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Article Review

Salmonellosis in Poultry

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ABSTRACT

Salmonella infection considers a widely occurring bacterial disease which affects the intestinal tract. Salmonella bacteria present in both animal and human intestines and are expelled through stool or faeces. Humans often get infected by consuming contaminated water or food. Salmonella infections are categorized into serotypes nonmotile as *Salmonella Gallinarum* and *Salmonella Pullorum*, and motile paratyphoid *Salmonella*. *Salmonella* non typhoidal serotypes poses a risk to the public health due to its involvement in food poisoning and its origin as zoonotic agents so proper awareness of poultry farm and good personal hygiene of the poultry farm is crucial to avoid infection.

INTRODUCTION

Salmonellosis regarded as is a significant disease present in the world practically affecting poultry farm. The researches reported a lots of routes via which *Salmonella* species can be affected the farms of poultry (Nayak et al. 2004).

To control the disease the cleanliness and hygienic condition of the poultry house and management are very important (Mekademi and Saidani 2013).

Salmonella is one of the most significant zoonotic bacteria can make both human and animal suffering from gastrointestinal infection such as gastroenteritis, typhoid fever, paratyphoid fever, and can induce signs in both young and old person, and could be fetal (Zhao et al. 2016 ; Li et al. 2014).

The primary cause of foodborne illness in human is consuming many types of contaminated food such as meat of broiler and layer chicken and any contaminated kind of products as eggs, seafood, beef, vegetables, and contaminated water (Im et al. 2015 ; Orji et al. 2005).

When egg shell is contaminated with *Salmonella* because it can present on the egg shell then enter to the egg content when eggs are broken for preparing the food, which consider dangerous for humans. Therefore, removing of the infection source and using of disinfection can significantly lower the amount of *Salmonella* that contaminates the shell and the egg content (Omwandho and Kubota 2010). *Salmonella* pathogenicity islands (SPIs), responsible for *Salmonella* virulence which contains multiple genes, are clustered and responsible for the pathogenesis of the bacterium (Hensel 2004).

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Transmission of *Salmonella*

1- Horizontal transmission: spread via contaminated litter, excrement, contaminated food and water, the dust, some insects, the contaminated equipment, the sick poultry and rodents also the domestic animals and the wild birds.

2- Vertical transmission: via the eggshell following laying and ovarian transmission .

Characterization of *salmonella*

Characterization of *salmonella* is Gram-negative bacteria facultative anaerobic or aerobic, can motile by using peritrichous flagella and non-spore forming bacteria (Popoff et al. 2001 ; Chao et al. 2007).

Salmonella are categorized into serotypes which based on anti gens reported as lipopolysaccharide (O), the flagella (H) and the capsular (vi) antigens .

Salmonella Gallinarum and *Salmonella Pullorum* consider host-specific to poultry (Shivaprasad and Barrow 2008), but the *Salmonella Typhi* induce enteric fever in human while *Salmonella Enteritidis* and *Salmonella Typhimurium* cause disease in both poultry and human.

According to the geographical location there are present many other *Salmonella* motile serotypes can induce infection in the poultry (Hohmann 2001; Ogunleye et al. 2006 ;Cogan and Humphrey 2003).

Salmonella can live with in the environment such as poultry house for a considerable amount time (Foler et al 2011) and the poultry reported as the primary reservoir for the zoonotic disease.

Symptoms and clinical signs

The symptoms represented as loss of appetite and less size of the growth of the chick and become very weakness. The chicks get become near the sources of heat and light with drooping wings with closed the eyes. The watery diarrhea could appear. The salmonellosis is rare-

ly found in adult poultry.

Post-mortem lesions

- The liver with small necrotic foci, congested and enlarged.

Kidneys and spleen engorgement.

Anemia.

Anterior small intestine has enteritis.

Diagnosis

1- Isolation and identification:

Buffered peptone water was prepared to pre-enrichment by 1:10 dilutions then incubated for 18 to 24 hours at 37°C. The enrichment selective media used by added of 0.1 ml of the broth to 10 ml of the (RV) broth and then incubation for 24 hours at 37 degree aerobically (Al-Abadi and Al-,Mayah 2011). Then a loopful of the RV culture was streaked into Xylose Lysine Deoxycholate agar (XLD) plates then incubated at 37°C for 24 hours aerobically. when appear. The pure red colonies with black centers we suspected as the *salmonella* then transfer the colony to the slope for identification.

2- Biochemical tests:

Using the triple sugar iron agar and H₂S production appear as indicator on (TSI), the indole test in tryptone broth as red ring and used Christensen's urea agar to urea splitting and sugar fermentation (ISO, 2002).

3- Serological test: tube and rapid plate agglutination test (Abdullah 2010). Elissa assay can be used.

4- PCR test could be effective and more accurate to diagnosis of the *Salmonella* in all products such as eggs (Ahmed et al. 2014). Also PCR used as accurate method used in the diagnosis of the genes of the virulence of the *Salmonella* and their serotypes (Fekry et al. 2018).

Antibiotic susceptibility testing (AST)

Clinical and Laboratory Standards Institute (CLSI, 2018). By using the diffusion methods to the antibiotics. The resistance of *Salmonella* species is a big problem all over world (Chiu et al. 2002). Chloramphenicol reported as the

first antibiotic which made resistance to antibiotic, reported in 1960s, (**Montville and Matthews 2008**). The resistance by one or more antibiotic agents has increased all over the world with the *Salmonella* strains.

The antibiotics which used in treatments of the *Salmonella* infections such as ampicillin, trimethoprim-sulfamethoxazole, fluoroquinolones, cephalosporins and nalidixic (**Ochiai et al. 2008**). When the salmonella get resist to these agent called and referred to multi-drug resistant (MDR). Bad choice of the antibiotics in animal feed to increase the growth of the animals, and to treat lead to more resistance to antibiotic and increasing the problems (**Hyeon et al. 2011**).

Salmonella MDR strains can spread by animals to humans through eating the both food and water tainted with the animal's excrements and direct contact, this lead to a major risk of zoonotic disease (**Holmberg et al. 1984**). By using muller hinton agar media (disc diffusion methods) to choose the accurate antibiotic.

Virulence of *Salmonella*:

The combination of the chromosome and the plasmid factors are responsible for the *Salmonella* virulence. The genes included as *inv*, *spv*, *fimA* and *stn* considered as the genes responsible for salmonellosis (**Sabbagh et al. 2010**). *invA* gene codes with the protein of the inner membrane of bacteria, it is important for invasive of epithelia (**Darwin and Miller 1999**). *Spv C* gene, it is virulence-related gene of the plasmid which responsible to survive into the host cell (**Chiu and Ou 1996**).

Salmonella is a complicated phenomenon that causes diarrhea by production of toxin called enterotoxin, this enterotoxin and is the major cause of gastroenteritis (**Chopra et al. 1987**).

Zoonotic Importance of the *Salmonella*:

The zoonotic pathogen that cause numerous losses and responsible for sever losses and lead to a public health problem.

The patients who suffered from *Salmonella*

MDR strains are become more sickness and ill at its worst of the infection then the sickness is associated with high fever. The splenic and liver Enlargement and the swelling in the abdomen are usually present

People can infect by *salmonella* through eating contaminated food from animals as contaminated both meat and eggs, and any kind of contaminated food as vegetables, spices and seeds, consider as sources of infection. Another way to get infection is by contact with infected persons is (**Zaheer 2018**).

The *Salmonella* infectious dosage of is varies according to the characteristics of strain, the age of individual and the state of immunity. The infectious takes up to 100,000 bacteria for a normal immune system, healthy and adult to get sick. On the other hand, children or the elderly person even little amount of bacteria can make the disease. (**Salmonella as azoonosis 2020**).

The disease outcome causes dehydration due to diarrhea, nausea and vomiting. Fever could occur. But in immune-compromised persons, it leads to septicemia. The diseases usually not lead to the mortality in humans; (**Orpi 2020**).

Salmonellosis Prevention and Control

Salmonella Control by applied the HACCP. The poultry farms and house should be compelled to maintain hygiene and biosecurity (**Wibisono et al. 2020**). The Poultry must be with good health condition and from sources with clean and good places.

By controlling who the persons is allowed to enters the farm, *Salmonella* can prevent in the farm and keeping hands and feet clean and wearing protective clothing (**Van Immerseel et al. 2009**). The drinking water and floors of poultry farm should be sterilized. (**Effendi et al. 2020**).

Biosecurity and sources of contamination:

Maintaining adequate biosecurity is an important to keeping the infection out of the poultry farms. The primary source of contamination

and infection is the humans who acting as carriers and the entrance of the backyard of the chickens serves as the most important reservoir of these bacteria. The persons are the ones who come into the farm and get contact with an infected chicken and then spread the infection into a clean flock. So biosecurity policy program will prevent contamination in poultry farm.

CONCLUSION

The main food-borne pathogenic bacterial are *salmonella*. The farm environment is one of the big source and reservoir for *Salmonella* MDR. Treatment of the *salmonella* MDR is very complicated, very expensive, and need long-time for treatment. Antimicrobial sensitivity test used to choice the accurate anti biotic.

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