

## Review on Epidemiology of Contagious Bovine Pleuropneumonia

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**Abstract:** Contagious bovine pleuropneumonia is an infectious and highly contagious respiratory disease of cattle caused by *Mycoplasma mycoides subspecies mycoides* which is a non-sporulating, Gram-negative, non-motile bacteria. It is the only bacterial disease in the Office International des Epizooties list “A” diseases. The disease occurs primarily in Africa and in some parts of Asian countries. It is transmitted from animal to animal through respiratory aerosols and the organism occurs in saliva, urine, fetal membranes and uterine discharges. The disease may be occur in acute, sub-acute, or chronic forms and characterized by fever, anorexia, dyspnea, polypnea, cough, and nasal discharge. All ages of cattle are susceptible, but young cattle develop joint swelling rather than lung infections. Many cattle show no disease signs despite being infected and chronically infected animals might act as carriers and sources of infections. Diagnosis can be made based on history of contact with infected animals, clinical examinations, postmortem inspections, and laboratory analyses through culture and isolation procedures, and serological analyses. Samples taken from live animals are nasal swabs or nasal discharges, broncho-alveolar lavage or transtracheal washing and pleural fluid collected aseptically by puncture made in the lower part of the thoracic cavity. It also has a great economic importance to cattle keepers because of its high mortality rate, production loss, increased production cost due to cost of disease control, loss of weight and working ability, delayed marketing, reduced fertility, loss due to quarantine, loss of cattle trade, and reduced investment in livestock production. Control and prevention can be done through cattle movement control and quarantine, stamping out, test and slaughter, treatment and vaccination.

**Keywords:** Contagious bovine pleuropneumonia, Cattle, *Mycoplasma mycoides subspecies mycoides* virus, Epidemiology

## 1. Introduction

Contagious bovine pleuropneumonia (CBPP) is an infectious and contagious respiratory disease which mainly affects cattle caused by *Mycoplasma mycoides subspecies mycoides* [1]. It is an Office International des Epizooties of the World Organization for Animal Health notifiable list “A” disease characterized by fever, anorexia, dyspnea, polypnea, cough, and nasal discharge [2]. The disease has great potential for rapid spread and causes major impact on the bovine industry due to the high mortality and morbidity rates, production loss, cost of disease control, loss of weight and working ability, delayed marketing, reduced fertility, loss due to quarantine, loss of cattle trade, and reduced investment in livestock production. The morbidity rates that could be as high as 75% to 90%. The mortality rate vary from 50% to 90% while the case fatality rate was found to be 50%. The principal route of infection is inhalation of infective droplets from diseased animals. The disease is more severe in housed and in those in transit by train and on foot [3, 4]. All age groups of cattle are susceptible, but young cattle develop joint swelling rather than lung infections. Many cattle show no disease signs despite being infected and chronically infected animals might act as carriers and sources of infections [5, 6].

Contagious bovine pleuropneumonia (CBPP) is present primarily in Africa and parts of Asia with minor outbreaks occurring in the Middle East. The last outbreak of contagious bovine pleuropneumonia in Europe occurred in Portugal in 1999. China declared freedom from CBPP in 1996 and is currently recognized as free of CBPP by the OIE. This disease is a major militating factor affecting cattle production in terms of animal protein supply and economic value in African countries [7]. It is estimated that annual losses due to CBPP amount to 38.81 million US dollars in some endemically infected sub-Saharan African countries [8].

Diagnosis of contagious bovine pleuropneumonia can be done based on clinical signs and confirmation is by using different laboratory tests. Control strategies are based on the early detection of outbreaks, control of animal movements and stamping-out policy. However, in Africa control of the disease is only based on vaccination and antibiotic treatment. Treatment is recommended only in endemic areas because the organisms may not be eliminated, and

carriers may develop [9]. Therefore the objective of this review is to give insights of contagious bovine pleuropneumonia on its epidemiology.

## **2. Epidemiology of contagious bovine pleuropneumonia**

### **2.1. Etiology**

The causative agent of contagious bovine pleuropneumonia is *Mycoplasma mycoides sub-species mycoides small colony* which belongs to the genus *Mycoplasma*. *Mycoplasmas* are non-sporulating, Gram-negative, non-motile bacteria [10]. In natural conditions, two types of *Mycoplasma mycoides* are recognized: large colony (LC) and small colony (SC). They cannot be differentiated serologically but are different morphologically, culturally and in their pathogenicity and can be distinguished through mouse protection tests. *Mycoplasma mycoides subspecies mycoides Small Colony type (MmmSC)* affects only the ruminants of the *Bos* genus (mainly bovine). Large colony types occur almost exclusively in goats, rarely in sheep while SC types cause CBPP in cattle. *Mycoplasma mycoides subspecies mycoides large colony (LC)* type does not result in disease in cattle, but causes septicemia, polyarthritis, mastitis and encephalitis in sheep and goats [11].

### **2.2. Host affected and transmission**

Contagious bovine pleuropneumonia is the disease of cattle (*Bos taurus*), zebu (*Bos indicus*), Asian buffalo (*Bubalus bubalis*), captive bison (*Bison bison*), and yak (*Poephagus grunniens*) but primarily it is the disease of cattle [10, 12]. Sheep and goats in Africa, Portugal, and India have been infected with contagious bovine pleuropneumonia. African buffaloes (*Syncerus caffer*) seem unaffected by contagious bovine pleuropneumonia. Other wildlife have not been shown to play a role in contagious bovine pleuropneumonia disease or transmission. There are some reports on breed differences with respect to susceptibility. In general, European breeds tend to be more susceptible than indigenous African breeds [12, 13]. There is a difference in the susceptibility of animals for the disease based on their age categories. Young animals are more susceptible to acute forms of contagious bovine pleuropneumonia infection than adult cattle and thus acutely infected young animals may die of contagious bovine pleuropneumonia and may not be available for testing. However, chronic stages of the disease are usually seen in adult cattle as the age progresses [14, 15].

The bacteria are primarily transmitted through the exchange and inhalation of infectious aerosols when animals are in close contact with each other. The bacteria can be found in nasal discharges, saliva, urine, fetal membranes, and uterine excretions. Transplacental transmission can also

occur. Carrier animals, including sub-clinically infected cattle, can retain viable organisms in encapsulated lung lesions (sequestra) for up to two years. These animals may shed organisms, particularly when stressed. Close and repeated contact is generally thought to be necessary for transmission; however, *Mycoplasma mycoides subspecies mycoides Small Colony* type might be spread over longer distances, if the climatic conditions are favorable but the organism is sensitive to all environment influences which do not ordinarily survive outside the animal body for more than a few hours [16].

### 3. Clinical signs

The incubation period of contagious bovine pleuropneumonia varies, but in most cases occurs within 2–8 weeks of exposure. Incubation periods of up to 6 months have been reported [17]. Contagious bovine pleuropneumonia affects the respiratory tract of cattle and characterized by fever, anorexia, dyspnea, polypnea, cough, and nasal discharge. Cattle of all ages are susceptible, but young cattle develop joint swelling rather than lung infections. Many cattle show no disease signs despite being infected and chronically infected animals might act as carriers and sources of infections. Depending on the resistance level of the animal and the intensity of exposure, contagious bovine pleuropneumonia takes an acute, sub-acute and chronic forms [2, 6].

Cattle affected by the acute form of contagious bovine pleuropneumonia shows clinical signs like depression, anorexic, and febrile with reduced milk production. Respiratory signs follow including coughing, panting, and mucoid or purulent nasal discharge. Severely affected animals stand with head and neck extended, elbows out, and breathing with an open mouth. Respiration appears labored and painful. Most adult cattle with acute CBPP die in 1–3 weeks. Calves up to 6 months old may have respiratory signs accompanied by polyarthritis and painful, swollen joints. The acute form occurs in approximately 33% of all cases [14]. The sub-acute form of contagious bovine pleuropneumonia is similar to the acute form of the disease but milder and can be develop into chronic infections. Animals with chronic form of contagious bovine pleuropneumonia may have recurrent low-grade fever, poor body condition, and coughing or breathing difficulty during exercise. The severity depends on other factors including nutrition, parasitism, and general health. Cattle may recover from chronic contagious bovine pleuropneumonia, although lung lesions may take a long time to heal. Cattle recovering from CBPP may not have apparent

clinical signs but still have the ability to spread disease. Females may abort or give birth to stillborn calves [18, 19].

#### **4. Diagnosis**

Diagnosis of contagious bovine pleuropneumonia can be done based on history of contact with infected animals, clinical examinations, postmortem inspections, and laboratory analyses through culture and isolation procedures, and serological analyses [21]. Serological tests such as complement fixation, latex agglutination, or competitive enzyme-linked immunosorbent assay tests can be used to aid definitive diagnosis. Confirmation is often by isolation of the mycoplasma followed by growth inhibition or immunofluorescence antibody test using hyperimmune rabbit sera against the mycoplasma or by Polymerase chain reaction assay. Confirmation of serologic reactions can be made by immunoblotting test. *Mycoplasma mycoides subspecies mycoides Small Colony* can be also isolated from samples taken from live animals or at necropsy. Samples taken from live animals are nasal swabs or nasal discharges, broncho-alveolar lavage or transtracheal washing and pleural fluid collected aseptically by puncture made in the lower part of the thoracic cavity [18, 20].

Contagious bovine pleuropneumonia is difficult to differentiate from other causes of cattle respiratory disease. Pneumonia (particularly unilateral illness) in adults and polyarthritis in calves should be considered warning signs for potential contagious bovine pleuropneumonia infection. Differential diagnosis considered in the diagnosis of CBPP include diseases like bovine pasteurellosis, hemorrhagic septicemia, theileriosis, bovine ephemeral fever, traumatic pericarditis, echinococcosis (hydatid cysts), actinobacillosis, tuberculosis, pulmonary abscesses, Foot and mouth disease [4,18,22].

#### **5. Prevention and Control**

The control options of contagious bovine pleuropneumonia include cattle movement control and quarantine, stamping out, test and slaughter, treatment and vaccination [4]. Contagious bovine pleuropneumonia can disappear from a country with movement control; however, movement control is difficult and often impractical because of need for transhumance, trade, socio-cultural practices and inadequate veterinary personnel [23-25]. Therefore, the control of contagious

bovine pleuropneumonia should be rely on preventive immune prophylaxis using live attenuated cultures of the causative agent.

## 6. Conclusion and recommendation

Contagious bovine pleuropneumonia is economically important infectious and highly contagious disease of cattle caused by *Mycoplasma mycoides subspecies mycoides Small Colony* type which is mainly endemic to African countries. It is notifiable list “A” disease. The disease is transmitted through inhalation of infectious aerosols when animals are in close contact with each other. So best control and prevention methods should be in place like movement control and vaccination.

## 7. References

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