METHODS

Study area

The study was carried out in slaughter houses located in Ile-ife, Osun state. The city is located in present-day Osun state with a population of 509,813 according to population census of 2006 (Figure 1).

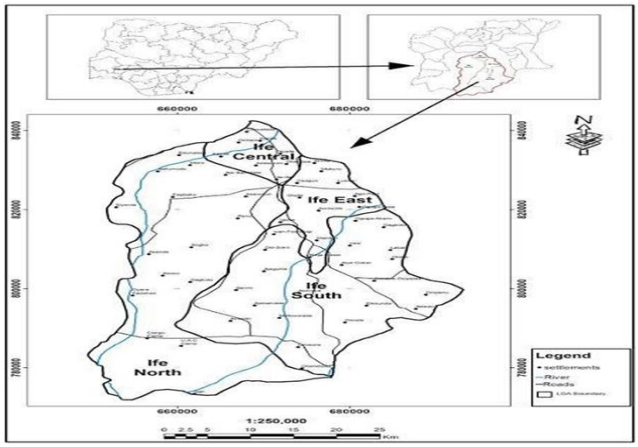

Figure 1: The study was carried out in slaughter houses located in Ile-ife, Osun state.

Sample selection

In order to get the cattle slaughter house, 15 locations were selected randomly out of (29 wards local government) located in Ile-ife.

Sample collection

The surface swabs from abattoir were collected aseptically using sterile moistened swab sticks by rubbing firmly over the predetermined surface area using parallel stroke lines with slow rotation with respectively chosen template surface area to be swabbed. In the abattoir the moistened sterile swab stick was used to swab 60 cm^2 from the slaughter slabs. The swabs were transferred to the respective capped sterile tubes and then transferred into the tube containing nutrient broth aseptically.

Isolation, identification and characterization

Each sample swab was inoculated into prepared sterile nutrient broth (Oxoid, UK) and incubated at 37°C for 24 h for enrichment. Discrete colonies were later sub-cultured on a solid differential media; MacKonkey agar (*E.coli*) and *salmonella*-shigella agar (SS Agar). All the plates were incubated at 37°C for 24 hr. Discrete colonies were further sub cultured onto freshly prepared plates of nutrient agar. Gram staining, morphological identification, catalase and coagulase tests, sugar fermentation analysis and antimicrobial susceptibility trends of the isolate were conducted [7-10].

RESULTS

A total of twenty-one (21) *Salmonella* isolates were isolated from 67 samples obtained from cattle dung and slaughter slab (Tables 1-4).

Table 1: Morphological reaction of isolate to the selected media.

Morphology	Results
Growth in nutrient agar	Positive for all isolates
Growth in macconkey agar	Positive for *Salmonella* species
Growth in *Salmonella*-shigella agar	Positive for *Salmonella* species
Motility testing	Positive for *Salmonella* species
Gram staining	Negative for *Salmonella* species

Table 2: Microscopic examination of isolates.

Isolates	Gram reaction	Shape	Arrangement
Mc22	-ve	Rod	Clustered
Kc4	-ve	Rod	Clustered
Ac4	-ve	Rod	Clustered
Ac2	-ve	Rod	Clustered
Hc2	-ve	Rod	Clustered
Hc4	-ve	Rod	Clustered
Gc4	-ve	Rod	Clustered
Ic2	-ve	Rod	Clustered
Ic4	-ve	Rod	Clustered
Jc2	-ve	Rod	Clustered
Hb	-ve	Rod	Clustered
Fb2	-ve	Rod	Clustered
Fb3	-ve	Rod	Clustered
Gb1	-ve	Rod	Separated
Ga	-ve	Rod	Clustered
Ia1	-ve	Rod	Clustered
Ia2	-ve	Rod	Clustered
Ma	-ve	Rod	Clustered
Fa	-ve	Rod	Clustered
Ea2	-ve	Rod	Separated
Ea1	-ve	Rod	Clustered

Table 3: Biochemical test of the *Salmonella* specie.

Sample Code	Biochemical test									
	Catalase	Indole	Citrate	Motility	Methyl red	Gram staining	Triple sugar iron			
							glucose	Lactose	H_2S	Gas
Kc4	+	-	+	+	+	-	+	-	+	-
Mc22	+	-	+	+	+	-	+	-	+	+
Ac4	+	-	+	+	+	-	+	-	-	-
Ac2	+	-	+	+	+	-	+	+	+	-
Hc2	+	-	+	+	+	-	+	-	+	-
Hc4	+	-	+	+	+	-	+	-	-	-

Gc4	+	-	+	+	+	-	+	-	+	-
Ic2	+	-	+	+	+	-	+	-	+	-
Ic4	+	-	+	+	+	-	+	-	+	-
Jc2	+	-	+	+	+	-	+	-	+	-
Hb	+	-	+	+	+	-	+	-	+	-
Fb2	+	-	+	+	+	-	+	-	+	-
Fb3	+	-	+	+	+	-	+	-	+	-
Gb1	+	-	+	+	+	-	+	-	+	-
Ga	+	-	+	+	+	-	+	-	-	-
Ia1	+	-	+	+	+	-	+	-	+	-
Ia2	+	-	+	+	+	-	+	-	+	+
Ma	+	-	+	+	+	-	+	-	-	+
Fa	+	-	+	+	+	-	+	-	+	+
Ea2	+	-	+	+	+	-	+	-	+	-
Ea1	+	-	+	+	+	-	+	-	+	-

Table 4: Antibiotic susceptibility index of *Salmonella*.

Antibiotics	Total isolates	Susceptible n (%)	Intermediate n (%)	Resistant n (%)	Total n (%)
Chloramphenicol	15	14 (93.33)	1 (6.67)	0 (0)	15 (100)
Ciprofloxacin	15	15 (100)	0 (0)	0 (0)	15 (100)
Amoxicillin	15	10 (66.67)	1 (6.67)	4 (26.67)	15 (100)
Augmentin	15	9 (60)	2 (13.33)	4 (26.67)	15 (100)
Gentamycin	15	2 (13.33)	0 (0)	13 (86.67)	15 (100)
Pefloxacin	15	15 (100	0 (0)	0 (0)	15 (100)
Streptomycin	15	15 (100)	0 (0)	0 (0)	15 (100)

DISCUSSION

The study revealed the antibiotic susceptibility pattern of *Salmonella* specie isolated from slaughter slabs and cattle dungs in Ile-Ife, Osun state and how it poses a significant risk on the consumers. From the 67 samples collected from abattoirs 21 samples showed *Salmonella* growth and the rest showed other enteric bacteria such as *Escherichia coli* and *Shigella*. There is thus, urgent need for applying proper hygienic practices among the food vendors as we equally recommend the use disposable aprons by the meat vendors as these will restrict transfer and the spread of food borne pathogens (Table 5) [11-14].

Table 5: Imperative chart of zone of sizes of sensitivity to antibiotics.

Antibiotics	Disc potency	Susceptible	intermediate	Resistance
Chloramphenicol	30 µg	≥ 18	13-17	≤12
Ciprofloxacin	10 µg	≥ 31	21-30	≤20
Amoxicillin	30 µg	≥ 18	14-17	≤13
Augmentin	30 µg	≥ 18	14-17	≤13
Gentamycin	10 µg	≤ 15	13-14	≥12
Pefloxacin	30 µg	≥15	12-14	≤11
Streptomycin	30 µg	≥15	12-14	≤11

Based on this study *Salmonella* showed resistance to Gentamycin, Amoxicillin and Augmentin but susceptible to Ciprofloxacin, Chloramphenicol, Pefloxacin and Streptomycin. The ability of some of these *Salmonella* isolates to show high level of resistance to some of the antimicrobial agents used is an indication that these antibiotics have been abused, hence the possibility they have acquired resistance.

CONCLUSION

Knowing the prevalent resistance of these microorganisms to antibiotics, different antibiotics must be used and tested to know which actually is potent to treat salmonella infections so as to reduce excessive cost of health services, reduce morbid services, reduce mortality rate and overall lead to a general wellbeing. However, preventive measures should be taken especially daily washing of the slaughter slab and proper disposal of feacal matters, availability of clean drinking water, promotion of safe food handling practices and public health education in order to maintain a proper hygiene level. The knowledge and understanding about factors that contribute to the occurrence, distribution and establishment of the salmonella disease may be helpful in eliminating its survival in the environment, thereby protecting public health.

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