

Bordetellosis (Turkey coryza)

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Definition

- It is a highly contagious upper-respiratory tract disease affect young chicken and turkey caused by *Bordetella avium* and is characterized by inflammation and distortion of the respiratory mucosa.
- In young turkeys, sneezing, mouth breathing, altered vocalization, stunted growth, clear oculonasal discharge, sub-mandibular edema, tracheal collapse, and a predisposition to other infectious diseases.
- In chickens, the disease is similar, but *B. avium* appears to be an opportunistic pathogen.

Economic importance

- Impaired growth.
- Mortalities
- The losses are resulting from colisepticemia, secondary or complicated infections and stressors.

The causative agent

- Bordetella avium is a gram-negative, non-fermentative, motile, strictly aerobic bacillus.
- Filamentous forms have been observed following the growth in broth media high in nutrients.
- It grows readily on MacConkey, Bordet-Gengou, veal infusion, trypticase soy blood agar and brain heart infusion. Trypticase soy and BHI broth support optimal growth when aeration is provided by agitation.

The causative agent

- Colonies are small, compact, translucent, and pearl like colonies (type I) A small percentage of strains dissociate into a rough colonies with a dry appearance and a serrated irregular edge (type II) Rough colonies were found to be nonpathogenic .A Larger size colony characterized by a circular, convex colony with an entire edge, smooth surface, (type III).
- B. avium isolates are closely antigenically related.
- Five toxins as virulence factors are associated with B. avium: a heat-labile toxin , a dermonecrotic toxin , a tracheal cytotoxin , a heat-stable toxin , and an osteotoxin .

The causative agent

- Differences in pathogenicity, associated with colony morphology and hemagglutination, led to categorization of isolates into various groups or types.
- Hemagglutinin and fimbriae (pili) may have roles in adhesion, local mucosal injury, or systemic effects to cilia of respiratory epithelium.

Epidemiology

- Bordetellosis is an important disease in turkeys.
- Wild turkeys act as a reservoir for the infection. Strains of *B. avium* isolated from avian species other than turkeys are pathogenic for turkeys .
- Turkeys and breeder flocks may also develop clinical disease.

Epidemiology

- Turkey and chicken strains of *B. avium* are similar, and cross-infection can occur between the species .
- Bordetellosis in chickens tends to be less severe than in turkeys. Naturally occurring infection with *B. avium* typically is recognized in turkeys 2-6 weeks old , although older are susceptible to infection.

Transmission

- The disease is readily transmitted to susceptible poult through close contact with infected poult or through exposure to litter or water.
- Infection is transmitted by aerosol transmission .
- A carrier state has not been demonstrated in turkeys recovered from bordetellosis.
- Upper-respiratory disease vaccine, as infectious bronchitis virus or Newcastle disease virus, was necessary to induce clinical signs in leghorn chickens.

Clinical signs

- The incubation period is 7-10 days when susceptible poults are exposed to infected poults by close direct contact.
- An abrupt onset of sneezing (snick) in a high percentage of 2-6 week-old turkeys over the course of a week is suggestive of bordetellosis.
- Older turkeys may also develop a dry cough .
- A clear nasal discharge can be expressed by placing gentle pressure over the bridge of the beak and between the nostrils.

Clinical signs

- During the first 2 weeks of disease, the nares and feathers of the head and wings become crusted with wet, tenacious, brownish exudate, and some birds develop submaxillary edema.
- Open-mouth breathing, dark stains around eye and nostril, and foamy exudate at the medial canthus of the eye.
- Mouth breathing, dyspnea, and altered vocalization in the second week of clinical signs result when the nasal cavity and upper trachea become partially occluded with mucoid exudate.

Clinical signs

- Tracheal softening can be palpated through the skin of the neck in some birds beginning in the second week of disease.
- Behavioral changes include reduced activity, huddling, and decreased consumption of feed and water.
- Concurrent infections and poor weight gains contribute to poor flock performance and numerous birds with stunted growth.
- Signs of disease begin to subside after a course of 2-4 weeks.

Clinical signs

- Bordetellosis in turkeys is typically characterized by high morbidity and low mortality.
- In turkeys 2-6 weeks of age, morbidity reaches 80-100%, whereas the mortality rate is less than 10%.
- Infection of a breeder flock with *B. avium* resulted in only 20% morbidity with no mortality.
- High mortality rates (>40%) in young turkeys frequently are associated with concurrent isolation of *Escherichia coli*.

Post-mortem lesions

- Gross lesions are confined to the upper respiratory tract and vary with the duration of infection.
- Nasal and tracheal exudates changes in character from serous initially to tenacious and mucoid during the course of disease.

Post-mortem lesions

- Tracheal lesions consisting of generalized softening and distortion of the cartilaginous rings, dorsal-ventral compression, and fibrinomuroid luminal exudate are highly suggestive of bordetellosis. In some cases, there is severe infolding of the dorsal tracheal wall into the lumen immediately below the larynx. In cross-section, tracheal rings appear to have thick walls and a diminished lumen. Distortion of tracheal cartilages persists at least 53 days post-infection. Accumulation of mucoid exudate in an area of tracheal folding frequently leads to death by suffocation .

Post-mortem lesions

- Hyperemia of the nasal and tracheal mucosa and edema during the first 2 weeks of infection.
- Loss of ciliated epithelium and depletion of mucus from goblet cells are distinctive characteristics of bordetellosis.
- Colonization of ciliated epithelium begins on the nasal mucosa, progresses down the trachea, and moves into primary bronchi within 7-10 days. Bacteria adhere specifically to cilia and have not been found attached to other cell types.

Diagnosis

- The diagnosis of bordetellosis is currently based on clinical signs and lesions, isolation of *B. avium* from the respiratory tract, a positive serologic test, or some combination of these.
- Additional diagnostic techniques that have been developed include a monoclonal antibody-based latex bead agglutination test ,an indirect fluorescent antibody staining technique using a monoclonal antibody, a capillary gas chromatography assay.

Diagnosis

- Samples collected from the choanal opening and nostril, or by passing a swab into the trachea through the larynx, commonly yield large numbers of nonpathogenic bacteria. When turkeys are available for necropsy examination, swab samples should be collected aseptically through an opening in the mid-cervical trachea.
- Isolation and identification of bacterial agent
isolation is accomplished on MacConkey agar inoculated with a swab sample from the tracheal mucosa.

Diagnosis

- Serologic testing has proven to be useful a microagglutination test (MAT) using a killed, neotetrazolium- chloride-stained *B. avium* antigen in a microtiter system.

Prevention

- Strict biosecurity measures are required to prevent infection of clean flocks.
- Rigorous cleanup procedures are required to eliminate the organism from contaminated premises.
- Application of a disinfectant followed by formaldehyde fumigation.

Prevention

- The severity of bordetellosis is exacerbated by adverse environmental and infectious factors, attempts should be made to optimize temperature, humidity, and air quality while avoiding or delaying the use of live attenuated vaccines.
- Vaccines available commercially for the prevention of bordetellosis are (ts) mutant of *B. avium* and a whole cell bacterin.

Prevention

- Turkeys were immunized by spray and eyedrop/oral methods of immunization were equally effective in reducing the severity of tracheal lesions.
- Vaccination of breeder hens with either heat-killed or formalin-killed adjuvanted bacterins delayed the onset and severity of clinical disease in challenge-exposed poults.
- Passive immunization of 3-week-old poults with convalescent serum reduces adherence of *B. avium* to the tracheal mucosa in a dose- and time-dependent manner.

Treatment

- Treatment of bordetellosis with antibiotics administered in the water, by injection, or by aerosol has produced minimal clinical improvement in most cases.
- Treatment of an infected breeder flock with 1.8 g tetracycline-HCl and 2 - 10⁶ IU potassium penicillin-G per gallon of drinking water for 3 days produced clinical improvement within 24 hours.
- Niacin added to the drinking water at 70 mg/L. Niacin treatment also reduced clinical signs, increased body weight, and reduced adherence of bacteria to the tracheal epithelium .

Thank you