Serologic investigation of respiratory viruses in captive Goitred Gazella (Gazella subgutturosa subgutturosa)

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Introduction

Gazella subgutturosa subgutturosa (G.s.s.), one of the two native species of gazelle in Anatolia, are kept and reared free within the premises of Ceylanpinar State Farm in Turkey. The aim of the study was to serologically investigate the well-known respiratory viruses in gazelle. For this purpose, indirect ELISA and virus neutralisation (VN) tests were performed on 82 serum samples for Bovine Viral Diarrhea Virus (BVDV), Bovine Herpesvirus-1 (BHV-1), Parainfluenza Virus-3 (PIV-3), Bovine Adenovirus-3 (BAV-3) and Bovine Respiratory Syncytial Virus (BRSV). All of the samples were negative for BVDV and BHV-1, while 11.0%, 14.6%, and 24.4% seropositivity was identified for BAV-3, PIV-3, and BRSV, respectively. It was noticed that two ELISA positive samples for BRSV and BAV-3 had been detected as negative for VN; therefore, the ELISA test was maybe more sensitive than VN test.

Key-words: Bovine viral diarrhea virus, bovine herpesvirus, bovine adenovirus, bovine respiratory syncytial virus, parainfluenza virus, Gazella subgutturosa subgutturosa.

Material and Methods

SAMPLED ANIMALS

Around 850 Gazella subgutturosa subgutturosa, the only surviving gazelle species in Anatolia, are kept and reared free within the premises of Ceylanpinar State Farm in Turkey. The aim of the study was to serologically investigate the well-known respiratory viruses in gazelle. For this purpose, indirect ELISA and virus neutralisation (VN) tests were performed on 82 serum samples for Bovine Viral Diarrhea Virus (BVDV), Bovine Herpesvirus-1 (BHV-1), Parainfluenza Virus-3 (PIV-3), Bovine Adenovirus-3 (BAV-3) and Bovine Respiratory Syncytial Virus (BRSV). All of the samples were negative for BVDV and BHV-1, while 11.0%, 14.6%, and 24.4% seropositivity was identified for BAV-3, PIV-3, and BRSV, respectively. It was noticed that two ELISA positive samples for BRSV and BAV-3 had been detected as negative for VN; therefore, the ELISA test was maybe more sensitive than VN test.

Key-words: Bovine viral diarrhea virus, bovine herpesvirus, bovine adenovirus, bovine respiratory syncytial virus, parainfluenza virus, Gazella subgutturosa subgutturosa.

Recherche sérologique de virus respiratoires chez la gazelle goitreuse (Gazella subgutturosa subgutturosa) en captivité

Environ 850 Gazella subgutturosa subgutturosa, seule espèce de gazelle ayant survécu en Anatolie, sont conservées et élevées librement à la ferme d’état de Ceylanpinar en Turquie. Le but de cette étude était de rechercher dans le sérum les virus respiratoires bien connus chez la gazelle. À cette fin, des tests ELISA indirect et de neutralisation virale (VN) ont été réalisés sur 82 échantillons de sérum pour le virus de la diarrhée bovine (BVDV), l’herpesvirus bovin de type 1 (BHV-1), le virus parainfluenza de type 3 (PIV-3), l’adenovirus bovin de type 3 (BAV-3) et le virus syncytial respiratoire bovin (BRSV). Tous les échantillons se sont avérés négatifs pour le BVDV et le BHV-1, alors qu’une séropositivité de 11.0%, 14.6%, et 24.4% était notée pour le BAV-3, le PIV-3, et le BRSV, respectivement. Par ailleurs, deux échantillons positifs en ELISA pour le BRSV et le BAV-3 étaient négatifs avec la VN ; ainsi, le test ELISA est probablement plus sensible que le test VN.

Mots-clés : BVD, BRSV, diarrhée bovine, herpesvirus bovin, parainfluenza virus, adenovirus bovin, virus syncytial respiratoire bovin, Gazella subgutturosa subgutturosa.
Agents and stressors, the prognosis may be severe.

Clinical signs alone, but when combined with other pathogens, the degree of the enzootic pneumonia may be determined especially in newborn calves up to five months old. The occurrence of pneumonia has a worldwide distribution, and field studies show that prevalence could be very high in adult cattle in some herds. The BAVV infection has a high prevalence in Turkey: 95.8% [7] and 89% [22] rates were determined in cattle, and 55% seropositivity was found in adult buffaloes [1]. In this study, 9 out of 82 samples (11.0%) were seropositive for BAVV-3.

**MICRONEUROTALISATION TEST**

The viruses were propagated and titrated in Madine Darby Bovine Kidney (MDBK) cells prior to the test. BHV-1 (Colorado), BVDV (NADL), BRSV, PIV-3 (SF-4, German strain), and BAVV-3 (strain 13/66) viruses were used in the VN test [9, 13]. A negative control serum was used, but a positive control serum was not available.

**Results**

The results of the ELISA and VN tests for BHV-1, BVDV, BRSV, PIV-3 and BAVV-3 are given in Table 1. All of the tested sera were negative for BHV-1 and BVD in both tests. However, 24.4%, 14.6% and 11.0% positivity rates were determined for BRSV, PIV-3 and BAVV-3, respectively, with ELISA test. Two ELISA positive samples were negative for BRSV and BAVV-3 viruses with VN test.

As a result of the ELISA test, fifty three gazelles were found to be seronegative for all of the named infections. Only two were positive for the three infections (BRSV, PIV-3, BAVV-3). Eight gazelles were detected as positive for two infections (3 were BRSV and PIV-3 positives, 3 were BRSV and BAVV-3 and 2 were PIV-3 and BAVV-3). Nineteen animals were detected as positive for only one infection, (12 were BRSV, 5 were PIV-3, 2 were BAVV-3).

The infection rates in males (44) and females (38) were seronegative for all of the named infections. Only two were positive for the three infections (BRSV, PIV-3, BAVV-3). Eight gazelles were detected as positive for two infections (3 were BRSV and PIV-3 positives, 3 were BRSV and BAVV-3 and 2 were PIV-3 and BAVV-3). Nineteen animals were detected as positive for only one infection, (12 were BRSV, 5 were PIV-3, 2 were BAVV-3).

The infection rates in males (44) and females (38) were found to be similar.

**Discussion**

Enzootic pneumonia has a worldwide distribution, especially in newborn calves up to five month old. The occurrence and degree of the enzootic pneumonia may be determined by many factors: existence of different infectious agents, stresses of weaning, changes of feed, environmental factors such as humidity and temperature variations, and immunological status of the animals. Some of the viral agents produce only mild clinical signs alone, but when combined with other pathogen agents and stressors, the prognosis may be severe.

Although infectious bovine rhinotracheitis and BVDV are widespread in Turkey with a seroprevalence up to 74% and 96.8% respectively [5, 8], the gazelles were seronegative. This could be explained by a lack of transmission, since these results are significant for this gazelle species facing extinction.

Bovine adenoviruses have 10 serotypes, which are separated in two groups. Serotype 3 and 5 appear to be more pathogenic than others, causing enteric and respiratory disorders [11, 20]. The main clinical findings are fever, anorexia, conjunctivitis, pneumonia and enteritis [10, 16], young calves being more susceptible than older ones. BAVV-3 infections have a worldwide distribution, and field studies show that prevalence could be very high in adult cattle in some herds. The BAVV-3 has a high prevalence in Turkey: 95.8% [7] and 89% [22] rates were determined in cattle, and 55% seropositivity was found in adult buffaloes [1]. In this study, 9 out of 82 samples (11.0%) were seropositive for BAVV-3.

Parainfluenza-3 virus (PIV-3) is a RNA virus classified in the subfamily Paramyxovirinae, which belongs to the family Paramyxoviridae. By itself, PIV-3 has a relatively mild clinical picture, characterized by fever, coughing, anorexia, dyspnea, nasal and ocular discharge [12]. Death loss to the disease is rare, but it can turn into a more severe clinical form in the presence of adverse environmental conditions and other pathogens [18, 21]. The most important role of PIV-3 is to serve as an initiator that can lead to the development of secondary bacterial pneumonia. Mixed infections are more damaging and dangerous because PIV-3 can enhance the damage caused by other diseases. PIV-3 infection is also very widespread in Turkey: positivity was between 10-72% in organized cattle herds [2]. In this study, a 14.6% (12/82) ratio was determined in gazelle.

Today, BRSV has been recognized as a major viral component of the bovine respiratory disease complex [19]. In outbreaks, nearly 80-90% of the calves may be affected. The main symptoms are fever, nasal and lacrimal discharge, emphysema, dyspnea, and coughing [17]. Mortality can reach 20%, surviving calves recover after a few days. BRSV has an affinity for the lower respiratory tract, and can damage the respiratory tract and cause a secondary bacterial infection [3]. BRSV has been isolated in most European countries, North America, and Japan. In Turkey, a 46.12% seropositivity rate was determined in cattle [6]. In this study, highest antibody rate was found for BRSV (24.4%), these serological responses suggested that there was an outbreak in the herd.

Infections with PIV-3, BAVV, and BRSV have been observed to have occurred mostly in the autumn and winter months. Outdoor reared calves may severely affected by pneumonia [23, 24]. At Ceylanpinar state farm, gazelles have been breeding.
in completely open restricted areas. Although there was no direct contact, susceptible animal species (sheep and cattle) in the same farm could be the source of the viral infection by way of aerosol.

Some researchers obtained similar results for other gazelle species. Seropositivity was found for PIV-3 and BVDV in gemboks (Oryx gazella gazella) in the USA [4]. FRÖLICH et al., [14] detected seropositivity for BRSV, BA-3 and BVDV in the Arabian Oryx (Oryx Leucoryx) in Saudi Arabia and in the United Arab Emirates.

There are no specific ELISA kit or test viruses for VN for gazelle. In the reference to investigated infections that have been reported before in different ruminant species, two of the sensitive methods were used for specific antibody detection. As a result of the tests, two BRSV and BA-3 ELISA positive samples were negative with VN, and the ELISA test seem to be more sensitive.

Due to gazelles being wild by nature, vaccination, treatment, disease control studies, and close observation was not possible; therefore, there is no exact information about the health status of the animals. The viruses are primary respiratory system pathogens alone or mixed, it is often suggested that the bacterial agents (Pasteurella haemolytica and P. multocida, staphylococi, Histophilus somni, corynebacteria and other) act as the secondary invaders. In cases of severe bacterial broncho-pneumonia, especially in the absence of treatment, death often occurs within a few days. So, such study are very important to supervise gazelle herd health and survival.

**Conclusion**

In conclusion, PIV-3, BA-3, and BRSV specific antibodies were detected for the first time in Goitred gazelles and the ELISA test was maybe more sensitive than the VN test. The obtained data showed that PIV-3, BA-3 and BRSV viruses are in circulation in gazelles in Ceylanpinar. Even though these infections were not latent and seropositivity rates were not very high, newborns may have been infected by viruses alone or mixed with other viral and bacterial pathogens and in the absence of protection and therapy, the prognosis for these animals could be severe, and deaths may occurred.

The reintroduction of gazelles into the wild seems not to be possible today due to the status of the region, but knowing the serological status of the animals is important in order to be able to determine potential health risks. New research is necessary in order to accomplish this aim.

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**References**


