

Isolation of *Escherichia coli* and *Salmonella spp* from Japanese quail (*Coturnixcoturnix japonica*) raw eggs from selected farms in Sokoto metropolis, Nigeria

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Abstract: In Nigeria, demand for quail eggs and meat in recent years has been unprecedented as most of the consumers believed that the eggs have medicinal value with most of them taking the eggs raw. These claims have public health significance as taking raw eggs could be detrimental to health if the quails/quail eggs harbour pathogens like *Salmonella spp* or *E. coli*. This study was aimed to isolate *Escherichia coli* and *Salmonella spp* from Japanese quail raw eggs from ten selected farms in Sokoto metropolis. A total of 50 Japanese quail raw eggs were used, 5 eggs from each of the selected farms. Two hundred swabs (200) were collected from 50 eggs for *Salmonella spp* and *E. Coli* isolation. The results obtained showed out of 50 eggs (200 swabs) that were cultured on Mac Conkey agar, a total of 77/200 (38.5%) samples had bacterial growth of which 33/200 (16.5%) swab were from egg shell swab, while 44/200 (22%) were from egg internal content swab. A total of 24/200 (12%) swabs expressed lactose fermenters on Mac Conkey agar (Presumed *E. coli*), with 21/24 (87.5%) of the isolates identified as *E.coli* base on their biochemical characteristics of which 11/21(52.4%) were from egg shell swab and 13/21 (61.9%) were from internal egg content. A total of 51/200 (25.5%) swabs expressed non lactose fermenters (presumed *Salmonella spp*) of which 19/51 (37.3%) was identified as *Salmonella spp* base on their biochemical reactions of which 8/19 (42.1%) were from egg shell and 11(57.8%) from egg internal content. It was concluded that incidence is higher and that economic and public health burden of these diseases is enormous therefore concern should be given to control and prevention of these diseases.

Keywords: *E. coli*, *Salmonella Spp*, Japanese quails, Raw eggs

INTRODUCTION

The Japanese quail (*Coturnix coturnix japonica*) has been successfully adapted in several ecological zones in Nigeria beginning in Vom, Plateau State [1]. The initial apathy to the meat and eggs has been overcome with corresponding increase in demand for these products. However, the demand in recent years has been unprecedented as most of the consumers believed that the eggs have medicinal value with most of them taking the eggs raw. These claims have public health significance as taking raw eggs could be detrimental to health if the quails/quail eggs harbour pathogens like *Salmonella spp* or *E. coli*. There has been a significant increase in the demand for quails and quail products in Nigeria over the years as more people become aware of this bird. Recently quail eggs and meat are gradually gaining popularity in Sokoto [2,1]. However little or no information exist on the surface contamination of quail eggs by *Salmonella* and *E. coli* poisoning [3]. Common pathogenic bacteria that associated with food borne diseases include *E.coli* and strains of *Salmonellae spp*. [4,5,6]. These pathogenic organisms (*Salmonella species* and *Escherichia coli*) are causative agents of colibacillosis and avian

salmonellosis. Avian colibacillosis and salmonellosis are considered to be the major bacterial diseases in the poultry industry world-wide. Avian colibacillosis has been noticed to be a major infectious disease in birds of all ages. This disease has an important economic impact on poultry production worldwide. The majority of economic losses results from mortality and decrease in productivity of the affected birds [7,5]. According to the number of cases reported, and the opinion of many public health authorities, *Salmonella* is one the most common infection diseases transmitted by contaminated food products including meat and eggs [8]. Studies worldwide have shown that *Salmonellae spp* are often present and can be isolated from raw meat and eggs[9]. In Calabar, Nigeria [10] isolated *Salmonella* from raw meat There are little or documented reports on the isolations of *Salmonellae species* from raw eggs in Sokoto metropolis. This study aimed to isolate *E. coli* and *Salmonellae spp* from egg shell and internal content (albumin and yolk) of Japanese quail eggs and highlights public health significance of such findings.

MATERIALS AND METHODS

Study Area

The study was conducted in Sokoto. Sokoto is located between latitudes 12° and 13° 05' N and between longitudes 4°8' and 6°4' E in the Northern part of Nigeria and at an altitude of 350m above sea level [11]. The Sokoto climate is marked with distinct dry and wet seasons, having a mean annual rainfall of 700mm from May to October with a peak in August. The ambient temperature ranges from 14°C during the harmattan season (November to January) and over 40°C during the hot season (March to May). Humidity is usually less than 40% during the dry season but can be as high as 70% during the wet season [12]. Maximum temperature of 41°C has been reported in April and minimum of 13.2°C in January [13].

Sample Collection

Quail eggs were collected from 10 farms in Sokoto metropolis. A total of 50 eggs (5 from each farm) were collected, aseptically placed in sterile polythene bags and transported to the Veterinary Public Health Laboratory, Usmanu Danfodiyo University, Sokoto for processing.

Sample Inoculation and Processing

The external surface (shell) of the eggs were swabbed using sterile swab stick pre enriched in peptone water and selenite F broth separately while the internal content (albumin and yolk) were homogenized and pre enriched in peptone water and selenite F broth separately incubated at 37°C for 24 hours. After the enrichment, a loop full of the peptone water was streaked on Mac Conkey agar. Plates were then examined for the presence of small circular pale (whitish) and pinkish colonies suggestive of non-lactose and lactose fermenters respectively as described by [8].and [14].

Sample Preservation

Suspected *Salmonella* and *E.coli* colonies were sub cultured onto non selective nutrient agar slant for biochemical characterization.

Biochemical Tests

Biochemical tests comprising of Triple Sugar Ion (TSI) tests was conducted on each *Salmonella* isolates and indole production on each *E. coli* isolate based on procedures described by [15]. Further tests to identify the species of *Salmonella* were not carried out.

RESULT AND DISCUSSION

In many developing countries including Nigeria, lack of appropriate processing facilities as well as unsanitary slaughtering methods are the causes of unnecessary contaminations of eggs and poultry meat. Meat and eggs products coming from such conditions are often deteriorated due bacterial infection which may expose consumers to food poisoning [3].

The results obtained in this study showed that from the total samples of 50 eggs (200 swabs) that were cultured on Mac Conkey agar, 77/200 (38.5%) samples had bacterial growth of which 33/200 (16.5%) swabs had bacterial growth which were from egg shell swab, while 44/200 (22%) swabs from egg internal content (Table 1). Various routes of infection have been described. Oral route of infection represents the normal route of infection [16]. In adult carriers the reproductive organs are the predilection sites that often lead to the infection of ovarian follicles and as a result transovarian transmission of the disease occurs [5].

The results obtained from this study further showed that from the total of 50 examined samples (50 egg external swabs which were pre- enriched in peptone and selenite F broth separately and the corresponding eggs internal content pre- enriched in peptone and selenite F broth). A total of 24/200 (12%) swabs expressed lactose fermenters on Mac Conkey agar (Presumed *E. coli*) of which 11/24 (45.8%) were from eggs shell swab and 13/24 (54.2%) from the eggs internal content. However, 21/24 (87.5%) of the isolates could be identified as *E.coli* base on their biochemical characteristics of which 11/21(52.4%) were from egg shell swab and 13/21 (61.9%) were from internal egg content (Table 2). This result is in agreement with earlier report of [17] isolated *Salmonella* and *E. coli* from raw meat in Calabar, Nigeria. Avian colibacillosis is an infectious disease of birds caused by *Escherichia coli*, (*E. coli*) which is considered as one of the principal causes of morbidity and mortality, associated with heavy economic losses to the poultry industry by its association with various disease conditions, either as primary pathogen or as a secondary pathogen. It causes a variety of disease manifestations in poultry including yolk sac infection, omphalitis, respiratory tract infection, swollen head syndrome, septicemia, polyserositis, coligranuloma, enteritis, cellulitis and salpingitis [5]. The higher percentage (54.2%) recorded for egg shell swab may be due faecal contamination of eggs which may result in the penetration of *E. coli* through the shell and may spread to the chicks during hatching and is often associated with high mortality rates, or it may give rise to yolk sac infection as reported by [5], likewise eggs may become contaminated during laying [18]. As the shelled egg lies in the cloaca prior to being laid, it becomes contaminated with the excrement of the intestinal tract, including *E. coli*. More bacteria are added to the shell when the egg remains in the nest.

On the other hand, *Salmonella* infection caused by a variety of *Salmonella* species is one of the most important bacterial diseases in poultry causing heavy economic losses through mortality and reduced production [19]. Avian salmonella infection may occur in poultry either as acute or chronic form by one or more member of genus *Salmonella*, under the family *Enterobacteriaceae* [20]. Besides, motile *Salmonellae*

(paratyphoid group) infection cause salmonellosis in chickens and have zoonotic significance. *Salmonella* infections are also commonly diagnosed in quails in Nigeria. Isolation of *Pastereulla species* and *Salmonella* from quails was also reported in Nigeria [21]. From the total of 50 examined samples (50 egg external swabs which were pre- enriched in peptone and selenite F broth separately and the corresponding eggs internal content pre- enriched in peptone and selenite F broth). A total of 51/200 (25.5%) swabs expressed non lactose fermenters (presumed salmonella) of which 24/50 (47.5%) were from egg shell swab and 27/50(52.9%) were from egg internal content swabs. Of the presumed

salmonella (51/200 (25.5%) 19/51 (37.3%) could be identified as salmonella base on their biochemical reactions of which 8/19 (42.1%) were from egg shell swab and 11(57.8%) from egg internal content. (Table 3). This result is in agreement with report of [22], that the epidemiology of fowl typhoid and pullorum disease in poultry, particularly with regard to transmission from one generation to the next is known to be closely associated with infected eggs. The birds that survive from clinical disease when infected at a young stage may show few signs of infection but can become carriers [23].

Table 1: Total Number of Swabs That Yielded Bacterial Growth

Swab Sample type	Number of samples with bacterial growth (%)
Egg shell (external) swab	33/200 (16.5%)
Egg content (Internal) swab	44/200 (22%)
Total	77/200 (38.5%)

Table 2: Total Number of swabs expressed lactose fermenters on Mac Conkey (presumed *E.Coli*)

Swab Sample Type	Number of Samples (%)
Number of samples with bacterial growth	24/200 (12%)
Samples identified as E.coli base on biochemical characteristics	21/24 (87.5%)
a) Egg shell (external) swab	11/21 (52.4%)
b) Egg content (Internal) swab	13/21 (61.9%)

Table 3: Total Number of swabs expressed lactose fermenters on Mac Conkey (presumed *Salmonella spp.*)

Swab Sample type	Number of samples (%)
Number of samples with bacterial growth	51/200 (25.5%)
Samples identified as E.coli base on biochemical characteristics	19/51 (37.3%)
a) Egg shell (external) swab	8/19 (42.1%)
b) Egg content (Internal) swab	11/19 (57.8%)

CONCLUSION

Avian colibacillosis and salmonellosis are considered to be the major bacterial disease problems in the poultry industry world-wide. The economic and public health burden of these diseases is enormous and much concern is given to hygienic practices during handling and processing of raw eggs by retailers so as to prevent or reduce the pathways that may expose the consumers to increase risk of acquiring food-borne disease causing agent such as *E. coli Salmonella*.

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