



RESEARCH ARTICLE

Antibody prevalence against respiratory viruses in naturally infected cattle in Central Anatolia

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Özet

Avci O, Yavru S, Şevik M. İç Anadolu Bölgesi'ndeki doğal enfekte sığırlarda solunum viruslarına karşı gelişen antikor prevalansı.

Abstract

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Amaç: Bu çalışma İç Anadolu bölgesindeki sığırlarda major respiratorik viral ajanların seroprevalanslarının belirlenmesi amacı ile yapıldı.

Aim: The aim of this study was to determination of the seroprevalences of major respiratoric viral agents of cattle in central region Anatolia.

Gereç ve Yöntem: Bu çalışmada İç Anadolu Bölgesi'ndeki 5 ilden (Amasya, Çorum, Kayseri, Nevşehir ve Yozgat) solunum sisteminin en önemli enfeksiyöz ajanları olan Bovine Herpesvirus tip 1 (BHV-1), Bovine Viral Diarrhea Virus (BVDV), Bovine Respiratory Syncytial Virus (BRSV), Parainfluenza Virus-3 (PIV-3) ve Bovine Adenovirus-3 (BAV-3)'e karşı herhangi bir aşı uygulaması yapılmamış toplam 500 sığırdan kan örnekleri toplandı. Serum örnekleri BHV-1, BVDV, BRSV, PIV-3 ve BAV-3'e karşı gelişen spesifik antikor varlıkları yönünden serolojik olarak indirekt Enzyme Linked Immunosorbent Assay (ELISA) ile incelendi.

Materials and Methods: In the present study, blood serum samples were collected from 500 cattle not vaccinated against Bovine Herpesvirus type 1 (BHV-1), Bovine Viral Diarrhea Virus (BVDV), Bovine Respiratory Syncytial Virus (BRSV), Parainfluenza virus-3 (PIV-3) and Bovine Adenovirus-3 (BAV-3), which are the most important infectious agents of respiratory system in cattle, in five provinces (Amasya, Çorum, Kayseri, Nevşehir, and Yozgat) of Central Anatolia. Serum samples were investigated serologically with indirect Enzyme Linked Immunosorbent Assay (ELISA) for specific antibodies developed against BHV-1, BVDV, BRSV, PIV-3 and BAV-3.

Bulgular: Serum örneklerinin seropozitivite oranları BHV-1, BVDV, BRSV, PIV-3 ve BAV-3 için sırasıyla %57.8, %68.0, %78.2, % 85.6 ve %76.8 olarak belirlendi.

Results: Seropositivity of the serum samples of BHV-1, BVDV, BRSV, PIV-3 and BAV-3 were determined as 57.8%, 68.0%, 78.2%, 85.6% and 76.8%, respectively.

Öneri: Sonuç olarak İç Anadolu Bölgesi'ndeki sığırlarda solunum sistemi hastalıklarında temel enfeksiyöz viral ajanların varlığının devam ettiği ve aşılama programlarının uygulanması gerektiği ifade edilebilir.

Conclusions: It may be stated that main infectious viral agents for respiratory disease of cattle in Central Anatolia is still presents, and vaccine programs should be applied.

Anahtar kelimeler: BHV-1, BVDV, BRSV, PIV-3, BAV-3

Keywords: BHV-1, BVDV, BRSV, PIV-3, BAV-3





Introduction

Bovine Respiratory Disease (BRD) is the most common and lead to financial losses in cattle industry in world (Thomson and White 2006). BRD results from different pathogenic agents (special viruses, bacteria, and mycoplasma) in dairy cattle (Snowder et al 2006). Major viruses of cattle in BRD include Bovine Herpesvirus 1 (BHV-1), Bovine Viral Diarrhea Virus (BVDV), Bovine Respiratory Syncytial Virus (BRSV), Bovine Parainfluenza Virus 3 (PIV-3) and Bovine Adenovirus 3 (BAV-3) (Pardon et al 2011).

Infectious Bovine Rhinotracheitis (IBR) caused by BHV-1 (subfamily of *Alphaherpesviridae*, and family *Herpesviridae*) may cause respiratoric symptoms (conjunctivitis, nasal mucopurulent discharge etc), as well as reduced milk yield and abortions (Rajkhowa et al 2004). BHV-1 causes abortion in cattle while it is considered as a respiratory pathogen (Nandi et al 2009). Bovine Viral Diarrhea (BVD) is an important viral disease both wild and domestic cattle. BVDV is classified in the genus of *Pestivirus* within the *Flaviviridae* family (Grondahl et al 2003). BVDV has widespread distribution in cattle industry with over symptoms including different mucosa such as digestive, respiratory, and genital systems (Passler et al 2010). BRSV, an enveloped, non-segmented, single-stranded negative RNA virus, genome encoding 11 proteins, is one of the major viral pathogen causes of BRD (Larsen 2000). BRSV belongs to the genus of *Pneumovirus*, subfamily of *Pneumovirinae*, and family of *Paramyxoviridae* (Larsen et al 2001). BRSV not only replicates in ciliated respiratory epithelial cells but also in type II pneumocytes (Viuff et al 2002). Bovine PIV-3, an enveloped, non-segmented negative-sense RNA virus within the genus *Respirovirus*, and family of *Paramyxoviridae*

(Murphy et al 1995) and causes respiratoric symptoms secondary agents are present (Radostits et al 2000). BAV-3 cause different clinical symptoms such as pneumonia, polyarthritits, conjunctivitis, belongs to the *Mastadenovirus* genus of the family *Adenoviridae* (Davison et al 2003). It is known that BAV-3 is an important virus of cattle in newborn calves (Zakhartchouk et al 1999).

Some viruses such as bovine reovirus, enterovirus, rhinovirus, and coronavirus were reported associated with BRD (Heckert et al 1990). The BRD can be accompanied by secondary infections frequently. It could be detected differences in prevalence and incidence of different viral respiratoric pathogens. Serological tests as Virus Neutralization Test (VNT), ELISA, Immunofluorescence Antibody (IFA), and Hemagglutination Inhibition (HI) can be preferred for diagnosis of respiratoric diseases of cattle (Yavru et al 2005, Algirdas et al 2008, Yesilbag and Gungor 2008, Sakhaee et al 2009). Serological or virological detecting, prevention, and controlling of respiratory diseases in cattle can increase economic acquisition (Radostits et al 2000).

The aim of this study was to determine the seroprevalence of five major viral agents (BHV-1, BVDV, BRSV, PIV-3, and BAV-3) of bovine respiratory infections in cattle in the central region of Turkey.

Materials and Methods

Animals and samples

The total 500 samples according to geographical position of locations and provinces examined and summarized in Table 1 in this study. The following criteria were used to select

Table 1. Number of sampled according to geographical position of locations and provinces.

Provinces	Geographical Position	Study sample
Amasya	40°39'N, 35°51'E	100
Çorum	39°14'N, 38°27'E	100
Kayseri	38°43'N, 35°30'E	100
Nevşehir	38°38'N, 34°43'E	100
Yozgat	39°50'N, 34°48'E	100
Total		500

Table 2. Seropositivity rates of viruses in cattle populations detected according to locations.

Provinces	Study sample	BHV-1 (%)	BVDV (%)	BRSV (%)	PIV-3 (%)	BAV-3 (%)
Amasya	100	58	71	88	91	71
Çorum	100	62	64	57	87	68
Kayseri	100	55	61	82	80	88
Nevşehir	100	57	72	79	77	65
Yozgat	100	57	62	85	93	92
Total	500	289 ^d (57.8)	340 ^c (68.0)	391 ^b (78.2)	428 ^a (85.6)	384 ^b (76.8)

a, b, c, d: Different letters in the same line are statistically significant (P<0.05).





the farms for the study: They should have medical records in the University of Selcuk, Faculty of Veterinary Medicine, have a history of cattle with clinical signs of respiratory disease. The animals for the present study were randomly picked up among the five cattle farms population that were not vaccinated for those infections of central Anatolia region (Amasya, Çorum, Kayseri, Nevşehir, Yozgat). Holstein cattle were used in this study. Samples of cattle with clinical signs such as runny nose, tears, coughing, wheezing, nasal discharge symptoms were collected from at least 50% of the cattle in each farm. The target population in the current study was herds with more than 100 cattle. As the main interest of the study was to investigate the seroprevalence of BRDV infections on cattle health, the farms were included in the study depending on their antibody status. All the sampled animals were older than 3 years old and randomly selected from privately owned large capacity farms.

Blood samples were collected (8 µL per animal) by venipuncture of the jugular vein using sterile vacuum tubes containing a serum separator gel (BD, Vacutainer®, USA). Tubes were labeled and taken to the Virology laboratories (University of Selcuk, Faculty of Veterinary Medicine, Department of Virology) in isothermal containers held at 4°C, and samples were centrifuged at 3000 g for 10 min for serum separation. Serum samples were stored at -20°C until testing.

ELISA analyses

The serum samples were analyzed by commercially available indirect ELISA kit (Bio-X Respiratory Elisa Kit, Belgique). The test was performed according to manufacturer's instructions. The optical density (OD) at 450 nm (Rayto RT2100, China) was corrected by subtraction of the negative control antigen OD.

Statistical analyses

Statistical significance of differences in seroprevalence values between locations were analyzed using Chi-square analysis (Minitab release 11.0). $P < 0.05$ level was accepted as statistically significant.

Results

Seroprevalence of BHV-1, BVDV, BRSV, PIV-3 and BAV-3 antibodies are shown in Table 2. Overall seroprevalence values for the viruses BHV-1, BVDV, BRSV, PIV-3 and BAV-3 were 57.8%, 68.0%, 78.2%, 85.6% and 76.8%, respectively (Table 2). Seroprevalence of PIV-3 was statistically significance higher than others.

Discussion

Viral respiratoric diseases are major important problem and economic losses due to decrease in milk production, weight loss, and reproductive problems in dairy cattle industry in worldwide (Beaudeau et al 2010, Klem et al 2014). In this study, seropositivities of PIV-3 and BHV-1 were determined as 85.6% and 57.8%, respectively (Table 2). When the results of this study are compared to the results of study performed

by Yesilbag and Gungor (2008); it is determined that rate of BHV-1 (57.8%), BVDV (68.0%) and PIV-3 are higher, whereas rates of BAV-3 (76.8%) and BRSV (78.2%) are lower. Presence of major viruses of BRD in cattle was established in most cases of bovine respiratory infections in several reports and serological studies (Radostits et al 2000, Yavru et al 2005, Algirdas et al 2008, Yesilbag and Gungor 2008, Sakhaee et al 2009, Roshtkhari et al 2012, Shirvani et al 2012).

Pestiviruses are very significant infectious viral agent for domestic and wild ruminants, and occurrence of pestivirus infections is reported in Turkey (Alkan et al 1997, Yavru et al 2005, Yesilbag and Gungor 2008, Duman et al 2009). Immunosuppressive effect of BVDV may predispose for respiratory infections in cattle (Potgieter et al 1984). Researchers (Yesilbag and Gungor 2008) showed the presence of pestivirus antibodies 41.4%. In the current study, seroprevalence rate detected against BVDV was determined much higher than those obtained in different parts of the country. The reason of this may be explained by the samples selected among the cattle which have respiratory problems. The first study in Turkey about BHV-1 infection in cattle was performed by Gurturk et al (1974). Gencay et al (2009) reported that among the others, 285 serum samples (51.63%) were positive against BHV-1. The results of the current research showed that BHV-1 infections are very common (Table 2), and this data is agreement with the previous reports from different parts of the Turkey. In Turkey, prevalence and etiological role of BHV-1 in certain kinds of clinical features as respiratory tract infection and mastitis detected in closed dairy herds have been reported previously (Alkan et al 1997, 2000, Bilge 1998). Prevalence of BHV-1 infection was reported range from 35.25% to 74% by different researchers in Turkey (Akca 1981, Burgu and Akca 1982, Cabalar 1994, Bilge 1998, Duman et al 2009). In this study, it was determined as 57.8% seropositivity and claimed that this high rate was due to our sampling collected from the herds with clinical signs respiratoric diseases.

In the present study, 78.2% seropositivity was detected for BRSV and this percentage higher than the reports of Gumusova et al (2007) and Duman et al (2009). The high seroprevalence in the current study could be explained by sampling herds which suspicious for possessing BRDV infections and using of ELISA technique, more sensitive other than serological techniques used in the past. BRSV is mainly transmitted by aerosol via or direct contact (Mars et al 1999) and an important viral pathogen in young calves (Antonis et al 2010). Detected in this study the high seroprevalence (78.2%) may be linked to training of cattle in closed areas. Contrary to previous studies reports performed in different regions of Turkey (Alkan et al 1997, Yavru et al 2005, Gumusova et al 2007), the most common respiratory virus in central Anatolia region of Turkey is PIV-3 which has a seroprevalence of 85.6%. Similar result was also reported in central region of Iran where among the evaluated cattle 84.4% were infected with PIV-3 (Shirvani et al 2012). It must be evaluated that there are many factors contributing to differences of BAV-3 in different regions or herds; low or high temperatures, herd capacity (Yesilbag and Gungor 2008), poor nutrition, early weaning are very important risk factors for respiratory viruses (Snowder et al 2006).





Conclusions

In conclusion, the present study results indicate that bovine respiratory viruses are very common in cattle in Central Anatolia region, where it is one of the most important dairy cattle production areas of Turkey. In addition, protective measures such as general ventilation system, good management practices, quarantine, and vaccine administration can help to reduce viral causes of bovine respiratory diseases among dairy cattle farms.

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