

# Bordetella

Dr. Pankaj Kumar  
Veterinary Microbiology  
BVC, Patna

# General Characteristics:

- Gram negative rods- coccobacillary appearance
- Aerobe
- Catalase positive
- Oxidase positive
- Cannot utilize carbohydrate
- Motile by peritrichous flagella  
(Except- *B. parapertussis*)
- Agglutinate RBCs

# Cultural characteristics:

- On blood agar- small, convex and smooth colonies
- Mostly hemolytic (ex- *B. avium*)
- Grows on MacConkey agar
- Produces Pale colonies

# Usual Habitat:

- Commensal – mucous membrane of upper respiratory tract
  - stress predisposes infection
- Considered to be fragile organism
- Survival in environment is quite short

**Table 26.1** *Bordetella* species of veterinary importance and disease conditions with which they are associated.

<b><i>Bordetella</i> species</b>	<b>Host</b>	<b>Disease conditions</b>
<i>B. bronchiseptica</i>	Pigs	Atrophic rhinitis
	Dogs	Canine infectious tracheo-bronchitis
	Kittens	Pneumonia
	Horses	Respiratory infections
	Rabbits	Upper respiratory tract infection
	Laboratory rodents	Bronchopneumonia
<i>B. avium</i>	Turkeys	Coryza
<i>B. parapertussis</i>	Lambs	Pneumonia

Feature	<i>B. bronchiseptica</i>	<i>B. avium</i>
Colonial characteristics on:		
Sheep blood agar	Haemolysis	No haemolysis
MacConkey agar	Pale, pinkish hue	Pale, pinkish hue
Selective medium <sup>b</sup>	Small, blue	Small, blue
Oxidase production	+	+
Catalase production	+	+
Urease production	+	-
Utilization of carbon exclusively from:		
Citrate	+	+
Malonate	-	-
Nitrate reduction	+	-
Motility	+	+
Haemagglutinating activity of virulent strains	Agglutination of ovine and bovine red blood cells <sup>c</sup>	Agglutination of guinea-pig red blood cells <sup>c</sup>

Virulence factor	Activity	<i>Bordetella</i> species	
		<i>B. bronchiseptica</i>	<i>B. avium</i>
Filamentous haemagglutinin	Binds to cilia	+	-
Pertactin	Binds to cells	+	+
Fimbriae	Mediate attachment to cells	+	+
Adenylate cyclase-haemolysin	Interferes with phagocytic cell function	+	-
Tracheal cytotoxin	Inhibits ciliary action, kills ciliated cells	+	+
Dermonecrotic toxin	Induces skin necrosis, impairs osteogenesis	+	+
Osteotoxin	Toxic for osteoblasts	+	+
Lipopolysaccharide	Stimulates cytokine release, role in disease uncertain	+	+

# Clinical infection:

- Usually affects upper respiratory tract
- Young animals are most susceptible
- Infection in adults are subclinical /mild
- Stress and other concurrent infections are predisposing factor
- High morbidity / low mortality



# Kennel Cough:

- Canine infectious tracheo-bronchitis
- Most prevalent-Respiratory complex
- Canine parainfluenza virus 2 (PI-2) and canine adenovirus 2 (CAV2) are also associated
- Transmission by –Direct and indirect means
- Morbidity – upto 50 % (mortality very low)

# Clinical signs:

- Develops in 3-4 days
- Persists for 14 days
- Coughing, gagging, retching
- Serous oculonasal discharge
- Dog – remain alert and afebrile
- Condition is self limiting
- Secondary infections may lead to bronchopneumonia



# Atrophic rhinitis:

- *Caused by B. bronchopneumoniae*
- Causes turbinate hypoplasia –without distortion of snout
- Predisposes infection with *P. multocida* type D – severe atrophic rhinitis
- Distortion of snout
- Poor ventilation; overstocking are predisposing factor



# Turkey Coryza:

- Caused by *B. avium*
- Highly contagious disease of poults
- High morbidity- low mortality
- Sneezing, beak breathing; mucus accumulation in nares; swelling of sub-maxillary sinus; excessive lacrymation
- Predisposes for secondary infection – *E. coli* infection leading to high mortality

Moraxella

## General Characteristics:

- Short, plump, Gram negative rods
- Typically occur in **pairs**
- Aerobe
- Catalase, Oxidase positive
- Non-motile
- Better growth – on blood /serum supplementation
- Proteolytic – do not ferment sugar

## Infectious Bovine Kerato-conjunctivitis:

- Cond also k/a – **Pink Eye** or New Forest Disease
- Caused by *Moraxella bovis*
- Asymptomatic carriers
- Present on mucous membrane
- Susceptible to desiccation
- Can be transmitted by flies

# Clinical signs:

- Highly contagious condition
- Affects superficial structures of eyes
- Animal – 2 years age are primarily affected
- Conjunctivitis; lacrymation; keratitis; corneal ulceration; opacity; panophthalmitis
- Have economic importance



---

Factor	Comments
Age	Young cattle less than 2 years of age are particularly susceptible to infection
Breed	<i>Bos taurus</i> breeds appear to be more susceptible than <i>Bos indicus</i> breeds
Fly activity	Flies can act as vectors of <i>Moraxella bovis</i>
Ocular irritants	Dust, tall grasses, grass seeds, wind, ultraviolet light and cold ambient temperatures may predispose to disease
Concurrent infections	Infection with bovine herpesvirus 1 or <i>Thelazia</i> species may exacerbate infectious bovine keratoconjunctivitis
Vitamin deficiency	A deficiency of vitamin A may predispose to disease

---