SECOND INTERNATIONAL EPIZOOTIOLOGY SYMPOSIUM

(XIV SERBIAN EPIZOOTIOLOGY DAYS)

PROCEEDINGS

Hotel "Srbija"

April 18-21st, 2012, Belgrade
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ISBN: 978-86-83115-20-4

UDC: 636.09:616(082)
Publisher / Издавач
Serbian Veterinary Association - Српско ветеринарско друштво
Section of zoonoses SVA - Секција за зоопозе СВД

For the publisher / За издавача
Проф. др Босиљка Ђуричић

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Доц. др Милорад Мириловић

Print / Штампа
Научна КМД

Тираж 200 примерака
3. VIRAL RESPIRATORY INFECTIONS OF CATTLE IN VOJVODINA PROVINCE

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Abstract

Respiratory infections are one of the major health disorders that can cause great economical losses in cattle breeding. Viruses are a significant cause of these infections and they can affect the animal independently or act as initiators for development of serious health disorders. The effect of the virus to the host by various mechanisms can lead to immunosuppression, which favors the development of secondary infections. Many types of viruses can cause respiratory infections in cattle, but nowadays the most important are considered to be the following: bovine respiratory syncytial virus (BRSV), bovine herpes virus 1 (BHV-1), bovine viral diarrhea virus (BVDV) and parainfluenza virus 3 (Pi-3).

Over the years the study of etiology of bovine respiratory infections was conducted prevalence survey of some viral infections in the population of cattle in Vojvodina. BRSV is the most frequently identified agent of bronchopneumonia in feedlots, followed by BVDV, Pi-3 and the rarest one found was BHV-1. On dairy farms, in the case of severe bronchopneumonia among older animals, the most commonly isolated was BHV-1. Regularly, these outbreaks appeared after mixing animals from different herds, weather the infection was found only in newly acquired animals or exclusively in animals that were previously in the herd. Serological tests showed a different prevalence of individual viruses in different herds, but also within the same herd, depending on age groups. According to this study, the highest seroprevalence among calves up to one year old was for Pi-3 virus BRSV and BVDV. BHV-1 seroprevalence increases after coming into contact with older animals (cows at milking).

Each of these viruses has its own characteristics in terms of epizootic characteristics and according to them it is possible to set up infection control programs, depending on the situation and needs in the herd. Immunoprophylaxis is one of the measures and in the case of infection with BHV-1 and BVDV in dairy farms their eradication should be the ultimate goal.

Key words: respiratory infections, cattle, BRSV, BHV-1, BVDV, Pi-3

Introduction

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Acknowledgments: The study was supported by grant TR31084 from Serbian Ministry of Education and Science.
Respiratory infections are one of the most frequent, and from economic point of view, one of the major health disorders in cattle breeding. Viruses are important cause of these infections and independently or together with bacteria and mycoplasma (Fulton 2009), act as an agent that causes serious health disorders. The viruses affect the host by various mechanisms leading to immune-suppression, which is a favorable condition for the development of secondary infections. Several types of viruses can cause infections of the respiratory system of cattle, but nowadays bovine respiratory syncytial virus (BRSV), bovine herpesvirus 1 (BHV-1), bovine viral diarrhea virus (BVDV) and parainfluenza virus 3 (PI-3) are considered the most important. Since these viruses spread also through aerosols (Mars et al. 1999) many animals are affected by the disease what causes mass outbreaks of a disease in a livestock. All the above mentioned viruses have been identified in previous researches of cattle population in Vojvodina (Petrovic et al 2002; Lazic et al, 2008; Lazic et al, 2009; Petrovic et al 2009).

Material and methods

The examination of bronchopneumonia etiology in cattle was carried out after the notification of field and farm veterinarians on a mass occurrence of the diseases on the farms and the Vojvodina settlements in the period 2007 to 2011. Virus isolation from nasal swabs or lung samples of dead animal was carried out by standard virology methods. The nasal swabs were taken at the same time from several animals in a herd at the early stage of the disease. Serological examination was carried for determining seroprevalence against BRSV, BHV-1, BVDV and PI-3 in calves upon the arrival into the feedlots and in the animals who had not previously been vaccinated. Also, the tests were performed in order to determine the seroprevalence of some pathogens on dairy farms. Serological examination was done by serum neutralization (BRSV, BHV-1 and BVDV) and inhibition of hemagglutination (Pi-3).

Results

Virology examination

Viral etiology of 29 outbreaks reported in the feedlots and dairy farms were examined. In most cases the agent was BRSV, BVDV, BHV-1, PI-3. In one case a mixed infection with BVDV and BHV-1 was detected (Graph 1).

Graph 1. Proportion of viral infections in the examined outbreaks of bovine bronchopneumonia
On the dairy farms 10 outbreaks were examined. BRSV, BVDV and BHV-1 infection were present (Graph 2). In all the cases where it was determined that the causative agent was BHV-1 the occurrence of the disease was severe in adult animals proceeded by mixing of cattle from several herds after purchasing and after introducing the animals in a new herd. Either newly purchased animals or those that had been in the herd had clinical sign of disease. BRSV and BVDV were detected at different age: from the calves in post-colostral period up to cows. Mixing of cattle with the animals from different herds was also the switch on button for BVDV in one and BRSV outbreak in another herd.

**Graph 2.** Proportion of virus infections in the examined outbreaks of bronchopneumonia on the dairy cow farms

19 outbreaks in the feedlots were examined and most of them were caused by BRSV. Unlike dairy farms, in none of the cases BHV-1 was isolated as an independent virus causative (Graph 3). Yet, one case of mixed virus infection with BVDV and BHV-1 was detected in the calves in the feedlot.

**Graph 3.** Proportion of the viral infection in the examined outbreaks of bronchopneumonia in the feedlot.
Serology examination
At the beginning of fattening in various feedlots 195 animals were examined in 23 animal groups. The calves entered the herds with different immune status regarding the viruses. Most of the calves had specific antibodies against Pi-3, and it was the least against BHV-1 (Graph 4).

![Graph 4. Seroprevalence in the calves at the beginning of fattening period](image)

On the farms, where BHV-1 was detected, it was observed that the calves, after losing colostral antibodies against BHV-1, remained seronegative in most of the cases until they mixed with the cows. On three farms serology examination was carried on 262 calves and 69 heifers. Specific antibodies were detected in 1.14% calves and 4.35% heifers. All the heifers with detected antibodies were in late pregnancy.

Discussion
The most frequent finding of BRSV as a cause of respiratory infections in our study is in accordance to the research results from other authors (Valarcher and Taylor, 2007). The significance of this virus for respiratory infections in cattle was doubted for some time (Tjörneboj et al, 2003) but nowadays it is considered the most spread and most significant virus in the etiology of bronchopneumonia in cattle (Valarcher and Taylor, 2007). In the epizootiology of this virus it is not quite clear where the reservoir of infection is because a latent infection and a model of spreading within the cattle population has not been proved or found yet (Van der Poel et al, 1997; Gershwin, 2008). In our study BRSV was found as a cause of disease cases where in the history there was no recent trade or mixing with animals from other herds and where in the history of animals mixing was present recently (one enzootic was found on the fair). If scaled by frequency of appearance, the following viruses BVDV, BHV-1 and Pi-3 are behind BRSV. A low titer of antibodies against viruses that cause respiratory infections in calves at the beginning of fattening period is a risk factor for the appearance of the disease (Martin and Bohac, 1986). In this study, antibodies against BRSV were found in
blood of a relatively high number of calves at the beginning of fattening period, but the titers were low and probably could not ensure a proper protection from the infection and pathogen influence of the virus. In our study at the beginning of fattening period, the highest number of animals was seronegative for BVDV and BHV-1, nevertheless, these viruses were not found as the most frequent causes of infections. In the epizootiology of BVDV, persistently infected animals have the most important role and the appearance of enzootic is tightly related to the existence of these animals in the herd. In Vojvodina feedlots, calves are being transported from the regions where breeding is done with smaller number of cows, so that the probability of the existence of persistently infected animals is low. Also in this study a low significance of BHV-1 in the occurrence of bronchopneumonia in feedlots of Vojvodina was found, and that was repeated finding from previous research (Bugarski et al, 2008). The reason for this lies in the small number of calves with possibly latent infection and also in the subclinical form of BHV-1 among animals at feedlots, what was also previously found (Bugarski et al, 2008). A low seroprevalence of BHV-1 in calves and heifers in the dairy farms where this virus is present is also due to the technology of breeding where calves are being separated from their mother’s right after birth and the possibility of infection is reduced. It is a well known fact that if it comes to an infection while the colostral antibodies are still present, the result can be the appearance of seronegative latently infected calves (Bradshaw and Edwards, 1996), but a long lasting seronegativity (until calving) could indicate that infection with BHV-1 was avoided in the early stage of life. There was no evidence of clinical respiratory infections after mixing heifers with the older cows on the same farms, what indicates that infections caused with BHV-1 are in subclinical form. The occurrence of enzootic in farms with BHV-1 after mixing animals from different herds highlights once more that there is a problem if the program for eradication of this infection in Serbia is missing. In BVDV and BHV-1 infections, the way of the maintenance of virus in cattle population is clear and known and it is easy to detect animals which can be the source of infection. Eradication of these viruses from the population would be a good step towards reduction of economical losses that they cause. The losses are evident in dairy cows herds, but they are particularly noticeable in the herds of dairy cows (the damage does not relate only to the respiratory infections).

Shown results are maybe not complete in the terms of the etiology of viral bronchopneumonia in cattle farms, because the isolation of virus in calves from 30 to 60 days old has not been done. The reason for this is that viral respiratory infections at this age, because of the existence of colostral immunity, have a mild form and the disease becomes obvious much later after a secondary bacterial infection when the virus is not shedded any more and it is not possible to detect it from a nasal swab. Of course, one should never exclude the possibility of simple bacterial or micoplasmatyic infection of the lungs. Based on the appearance of antibodies found in older calves, it can be assumed that in the early age virus Pi-3 may have a certain roll in the development of respiratory infections. Virus Pi-3 is considered less significant as a cause for bronchopneumonia but is one of the participants in a mixed infection (Fulton, 2009).

Literature

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ВИРУСНЕ РЕСПИРАТОРНЕ ИНФЕКЦИЈЕ ГОВЕДА У ВОЈВОДИНИ

Бугарски Д., Лазић С., Бобоши С., Миланов Д., Петровић Т.

Кратак садржај

Инфекције дисајних органа представљају један од најчешћих и са економског становништва један од најзначајнијих здравствених поремећаја у говедарству. Вируси су значајни узрокници ових инфекција и могу да делују самостално или као покретач развоја озбиљнијих здравствених поремећаја. Дејство вируса на домаћина може различитим механизмима довести до имуносушења што погодује развоја секундарних инфекција. Више врста вируса може да изазове инфекције дисајних органа говеда, али се данас најзначајнијим сматрају говеђи респираторни синцицијални вирус (BRSV), говеђи херпесвирус 1 (BHV-1), вирус говеђе дијареје (BVDV) и вирус паранфлуензни 3 (Pi-3).

Током протеклих година у испитивању етиологије инфекција дисајних органа говеда вршено је истраживање распространости појединих вирусних инфекција у популацији говеда у узгојима Војводине. BRSV је најчешће утврђен узрокних бронхопнеумонија у товилиштима, а затим следе BVDV, Pi-3 и најреже BHV-1. На фармама маљних крава, у случајевима масовних појава бронхопнеумонија међу старијим грлима, најчешће је изолован BHV-1. По правилу, ове ензотоци су се појављивале по мешању грла из различитих запата било да су оболевали искључиво новонасебљене грла или искључиво грла која су од раније у запату. Серолошки испитивања су показала различиту преваленцу појединих вируса у различитим запатима, али и унутар истог запата зависно од старосне категорије. Према овим испитивањима највећу серопреваленцу међу теладима старијим до једне године има вирус Pi-3, а затим BVDV. Серопреваленцу BRSV се повећава у категорији јунаци, а BHV-1 тек након доласка у додир са старијим животињама (краеве на музи). Сваки од поменутих вируса има своје особености у погледу епизоотолошких особина и према њима је могуће поставити програме контроле инфекције зависно од ситуације и потреба у запату. Имунореактиваса је једна од мера, а у случају инфекција са BHV-1 и BVDV на фармама музних крава њихово искорењивање би требало да буде крајњи циљ.

Кључне речи: респираторне инфекције, говеда, BRSV, BHV-1, BVDV, Pi-3