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Salmonella in Poultry; An Overview

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ABSTRACT

An essential part of commercial poultry production is safeguarding flocks of birds against contamination by unwanted microorganisms. Currently, a serious issue called salmonellosis poses a threat to the chicken industry globally. The two most virulent serovars in avian species, Salmonella gallinarium and Salmonella pullorum (Fowl Typhoid), cause systemic infection and significant financial losses in the poultry sector. Salmonella nontyphoidal serotypes (Paratyphoid illness) pose a risk to the public's health because of their role in cases of food poisoning and their significance as zoonotic agents. All animals, including humans, can transmit the intestinal bacterium known as salmonella. Out of a total of 2500 serovars, Salmonella pullorum (pullorum illness) and S. gallinarum (bird typhoid) are the two host-adapted serovars that primarily harm poultry. Salmonella can spread horizontally from contaminated environments to birds as well as vertically from parent flocks to offspring. The danger of the introduction and persistence of infections can be substantially reduced by good management of biosecurity. This study is an overview of Salmonella in poultry which tell us some diagnostic and treatment of salmonella. By reading this study people will get sound knowledge regarding salmonella even they will be able to do desirable management in order to save their bird from Salmonella.

INTRODUCTION

One of the most important global public health issues is salmonella infections. Salmonella alone causes 1.35 million infections annually in the United States of America, with diarrhea, fever, and abdominal pain being the primary symptoms, according to the Centers for Disease Control and Prevention (CDC) [1]. The disease, which often manifests as a self-limiting gastroenteritis, requires the presence of 7-8 log10 of Salmonella [2]. However, particularly in those with impaired immune systems, it can also result in extraintestinal infections [3]. The main source of infection for humans is poultry products (meat and eggs), which are frequently derived from healthy animals [4,5]. The likelihood of zoonotic transmission to humans via the food chain increases since salmonella transmission happens horizontally and vertically in birds, either resulting in a subclinical illness or not causing any modification [6,7]. Although the exact mechanism by which Salmonella persists and spreads on farms is uncertain, one suggested strategy is biofilm development [8]. These biofilms may contain strains of bacteria that are multi resistant to antibiotics as well as other elements that encourage their environmental persistence [9,10]. As a result, lowering the amount of Salmonella on the farm is crucial for improving food safety in broilers. As a result, the poultry industry has been looking for innovative feeding- and non-feeding-based solutions to manage Salmonella's prevalence in the chicken production chain. Probiotics [11], prebiotics [12], postbiotics [13], such as certain bacteriocins [14], and other substances, such as Phyto biotics [14], are some of these tactics. These substances also increase food efficiency by functioning as growth boosters. On the other hand, technological non-feeding-based tactics that have been thoroughly tested and put into practice include bacteriophages [15,16], in ovo applications [17,18], and vaccinations [19,20,21]. These methods can minimize or control Salmonella infection in poultry. Currently, -omic technologies can be utilized in poultry as supplemental tools to gather data that can lead to the development of therapeutic strategies and the detection of patterns of antibiotic resistance, reducing the presence of Salmonella and production costs [22]. As we know that bacterial disease are mainly treated by antibiotics but these are causing antibiotic

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resistivity in poultry [23,24]. Salmonella is caused by a bacterium name as Enterobacteriaceae. This bacterium are gram negative, non-spring and rod shaped. The disease has got economic importance as this causes heavy mortality and morbidity 40%.

ROUTE OF TRANSMISSION

S. typhimurium is the principal contributor to food-borne salmonellosis in humans. The disease eventually gets to people after colonization, survival, and replication on poultry farms, the bird, and eventually eggs. S. typhimurium is the principal contributor to food-borne salmonellosis in humans. After The disease eventually gets to people through colonization, survival, and replication on poultry farms, the bird, and eventually eggs. Maddadi and his co-workers discovered that the infected mature chickens' feces and eggs were free of any S. typhimurium strain that had been obtained from a pheasant and administered intravenously at a dose of 5 106 CFU [25] . According to a study by Gantois and his co-workers there was minimal S. enteritidis colonization in the spleen and reproductive organs after injecting younger hens with a high dose (108 CFU) of various Salmonella serovars, including S. enteritidis, typhimurium, heidelberg, hadar, and Virchow]26]. In contrast to the other serovars, S. typhimurium and enteritidis were shown to colonize more effectively, resulting in a larger frequency of infected eggs. While a study by Miyamoto and his coworkers revealed a higher contamination rate when birds were infected intravenously [27], Gast and his co-workers claimed that many inoculation routes (oral, aerosol, and intravenous) have demonstrated similar frequencies of egg contamination. When several salmonella serovars were administered to chickens [28]. In contrast to S. typhimurium and other serovars, postmortem analyses of several organs revealed that the reproductive tract and ovaries exhibited substantial loads of S. enteritidis. While no internal egg contamination was observed for other serovars, S. enteritidis contamination was occasionally observed in eggs. In a different investigation, mature laying hens were vaccinated with 106–107 CFU using vaginal, cloacal, and intravenous methods. The hens were then observed for up to a week. The vaginal and cloacal injection routes were found to cause less morbidity than the intravenous inoculation route. No bacteria were identified from the ovaries and upper reproductive system, but bacterial infection was observed in the liver, spleen, and reproductive tract. According to Rick oral ingestion of salmonella causes colonization of the gastrointestinal tract, particularly the crop and caecum, in chicken. Different S. enteritidis and S. typhimurium strains were administered orally to laying hens, and both serovars equally colonized the reproductive system and produced eggs [29]. But according to research by Keller and his coworkers only S. enteritidis was isolated as having the ability to lay eggs following oviposition [30]. Salmonella infection by the oral route more closely resembles a natural infection than intravenous injection. This S. typhimurium is the principal contributor to food-borne salmonellosis in humans. The disease eventually gets to people after colonization, survival, and replication on poultry farms, the bird, and eventually eggs.

SIGNS OF DISEASE

Salmonellosis symptoms included decreased egg production, sluggishness, anorexia, and profuse watery diarrhea. The liver enlarges, mottle, with or without white necrotic foci in salmonellosis. In certain cases, the spleen may be arger than usual and included white necrotic foci.

POSTMORTEM LESIONS

After acclimatization, fish were introduced into 14 aquariums, each with a water capacity of approximately 29 L. Thirty fingerlings of nearly comparable size were randomly distributed among the aquariums. Every day, according to established procedures, the water quality parameters of pH, dissolved oxygen, and temperature were measured (APHA 1985). The fingerlings were fed twice daily, in the morning and evening, at 4% of live body weight, and the amount of feed consumed each day was tracked.

HOW TO FIND OUT DISEASE

Salmonella strain isolation, identification, and serotyping should be done in order to validate the diagnosis of avian salmonellosis. Serologic testing, necropsy analysis, accompanied by microbiologic culture and typing for confirmation, can be used to detect infections in mature birds. For the diagnosis of avian salmonellosis caused by S. typhimurium or S. enteritidis, a serological ELISA test has been developed For the objective of monitoring the chicken food chain, Szmolka et al. developed a diagnostic and real-time PCR method for quick and accurate genus- and serovar-specific Salmonella detection (S. enteritidis and S. typhimurium).

TREATMENT

Various broad-spectrum antibiotics are used as treatment in chicken which might prevent bird from disease. Chloramphenicol, Neomycin, Polymyxin-B, Nitrofurazone, Amoxicillin, Tetracycline, are some antibiotics or drugs which are used to prevent salmonella infection. These are some treatment of Salmonella in Poultry but now a days drug resistivity is increasing day by day so that's why we should use some other drug like Herbal or Peptides [31] Some electrolytes also used due to dehydration.

Control Measure

- Biosecurity
- Vaccination

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BIOSECURITY

Biosecurity method should be following. Be ensure no one enter in the shed and prevent from cross infection between houses. Always use disinfect and sanitize equipment in shed. Shed should be rodents' proof. Shed should be properly cleaned from fecal material and wet litter. Proper isolation needed for prevention of salmonella infection. Overcrowding should be avoided.

VACCINATION

Live or inactivated vaccines used against salmonella and the competitive exclusion method, which is effective for a very short period (until 1 to 2 weeks after hatching). These vaccinations help to reduce the infection of birds and reduce the risk of mortality.

SALMONELLA INFECTION MINIMIZES FACTORS

Shed should be hygienic, avoid unpasteurization food, store your food appropriate temperature, avoid huddling, Avoid sewage water

DIFFERENTIAL DIAGNOSIS

There is some important differential diagnosis: Coccidiosis: It produces hemorrhagic diarrhea which is scanty in nature. Oocytes of coccidia can be identified in feces. Liver fluke infestation: Signs of anemia, eggs diseases and constipation. Pasteurellosis: Involved in respiratory system. Poisoning: Poisons may cause diarrhea

KEY POINT

Salmonellosis is one of the important zoonosis due to bacterial agents. This disease spread worldwide and has been recorded from almost all the countries. The bacteria killed by drying, sunlight and heat but they remain alive for almost 7 months in soil or feces. This bacterium can be destroyed at 60-degree temperature in 20 minutes. We can reduce the disease infection by using different strategies like improving the management issues, use antibiotics and vaccines and doing biosecurity method.

CONCLUSION

Salmonella may survive in and on a variety of materials. A "farm to fork" strategy is acknowledged as being important to reduce pathogens as the prevalence of human salmonellosis rises, and Good Manufacturing Practices (GMPs) using Hazard Analysis Critical Control Point (HACCP) principles are increasingly applied to achieve a reduction. The prevention of salmonella infections requires a thorough understanding of the epidemiology of infection as well as a tailored control strategy for each unique unit. On a farm, it's important to combine monitoring with adequate biosecurity since environmental and litter monitoring is more accurate than sampling individual birds. It is crucial to identify the vital control points for each unique farm and to keep the HACCP implementation up to date through key point process monitoring. Salmonella can spread from livestock to people because it can result in zoonoses. Eggs, egg products, and poultry meat are the main sources of Salmonella infections in people. Salmonella typically causes diarrhea in people, but in those with weakened immune systems, such as infants, young children, immunosuppressed individuals, or the elderly, a Salmonella infection can result in serious illnesses and, in extreme circumstances, even death. Salmonella must first be reduced on farms due to this significant danger. Furthermore, a high prevalence of Salmonella could be a sign of poor biosecurity and cleanliness, which could lead to the presence of unwanted microorganisms. Several national and international rules have been established, are presently being discussed, or are in the planning phase in order to limit Salmonella contamination in chicken to an acceptable level. On international food markets and in trade negotiations, these regulations must be considered. However, there are still a lot of unanswered problems regarding the most practical and cost-efficient ways to control Salmonella in the chicken sector.

REFERENCE

1. Center for Disease Control and Prevention. Salmonella. Available online: **https://www.cdc.gov/Salmonella/index.html** (accessed on 30 November 2021).
2. Arya, G.; Holtslander, R.; Robertson, J.; Yoshida, C.; Harris, J.; Parmley, J.; Nichani, A.; Johnson, R.; Poppe, C. Epidemiology, pathogenesis, genoserotyping, antimicrobial resistance, and prevention and control of non-typhoidal *Salmonella* serovars. *Curr. Clin. Microbiol. Rep.* **2017**, *4*, 43–53.
3. Feasey, N.A.; Dougan, G.; Kingsley, R.A.; Heyderman, R.S.; Gordon, M.A. Invasive non-typhoidal *Salmonella* disease: An emerging and neglected tropical disease in Africa. *Lancet.* **2012**, *379*, 2489–2499.
4. Gast, R.K.; Regmi, P.; Guraya, R.; Jones, D.R.; Anderson, K.E.; Karcher, D.M. Contamination of eggs by *Salmonella* Enteritidis in experimentally infected laying hens of four commercial genetic lines in conventional cages and enriched colony housing. *Poult. Sci.* **2019**, *98*, 5023–5027.
5. Jibril, A.H.; Okeke, I.N.; Dalsgaard, A.; Kudirkiene, E.; Akinlabi, O.C.; Bello, M.B.; Olsen, J.E. Prevalence and risk factors of *Salmonella* in commercial poultry farms in nigeria. *PLoS ONE.* **2020**, *15*, e0238190.
6. Knap, I.; Kehlet, A.B.; Bennedsen, M.; Mathis, G.F.; Hofacre, C.L.; Lumpkins, B.S.; Jensen, M.M.; Raun, M.; Lay, A. *Bacillus Subtilis* (DSM17299) Significantly reduces *Salmonella* in broilers. *Poult. Sci.* **2011**, *90*, 1690–1694.

E-ISSN : 2962-1658
Volume 01, **Number** 01, August, 2022
https://doi.org/10.47709/ijmdsa.vxix.xxxx

7. Antunes, P.; Mourão, J.; Campos, J.; Peixe, L. Salmonellosis: The role of poultry meat. *Clin. Microbiol. Infect.* **2016**, *22*, 110–121]
8. Merino, L.; Trejo, F.M.; de Antoni, G.; Golowczyc, M.A. *Lactobacillus* strains inhibit biofilm formation of *Salmonella* sp. isolates from poultry. *Int. Food Res. J.* **2019**, *123*, 258–265.
9. Dhanani, A.S.; Block, G.; Dewar, K.; Forgetta, V.; Topp, E.; Beiko, R.G.; Diarra, M.S. genomic comparison of non-typhoidal *Salmonella* Enterica serovars Typhimurium, Enteritidis, Heidelberg, Hadar and Kentucky isolates from broiler chickens. *PLoS ONE* **2015**, *10*, e0128773.
10. Guillén, S.; Marcén, M.; Álvarez, I.; Mañas, P.; Cebrián, G. Stress resistance of emerging poultry-associated *Salmonella* serovars. *Int. J. Food Microbiol.* **2020**, *335*, 108884.
11. Khan, S.; Chousalkar, K.K. Transcriptome profiling analysis of caeca in chicks challenged with *Salmonella* Typhimurium reveals differential expression of genes involved in host mucosal immune response. *Appl. Microbiol. Biotechnol.* **2020**, *104*, 9327–9342.
12. Al-Khalaifah, H.S. Benefits of probiotics and/or prebiotics for antibiotic-reduced poultry. *Poult. Sci.* **2018**, *97*, 3807–3815.
13. Buncic, S.; Sofos, J. Interventions to control *Salmonella* contamination during poultry, cattle and pig slaughter. *Int. Food Res. J.* **2012**, *45*, 641–655. [
14. Abdel-Wareth, A.A.A.; Lohakare, J.D. Effect of dietary supplementation of peppermint on performance, egg quality, and serum metabolic profile of hy-line brown hens during the late laying period. *Anim. Feed Sci. Technol.* **2014**, *197*, 114–120.
15. Grant, A.; Hashem, F.; Parveen, S. *Salmonella* and *Campylobacter: Antimicrobial* resistance and bacteriophage control in poultry. *Food Microbiol.* **2016**, *53*, 104–109.
16. Wernicki, A.; Nowaczek, A.; Urban-Chmiel, R. Bacteriophage therapy to combat bacterial infections in poultry. *Virol. J.* **2017**, *14*, 1–13.
17. Uni, Z.; Ferket, R.P. Methods for early nutrition and their potential. *Worlds Poult. Sci.* **2004**, *60*, 101–111.
18. Givisiez, P.E.N.; Moreira Filho, A.L.B.; Santos, M.R.B.; Oliveira, H.B.; Ferket, P.R.; Oliveira, C.J.B.; Malheiros, R.D. Chicken embryo development: Metabolic and morphological basis for in ovo feeding technology. *Poult. Sci.* **2020**, *99*, 6774–6782.
19. Hofacre, C.L.; Rosales, A.G.; da Costa, M.; Cookson, K.; Schaeffer, J.; Jones, M.K. Immunity and protection provided by live modified vaccines against paratyphoid *Salmonella* in poultry—an applied perspective. *Avian Dis.* **2021**, *65*, 295–302.
20. Revolledo, L.; Ferreira, A.J.P. Current perspectives in avian salmonellosis: Vaccines and immune mechanisms of protection. *J. Appl. Poult. Res.* **2012**, *21*, 418–431.
21. Renu, S.; Markazi, A.D.; Dhakal, S.; Shaan Lakshmanappa, Y.; Shanmugasundaram, R.; Selvaraj, R.K.; Renukaradhya, G.J. Oral deliverable mucoadhesive chitosan-*Salmonella* subunit nanovaccine for layer chickens. *Int. J. Nanomed.* **2020**, *15*, 761–777.
22. Vaid, R.K.; Thakur, Z.; Anand, T.; Kumar, S.; Tripathi, B.N. Comparative genome analysis of *Salmonella enterica* serovar Gallinarum biovars Pullorum and Gallinarum decodes strain specific genes. *PLoS ONE* **2021**, *16*, e0255612.
23. Samad, A., Hamza, M., Muazzam, A., Ahmer, A., Tariq, S., Shahid, M. J., ... & Din, F. U. (2022). Overview of Bacterial Diseases in Poultry and policies to control disease and antibiotic resistance. *BULLET: Jurnal Multidisiplin Ilmu*, *1*(01), 19-25.
24. Mohammed, A. A., Samad, A., & Omar, O. A. (2022). Escherichia coli spp, Staph albus and Klebseilla spp were affected by some Antibiotics for Urinary Tract Infections in Bani Waleed City. *Brilliance: Research of Artificial Intelligence*, *2*(2), 66-70.
25. MADDADI, M.S., HASSANZADEH, M., BOZOGMEHRIFARD, M. and SHOJAEI, H. (2010) Study on two inoculation routs of salmonella enteritidis in abilities to colonize in internal organs and to contaminate of eggs in broiler breeder hens. International Journal of Poultry Science 9 (3): 254-258.
26. GANTOIS, I., EECKHAUT, V., PASMANS, F., HAESEBROUCK, F., DUCATELLE, R. and VAN IMMERSEEL, F. (2008) A comparative study on the pathogenesis of egg contamination by different serotypes of salmonella. Avian Pathology 37: 399-406.
27. MIYAMOTO, T., BABA, E., TANAKA, T., SASAI, K., FUKATA, T. and ARAKAWA, A. (1997) Salmonella Enteritidis contamination of eggs from hens inoculated by vaginal cloacal and intravenous routes. Avian Diseases 41: 296-303.
28. GAST, R.K., GUARD-PETTER, J. and HOLT, P.S. (2002) Characteristics of Salmonella Enteritidis contamination in eggs after oral, aerosol, and intravenous inoculation of laying hens. Avian Diseases 46: 629-635
29. RICK, S.C. (2003) The gastrointestinal tract ecology of Salmonella Enteritidis colonization in molting hens. Poultry Science 82: 1003-1007
30. KELLER, L.H., SCHIFFERLI, D.M., BENSON, C.E., ASLAM, S. and ECKROADE, R.J. (1997) Invasion of chicken reproductive tissues and forming eggs is not unique to Salmonella Enteritidis. Avian Diseases 41: 535-539.

E-ISSN : 2962-1658
Volume 01, **Number** 01, August, 2022
https://doi.org/10.47709/ijmdsa.vxix.xxxx

31. Samad, A. (2022). Antibiotics Resistance in Poultry and its Solution. *Devotion Journal of Community Service*, *3*(10), 999-1020.