SALMONELLA INFECTIONS

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Significance

Economic: Human illnesses resulting from the consumption pf poultry products contaminated with *Salmonella* can be costly for the poultry industry, governments, and affected individuals.

Public Health: Salmonellosis is the second most common zoonotic disease after campylobacteriosis in the EU, and *Salmonella* is a common cause of foodborne disease outbreaks.

- In the EU, over 91,000 salmonellosis cases are reported each year.
- EFSA has estimated that the overall economic burden of human salmonellosis could be as high as €3 billion a year

Etiology

1- Salmonella enterica

2- Salmonella bongori (species)

Subspecies;

1.1. Salmonella enterica subsp. *enterica:* disease in warm-blooded animals, more than 2500 serovars

1.2. Salmonella enterica subsp. *salamae*

1.3. Salmonella enterica subsp. *arizonae*

1.4. Salmonella enterica subsp. *diarizonae*

1.5. Salmonella enterica subsp. *houtenae*

1.6. Salmonella enterica subsp. *bongori*

1.7. Salmonella enterica subsp. *indica*

S. enterica subsp. *enterica* serovar Enteritidis: *Salmonella* Enteritidis

S. enterica subsp. *enterica* serovar Gallinarum

- *S. enterica* subsp. *enterica* serovar Gallinarum biovar Pullorum and biovar Gallinarum: *S.* Gallinarum or *S.* Pullorum

Salmonella : Biology

HOST SPECIFIC

S. Paratyphi

S. Typhi

S. Gallinarum/ Pullorum

S. Dublin

S. Abortusequi

S. Abortusovis

S. Cholerasuis

NON-HOST SPECIFIC

S. Enteritidis

S. Typhimurium

S. Infantis

S. Hadar

S. Wirchow

Pathogenicity

Typhoidal: *S.* Typhi and *S*. Paratyphi A, *S*. Paratyphi B, *S*. Paratyphi C

- Especially in humans
- Typhoid fever
- Paratyphoid

Non-typhoidal: All Salmonella strains

- Both human and animals
- Toxiinfection

Etiology

Gram-negative

Non-spore forming rods

Paratyphoid species are usually **motile**

S. Gallinarum and *S*. Pullorum are **nonmotile**

Facultative anaerob

Grow under both aerobic and anaerobic

Classification/ Serotyping

Antigenic Structure

Kauffmann-White classification is based on both somatic and flagellar antigens.

First: O somatic antigen are identified by numbers. Serogroups are defined by somatic antigens unique to memebers of that group.

- ✓ Most isolates found in poultry belong to serogroops B, C and D

Second: H flagellar antigens are identified by lowercase letters

- ✓ Flagellar antigens sometimes occur in 2 different phases
- ✓ Antigenic structure is written respectively *(S.* Typhi (9,12(vi):d:- / S. Gallinarum 1,9,12:-:-)

Pullorum disease and Fowl typhoid

Pullorum disease → *S*. Pullorum

Fowl typhoid → *S*. Gallinarum

} Antigenic structure 1,9,12:- :-

S. Gallinarum → Ornithine decarboxylase negative

S. Pullorum → Ornithine decarboxylase positive

- Pullorum disease (PD) and fowl typhoid (FT) are septicemic diseases affecting primarily chickens and turkeys, but other birds such as quail, pheasants, ducks, peacocks, and guinea fowl are also susceptible
- Both diseases can be transmitted through the **egg by transovarian infection**!
- **Vertical transmission**
- Contact transmission of infected chicks or pullets are important route of dissemination of the diseases

Necropsy

- There may be no symptom in per acute infection
- In acute infection liver, spleen and kidneys are hemorrhagic also liver is hypertrophic
- Egg yolk is generally not absorbed in chicks
- The kidneys are pale and full of urate crystals
- **Rectum is filled with a whitish liquid because of urate**
- Biliary sac is enlarged and filled with bile
- Peritonitis and pericarditis could be observed
- Cocks have white foci and nodules on testes

Diagnosis

Definitive diagnosis of PD or FT requires the isolation and identification of *S*. Pullorum or *S*. Gallinarum, respectively

Positive serologic findings can be of major value in detecting infection

- Serologic tests to detect PD and FT include;
  - the macroscopic tube agglutination test (TA)
  - rapid serum test (RS),
  - stained antigen whole blood test (WB) ,
  - micro agglutination test (MA)
- *Salmonella* Serotyping method (**ISO6579**)

Treatment

Nalidixic asid

Enrofloxacin

Amoxicillin

Ampicillin

Gentamicin

Tetracycline

Protection and control

Preventing chicks direct or indirect contact with *S*. Pullorum and *S*. Gallinarum

Separating chicks and young birds from each other to reduce the risk of infection

Keeping all poultry in a clean and sanitized environment

Ensuring that disease-free flocks are kept isolated from potentially infected flocks

Biosecurity

Paratyphoid Infections

The numerous motile members of the genus *Salmonella* are collectively referred to as paratyphoid (PT) salmonellae

- ***S*. Infantis**
- ***S*. Virchow**
- ***S*. Hadar**
- *S*. Heidelberg
- *S*. Newport
- *S*. Agona
- *S*. Stanley
- *S*. Derby
- *S*. Thomson

Mostly *S*. Enteritidis and *S*. Typhimurium

Epidemiology

I. Paratyphoid (PT) *Salmonella* are consistently reported as one of the leading causes of food-borne diseases worldwide

II. Poultry products are often identified as prominent sources of *Salmonella* which cause PT infection

III. Eggs and egg-containing foods have been implicated as the principal vehicles for the transmission of *S*. Enteritidis infections in humans

IV. Feeds containing contaminated animal or vegetable proteins, cereals, or those contaminated by vermin or wildlife, are potential sources of *Salmonella* in both chickens and turkeys

Clinical signs

Typically cause clinical disease only in very young birds

Salmonella contamination within eggs may lead to embryo mortality or rapid death among newly hatched birds

Typical signs of PT infection in chicks and poultry include;

- progressive somnolence with closed eyes,
- drooping wings,
- ruffled feathers,
- shivering and huddling near heat sources,
- anorexia,
- emaciation,
- profuse watery diarrhea

Necropsy

- Liver and spleen are hypertrophic
- Egg yolk is generally not absorbed in chicks
- Peritonitis and pericarditis could be observed

Diagnosis

While clinical signs can be suggestive of PT infection, confirmation requires **isolation and identification** of the etiological organisms

Treatment

Tetracycline

Neomycin

Bacitracin

Protection and control

- Eggs, chicks or chickens should only be obtained from *Salmonella*-free breeding flocks
- Disinfection and sanitation should be carried out
- Biosecurity measures must be implemented