

Seroprevalence of Viral Upper Respiratory Infections in Dairy Cattle

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Summary

In this research, dairy cattle, located in Konya in Central Anatolian Region and its surrounding and had respiratory system symptoms, were investigated for the seroprevalence Infectious Bovine Rhinotracheitis (IBR), Bovine Viral Diarrhea Virus (BVDV), Bovine Respiratory Syncytial Virus (BRSV), Parainfluenza Virus type 3 (PI-3) and Bovine Adenovirus type 3 (BAV-3). For that purpose, 5800 animals, one year old and over, and bred in the private farms, were investigated and the blood samples were collected from 278 animals with respiratory system disease symptoms and high body temperatures. These samples were tested for presence of antibodies against IBR, BVDV, BRSV, PI-3 virus and BAV-3 by ELISA that was bought commercially. The seroprevalences which were determined for 5 viruses in cattle -(IBR, BVDV, BRSV, PI-3 virus and BAV-3)- were 35.25%, 96.04%, 94.40%, 92.80% and 85.97%, respectively. On the other hand, 0.35% (1 animal) of the dairy cattle sampled did not have any antibodies against the viruses. The existence of antibodies against the viruses were as such; 1.43% of cattle (4 animals) had antibodies against only one virus, 2.87% of cattle (8 animals) had antibodies against two, 14.02% of cattle (39 animals) had antibodies against three, 49.64% of cattle (138 animals) had antibodies against four and 31.65% of cattle (88 animals) had antibodies against five viruses. It was determined that IBR, BVDV, BRSV, PI-3 and BAV-3 infections were widespread and seroprevalences were high.

Keywords: Seroprevalence, Dairy cattle, Respiratory viruses, ELISA

Süt Sığırlarında Viral Üst Solunum Yolu Enfeksiyonlarının Seroprevalansı

Özet

Bu araştırmada, İç Anadolu Bölgesi'nde yer alan Konya ve çevresindeki solunum sistemi semptomu gösteren süt sığırlarında Infectious Bovine Rhinotracheitis (IBR), Bovine Viral Diarrhea Virus (BVDV), Bovine Respiratory Syncytial Virus (BRSV), Parainfluenza Virus tip 3 (PI-3) ve Bovine Adenovirus tip 3 (BAV-3) enfeksiyonlarının seroprevalansı araştırıldı. Bu amaçla, özel çiftliklerde bulunan 1 yaş ve üzeri 5800 hayvan tarandı ve solunum sistemi hastalık semptomu gösteren, vücut ısı normalin üstünde olan 278 hayvandan kan örneği alındı. Bu örnekler IBR, BVDV, BRSV, PI-3 ve BAV-3'e karşı antikorların varlığı yönünden ticari olarak temin edilen Enzyme Linked Immunosorbent Assay (ELISA) ile test edildi. Sığırlarda 5 virusa (IBR, BVDV, BRSV, PI-3 ve BAV-3) karşı tespit edilen seroprevalans sırasıyla, %35.25, %96.04, %94.40, %92.80 ve %85.97 olarak saptandı. Diğer taraftan, örneklenen süt sığırlarının % 0.35'inde (1 hayvan) araştırmada kullanılan virüslara karşı antikor tespit edilmezken, %1.43'ünde (4 hayvan) yalnızca bir, %2.87'sinde (8 hayvan) iki, %14.02'sinde (39 hayvan) üç, %49.64'ünde (138 hayvan) dört ve % 31.65'inde (88 hayvan) ise beş virusa karşı antikor varlığı belirlendi. Solunum sistemi problemi olan süt sığırları işletmelerinde IBR, BVDV, BRSV, PI-3 ve BAV-3 enfeksiyonlarının yaygın ve seroprevalanslarının yüksek düzeyde seyrettiği belirlendi.

Anahtar sözcükler: Seroprevalans, Süt sığırları, Solunum virüsleri, ELISA



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INTRODUCTION

Viral respiratory system infections of cattle which generally occur subclinical may be caused by one or more viruses. The most common viruses that cause infection of the upper respiratory tract in cattle are infectious bovine rhinotracheitis (IBR), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), parainfluenza type 3 (PI-3) virus and bovine adenoviruses (BAV) ¹.

IBR is characterized by clinical symptoms of the upper respiratory tract such as conjunctivitis and nasal mucopurulent discharge, appetite loss, reduced milk yield ²⁻⁴.

PI-3 causes subclinical infections and if it is together with the secondary pathogens, clinical symptoms are observed ⁵. PI-3 infection can occur together with the other viral infections as BRSV, BAV or BVDV in the respiratory system ⁶.

BAV-3 is an important respiratory pathogen and forms an acute or subacute viral disease in cattle characterized by pyrexia, nasoocular discharge and pneumonia ⁷.

BRSV is one of the most important causes of respiratory disease in beef and dairy cattle ^{8,9}. Involvement of IBR, BVD and parainfluenza-3 (PI-3) viruses have been well documented as respiratory pathogens causing pneumonia, conception problems, congenital defects and abortion ¹⁰. However, the significance of BRSV as an acute respiratory pathogen has only been recognized in the last two decades ¹¹.

Bovine Viral Diarrhea Virus (BVDV) causes a common viral infection, observed almost in the all cattle farms. It has profound detrimental effect on the immune system. BVDV's role in respiratory disease is primarily due to immunosuppression and synergism with other pathogens of the respiratory disease complex ¹².

In this study, animals, 1 year old and over from 10 cattle farms in Konya and its surrounding, were investigated clinically. The blood serum samples, which were collected from the dairy cattle which had the symptoms of upper respiratory tract infection, were investigated for the existence of antibodies against IBR, BVDV, BRSV, PI-3 and BAV-3 by ELISA. By this study, it was aimed to reveal the seroprevalence of the viral respiratory system infections.

MATERIAL and METHODS

Serum samples: Firstly 5800 cattle belong to 10 private cattle managements (Konya-Karatay, Kadınhanı, Yunak, Akşehir, Bozkır, Taşkent, Beyşehir, Cihanbeyli, Çumra, Ereğli) were screened and the serum samples were collected from 278 dairy cattle 1 year old or over and having respiratory system disease clinical signs or high body temperature. The blood samples were taken from vena jugularis by using the BD Vacutainer Systems (Becton Dickinson Vacutainer Systems, France). They were centrifuged in 3000 rpm and inactivated at 56°C for 30 min and kept at -20°C until use.

ELISA: Bio-X Respiratory ELISA Pentakit (Bio-X Diagnostics, Belgique), which was provided commercially, was used to determine the presence of antibodies in cattle against IBR, BVDV, BRSV, PI-3 virus, BAV-3. Microplates coated with the antigens of five viruses were used according to the test procedure. Optical density (OD) was measured at 450 nm by Titertek Multiscan Spectrophotometer (Flow Labs, Irvine, UK). The positivity degrees of each serum sample were evaluated according to OD values as indicated in the ELISA kit protocol.

RESULTS

By this study, 278 nonvaccinated dairy cattle with respiratory system symptoms from Konya region were sampled and 35.25% of them were identified as seropositive for IBR, 96.04% of them were seropositive for BVDV, 94.40% of them were seropositive for BRSV, 92.80% of them were seropositive for PI-3 virus and 85.97% of them were seropositive for BAV-3 infection (*Table 1*).

In the present study, one, double, threefold, quadruple and fivefold virus infection rates were

Table 1. The seropositivity results against 5 viruses which included in the 278 nonvaccinated cattle in Konya.

Tablo 1. Konya bölgesinde 278 aşılanmamış sığırda 5 virus'a karşı seropozitiflik sonuçları

Viruses	Number of nonvaccinated cattle	ELISA		Seroprevalance (%)
		+	-	
IBR	278	98	180	35.25
BVDV	278	267	11	96.04
BRSV	278	268	10	94.40
PI-3	278	258	20	92.80
BAV-3	278	239	39	85.97

found as 1.43%, 2.87%, 14.02%, 49.64% and 31.65%, respectively (*Figure 1*). The findings displayed that the multiple infections were common among non-vaccinated dairy cattle.

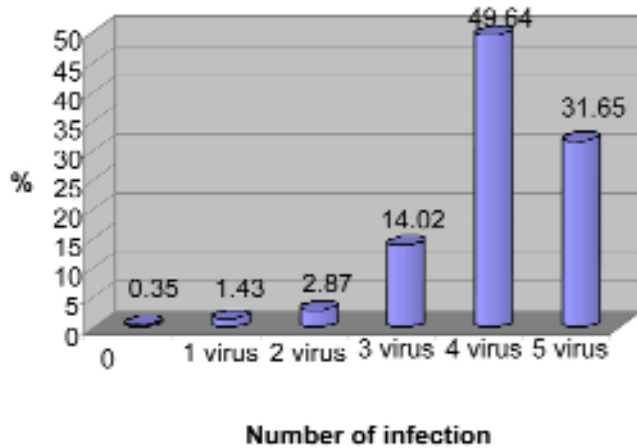


Fig 1. Multiple infection rates

Şekil 1. Multiple enfeksiyon oranları

DISCUSSION

When we compared the results of our study with the other studies conducted previously in Turkey, it was determined that the rates noted for IBR and BAV-3 were similar and the rates recorded for BVDV, BRSV and PI-3 virus were higher. However, it is possible for the herds to be exposed at different rates to the agents because the herds are located in different geographical regions there can be differences between the herds in husbandry practices and housing conditions. Also, in this study, the reason of having higher rates for seropositivity may be attributed to the sampling of only the nonvaccinated cattle with high body temperature, increased nasal and tear discharge and inactivity and to the cattle sampled. In order to identify the seroprevalence of the viral upper respiratory tract infection of cattle, ELISA which was used has higher sensitivity and specificity compared with Serum Neutralisation Test (SNT) which was commonly used for the serologic diagnosis of these infections in Turkey and in many countries ¹¹. Another point for the study that should be mentioned is that the seroprevalence of IBR tends to decrease in the Konya Region. In the previous studies held in the Konya Region by Öztürk et al.¹³ and Yavru et al.¹⁴, the seroprevalence of infection was identified as 56.30% and 41.60%, respectively. In our previous study done in the same area by SNT ¹⁵, the seroprevalence of IBR was found as 35.08%. In this study done in the same region, the seroprevalence of

IBR was determined as 35.25%. While the seroprevalences of other viruses investigated in the region tended to increase, the seroprevalence of IBR tended to decrease. This may originate from the introduction of IBR seronegative breeding bulls to the cattle farms in the region by Department of Agriculture for eradication program. The decrease of seroprevalence of IBR in Konya region is important, because IBR seropositive non-vaccinated cattle may be latent virus carriers¹⁶.

Other investigators from many countries had found the seropositivity rates of IBR, BVDV, BRSV, PI-3 virus and BAV-3 as 14.3-67.0%, 36.0-76.2%, 24.0-95.0%, 94.0-94.4%, 83.0-87.4%, respectively¹⁷⁻²². When we compared these results with our findings, the similar infection rates for IBR, BRSV, PI-3 virus and BAV-3, were seen. However, BVDV infections were more common in Konya and its surroundings.

Lauchli et al.²³ had sampled 123 cattle from 45 herds that had respiratory system symptoms and determined that the 1/4 of the animals had an infection because of one viral factor and the 3/4 of the animals had multiple infections. Alkan et al.² conducted an investigation to determine the presence of specific antibodies against 9 viruses (IBR, PI-3 virus, BRSV, BVDV, BAV-1, BAV-2, BAV-3, Enterovirus 1 and Enterovirus 2) and found the infection rates against one, two, and 3-8 viruses as 9.38%, 11.46% and 72.01%, respectively. Yavru et al.²⁴ had reported the seropositivity rates against one, two, three, four, five, six and seven viruses as 14.7%, 36.22%, 29.92%, 14.56%, 3.93%, 1.57% and 0.39%, respectively. Okur-Gümüşova et al.²⁵ conducted an investigation to explore the existence of specific antibodies against 5 viruses (BHV-1, BVDV, PI-3 virus, BAV-1 and BAV-3), and found one, double, threefold, quadruple and fivefold virus infection rates as 6.91%, 59.04%, 58.5%, 39.3% and 35.8%, respectively. Erol et al.²⁶ had investigated presence and seroprevalence of Parainfluenza-3 (PI-3) virus and adenovirus, two major viruses causing serious economic losses and their distribution in 4 different dairy cow enterprises. They found specific antibodies for PI-3 and BAV type 1-2-3 in 38.2%, 75.7%, 39.9% and 62.2%, respectively.

As a result, this study showed once more that the infections of IBR, BVDV, BRSV, PI-3 virus and BAV-3 were common among the cattle populations and especially in the respiratory system infection cases, the probability of participation of these agents to the infection was evaluated. It is important to note that

these infections that are mostly subclinical can easily cause to clinical infections depending upon malnutrition, improper environmental conditions and other stress factors and as a result, very important economic losses may occur.

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