

E.Coli Infections in chickens (Colibacillosis)

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History

- First declaration, 1984
- Experimental studies 1894-1922
- Colisepticemia in chickens, 1907
- Different clinical findings, 1938-1965
- Vaccination and control, >1965
- Antibiotic resistance and human health, 2001 and later

Economic significance

- It causes the most economic losses among the diseases in poultry industry.
 - Increase in mortality
 - Regression in performance targets
 - Increase in discard rates in the slaughterhouse
 - Poor carcass quality
 - Treatment costs
 - Decrease in hatching efficiency
 - Chick quality problems

Human Health Importance

- Poultry origin *E.coli* infections poses a potential risk for human health
 - Antibiotic resistance
 - Transfer of virulence genes/plasmids to other enteric bacteria
 - Colonization of the strains that are important to human such as (*E.coli* O157:H7) to chicken intestines
 - *E.coli* strains which producing EHEC and Shiga toxin causing natural infection in chickens/turkeys

Etiology

- Gram negative
- Rod (basil) shape
- Nonspore forming
- Oxidase negative, facultative anaerobe
- Generally motile
- Grow 18-44°C
- Some of them encapsulated
- *E. coli* strains causing infection in poultry, are called Avian Pathogenic *E. coli* (APEC)

Antigenic structure

1. **O (somatic) Antigen:** Lipopolysaccharide in the cell wall, is the antigenic portion of LPS, is resistant to boiling,
2. **H (flagellar) Antigen:** Proteins found in the different types of flagellin is resistant till 100°C
3. **K (Capsular) Antigen:** Polymeric acids containing 2% reducing sugars, associated with virulence, on the surface of the cell, can be removed by heating for 1 hour 100°C
4. **F (pilus) Antigen:** involved in attachment to cells, variably expressed depending on the environment, classified as being mannose sensitive or mannose resistant

Typing method

- **Serotyping** (Ewing scheme)
 - 167 O
 - 74 K
 - 53 H
 - 17 F antigens
 - According to antigens;
 - **O1, O2, O35, O78**
 - O8, O15, O18, O115, O116, 132
 - **O1:K1, O2:K1, O78:K80, O1:K1:H5**
- **Molecular typing**
 - RAPD, RFLP, PFGE

Virulence characteristics

- **Fimbria**
 - F1 fimbria (type 1)- adherence
 - P fimbria- adherence
 - Sex pilus
- Intimin is an important non-fimbrial adhesin (AEEC) - diarrhoea
- **Enterotoxins**
 - Stable toxin (ST)-100°C
 - Labile toxin (LT, cytotoxin)- 60°C
- **Enterotoxigenic *E. coli* (ETEC)**

Virulence characteristics-2

- **Aerobactin**

- Enteropathogenic *E. coli* (EPEC)
- Enterotoxigenic *E. coli* (EIEC)
- Enteroinvasive *E. coli* (EIEC)

- **Bacteriocins**

- Colicin (A-V)

- **Bacteriophages**

Vitality

- *E. coli* are sensitive to physical and chemical factors.
 - 2-30 minutes at temperatures of 60-70 C.
- Survival times increase in cold weather
- Litter
 - 90% reduction within 1-2 days at >25°C
 - This period is 6-22 weeks at 4°C
 - The presence of humidity increases life expectancy
- • Inhibit under conditions of pH <4.5 and >9

Epidemiology

- Chicken, turkey, goose, duck and other
- Colibacillosis usually occurs in young chicks
- Care-management, bacteria, viruses, stress effective
- *E. coli* form the normal flora of the digestive system
- Can also exist respiratory system
- In skin and feathers
- In environmental resources

Epidemiology

- 10^4 - 10^7 cfu/g in intestines,
- 10^8 cfu/g in feathers
- 10^6 cfu/g per litter
- Colonization into the digestive system of poultry begin with hatching and *E.coli* multiply rapidly.
- Pathogenic as well as non-pathogenic *E.coli* can also be isolated in the digestive system of healthy poultry

Epidemiology

- Contamination of eggshell with *E.coli*
 - passing through the cloaca
 - in laying nests
 - litter
- Transmission via eggs!!!
 - Transmission in the fallopian tube
 - 0.5-0.6% of eggs may contain *E. coli*
 - Embryonal deaths, yolk sac infection omphalitis, first week mortality cases

Epidemiology

- Horizontal transmission
 - contact with poultry
 - contaminated water and feed
- Transmission
 - Digestive system
 - The respiratory system
 - Entry from eyes and wounds

Clinical signs and necropsy

- **Systemic forms (colisepticemia)**
 - respiratory colisepticemia
 - colisepticemia of enteric origin
 - colisepticemia in chicks
 - Acute colisepticemia in layers/breeders
- **Localized forms**
 - omphalitis/egg yolk infection,
 - coliform cellulitis,
 - sinusitis
 - enteritis
 - salpingitis/peritonitis

Clinical signs and necropsy

- Some **sequela** are seen after colisepticemia.
 - meningitis
 - panophthalmitis
 - osteoarthritis
 - synovitis
 - coligranuloma

Clinical signs and necropsy

- **Respiratory colibacillosis**
 - Serious problem for broiler production
 - Primary and secondary can be seen
 - All ages in layers and breeders
 - Predisposing factors are effective

Clinical signs and necropsy

- Weakness, depression, and tangles
- Dyspnea
- Sinusitis and characteristic wheezing
- Air sac inflammation in necropsy, especially fibrinous thicknes in air sacs
- Internal organs are in dark color
- Pericarditis and perihepatitis

Diagnosis

1. Clinical and necropsy findings
2. Laboratory examinations
3. Typing
 - Serotyping
 - Molecular typing

Treatment

- According to clinical findings
- With appropriate antibiotics to antibiotic resistance

Protection and control

- **General precautions**

- Monitoring maintenance-management and serotypes in breeders
- Hatching egg management
- Egg storage
- Incubation
- Incubation sanitation

Protection and control

- **General precautions**

- Disinfection and preparation of flocks
- Good management-care and feeding
- Water quality, drinker management
- Rodent control
- Control of breeder-hatchery-broiler microbiota
- Control of microorganism interactions
- Elimination of social stress factors

Protection and control

- **Special precautions-** Vaccinations
- Inactive vaccines
 - Homologous strains
 - Combination of dominant strains
- Live vaccines
 - Natural strains
 - Mutant strains

Result

- Presence/distribution of *E.coli* infections in the management
- Evaluation of clinical findings
- Determination of the pathogenesis of the infection
- Serotype distribution
- Determination of antibiotic resistance profiles
- Organizing and monitoring of the control program

INFECTIOUS CORYZA

Etiology

- *Haemophilus paragallinarum*



- *Avibacterium paragallinarum*

- 3 sero-group: A, B, C

- Sensitive to environmental conditions

Macroscopic morphology of *A. paragallinarum*

Epidemiology

- Highly contagious acute upper respiratory tract infection
- The natural host of the agent is chickens
- Transmission occurs by respiratory and digestive tract
- All ages of chickens are susceptible to the disease
- The disease is more serious in chickens in the yield period
- Spreads very quickly in the flock
- High morbidity (60-100%)
- Low mortality (1-10% if no complications)

Epidemiology

- Decreased growth performance is observed in animals
- Causes significant yield reductions in egg laying animals
- Infection is common in many countries of the world and endemic in some regions
- Chronic infected chickens are important in the transmission of infection
- The disease is more common in autumn and winter
- **No vertical transmission**

Epidemiology

- Incubation period is quite short (24-48 hours)
- The agent infects most animals in a susceptible poultry flock within 72 hours
- The disease affects the all animals in the flock for about 2-3 weeks, but if there is a secondary factors, especially Mycoplasma infection, this period gets longer
- The agent lives approximately 50 days in active infected sinus exudate
- Other infections (such as Mycoplasma, IB) increases the severity of infection

Clinical Findings and Macroscopic Lesions-1

- Decreased feed intake and water consumption in animals
- Runny nose, facial edema, conjunctivitis, feathers can swell in cocks
- Loud lung sounds when lower respiratory tract is affected
- Arthritis and septicemia can be seen
- Diarrhea has also been reported in some cases
- Pneumonia and air sac inflammation are rare

Clinical Findings and Macroscopic Lesions-2

- 10-40% decrease in laying animals
- In cases where it is complicated with other bacteria and chronic infection a foul odor in the poultry flocks is seen
- Especially when *Mycoplasma* infections are complicated with *A. paragallinarum* infections, head swelling can be confused with AmPV infection

Morbidity and Mortality

- Depending on the virulence of the microorganism, generally in uncomplicated infectious coryza, low mortality and high morbidity are seen
- Mortality and clinical symptoms change according to the age of animals and depending on the way of cultivation
- Poor flock conditions, parasites infections, malnutrition, complicate the course of infection and cause extended infection
- In general, serious increases in mortality occur with other infection such as chicken pox, IB, ILT, CRD, *Pasteurella*

Diagnosis

- **Isolation and identification**

- Isolation of the bacteria is difficult
- Possible in materials taken in the acute period
- Best material sinus content

- **Serological tests**

- Agglutination
- AGP
- HI
- ELISA

Diagnosis

- **Molecular tests**
 - PCR
 - PCR-RFLP

Infection complicated with the disease

- CRD
- Chronic Chicken Cholera
- Chicken Pox
- AmPV (SHS)
- Deficiency of A vitamin

The disease is seen usually mixed infection. Therefore, the mortality rate can be changeable.

Protection and Control

- **General precautions**

- Chicks and pullets from infected flocks are not received
- Removal of infected carriers
- Separation of old and foster flocks
- Leaving the evacuated flocks empty for at least two weeks

- **Disinfection**

- The bacteria are susceptible to most disinfectants

- **Biosecurity measures**

Treatment

- Erythromycin
- Sulfonamides
- Quinolones
- Tetracyclines

Vaccines

- Inactivated vaccines are used
- Vaccines should be prepared in chicken embryos, broths and in cell cultures at least 10^8 cfu
- Losses after complications can be reduced with vaccinations
- Protection is provided for 9-12 months after vaccination
- Protection is provided with vaccines, only against the vaccinated serovar
- Live and attenuated vaccines are also available
- In recent years, there are studies about recombinant vaccines

Vaccines

- Licensed vaccines used in Turkey

Vaccine 1. Serotype A, Serotype B, Serotype C

Vaccine 2. Serotype A, Serotype C

- In Vaccination program

1st vaccination in 10-12th week

2nd vaccination in 16th week