

Other Bacterial Diseases

Assoc. Prof. İnci Başak Müştak

Ankara University Faculty of Veterinary Medicine

Department of Microbiology

AVIAN CHLAMYDIOSIS

(Psittacosis/Ornithosis)

Etiology

- *Chlamidia psittaci*
- Gram negative, oval-rod, immotile, asporous, acapsular, without muramic acid in cell wall, obligat intracellular
- The cell wall is very similar to that of Gram negative microorganisms
- It can not grow on non-viable broth and agar media
- Can grow on embryonated eggs, experimental animals and cell cultures

Epidemiology

- *Avian Chlamydiosis* is mostly endemic in tropical and subtropical (Australia, South America) region birds
- Pigeons, turkeys and ducks are the most susceptible animals to infection. Chickens are more resistant
- Psittacine family birds (parrots, budgerigars, canaries) show different clinical symptoms to infection
- Young animals can get disease more quickly than old animals and they can die if the treatment begins too late
- The causative agent is transmitted to the environment by nasal discharge and feces of the animals
- **Vertical transmission has not been detected**
- ***Chlamydiosis* is a zoonotic infection**

Symptoms

- The incubation period of Chlamydiosis varies from 5 to 60 days depending on the host's sensitivity, age, sex, pathogenicity, virulence of microorganism, route of entry and amount of the agent. The environmental conditions are also important for the incubation period
- The disease is seen as acute, subacute, chronic and asymptomatic forms
- Clinical symptoms are also variable
- Depending on the region where the infection is located, it can cause
 - **Digestive system** problems (enteritis, green diarrhea),
 - **Respiratory system** problems (cough, nausea, pneumonia, air sac inflammation, seropurulent discharge from the eyes)
 - Swelling in the eyes,
 - Dyspnea,
 - Sinusitis,
 - Encephalitis and sometimes polyarthritis

- Also
 - Stagnation,
 - Loss of appetite,
 - Weakness,
 - Thirsting,
 - Fever,
 - Decrease in egg production problems can also be observed
- The mortality rate can reach up to 30%, when the agent is virulent and the animals are young and sensitive to infection

- In the postmortem examination,
 - Congestion in the trachea and lungs,
 - Pneumonia,
 - Excessive secretion in trachea,
 - Swell and congestion in the spleen, liver and kidneys,
 - Pericarditis and peritonitis,
 - Sero-fibrinous exudate in the breast
 - Inflammatory reactions may be detected in extremities

However, it is not possible to observe all of these findings in an animal

Diagnosis

a) Clinical and necropsy findings: It is not possible to definitively diagnose the disease because of many bacterial (microplasmosis, coryza, salmonellosis, pastorelosis, listeriosis, etc.), viral (IB, ILT, ND, flower) and fungal infections (aspergillosis) can be complicated

Laboratory examinations : Infected animals and their blood, nasal and ocular exudates and feces samples are taken

a) Microscopy : Slides are prepared from the tissues and examined under light microscope (1000x-1500x) by staining with HxE, Giemsa and modified Ziehl-Neelsen (Stamp) techniques

Immunofluorescence (IFA) or in situ immunoperoxidase techniques can also be used to detect antigens of microorganism

b) Isolation

- c) **Serological tests:** ELISA, IFA, in situ immunoperoxidase, indirect complement fixation (ICF), agar gel diffusion (AGID), latex agglutination (with purified chlamydial antigen coated latex particles) can also be used. However, detection of an antibody titer in blood usually reveals an infection in the past, not an active infection. The detection of high titre with clinical signs in many animals is important.
- d) **Biotechnological methods**

Treatment

- The infected animals are separated immediately and they are used for the diagnosis of the infection.
- Healthy animals are taken to a clean flocks and 200-800 g / ton of chlortetracycline to feed and 0.2-0.4 g / liter to their water were added. This treatment takes 45 days.
- Quinolones, tetracycline, doxycycline and tylosin are also used in treatment. However, it should not be forgotten that antibiotics can not be used completely and re-infection can occur.

Protection and Control

- General and special precautions are continuously applied.
- Any bird that has not passed the control and inspection cannot be placed directly to the flocks.
- The poultry is kept closed to all kinds of live and inanimate material
- Good disinfection should be made. For this purpose, quaternary ammonium compound (1/1000), lime slurry (1/100) and formaldehyde can be used.

TUBERCULOSIS

*(Avian tuberculosis, Tuberculose,
Tuberculose aviaire)*

Etiology

- *Mycobacterium avium* (*Mycobacterium tuberculosis* var. *avium*)
- Gram positive, non-spore, immotile and acid-alcohol resistant
- The agent is briefly inactivated at 65-70°C in 10 minutes, 2% formol, 5% carboxylic acid and 3% chlorinated antiseptics

Epidemiology

- Poultry tuberculosis is seen especially in chickens and turkeys, geese, ducks, pigeons, etc. and other poultry species.
- Sometimes the agent is also isolated from humans

Symptoms

- The infection is seen in chronic form and does not show any symptoms for a long time in animals. For this reason, there is not a certain incubation period.
- It is possible to make experimental infection in chickens within 3-4 weeks.
- The symptoms that are seen in infected animals;
 - Progressive weakening,
 - Getting thin of the chest muscles
 - Greenish diarrhea
- Animals are seen healthy when they are examined visually. However, when they are clinically examined, weight loss is determined. When they are palpated the thinner chest and cachexia are determined.
- Although the appetite of the animals is normal, the decrease in body weight continues.

- Body temperatures of infected chickens are normal even during the severe period of the disease.
- Varying size irregularly greyish-yellow or greyish-white nodules in various organs (liver, spleen, bowel, bone marrow, kidney, etc.) are the important necropsy findings for the diagnosis of infection.
- In some cases, the spleen, liver and tearing of the heart can result in accumulation of the blood in the abdomen.
- In breeding, lung infections are more common.
- Lesions are usually localized to organs such as the liver, spleen, gut, bone marrow, lung, ovary and kidney in tuberculosis infected animals.
- The tuberculous lesions were found to be located in 95% liver, 90% bone marrow, 90-95% spleen, 70-80% intestine, 6% kidney and 50% lungs.

Diagnosis

- **Clinical and necropsy findings:** Avian tuberculosis is complicated with aspergillosis, coligranuloma, intestinal coccidiosis, lymphoid leukosis, Marek, typhoid and neoplastic diseases.
- **Laboratory examinations**
 - Bacterioscopy:** Slides are prepared from the organs sent to the laboratory and stained with Ziehl-Neelsen method.
 - Culture**
- **Serology**
 - Allergy:** One of the diagnostic methods used for the detection of tuberculous animals is the **tuberculin test**.
- **Animal experiment**

Treatment

No medication is used.

Protection

General hygienic precautions must be applied carefully. It has been reported that the vaccines prepared with avirulent strains have a positive effect to control the disease in turkeys.

STAPHYLOCOCCAL INFECTIONS

Etiology

- *S. aureus*
- Gram positive, coc, inmotile and asporous
- Are seen as cluster in media and short chains in broth
- Facultative anaerobic agents form β -hemolitic, smooth, 1-3 mm, pigmented (white-orange) colonies on 5% blood agar, in 18-24h
- Catalase, gelatinase positive
- Glucose and mannitol fermentative

Epidemiology

- All poultry species are susceptible to staphylococcal infections
- The transmission has little effect on the epidemiology of the disease. Because Staphylococcus species which are found in skin, mucous membranes of healthy animals and in the environment, can be in everywhere.
- The agents are commonly found in poultry incubation, growth, slaughterhouse and packaging environments.
- When the natural defenses of the host get weakness, infection occurs
- *S. aureus* enters the internal zone through the weakened barriers and forms local infections such as osteomyelitis.
- In newly hatched chicks, omphalitis and other infections can be seen
- Septicemic staphylococcal infections and acute deaths can be seen in immunosuppressive diseases as a result of damage to the bursa Fabricius or thymus and impaired host defense

- Gangrenous dermatitis, caused by *S.aureus* in combination with *Clostridium septicum*, follows the early stages of infectious bursal disease virus infections.
- Hemorrhagic enteritis virus (HEV), similar viral infections and intestinal infections lead to staphylococcal problems in turkeys.

Symptoms

- The incubation period in staphylococcal infections is short.
- Clinical symptoms occur 48-72 hours after intravenous inoculation in experimental infections.
- Unless the problem in vaccination and management procedures, heavy contamination of the environment, production regions and poultry animals the morbidity and mortality are generally low
- Clinical and necropsy findings vary according to the location of the infection

Arthritis, Tenosynovitis

- Is seen chicks, mostly in 7-12 week old chicks and 9-16 week old turkeys.
- The extremities, usually the shoulder (tibiotarso-tarsometatarsal) region are hot, edematous and painful.
- Infected animals are generally depressed, lame and walk reluctantly.
- When pharyngeal extremities are affected, a subdermal staphylococcal planter abscess (bumble foot) may occur.
- Around the synovial membranes and tendons of the extremities of shoulder or foot region, edematous and fibrinous exudate accumulation are seen.
- The necrosis may occur and the exudate can become caseous.
- Petechiae or larger bleeds may occur in early period. If the animals survive, fibrous tissue formation can make the infection chronic.

Gangrenous Dermatitis

- Can be seen in all age birds, but most in broiler chicks.
- Wing tips and dorsal pelvis are the most affected areas.
- The lesions are seen as dark, wet, gangrenous. There is a crepitation.
- Staphylococcus infections are usually associated with *C. perfringens* type A, which may be the primary pathogen.
- The resulting immunosuppression because of the damaged bursa fabricius predisposes to growing chicks.

Yolk Sac Infection

- Staphylococcus-related hatching infections are common.
- It can cause high lethality within a few days of hatching.
- The abdomen of the chicks are moist and they are rapidly deteriorating.
- The yellow sacs are enlarged, and the color and intensity of the contents have changed.

Subdermal Abscesses

- Are seen mostly old poultry, especially races.
- Affecting feet (bum foot) and sternal bursa.
- Abscess formation occurs with edema, heat and pain.
- The foot is the first affected area and the lesions spread to the whole foot.
- There are caseous, necrotic tissue and hemorrhage.
- Sternal bursa is affected in the same way, but less frequently and less severely.

Spondilitis and Osteomyelitis

- *S. aureus* cause abscesses with periostitis and osteomyelitis in 5-7th thoracic vertebrae. This causes paresis or paralysis in the spinal cord as a result of continuous pressure.
- Femoral head, tibiotarsus and sometimes other bones can be affected by osteomyelitis.

Staphylococcal Septicemia, Endocarditis and Granuloma

- Septicemia is the result of frequent local staphylococcal foci. It is rarely seen and causes sudden deaths.
- The conjunctival or hemorrhagic appearance occur in carcass.
- Necrotic foci in the liver, spleen, lungs and myocardium are also seen.
- In chronic infections granulomas are formed with loss of weight.
- Endocarditis can also be seen in the necropsy, especially in the left atrioventricular valves.
- Vomiting may occur without any macroscopic lesions following experimental intravenous infections.

Diagnosis

- Can be complicated with the infections caused by *E. coli*, *S. gallinarum* and other *Salmonella* species, *P. multocida*, *M. synoviae* and Reovirus.

Treatment

- Antibiotics such as penicillin, streptomycin, tetracyclines, erythromycin, novobiocin, sulfonamides, linkomycin and spectinomycin can be successfully used in *S. aureus* infections.
- However, antibiotic susceptibility testing should always be performed because of the antibiotic resistance problem.

Protection

Good management and feeding

CLOSTRIDIAL INFECTIONS

- *Clostridium* are rod-shaped, anaerobic, Gram-positive bacteria
- Most of them have spore. Cause infectious diseases in many species of poultry.
- The main infections are;
 - Botulismus, necrotic enteritis, gangrenous dermatitis, ulcerative enteritis, and the infection of the umbilicus and egg yolk

BOTULISMUS

(Botulism, Botulismus, Botulisme)

- C type exotoxin by *Clostridium botulinum* is the agent. Rarely types A and B are responsible for the disease.
- All species of poultry are susceptible to disease.
- Modern animal raising and poultry breeding methods have greatly reduced the incidence of the disease.
- Depending on the amount of toxin taken by body;
- First in legs, then wings and especially in back of the neck paralysis is a classic symptom. Numbness, lack of coordination and dyspnea are the other symptoms.
- There is no findings in necropsy. The gut may be empty, and sometimes the anus are contaminated with diarrhea.
- There is no effective treatment.
- **Good management and hygiene conditions in flocks are the main rule for the protection of the disease.**

GANGRENE DERMATITIS

- *C. septicum* and *C. perfringens* type A alone or in combination cause the Gangrenous dermatitis
- In some cases, *S. aureus* causes infection with these agents
- The hosts of the disease are chickens and turkey
- It can be mostly seen in 4-8 weeks old broilers at maximum
- Mortality can range between 1-60%
- Death has increased in flocks. There are animals that are depressed, coordination deficiencies in their movements
- The carcasses smell bad and they rot very quickly
- Beneath the wings, between the buttocks, on the ribs and on the sides of the body, the skin is inflamed and fried and wet
- There are dark red and swollen regions around the fur follicles above the feet, legs and often on the wing feathers
- Muscles have lost their color and are edematous in necropsy examination

ULCERATIVE ENTERITIS

- The agent is *Clostridium colinum*
- Ulcerative enteritis can be seen in many species of poultry
- The most sensitive animals are quails. Chickens, turkeys, pheasants, partridges, pigeons are affected.
- It is not seen in waterfowl.
- Predisposition factors are important in the emergence of the disease. These include coccidiosis, infectious bursa disease, chicken anemia virus and inadequate hygiene.
- On natural conditions, chickens become infected by consuming feces contaminated feed or water of infected animals
- Mortality can reach up to 100% in quails. It is 2-10% in chickens

- In acute disease, the animals are depressed and poorly.
- They stay intact. Animals are without appetite and the hair is fluffy.
- Infection occurs in chicken and turkey during the 4-10 week growing period.
- Necropsy findings vary according to the course of the disease
- Small rounded hemorrhagic edged superficial ulcers in ileum, cecum and colon are seen firstly in chronic infections. Then they unite and deepen into the serosa.
- Perforation of the intestine and peritonitis can be occur
- Necrotic lesions vary in color from yellow to gray in a variety of sizes are seen in the liver
- The spleen is usually enlarged and hemorrhagic

Treatment

- Antibiotics that used against Gram positive bacteria are very effective

Protection

- Improvement of general breeding and hygiene conditions is the main rule of the protection

NECROTIC ENTERITIS

- *Clostridium perfringens* type C
- The disease was first reported in England in 1961
- Later, many of the countries where poultry farming was conducted in the world reported the disease.
- Mortality is around 5-15%.
- Animals are often die without clinical signs or they may be depressed , loss of appetite, bloody diarrhea. And increased mortality is seen
- In untreated acute outbreaks, mortality may be 10% or more in broilers
- Symptoms can usually be confused with mild course of coccidiosis
- Clinical symptoms are more severe in turkeys
- Animals can aggregate. They could have diarrhea and making different noises.

- Infection usually lasts 7-10 days
- Fibrinonecrotic enteritis with diffuse membrane in ileum and jejunum is the main finding
- The mucosa of ileum become thick significantly due to deep and bloody, velvety-like necrosis areas
- In some cases, lesions in the lower parts of the ileum may be quite dry

Diagnosis

- Clinical findings are often inadequate
- Necropsy findings and detailed anamnesis (investigation of preliminary causes) are very important in diagnosis
- It often confuses with coccidiosis.

Treatment

- Severe clinical epidemics often respond to specific antibiotic treatment.

Protection

- Prevention of subclinical coccidiosis is one of the most important solutions.

Ornithobacterium
rhinotracheale
Infection
(ORT)

- *Ornithobacterium rhinotracheale* is an infectious disease causes respiratory disorder, growth retardation, death and yield losses in chickens and turkeys
- Losses in the disease increases with viral and bacterial disease, insufficient ventilation, high animal density and insufficient hygiene

History

- The disease was first reported in 1981 and after that year, *Ornithobacterium rhinotracheale* has been isolated in respiratory tract infections in both chicken and turkey flocks in many countries

Etiology

- The agent of the disease is *Ornithobacterium rhinotracheale*
- Gram negative, pleomorphic, cocobacil, inmotile, and non-spore
- Facultative-anaerob
- Blood, chocolate or tryptose agar are used for the first isolation
- Biochemical tests are used after the first isolation.
- Serological tests are also used for the identification of the agent

Serotyping

- *Ornithobacterium rhinotracheale* strains were divided into different serotypes according to their heat extract antigens.
- In serotyping, agglutination, agar gel precipitation and ELISA tests are used
- Today, 18 different (serotype A-R) serotypes have been determined by these serotyping methods. A, B, D, and E serotypes are the most common
- Electrophoretic methods, molecular techniques such as PCR and RAPD are also used in typing isolates

Resistance

- *O. rhinotracheale* strains are highly sensitive to commercially available disinfectants.
- It is not very resistant to environmental conditions.
- The life span in the litter ranges from 1-40 days, depending on the temperature.
- Can survive for 1 day at high temperatures and 40 days at 4°C

Epidemiology

- *O. rhinotracheale* infections are seen on chickens and turkeys in all over the World.
- The agent has also been isolated from poultry such as jacklin, pheasant, pigeon, crabgrass, quail, duck, camel, goose and gnat.
- All ages of turkeys and chickens are sensitive to infection
- Infection is transmitted horizontally, directly and indirectly. In particular, direct contact with infected birds is the most effective way of transmission.
- Vertical transmission of the disease is controversial. The isolation of the agent from ovaries, hatching eggs and chicks that died under the shell increases the thought that the agent can be transmitted vertically.
- Non-domestic birds play a role in transmission

Clinical signs

- The incubation period in the disease is 2-4 days.
- The clinical findings of the disease are highly variable. This is because *O. rhinotracheale* infection is rarely seen alone. It is often complicated by other bacterial and viral agents.
- Clinical findings are exacerbated by secondary infections, particularly by poor ventilation and high ammonia levels in the flocks
- High animal density and poor hygiene exacerbate clinical findings
- The disease is more common in broiler flocks aged 3-6 weeks.
- Also more common in breeder and commercial layer flocks, especially during the egg period and when it reaches peak yield.

- In broiler flocks, loss of appetite, decrease in daily live weight gain, decrease in feed consumption, nasal congestion, facial edema and death at the level of 1-10% are observed
- In adverse environmental conditions and secondary infections, the above-mentioned clinical findings are severe and mortality can reach up to 20%
- In breeding flocks, especially egg production decreases, egg shell quality deteriorates, and death is observed at 1-2% levels with mild respiratory disorders
- In some cases, increased death attention due to the disease is not so important (0.2-0.5%)

- In commercial layers, a decrease in productivity is observed with deterioration in egg shell quality
- Mortality remains at 1-10% on a weekly basis. In these flocks, secondary factors cause increased mortality and exacerbation of mild respiratory system problems
- In turkeys, young animals 2 to 8 weeks old are also affected, although it is usually seen in flocks over 14 weeks of age. In addition to the findings in the upper respiratory tract, sinusitis is seen and death occurs at 1-20% levels. In breeding turkey flocks, mild respiratory disorder and decrease in egg efficiency is observed.

Neucropsy

- The most obvious necropsy finding in both chickens and turkeys is pneumonia and air sac inflammation.
- With unilateral pneumonia, foamy white exudate in the air sacs (primarily the abdominal air sacs) is important
- In chickens, in some cases, osteomyelitis and encephalitis are seen
- The extremities problems can be seen in turkeys.

Diagnosis

Material

- Air sacs, trachea, lung and sinus contents taken from suspicious animals are the most suitable materials for the isolation
- Isolation of the causative agent is important in the diagnosis of the disease. After culture of the materials on suitable media (blood agar, chocolate agar), incubated for 48-72 h
- Colonies are identified according to their macroscopic and microscopic morphology and their biochemical properties
- AGP technique can also be used for slide agglutination and serotype determination with specific antigens from colonies
- Serological tests, especially ELISA and agglutination, can be used in the diagnosis of the disease and in the serological monitoring of flocks.
- IFA techniques are also useful in diagnosis
- In recent years, PCR has also been used in diagnosis.

Treatment

- Many antibacterial drugs are used in the treatment of *O. rhinotracheale* infection
- In the treatment of the disease, important problems are encountered due to the fact that the agent is more resistant to antibiotics than other bacteria or has higher MIC values
- The resistance of *O. rhinotracheale* strains to antibiotics varies regionally and depending on years
- In the studies, antibiotic resistance in strains isolated from the same region increases in the following years depending on the frequency of use.
- For this reason, the most effective way of treatment is to determine the susceptibility to the antibiotics of the isolated agent and use the appropriate antibiotics

Control and Protection

- It would be useful to evaluate the prevention and control precautions in disease depending on the management
- Disease-related losses increase and control becomes more difficult in management where very old animals are found and the disease is endemic.
- Basically, it should be aimed to have good biosecurity in management,
- Appropriate maintenance-management practices should be performed
- Prevention the entry of microorganisms into the flocks
- In recent years, the study of developing vaccines against *O. rhinotracheale* infection have increased. Vaccines are being tested for both broiler breeder and and turkey flocks.
- These vaccines are prepared in two different ways, inactive and live. After broiler breeders are vaccinated by injection with inactivated vaccines, broiler chicks with maternal antibodies are protected against experimental *O. rhinotracheale* infection for 4 weeks.

Control and Protection

- In studies conducted in Turkey, the presence of ORT in poultry flocks has been determined. In recent years, the presence of ORT in broiler, broiler breeder and layer flocks and the economic losses have been frequently observed.
- Taking samples from infection suspected animals and sending them to laboratories, both for serotyping and determination of antibiotic susceptibility, will guide the development of disease-related prevention and control programs.

SPIROCHETOSIS

(Spirochetosis, Spirochaetose, Spirochétose)

- Spirochetosis is a disease characterized by fever, bruising of head, prostration of animals and diarrhea
- The agent of the disease is *Borrelia anserina*
- Old animals often show resistance to this infection, however infection is seen most of the poultry
- Apart from ticks, mosquitoes and mites are also important in transmission

PSEUDOTUBERCULOSIS

- It is a chronic infection characterized by nodular and caseous swelling in internal organs or an acute infection in poultry
- The agent of the disease is *Yersinia pseudotuberculosis*
- *Y. pseudotuberculosis* is common in almost all domestic poultry species in the world, as well as in various wild birds, cage birds and rodents
- Although the agent has also been reported in humans, it is not considered an important zoonosis

ENTEROCOCCUS INFECTIONS

- It is found in the normal intestinal flora in poultry
- Mostly causes secondary infections
- Agents are found in poultry environments and nature
- It causes salpingitis, peritonitis and death in chickens
- *E. faecalis* is the agent of amyloid arthropathy in poultry

ERYSIPELAS

- Erysipelas is an acute disease, mostly seen in 13-week-old turkeys. It is also seen in duck, goose, quail and chickens with low mortality.
- It may cause low egg yield in chickens and high mortality in the pheasants.
- Infection is also seen in domestic pigs and sheep
- It is important for public health. It can be transmitted through wounds during the transportation of contaminated carcasses, causing skin rash and cellulitis (erysipeloid), possibly endocarditis and encephalitis
- The agent of the disease is *Erysipelothrix insidiosa* (rhusiopathiae).
- Gram positive, immotile and pleomorphic

ANTHRAX

- The agent of the disease is *Bacillus anthracis*
- The agent cause infection in mammalian, also cause infection in poultry
- Gram positive, aerobic, with spore
- Chickens and turkeys are very resistant to anthrax disease, and ducks and pigeons are sensitive

LISTERIOSIS

- Listeriosis is a bacterial disease seen especially in poultry which live in warm regions
- The agent of the disease is *Listeria monocytogenes*
- Gram positive, rod and motile at 22°C
- Listeriosis disease is seen in chicken, turkey, goose, duck and canary
- Animals of all ages are susceptible to infection
- The source of the disease is mostly people, especially people with listerial conjunctivitis, who work in slaughterhouses, infecting poultry
- Transmission occur with nasal discharge and feces of the infected animals. **There is no transmission with egg**
- Prostration, weakness and septicemia, sometimes central nervous system problems, torticollis and diarrhea are seen