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BOVINE RESPIRATORY SYNCYTIAL VIRUS- INFECTION (BRSV) IN CATTLE OF NOTHERN GERMANY

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Diseases of the respiratory and digestive tract are still causing high economic losses in cattle, especially in young animals. The cause of these diseases are mainly infectious agents, bacteria or viruses, which occur as single or mixed infections and cause death or decreased productivity of the animals by pneumonias or/and enteritides.
The diseases of the respiratory system are summarized under the term "Bovine Respiratory Disease (BRD) Complex". This entire disease complex belongs to the factorial diseases. It is characteristic of this disease complex BRD, that it is caused by a multitude of different viral agents, complicated by bacterial germs and determined by them during its course. Additional factors like i.e. barn climate, hygiene, transport, purchase, feed, can have an influence on the development.
The etiopathologic significance of the rhino-, reo-, adeno- and corona viruses concerned is in part not fully known, however, their causality in the BRD complex is indisputable and should not be underestimated. From the multifactorial complex of BRD the infection with bovine herpes virus (BHV-1 infection, formerly IBR/IPV/IBP (1)) can be separated as an independent disease. Bovine virus diarrhea/ mucosal disease (BVD/MD), better referred to as toga virus infection, sometimes goes along with respiratory symptoms (mixed infection, immunosuppression). This disease takes a separate position as well.
The BRSV infection has been known for a long time overseas but also in neighbouring countries and it is considered so important there, that specific vaccines have been developed against it. Therefore, it had to be anticipated, that this infection would appear in Germany as well. In the local literature it was already associated with the BRD complex or enzootic pneumonia of cattle respectively (Niemöller, 1976; Wizigmann et al., 1976; Oakley, 1983).
A constantly increasing spread of this infectious disease proves, that the BRSV infection is a true "missing link" in the BRD complex and consequently closes a further gap in this disease complex. According to experiences so far in connection with clinical outbreaks, the BRSV infection is an important independent disease within the BRD complex or enzootic pneumonia of calves respectively. The annual evaluation of approximately 3000 nasal swabs in the diagnostic laboratory reveals, that the BRSV infection in the years 1990/91 with 16%/19,6%, the BHV-1 infection with 9,9%/5,2%, the BVD/MD infection (better toga virus infection) with 9,8%/8,5% and the PI-3 infection with 1,3%/0,4% are involved in infectious respiratory diseases of cattle in Schleswig-Holstein.

Clinic

Anamnesis

On farms with the disease anamnestic findings are ascertained consistently, that there is an accumulative appearance of a respiratory disease in the herd in different states of development within a group of animals and that BRSV disease occurs mainly during the cold season. Particularly animals at an age of 4 weeks to 4 months get sick, that is, mostly calves and feeders, in exeptional cases animals of an age of up to a year or older. The symptoms start completely unexpected and are very severe. In some cases there are deaths within a few hours and therapeutic measures as they are carried out in practice frequently remain without success.

Clinical results

In the herds affected two different manifestations of the BRSV infection can be observed (Heckert et al., 1989): In some of the animals the general condition is only slightly disturbed, within 2 to 3 days recovery sets in. In other cases there are marked complications within a short period of time. The calves are severely affected in their general condition. The disease extends over 14 days. At times there is cough for several weeks.

The mortality in these cases can be as high as 30%. The most important symptoms of these two different clinical manifestations are the following:
In case of a benign, mild disease the animals show slightly disturbed general condition for 2 or 3 days, no or only little, mostly serous nasal discharge, high fever, increased respiration, dry cough, but undisturbed feed intake.
With the severe manifestation in addition to the symptoms described above a marked dyspnea and respiatory distress respectively develop. The animals affected show mouth breathing and cyanotic mucous membranes. Percussion of the lung reveals increased resonance with caudally displaced pulmonary borders in some cases. On auscultation of the lung frequently a crepitating sound can be heard, wich has to be interpreted as a sign of lung emphysema. In addition, subcutaneous emphysema of the lateral thoracic wall is present. With this severe manifestation not infrequently mixed viral infections and in the late state secondary bacterial infections are confirmed. Here, the nasal discharge becomes mucopurulent, feed intake is markedly decreased. Due to circulatory failure sudden deaths occur not infrequently.

Pathogenesis
So far little is known about the mechanism of disease. Scanning electron microscopical investigations show, that there is destruction of the ciliated respiratory epithelium. Furthermore, a change in phagocytic activity of the alveolar macrophages can be noticed. Also, allergic- hyperergic reactions of the organim with degranulation of mast cells and histamine release are seen, wich cause bronchospasm, bronchiolitis and pulmonary emphysema. These immunopathological mechanisms can help to explain the frequently peracute as well as the complicated course of disease and the pronounced alterations in the trachea and lung.

Prognosis
For the benign course the prognosis is favourable. With additional complications, however, it has to be guarded and with a progressive course of disease, severe lung emphysema and secondary bacterial infection it is mostly unfavourable. In those cases persisting lung lesions have to be expected, which lead to retarded growth, limited use and unthriftiness of the animals affected. In the herds concerned there can be relapses in the animals affected and additional diseases in the following younger animals or later purchased feeders. Also, on some farms annual recurrence of BRSV infections is noticed.

Diagnosis
a) Clinical diagnosis
A presumptive diagnosis should be made depending on the following criteria:
- accumulative occurrence of pulmonary emphysema with enzootic bronchopneumonia in the early state of disease
- lacking nasal discharge
- increased body temperature
- 4 weeks to 4 months old animals
- unsuccessful treatment for BRD

b) Pathologic- anatomical and histological diagnosis
The pathologic- anatomical findings in the upper and lower airways with BRSV infection are relatively striking, but like the histopathological changes not necessarily pathognomonic. In 30 BRSV positive calves of an age between 4 weeks and 4 months, which were submitted for necropsy by the Diagnostic Service on Cattle in the time from 1987 to 1992, in the majority of the cases, although not always, there was an atypical interstitial pneumonia (AIP). This is a special form of interstitial pneumonia, characterized by hyaline membranes on the alveolar walls and hyperplasia of the epithelial cells type II as well as edema and emphysema. Normally in interstitial pneumonia there is infiltration with predominantly mononuclear cells in the interalveolar septae and alveoli with little tendency to exsudation (Jubb et al., 1985; Yates, 1988). An etiologic diagnosis on the grounds of pathologic-anatomical and histopathological lesions cannot be made reliably, however, AIP in young

animals in correlation with the history and the clinical symptoms justifies the suspicion of a BRSV infection (Appel et al., 1989)
The pathomorphological changes are the following:
- marked redness of the mucous membranes of the upper and lower airways
- submucosal hemorrhages in the tracheal mucosa
- marked pulmonary edema
- interstitial and alveolar emphysema
- emphysema in the mediastinum reaching into the subcutis.

In contrast to the other pneumonias of the BRD complex, with the BRSV infection the following hitopathological lesions can be seen:
- hyperplasia of the alveolar lining cells
- multinucleate giant cells
- hyaline membranes on the alveolar walls
- interstitial and alveolar emphysema.

c) Virus detection
The direct confirmation of BRSV in live animals depends on the collection of fresh nasal mucosal cells. For sampling in addition to accuracy and experience a special swab system is required. It has to be sufficiently long and flexible, but at the same time unbreakable, in order to take the specimen high from the nose.
The stability of the swab system must allow abrasion of cells from the nasal mucosa. The purpose of taking the sample is to collect as many fresh, live cells as possible. The safe identification of the virus generally is achieved only during the first 6 days after infection. In each herd at least 2-3 nasal swabs from acutely diseased or suspicious animals (fever, no or only serous nasal discharge) should be taken. Animals with mucopurulent nasal discharge have to be excluded from sampling, because in most cases no BRSV can be found in the purulent cellular sediment. The fastest diagnosis possible at this time on live or dead animals is the direct fluorescent serological virus identification, which is possible only within a few hours (Steinhagen et al., 1987). Blood samples for a serologic diagnosis are of little use due the possibly peracute course of disease in the herd, because for a diagnostic evaluation of an acute disease process pairs of serum have to be taken 10 days apart, which makes a rapid clarification impossible (Gabathuler, 1987).

Therapy
The therapeutic measures in BRSV disease according to the state of information so far, are aimed at the relief of the bronchospasm, dilatation of the bronchial lumen, elimination of the dyspnea and prevention or control of secondary bacterial infections. For this purpose the application of the drug Clenbuterolhydrochlorid (Ventipulmin (R), Fa. Boehringer, Ingelheim GmbH) twice daily is suitable, which initially can be administered intravenously or intramuscularly. In exceptionally severe cases with marked respiratory distress the initial dosage can be doubled. Further treatment over several days should be changed to injections of the solution twice daily or oral application of the granulated formula at a normal dosage.
In animals which are severely sick and show marked dyspnea the application of the granulated formula with the drinking water is recommendable because of the heavy additional strain due to the injection. The dosage is 5g of the formula per 100kg of body weight twice daily. Furthermore, Ventipulmin (R) stabilizes the cell membrane of mast cells. This way mast cell degranulation and subsequent release of histamine are prevented. Also, the effect of Ventipulmin (R) reduces further formation of inflammatory mediators like prostaglandins and leukotrienes.
For the control of the allergic- hyperergic process the additional application of an antihistamine (Benadryl (R), Fa. Parke Davis & Co) for several days is indicated, because intravenously administered, it has a beneficial effect at the beginning of the treatment. Also, orally applicable "antihistamine cough mixtures" are commercially available, which can be given with the drinking water.

Immunoprophylaxis

In Germany a monovalent BRSV vaccine (Rispoval RS, Fa. Smith Kline, Beecham) and recently a combined BRSV/BVD vaccine (Rispoval RS/BVD, Fa. Smith Kline, Beecham) have been admitted. They are live vaccines (in combination with the BVD vaccine strain RIT 4350). The vaccination program should be started as a prophylaxis in late summer.
All calves and feeders up to the age of 6 months in an operation should be vaccinated twice 3-4 weeks apart. In addition all animals born during the winter and newly aquired animals should be included in the vaccination program. With the end of the winter the vaccination program can be terminated.

Summary

Infection diseases of the respiratory system nowadays are the most important disturbances of herd health in the bovine in Germany. Besides of enzootic bronchopneumonia, IBR (BHV - 1 - Infection) and BVD-dependent bronchopneumonia more and more infections caused by coronavirus and BRSV are registered. Symptoms, methods of diagnosis, therapy and prophylaxis are quite different from other maladies in the BRSV-complex.
Own investigations, clinical, virological and other ones will be demonstrated, . Treatment and methods for eridication of the infection from the farms will be discussed.

Infektionen mit dem Bovinen Respiratorischen Synzytialvirus (BRSV) in Norddeutschen Rinderbeständen

Zusammenfassung

Infektionskrankheiten des Respirationstrakts sind heute die wichtigsten Störungen der Herdengesundheit von Rindern in Deutschland.
Außer enzootischer Bronchopneumonie, IBR (BHV -1- Infektion) und BVD-abhängigen Bronchopneumonien werden in zunehmendem Maße Coronavirus-und BRSV-Infektionen registriert.
Symptome, Diagnostikmethoden, Therapie und Prophylaxe sind hier unterschiedlich im Vergleich zu anderen Krankheiten des Rindergrippe-Komplexes.
Eigene klinische, virologische und andere Forschungsergebnisse werden vorgestellt.
Die Behandlung und Methoden der Bestandssanierung werden diskutiert.

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