Journal of Agriculture and Veterinary Sciences
Volume 7, Number 1, 2015
ISSN: 2277-0062

Concurrent Caecal Coccidiosis and Bacteriosis in Slaughter Chickens in Maiduguri, Borno State, Nigeria

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ABSTRACT

The prevalence of concurrent coccidial and bacterial infections from caecal contents of slaughtered chickens was investigated in this study using saturated salt floatation technique and culture media standard bacteriological procedures. Out of the 450 caecal contents examined 63 (14%) had coccidian oocyts with severity scores of 1+ having 11 (17.5%), 2+ with 21 (33.3%), 3+ with 23 (36.5%) and 4+ with 8 (12.7%). Bacterial isolates were *Escherichia coli* with a prevalence of 6 (9.5%), *Salmonella species* mixed with *E. coli* 14 (22.2%), *Enterobacter* species mixed with *E. coli* 7 (11.1%), *Klebsiella* species mixed with *E. coli* 6 (9.52%), *Staphylococcus aureus* mixed with *E. coli* 8 (12.7%), *Corynebacterium* species mixed with *E. coli* 6 (9.5%) and *Staphylococcus* species mixed with *E. coli* 7 (11.1%). Antibiogram of the bacterial isolates showed that they were susceptible to ciprofloxacin, gentamycin, ofloxacin and resistant to erythromycin, nitrofurantoin and floxapen.

Keywords: Caecal Coccidiosis, Bacteriosis, Chicken, Maiduguri, Nigeria

Introduction

Poultry is a domesticated species of birds which are reared in many parts of the modern world for the production of chief source of not only cheaper protein of animal origin but also of high quality human food (Jordal *et al.*, 2002; Adebambo, 2005). Even though the term poultry is mostly used for chickens, it also includes other avian species like turkey, duck, guinea fowl and geese (Adene, 2004). One more species of birds namely the quail has been recently domesticated. The most popular species among poultry is chicken and it constitutes about 85 – 90% of the poultry industry in most parts of the world (Alders 2004). In developing countries poultry production offers an opportunity to feed the fast growing human population and to provide income for resource poor farmers (CSA, 2004).

Rearing healthy poultry is one of the major factors affecting the economy of poultry farming, as it is directly related to profit or loss in poultry production. Therefore, managing poultry health provides an enhanced productive performance of birds by minimizing disease risk. As far as poultry diseases are concerned practically they are difficult to diagnose. The symptoms and lesions of most of the diseases are interminglingly similar, puzzling, overlapping and less specific to their causes. Secondly, with one major disease many other secondary invaders are also involved in several outbreaks (Jordan, 1990). It is always better to prevent a disease than to cure it. Sick birds will always be unproductive. Even if the birds survive, the recovered birds may be chronic carriers and transmitters of pathogenic organisms. Therefore, birds should always be kept as free as possible from disease in order to ensure both maximum profitability and productivity. The risk of disease outbreak continues to be a major concern to the poultry industry (Livestock and Aquaculture Watch, 2009). Various infective agents like viruses, bacteria, fungi, protozoan parasites, mould and nutritional deficiencies are causative entities responsible for production of diseases in poultry (Jordan and Pattison, 1996). Coccidiosis is one of the most important diseases of poultry particularly in chickens worldwide and it is characterized by enteritis (Getachew and Getachew, 2008). It is caused by protozoan of the Phylum Apicomplexa which undergoes a direct life cycle with transmission between hosts by way of resistant oocysts, most coccidia in poultry belongs to the genus *Eimeria*. The most common species are *E. hangani, E. mivati, E. acervulina, E. brunetti, E. mitis, E. maxima* and *E. tenella* (Jordan, 1990). The sites and nature of lesions vary between species. *E. acervulina* and *E. maxima* are the most prevalent with *E. tenella* the commonest of the highly pathogenic species. *E. tenella* causes caecal coccidiosis initially with blotchy hemorrhagic lesion, accompanied by hemorrhage into the caecal lumen and dysentery. The second stage schizonts in deep, sub – epithelial position are responsible for the lesion. This phase resolves in 1 or 2 days and the caeca become pale and shrunken with a thickened wall. A core of cellular debris and oocysts forms in the lumen (Jordan, 1990).

Concurrent infections in the avian species have been reported to aggravate the main clinical disease and increased mortality. The clinical effects of *Histomonas* infection has been aggravated by concurrent infection with *Eimeria* and *Enterococcus* species in young chicks (Alkhalof and Mahmoud, 2009). Many drugs have been developed for the treatment or suppression of coccidiosis and are usually administered in feed or water. Amprolium, nitrofurazone, nicarbazine, sulphaquinoxaline and zoalene when administered appropriately have

been demonstrated to reduce the rate of mortality in outbreaks (McDougald and Reid, 1991; Rabo *et al*., 2002). Populations of bacteria within the microflora of the caecum appear to undergo significant changes in clinical periods of the disease (4 – 7 days) when *Escherichia coli, Staphylococcus* species, feacal *Streptococcus* and H_2S producing *Clostridium* rose to very large numbers (Kokosharov, 2001). The Enterobacteriaeceae are a family of gram negative rod shaped bacteria many of which are potential pathogens living in the intestines of animals and man. The family comprises of *Salmonella, E. coli, Citrobacter, Proteus* and *Klebsiella*. A number of important diseases of poultry are caused by the members of this family (Jordan, 1990). This study was conducted to provide information on concurrent caecal coccidiosis and bacteriosis in chickens slaughtered in Maiduguri Monday and Customs market, as well as to proffer ways of reducing the risk of zoonosis amongst poultry meat handlers and consumers.

Materials and Methods

Study area

This study was conducted in Maiduguri the capital of Borno State, Nigeria, located between latitude 11° 5′ and 12° N and longitude 13° 5′ and 14° E at about 354m above sea level with an ambient temperature of 40-45° (Alaku, 1983). The mean relative humidity of Maiduguri ranges from 30-50% with the minimum been experienced in February and March when it drops to as low as 10% and reaches maximum in August when it rises to as high as 90% (Ugherughe and Ekedohun, 1986)

Sample Collection

The caeca of 450 slaughtered chickens from Monday and Customs market within the Maiduguri metropolis were collected into clean polythene bags and transported to the Microbiology Laboratory of the Department of Veterinary Medicine, University of Maiduguri for processing. The caeca were aseptically opened by dissecting midline using sterile surgical blade and the faecal contents collected carefully into a clean and sterile plastic Petri dish.

Parasitological and Bacteriological Examination of Caecal Contents

Parasitologically the caecal contents were examined for the presence of coccidian oocysts by both the direct faecal smear and flotation techniques as described by Soulsby (1982). In the direct smear technique, a drop of saturated solution of sodium chloride was placed on a glass slide. An applicator stick was then used to place a small quantity of the caecal sample into the drop of salt

solution to dissolve under a cover slip then examined microscopically for oocysts. In the floatation technique, about 1gram of the caecal content was thoroughly ground and mixed with a little quantity of saturated sodium chloride using a mortar and a pestle. It was then sieved and transferred into a Bijou bottle which was filled to the brim with saturated sodium chloride solution using a Pasteur pipette. A cover slip was carefully placed on the meniscus and the setup was allowed to stand on the laboratory bench top for 5 minutes. The cover slip was then carefully lifted and placed on a clean glass slide. The slide was then examined under x10 and x40 objective lens of the light microscope for coccidian oocysts. All positive samples were recorded. Bacteriologically, caecal contents were examined using biochemical tests. 0.5g of positive caecal contents was suspended in a Bijou bottle aseptically and 0.5ml of sterile physiological saline was added and mixed thoroughly. Then, about 0.02ml of the suspension was withdrawn using a standard calibrated sterile wire loop and spread on the surface each of blood and MacConkey agar plates which were then incubated at 37^0C for 18 to 24 hours. After incubation, the plates were examined for any bacterial growth. The bacterial growths were further identified using conventional methods as previously described by Carter (1973) and Monica (2004).

Results

Table 1 shows the scores for severity of coccidiosis in slaughtered chickens examined. An overall prevalence of 63 (14.0%) was recorded. Scores of 1+ had a prevalence of 11 (17.5%), 2+, 3+ and 4+ had 21 (33.3%), 23 (36.5%) and 8 (12.7%) respectively. Table 2 shows the prevalence of bacteriosis in slaughtered chickens examined. Bacterial isolates were *E. coli*with 6 (9.5%) as single infection, while mixed infections of *Enterobacter + E. coli*, *Streptococcus faecalis + E. coli, Klebsiella + E. coli, Staphylococcus aureus + E. coli, Salmonella + E. coli, Corynebacterium + E. coli, Staphylococcusalbus + E. coli* with 9 (14.3%), 7 (11.1%), 6 (9.5%), 8 (12.7%), 14 (22.2%), 6 (9.5%) and 7 (11.1%). Table 3 shows the antibiogram of bacterial isolates of chickens examined. The Gram +ve isolates were susceptible to all the antibiotics except for Floxape and Erythromycin which showed 100% resistance and *Streptococcus faecalis* which was only susceptible to AU and CD. The Gram –ve isolates of *E. coli*, *Salmonella*, *Klebsiella* and *Enterobacter* were 100% susceptible to CIP, GN, OF and C, 100% resistant to AM and N, while there was some resistance of *E. coli* to AX, *Salmonella* to CF, *Klebsiella* to TE, NB and AX and *Enterobacter* to AX and CF.

Table 1: Severity Scores for Coccidiosis in Slaughtered Chickens Examined in Maiduguri

Severity Score	No (%) Chickens Infected
Overall	63/450 (14.0)
1+	11 (17.46)
2+	21 (33.33)
3+	23 (36.51)
4+	8 (12.70)

NB
1+ = 1 – 3 oocysts/field
2+ = 4 – 10 oocysts/field
3+ =11 – 15 oocysts/field
4+ = > 15 oocysts/field

Table 2: Bacterial isolates from chicken infected with coccidiosis in Maiduguri

Bacterial isolates	No (%) of chicken infected (n = 63)
Escherichia coli	6 (9.5)
Enterobacter species + *E. coli*	9 (14.3)
Streptococcus faecalis + *E. coli*	7 (11.1)
Klebsiella species + *E. coli*	6 (9.5)
Staphylococcus aureus + *E.coli*	8 (12.7)
Salmonella species + *E. coli*	14 (22.2)
Corynebacterium species + *E. coli*	6 (9.5)
Staphylococcusalbus + *E. coli*	7 (11.1)

Table 3: Antibiogram of bacterial isolates from chicken infected with coccidiosis

Isolates	Zone of inhibition (millimeters)								
	CIP	GN	CX	CO	FX	AU	CD	OF	E
Gram positive									
Staphylococcusaureus	28	17	9	23	R	R	R	24	R
Streptococcusfaecalis	32	20	14	19	R	11	8	31	R
Staphylococcusalbus	30	22	11	23	R	R	R	25	R
Corynebacterium species	29	18	12	20	R	R	R	27	R

Isolates	Zone of inhibition (millimeters)									
	CIP	GN	TE	NB	AX	OF	C	CF	AM	N
Gram negative										
Escherichiacoli	27	14	19	23	R	23	18	9	R	R
Salmonella species	29	22	18	24	11	33	12	R	R	R
Klebsiella species	20	17	R	R	R	13	10	R	R	R
Enterobacter species	23	13	15	21	R	18	11	R	R	R

KEYS:

CIP – Ciprofloxacin 5MCG, GN–Gentamycin 10MCG, CX – Cephalexin 30MCG
CO – Cotrimoxole 50 MCG, FX – Floxape 30 MCG, AM – Ampicillin / Cloxacillin 30 MCG
CD – Clindamycin 10 MCG, OF – Floxacintravid 5 MCG, E – Erythromycin 10 MCG
TE – Tetracycline 50 MCG, NB – Norfloxacin (nobacilin) 10 MCG, AX – Amoxicillin 20 MCG
C – Cefuraxime (zinnot) 30 MCG, AM – Ampicillin 10 MCG, N – Nitrofuranitin 100 MCG
AU – Augumentin 30 MCG, CF – Cefuroxime 30 MCG
R – Resistance.

Discussion

This study has shown that chickens in Maiduguri have concurrent caecal coccidian and bacterial infections. An overall prevalence of 14% recorded is consistent with the findings by Saidu *et al.* (1994), Akpavie (1998) and Alkalof and Mahmoud (2009) that clinical effects of *Histomonas meleagridis* have been aggravated by concurrent infection with *Eimeria* and concurrent infection of *Escherichia coli*, *Salmonella* and coccidiosis favoured incidence of infectious bursal disease (IBD) (Amin *et al.*, 1995). The prevalence of *Escherichiacoli* mixed with *Salmonella*, *Staphylococcus aureus, Klebsiella* species, *Enterobacter* species, *Streptococcus faecalis, Corynebacterium* species and *Staphylococcus albus* agrees with the findings of Chinagoro (2002) who demonstrated bacteria

in the villi of chicken caeca. The family of enterobacteriaceace, especially the coliform group and particularly *Escherichia coli* is used as indicator for faecal contamination when present in food or water (Cruickshank, 1972; Barnes *et al.*, 1972). The protozoan parasite of the genus *Eimeria* multiplies in the intestinal tract and causes tissue damage, resulting in the interruption of feeding, digestive processes, nutrient absorption, dehydration, blood loss and increased susceptibility to other disease agents (Adamu *et al.*, 2013). Additionally, the caecum provides ideal conditions for bacterial proliferation, the content is liquid possibly with some urine which enters by retro-peristalsis, and studies has pointed out cross contamination via slaughter houses (Newell *et al.*, 2001). In conclusion, concurrent infections constitute a major risk factor limiting productivity of the poultry industry (Williams, 2005; Benisheik *et al.*, 2013), as such intensive and improved management of poultry facilities should be encouraged to decimate these challenges.

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