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SALMONELLA ORGANISM TRANSMISSION IN HATCHING BROILER EGGS

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Abstract

The vertical transmission of Salmonella organism in hatching broiler eggs were investigated in selected states in South Western Nigeria. Hatching eggs obtained from five major hatcheries located within each state were used to isolate and characterize salmonella in shell, yolk and albumin of eggs. The study revealed that Salmonella gallinarum and Salmonella arizorae were isolated from hatcheries in Lagos State while some hatcheries in Oyo State respectively were positive for salmonella organism in hatcheries A & B for organism in hatcheries B while yolk & albumin were positive for salmonella organism in Lagos State (Hatchery A).

Introduction

In the European Union, two species of bacteria viz. Salmonella and Campylobacter caused the major part of the reported cases of food borne outbreaks in 2001. Whether the number of salmonellosis cases exceeded campylobacteriosis causes or the reverse was country specific (Cavitte, 2003). Foods of animal origin, especially poultry, poultry products, eggs and egg products are often implicated in sporadic cases and outbreaks of human salmonellosis (Bryan and Doyle, 1995). Food associated with Salmonella enteritidis outbreaks includes eggs and egg products in 68.2% of the cases (W.H.O., 2001)

There are two possible routes of salmonella contamination of intact eggs. In the transovarian route (vertical transmission), whereby the yolk membrane (very infrequently the yolk itself) or the albumin surrounding it is directly contaminated as a result of salmonella infection of the reproductive organs, i.e. ovaries or oviduct tissue, before the eggs are covered by the shell. In the trans-shell (horizontal transmission), salmonella penetrates through the egg shell after the egg is laid (Miyamoto et al., 1998).

Salmonella infection in eggs is a worldwide problem leading to millions of avoidable cases of food poisoning, (Gast et al., 2006). However, much of the poisoning has been linked to consumption of raw uncooked eggs, broilers and hatching eggs have also been a reservoir of the infection of day-old chicks.

Materials and Methods

The study was carried out with hatching egg sample from 15 major hatcheries located in Ogun, Oyo and Lagos that are within South Western Nigeria. For ease of effective coverage the sample size in (each) state was divided into zones where livestock farming is most pronounced. Five hatcheries each from Oyo, Ogun and Lagos; making 15 hatcheries in all were randomly selected. Twenty-hatching eggs were obtained from each hatchery for salmonella isolation/and characterization making a total of 300 eggs. Individual eggs were broken and separated into shell, albumin and yolk. The separated components of five eggs were pooled together separately so that each hatchery had four replicates comprising of the five pooled samples for each of the egg: yolk, shell and albumin in each replicate. The samples were inoculated into buffer peptone water in bijou bottle (BPW Ager) for pre enrichments and incubated at 37oC for 24 hours. A volume of 0.1ml of each of the pre-enriched samples (shell, albumin and yolk) was transferred into 10ml of Rappaport vassiliadies Broth with Soya (RVS) medium in bijou bottle and incubated at 41.5 ± 1oC for 24 ± 3 hours. The samples were thereafter inoculated by mean of sterile loop into plates containing xylose lysine deoxycholate agar (XLDA) plates and incubated at 37oC for 24 hours. Colonies resembling salmonella were sub cultured into brilliant green agar (BGA) plates and incubated at 37oC for 24 hours.

The inoculated Petri dishes were inverted and transferred to an incubator at 37oC for 42 hours. Typical colonies of salmonella grown on XLDA were lining a black centre and lightly transparent zone of reddish colour. When sub cultured in BGA the colonies appeared pink with 1mm to 2mm diameter. Suspended colonies were seeded into pre-dried nutrient agar plates and incubated at 37oC for 24 hours for purity. The cultures on nutrient agar plates were further used for confirmatory test. The biochemical characterization was carried out using rapid kit (oxoid microbact 24E) for the identification of members of the Enterobacteriaceae family.

The data were subjected to descriptive statistical analyses.

Result and discussion

Table 1 showed the presence of salmonella organism in hatching broiler eggs from different hatcheries across Oyo, Ogun and Lagos state Nigeria. The result for salmonella organism as evident in the table revealed that the yolk and albumin were positive for salmonella organism in all states respectively. In Oyo State, only albumin was positive for salmonella organism in hatchery B while yolk and albumin were positive for salmonella organism in Lagos State (Hatchery A).

Table 2 showed the biochemical characterization of isolated salmonella organism from hatching broiler eggs from different hatcheries in selected states in South Western Nigeria. The result revealed two hatcheries in Ogun State (A & C) that are positive for salmonella organism. Hatchery A was identified to contain the serotype *Salmonella arizorae* in the yolk. The table also revealed *Salmonella pullorum* in the yolk of egg from Lagos state hatcheries and *Salmonella gallinarum* from the albumin of hatching egg from hatchery B in Oyo State, however, no salmonella organism isolated was detected from form OG-A yolk, OG-C albumin and OY-B yolk respectively.

It is evident from the result that *Salmonella gallinarum* and *S. paratyphi A* were found in the albumin of hatching eggs: *Salmonella arizorae*, *Salmonella pullorum* were also detected in the yolk of the hatching eggs, this result is in line with Pope, (2000) who reported that vertical transmission can occur when follicles in the ovary are infected or the developing eggs become infected in the oviduct. Davies and May (1994) also reported that salmonella bacteria are not a single entity but exist in a huge range of serotypes (serovars) from dedicated poultry pathogens like *Salmonella pullorum* and *Salmonella gallinarum* as recorded in the present study. Migration of bacteria from outside through the porous shell matrix of undamaged egg is possible especially when eggs are newly laid and under humid conditions.

Conclusion

It is evident from the study that; Salmonella organism can reside in both the albumin and yolk of an eggs e.g. Salmonella gallinarum, S. arizoreae, S. pullorum, S. paratypi A which was isolated in eggs. In effect could cause vertical transmission from the parent stock to the day-old chicks.

Table 1: Presence of Salmonella in hatching broiler eggs from different Hatcheries in Ogun State, Oyo and Lagos state Nigeria.

	Hatcheries				
Parameters	**A**	**B**	**C**	**D**	**E**
Ogun State					
Yolk	-	-	+	-	-
Albumen	+	-	-	-	-
Shell	-	-	-	-	-
Oyo State					
Yolk	-	-	-	-	-
Albumen	-	+	-	-	-
Shell	-	-	-	-	-
Lagos State					
Yolk	+	-	-	-	-
Albumen	+	-	-	-	-
Shell	-	-	-	-	-

Table 2: Biochemical Test for Salmonella Isolate

Samples	Motility	Arginne	Salicin	Raffinise	Adonitor	Arabinise	Sucrose	Rhamnose	Sorbitol	Inositol	Malinate	Gelatin	IDA	Citrate	Urease	Indole	ONPG	Xylose	Mannitol	Glucose	H2S	Ornithine	Lysine	Suspected Isolate
OG-A Albumen OG-A Yolk																								*S. gallinarum*
OG-C Yolk OG-C Albumen																								*S. arizorae*
L-A Yolk L-A Albumen																								*S. pullorum*
L-A Albumen L-A Yolk																								*S. gallinarum*
OY-B Albumen OY-B Yolk																								*S. paratyph A* No isolate

Key

OG-A Albumen- Ogun state Hatchery A

OG-C yolk- Ogun state Hatchery C

L-A yolk-Lagos state hatchery A

L-A Albumen- Lagos state hatchery A

OY-B Albumen- Oyo state Hatchery B

References

Cavitte, J.C. (2003). Present and future control of food-borne pathogens in poultry; revision of the European Community legislation on zoonoses. In salvat G and Protais J (ed), Proceedings of the Xvith European symposium on the quality of poultry meat and xth European symposium on the quality of Eggs and Egg product. Saint-Brieuc, Prontragon, France, September 23-26, 2003. Volume 1 pp 46-58.

Miyamoto, T., Horie, T. Baba, E., Sassal S. and Solomon, S. E. (1992). Relationship between egg shell structure and increment of Salmonella enteritidis across the egg shell associated with freshness of laid eggs and refrigeration. Journal of Food Protection 61: 350-353.

Bryan, F. L. And Doyle, M. P. (1995). Health risks and consequences of Salmonella and Campylobacter jejuni in raw poultry. Journal of food protection 58:326-344.

W.H.O. (2001). World Health Organisation Surveillance programme for control of food borne infection and intoxications in Europe. Seventh report, 1993 – 1998. In: Schmidt K. and Tirado E. (ed). Federal Institute for Health Protection of Consumers and Veterinary Medicine (Bg vv). Berlin, Germany, pp 415, 422-423.

Gast, R. K., Guraya, R., Bowldin, J. G., Holt, P. S. and Moore, R. W. (2006). Colonization of reproductive tract and deposition inside eggs laid by hens infected with Salmonella enteriditis or Heidelberg. Poultry Science Association Meeting. 85: (1): 138.

Daves, R. H. and Wray, C. (1994). Salmonella pollution in poultry units and associated enterprises. In; pollution in livestock production system (Dewi, A., Axford, R., Marai, F. M. (Eds). International, Wallingford, UK. Pp. 137 – 165.

Poppe, C., Wray. C and Wray, A. (2000). Salmonella infections in the domestic fowl. In: Salmonella in domestic animals, CAB International, p. 107-124.