

Seroprevalence of the Rotavirus and Corona Virus Infections in Cattle

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Abstract: In this study, the prevalence of Bovine rotavirus (BRV) and Bovine Corona Virus (BCV) infections were investigated in blood serum of 498 unvaccinated adult cattle in northeast part of Turkey by using the virus neutralization test. The results showed that seroprevalence of BRV was found in 146 (29.3%) and that of BCV was found in 131 (26.3%) in tested cattle sera. Antibodies to both viruses were found in 21 (4.2 %) cattle sera. From the results, it can be assumed that BRV and BCV infections are common among the adult cattle and the seropositive animals should be considered as a source of infection within the herd.

Key words: Cattle, corona virus, rotavirus, seroprevalance

INTRODUCTION

Diarrhea of the adult cattle is of great significance in cattle breeding as a result of economical losses. Etiology of diarrhea in calves can be attributed to malnutrition, insufficient colostrum, unsuitable breeding conditions and environmental temperature and stress factors, bacterial and viral agents. Even in modern plants, diarrhea arising from the presence of one or more of these factors being in effect simultaneously may be encountered (De la Fuente *et al.*, 1998; Kahrs, 2001).

The bovine rotaviruses (BRV) and Bovine Corona Viruses (BCV) causing diarrhea in calves cause subclinical infections in adult cattle. In many studies (Alonso *et al.*, 1984; Crouch and Acres, 1984; Alkan *et al.*, 2004), seropositivity against these viruses were detected at varying rates in adult cattle. As the BRV and BCV specific antibodies arising in cattle as result of either natural infection or vaccination are transferred to calves via milk and colostrum that play an important factor in protection of the calves from these infections (Kahrs, 2001; Crouch *et al.*, 2001).

Dogs, cats and other wild animals may have a role for transmitting rotaviruses among the cattle populations (Schwers *et al.*, 1982). It has also been suggested that cross-contamination is also possible among the species kept together such as pigs, poultry and cattle (Brussow *et al.*, 1992; Pongsuwanna *et al.*, 1996).

The aim of this study was to determine prevalence of the BRV and BCV infections in unvaccinated cattle older than one year old.

MATERIALS AND METHODS

Cells and viruses: Two types of cell lines Madin Darby Bovine Kidney (MDBK) and Foetal Calf Trachea (FBTr) were used in this study. MDBK cells were used to obtain BRV stock and used for neutralization test. FBTr cells were used to produce BCV stock and used for neutralization test. The titres (TCID₅₀) of BRV (Northern Ireland 75/447) and BCV (England) were 10^{-6.25}/0.1 and 10⁻⁴/0.1 mL, respectively.

Serum samples: The serum samples were collected from 498 cattle older than one year old that were randomly selected from herds within the northeast part of Turkey. These cattle were not vaccinated against both BRV and BCV. All blood samples were centrifuged in the laboratory at 3000 rpm for 15 min to remove the sera, which were then heat-inactivated at 56°C for 30 min before testing.

Virus neutralisation test: Virus neutralisation test were performed essentially as described by. Briefly, serial two fold dilutions of serum samples as described above were made in maintenance medium in 96-well flat-bottom tissue culture plates. Duplicate wells were used for each assay and 50 µL of each dilution of serum (1/5) were

retained in the wells. An equal volume of BRV and BCV that were added 100 TCID₅₀/0.05 mL was added to each well. Virus and cell controls were included to test. The plates were incubated for 1 h at 37°C and 5% CO₂. Finally, 50 µL of a suspension of cells at 3×10⁵ cells mL⁻¹ suspended in maintenance medium was added and the plates were incubated up to 6 day at 37°C and 5% CO₂ until complete cytopathic effect was observed in virus control. The neutralising titer of BRV and BCV antibodies was assessed as the highest antibody dilution that inhibits 50% of cytopathic effect in cells.

RESULTS AND DISCUSSION

The seropositivity rates of the BRV and BCV in the 498 tested serum samples were found as 29.3% (146/498) and 26.3% (131/498), respectively and the seropositivity rates for both viruses were found as 4.2% (21/498). In the neutralization test, it was observed that the antibody titer values (SN₅₀) of the serum that were found to be BRV positive in varied from 5.6-320 and the antibody titer values (SN₅₀) of the serum samples that were found to be BCV positive varied from 5.6-640 (Table 1). The geometric mean (X_G) of positive sera for BRV was 1/9.1 and for BCV was 1/7.1 (Table 1).

Neonatal calf diarrheas results in great economic loss directly through mortality and the cost of treatment and indirectly from poor growth following clinical disease (De la Fuente *et al.*, 1998). It is believed that the neonatal calf diarrhea causes approximately 75% of the mortality of dairy calves under 3 weeks of age (Radostits *et al.*, 1994). According to a study reported by House (1978), there was nearly 95 million dollar economic loss per year caused by neonatal calf diarrheas in USA between 1970 and 1976 years.

The diarrheal syndrome has a complex etiopathogenesis due to various infectious agents, nutritional disorders, environmental factors and breeding problems (De la fuente *et al.*, 1998; Kahrs, 2001). Both of BRV and BCV are common causes of viral diarrheas. In particular, BRV causes degradation of liquid electrolyte balance by enterocyte losses in small intestine mucous and villus atrophies and high mortality together with the secondary infections of 1-10 days old calves. In addition, BRV causes mortalities by degeneration in small intestine,

colons and secondary complications with the degradation of digestive system absorption resulting in villus atrophies (Torres-Medina *et al.*, 1985).

It is known that adult cattle disperse BRV and BCV in their late term pregnancy and especially on the day of giving birth. Calves which were born from these cattles are likely infected with the viruses dispersed from their mothers who can also infect other neonatal calves kept together with them. In addition, cattle having subclinical infection can play a major role for transmitting virus for a long period. Because of this, serological investigations are important for searching epidemiology of BRV and BCV associated diarrheas among mature cattle (Crouch and Acres, 1984; Collins *et al.*, 1987; Can-Sahna and Alkan, 2003).

Collins *et al.* (1987) reported in one of their studies that the mature cattles disperse BCV via their faeces during the winter months (November-March). In their study, the comparison of a group of cattle vaccinated with BCV-BRV-*E. coli* combined graft with a non-vaccinated group of cattle showed that vaccination had no effect on seasonal BCV dispersion. However, they showed that the 20-30% increase of BCV dispersion from vaccinated cattle occur in the last 2 months of the pregnancy and during the birth time.

In a study of Alkan *et al.* (2004) which was based on young animals born from the cattles vaccinated with commercial graft, it was shown that the rate of calves borned from the vaccinated and not vaccinated mothers exposed to infection was 30 and 54.5%, respectively, but they were not able to determine a clear antibody response in the vaccinated mothers. In the same study, they also found that the seroprevalence for BRV was 72.7-90.9% and for BCV was 9.1-100% in sera taken from vaccinated and non-vaccinated cattle during pre-partum and post-partum terms.

In the serological studies performed in many countries, the BRV and BCV infections have been found to be common in cattle (Crouch and Acres, 1984; Alkan *et al.*, 1999; Brandao *et al.*, 2002; Alkan *et al.*, 2004; Cabalar 2004). Crouch and Acres (1984) showed that the BRV and BCV seroprevalances among 121 adult cattle were 44 and 70%, respectively. According to a study, carried out Alonso *et al.* (1984) based on testing sera from 16 different farms, it was found that seroprevalence for

Table 1: Geometrical means of distribution of titres and seropositivity percentages in BRV and BCV

	Number of		Antibody titre distribution (SN ₅₀) of BRV and BCV														X _G
	Serum samples	Seropositives (%)	5.6	10	14.2	20	28.2	40	56.2	80	112	160	222	320	446	640	
BRV	498	146 (29.3)	33	6	16	2	20	6	15	6	13	15	12	2	-	-	1/9.1
BCV	498	131 (26.3)	-	8	13	2	15	4	29	12	24	9	6	5	2	2	1/7.1

BRV was 94% and for BCV was 96%, respectively. The seroprevalence of BRV was ranged from 65.9-98.1% in a study carried out by Schlafer and Scott (1979), Schwers *et al.* (1984) and Brandao *et al.* (2002). In addition, it was also suggested that the seropositivity rate was connected with the sexuality of animals (Brandao *et al.*, 2002), which was found 85.4% for the males and found 69.9% for females older than 1 year old.

According to studies, carried out in Turkey (Burgu and Akca, 1983; Alkan *et al.*, 1999, 2003; Can-Sahna and Alkan, 2003; Cabalar, 2004), the seroprevalence of BRV was ranged from 31-54.1%. Alkan *et al.* (2003), carried out a study involving 919 cattle in 5 diary herds to determine BCV seroprevalence. They found that BCV seropositivity was 16.3% which was varied between 4.4 and 100% in the sampled population.

In our study, the seroprevalence of the BRV and BCV infections were found as 29.3 and 26.3%, respectively. The rate of the animals having the specific antibodies against both viruses was 4.2%. The result obtained for BRV in our study indicated that the seroprevalence value of BRV is close to the values obtained in other studies performed in Turkey and the seroprevalence value for BCV was in accordance with the other studies reported in Turkey.

CONCLUSION

In conclusion, the results obtained in our study showed the existence of the BRV and BCV infections in adult cattle. These infected cattle can be considered as source of infection for newborn calves. Thus, immunization of dams against these viruses should be done.

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