

## General Overview of *Escherichia coli* Infections in Animals in Nigeria

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### Abstract

Colibacillosis is an important disease of animal in Nigeria. In poultry *E. coli* causes colisepticaemia, dead-in-shell embryos, salphingitis, omphalitis, air sacculitis, which have been documented and significant economic losses have been attributed to *Escherichia coli* infections. The losses occur in form of weight loss, reduction in egg production and mortality. The important samples for the isolation of *E. coli* were heart blood, spleen, liver, gall bladder, faecal, yolk sac, and pericardium of the infected birds. The major clinical signs found in colibacillosis are enlarged and congested spleen, kidneys, lungs and intestinal mucosa. The most important serogroups of *E. coli* found in poultry in Nigeria are O2, O6, O75, O8, O9, O15, O20, O21, O23, O73, O78, and O55. There were few reports of *E. coli* infection on small ruminants in Nigeria. In sheep and goat, *E. coli* causes diarrhoea and mortality in kids and lambs. In cattle infection with *E. coli* presents with a wide spectrum of clinical manifestations, including asymptomatic carriage, diarrhea, and mastitis. It is also one of the leading causes of bacterial diarrhoea in animals. In conclusion economic importance of colibacillosis is due to severe losses it produces in different sectors of animal production. Therefore, there is need to study the organism, so as to gain a better understanding of the organism in Nigeria.

**Keywords:** *Escherichia coli*; Infections; Animal; Nigeria; General overview

### General Overview of Colibacillosis in Nigeria

#### Colibacillosis in poultry in nigeria

Diseases of poultry caused by *Escherichia coli* are of economic importance in the poultry industry in Nigeria. The organism is responsible for 30-40% mortality in broiler industry and the losses do not take into consideration weight loss and poor carcass quality in birds infected with *E. coli*. In Zaria, Saidu et al. [1] reported that a total of 834 cases of colibacillosis were recorded during a five year retrospective study (1993-1997) of colibacillosis in improved poultry breeds diagnosed at the Veterinary Teaching Hospital in Ahmadu Bello University, Zaria. Only 7.7% of these cases were confirmed by laboratory diagnosis to be colibacillosis. The highest numbers of cases were recorded in the months of January, March, April and October apparently due to chicks less than five weeks old and older birds greater than thirty-one weeks were found, to be most frequently affected. It was also found that there was no association between season and the disease, implying the occurrence of the disease all year round. Besides, birds that were subjected to stress of egg production and young chicks were highly susceptible to colibacillosis from their study. Based on the various samples obtained from sick chickens from suspected of clinical cases of colibacillosis and submitted to the Microbiology Section of Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Oladele and Raji [2] documented clinical signs such as colisepticemia, omphalitis, salphingitis and respiratory tract infection. The result of bacteriology examination was combined with clinical signs observed at the Avian unit of Veterinary Teaching Hospital, A.B.U, Zaria. A total of 324 chicken samples were submitted to the Microbiology Laboratory and *E. coli* constituted the highest number of micro-organisms isolated in the study, accounting for 104

(33.6%) of the total isolates. In another study in Zaria, Molokwu et al. [3] reported the isolation of ten bacterial species from the nasal sinus, trachea, lungs, and air- sacs of 90 chickens with respiratory distress, out of which *E. coli* accounted for 29 (17.7%) of all the isolates.

#### Dead-in-shell embryo in nigeria

Dead-in-shell embryo mortality accounting for considerable percentage of lower hatchability has been associated with specific and non-specific bacterial infections in Oyo State [4]. *Escherichia coli* are one of the bacteria known to induce embryonic mortality and losses due to early chick mortality [5,6]. In Eastern part of Nigeria dead-in-shell embryos resulting in low hatchability appear to account for significant losses [5]. Orajaka and Mohan [5] reported dead-in-shell embryo losses of 14.36% and 17.60% based on hatchery records in two farms during one-year investigation. In another study in the same area conducted by Orajaka and Mohan [5], two commercial hatcheries in Anambra State of Nigeria were investigated for the presence *E. coli*. The bacterium was recovered from 79-pooled samples containing 632 dead-in-shell embryos. From these samples, 23 strains of *E. coli*, including serogroups O1, O2, O8, O55, O86 and O111, known to be associated with pathogenic lesions in poultry, were isolated. The results of their investigation suggested that *E. coli* isolates contributed to embryonic mortality and reduced hatchability in the farms investigated. It has been established that the most common *E. coli* serogroups isolated in poultry infections include O1, O2, O4, O8, O14, O16, and O78 [6-8]. Falade [9,10] reported isolation of *E. coli* from 100 yolk samples obtained from 11-day-old dead embryos, which were characterized by darkish brown to gray yellow with foul offensive odour yolk sacs. Eighteen strains of *E. coli* were isolated with sixteen of the strains belonging to serogroup O141:K85a.c (B) and two to O139:K82 (B). Falade [10] incriminate O139 in poultry diseases, and did not attempt to assess the pathogenicity of O139 and O141 for poultry and identification of other serogroups that may be involved in

poultry infection in Nigeria. Owoade et al. [11] reported five species of bacteria from cases of dead-in-shell embryos in Oyo state of Nigeria. The bacteria species were *Alkaligenes faecalis*, *Escherichia coli*, *Proteus mirabilis*, *Staphylococcus epidermidis* and *Yersinia enterocolitica* from the yolk of 82 (22.78%) of the 360 unhatched eggs examined. The *E. coli* was observed in single or mixed cultures. All the embryos were nearly fully formed. Some of the yolks were pale-brown, while others were coagulated pale yellow and foul smelling. In Zaria, located in the Northern Guinea Savannah zone of Nigeria, there is paucity of information on bacteria associated with yolk sac infection in embryos or chicks. Therefore, there is need to conduct more research in this area.

### Colibacillosis in goats

Adetosoye [12] was among the first authors to obtain plasmid from *Escherichia coli* isolated from diarrhoeic lambs and from a clinically healthy kid. Obi [13] isolated a total of 550 *E. coli*, 250 from apparently healthy and 300 from diarrhoeic West African dwarf goats were tested for colicinogenicity. 33.2% of the strains from apparently healthy animals were colicinogenic as against 56% recorded for strains from animals with diarrhoea. Of the 251 colicinogenic, *E. coli* strains from both healthy animals consisted of types G, K, E2, A and V in decreasing frequency of occurrence, whereas those from goats with diarrhoea were made up of types V, B, E1, G, E2, E3, and in decreasing frequency of occurrence. In contrast to isolates from healthy animals, there was a marked variation in the colicin spectra of Types I and II *E. coli* from the diarrhoeic animals- that of type I being much broader. The Public Health significance of possible transfer of multiple drug resistance from colicinogenic *E. coli* strains to other enterobacteria is well known. Thus, the strains constitute a serious health risk. Ugochukwu and Anukam [14] conducted an investigation to isolates *E. coli* from faecal swabs of West African dwarf goats suffering from diarrhoea in the Nsukka area of Anambra State, Nigeria. In one academic year, a total of 37 enteric bacteria were successfully recovered aseptically from 35 faecal swabs from caprine species. The predominant enterobacteria pathogens isolated from diarrhoeic goats and their relative percentage frequency of isolation are 27 *Escherichia coli* and 73% respectively. Ushe conducted a study at the Ahmadu Bello University Veterinary Teaching Hospital (ABUVTH), Zaria to document the diseases of goats that occurred in Zaria between January, 1986 and December, 2002. A total of 1247 goats aged between day old to 4 years and reared on free range were treated during the period. Colibacillosis was among several diseases of goats diagnosed in that study, and constitute.

### Colibacillosis in turkey

Mohammed et al. [15] reported the clinico-pathological manifestation of *E. coli* infection in 36 exotic intensively managed turkeys. The turkeys were 30 weeks old and raised in the Poultry Research Section of National Animal Production Research Institute (NAPRI), Shika. The two sick birds examined were lethargic and febrile (41.2°C) with dropped wings. They were anorexic and had yellowish-white diarrhoea with darkened wattles. The post-mortem findings showed congested and enlarged liver with pin-point haemorrhages and necrotic foci. The spleen, kidneys, lungs and intestinal mucosa were enlarged and congested.

### Colibacillosis in Cattle

Onyekaba and Njoku [16] through random bacteriological examination of 300 bile samples aseptically drawn from the gallbladders of adult cattle at slaughter revealed the presence of *Escherichia coli* in 30%, and bacteriological examination of another 116 faecal samples revealed *E. coli* in 60%. Ogunrinade and Adegoke [17] reported association of *Staphylococcus pyogenes*, *E. coli* and mixed infections of these with other Enterobacteriaceae were the common bacteria isolated from the bile of infected cattle. Umolu reported that sixty samples of beef were collected randomly from Ekpoma market in Edo State Nigeria. *E. coli* was isolated from 40/60 (66.7%) of samples. Mastitis in cows was investigated by surveying a number of herds located within and around Maiduguri, Nigeria. Five thousand cows (in lactation and dry) were examined. The prevalence of mastitis was assessed by the results of physical examinations of the mammary gland by palpation, and by evaluation of milk secretion. Bacteriological examination also was carried out on all milk samples collected from affected cows, and some selected control cows. One hundred and four (2.1%) of the 5,000 cows examined showed evidence of clinical mastitis. There was no significant difference in the number of quarters affected in relation to their anatomical positions (fore- and hindquarters). The survey revealed that the majority of cases occurred in cows between 4 and 7 years of age and that the incidence declined as the animals became older. One hundred and fifty-four apparently normal cow udders (53%) contained bacterial pathogens. Bacterium isolated from mastitic cow's milk was *Escherichia coli* (6.7%). The prevalence of bovine mastitis in this area was sufficiently high as to cause substantial economic loss to farmers. It is, therefore, imperative that measures aimed at prevention and control of the disease (mastitis) be instituted in all the herds.

### Pathogenicity of some *Escherichia coli* isolated in Nigeria

Raji et al. [18] conducted in-vitro pathogenicity using Congo red, motility and haemolytic tests, while the in vivo pathogenicity was studied using day-old-chicks. The results showed that 40% of the isolates from clinical cases were Congo red positive, while 56% and 39% of the isolates from private farm in Zaria and government own farm in the same area were Congo red positive, respectively. The results of haemolysis indicated that none of the isolates from private farm in Zaria was haemolytic, while only 2 (10%) out of 20 clinical colibacillosis isolates were haemolytic and 1 (2%) out of 50 isolates from the government farm showed a zone of haemolysis on 5% sheep blood agar. Most of the *E. coli* isolates were motile and all the clinical cases and NAPRI isolates. In vivo pathogenicity of all the serotyped isolates were compared using day-old-chicks inoculated with various isolates. Strain differences in the response of the birds were noted in the mortality. Clinical cases, 91-2000 (O9:K30), 98-2000 (O8:K50) and 92-2000 (O9:K30) produced clinical signs of severe lameness, depression, diarrhoea, and loss of weight and 100% mortality in in vivo pathogenicity studies in the day-old chicks. The study highlights the serogroups of *E. coli* in this environment, and is also the first documentation of *E. coli* serotypes in Zaria-Northern Nigeria. The results for the first-time in Zaria, successfully demonstrated the pathogenicity of these isolates for day-old-chicks.

### *Escherichia coli* complicating viral and mycoplasma infections

Igbokwe reported an outbreak of Infectious Bursal Disease (IBD) which occurred concurrently with acute septicaemic colibacillosis in

15-week-old prelayer hens. The septicaemia was preceded by a subclinical IBD. Mortality in the outbreak began with lesions of septicaemia and *Escherichia coli* were isolated from the heart and blood of the infected birds. After antibiotic treatment of the bacteraemia, mortality continued, spiked, declined and then ceased. IBD was confirmed by bursal lesions, characterized by severe lymphocytolysis and cystic degeneration of the lymphoid follicles. Out of 253 infected birds, 42 (16.60%) died within eight days. The circumstances of the outbreak suggested that lack of IBD booster vaccination favoured the establishment of subclinical IBD, which suppressed immunity to predispose the birds to colisepticaemia. Etukudo and Adegboye [19] also documented complication of Chronic Respiratory Disease (CRD) cases with *E. coli* in Zaria. *Mycoplasma gallisepticum* was isolated from 71.35% of the total CRD cases while infections complications of *E. coli* were recorded from over 70% of CRD cases.

### Colibacillosis in rabbits

The only report obtained from rabbits on colibacillosis was that of Ajuwape, who examined nasal bacterial flora of 108 apparently healthy rabbits housed in Ibadan rabbitaries. *E. coli* accounted for 6% in the study. In conclusion colibacillosis is an important disease of livestock in Nigeria. The organisms have been isolated from different animal species in Nigeria. It is responsible for morbidity and mortality in livestock industry in Nigeria. The most important control measures strictly depend on good sanitisation and hygiene measures. The use of antibiotic in the treatment of *E. coli* infection should be based on antibiotic sensitivity test [20].

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