Seropositivity of agents causing abortion in local goat breeds in Eastern and South-eastern Anatolia, Turkey

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SUMMARY

The epidemiological information has not been available on the seroprevalence of agents causing abortion and genital tract infection in indigenous goats of Eastern and South-eastern regions of Turkey, yet. In these regions, the goats have importance for local economy and their production of meat, milk and mohair. There are also differences of the husbandry and climate conditions between two regions. The objective of this study was to describe the seroprevalence and distribution of antibodies to agents causing abortion involving Bluetongue (BT), Bovine viral diarrhoea virus (BVDV), Border disease virus (BDV), Caprine arthritis encephalitis virus (CAEV), Toxoplasma gondii, Brucella spp. in two local goat herds in Eastern and South-eastern regions of Turkey. None of the goats from the two herds had detectable antibodies against CAEV, although seropositivity towards BT, BVDV, BDV, Brucellosis and Toxoplasmosis infections were found to be 14.5%, 30.2%, 63.6%, 26.5% and 72.7%, respectively. The abortion cases were found significantly associated with serological status of the herd from the South-eastern region of Turkey.

Keywords: abortion, goat, serology.

RÉSUMÉ

Aucune information épidémiologique n’est disponible sur la séroprévalence dans l’Est et le Sud-Est de la Turquie. Dans ces régions, les chèvres ont une incidence sur l’économie locale (production de viande, de lait et de mohair). Entre ces deux régions, il y a également des différences dans les conditions d’élevage et le climat. L’objectif de cette étude était de décrire la séroprévalence et la distribution des anticorps vis-à-vis des agents abortifs tels que la Fièvre catarrale ovine (BT), la Diarrhée virale bovine (BVD), la Border Disease (BD), la toxoplasmose et la brucellose dans deux troupeaux caprins des régions de l’Est et du Sud Est de la Turquie. Les chèvres des deux troupeaux ont été séronégatives en CAEV et les séropositivités vis-à-vis de BT, BVD, BD, Brucellose et toxoplasmose ont été respectivement de 14.5%, 30.2%, 63.6%, 26.5% et 72.7%. Les avortements ont été significativement associés au statut sanitaire du troupeau du Sud-Est de la Turquie.

Mots-clés : avortement, caprin, sérologie

Introduction

The goat population in Turkey has reported as 6,700,000 by the State Institute of Statistic of Prime Ministry of Turkey [14]. According to this report, 7.3% of meat production and 2.3% of milk production has been provided from goats in Turkey. The meat production and the milk production per goat are 16.3 kg and 61 kg, respectively. Totally 60% of products obtained from goats were consumed in the internal market [14]. Siirt mohair goats are a variety with different hair colour of Angora goats. These goats were originated from a wild goat named as Capra prisca. These goats were bred for producing mohair and blanket, but rarely milk [19]. Norduz goats are originated from Norduz valley of Gürpinar town in the province of Van, Turkey. These indigenous goats have importance for milk and hair productivity [28]. Despite the importance of goats as economical income for especially rural people, with their milk (cheese production), meat and mohair production in Eastern (the province of Van) and South-eastern (the province of Siirt) of Turkey, there is not any information about serological evidence of reproductive diseases of indigenous goats localized in these regions. The previous studies about foetal loss were generally conducted in cattle and sheep.

The small ruminant foetus could be exposed to viral (blue-tongue virus, pestiviruses and caprine arthritis encephalitis virus), bacterial (Brucella spp., Salmonella spp.) and protozoa (Toxoplasma gondii) infections from early embryonic term to the end of gestation period, and these diseases causes abortion, foetal loss and congenital abnormalities in goats [3, 8, 18, 35, 44, 46]. Also, the International Embryo Transfer Society has recommended to searching these viral, bacterial and protozoa agents for the safety of animal husbandry, reproduction and production [18].

In this study, seropositivity of Border disease virus (BDV), Bovine viral diarrhoea disease virus (BVDV), Bluetongue (BT), Caprine arthritis-encephalitis virus (CAEV), Brucellosis and Toxoplasmosis causing abortion and genital tract infections were investigated in two local goat herds in Eastern and South-eastern regions of Turkey.
infection in local goat breeds in Eastern and South-eastern Anatolia (the provinces of Van and Siirt) in Turkey was investigated.

**Materials and Methods**

**ANIMALS**

Totally 275 blood samples were randomly collected from the animals in two different herds. From the herd I and II, 94 out of Norduz goats of Van and 181 out of mohair goats of Siirt were sampled, respectively (Table I). The goats were not vaccinated against any agent investigated in this study. There was high level of abortion in Herd II. The animals with abortion were not determined because of they didn’t have the ear numbers.

**DETECTION OF BRUCELLA ANTIBODIES**

*Brucella* tube agglutination test antigen, which produced from *B. abortus* S99 strain and standardised against Standard Anti-*Brucella abortus* antibodies was obtained from Pendik Veterinary Control and Research Institute, Istanbul. Sera reacted with titre \( >1:20 \) (++) in SAT were considered as positive for Brucellosis in unvaccinated goats as described by the manufacturer.

**DETECTION OF TOXOPLASMA GONDII ANTIBODIES**

The Sabine-Feldman Dye Test was performed as described by SABIN and FELDMAN [38]. Sera having titre \( \geq 1:4 \) are accepted as seropositive.

**DETECTION OF CAEV ANTIBODIES**

The prevalence of CAEV antibody was determined by using a commercially available agar gel immunodiffusion kit (AGID), (Pourquier Institute, France). The kit was consisted p28 of CAEV as antigen. The test was carried out as described by the manufacturer.

**DETECTION OF BLUETONGUE VIRUS ANTIBODIES**

The commercial AGID kit was obtained from VMRD Inc., USA. The test was performed as described by the manufacturer.

**DETECTION OF BORDER DISEASE AND BVD VIRUS ANTIBODIES**

The presence of Border disease and BVDV antibodies were determined by using neutralisation peroxidase linked antibodies (NPLA) test as described by HYERA et al.[23]. The cytopathogenic Moredun strain of BDV genotype I [33, 45] and NADL as reference strain of BVD genotype I virus [21, 36] were used for NPLA tests. SFT-R (sheep thymus) cell line was used for neutralization test against Moredun strain. The primary foetal calf kidney cell culture was also used for neutralization test against NADL strain. Both cell lines were determined negative for pestiviruses contamination.

**DETECTION OF PESTIVIRUS ANTIGEN**

The commercial ELISA kit (IDEXX Laboratories, Sweden) was performed in plasma or serum for detection of pestiviruses as described by the manufacturer.

**STATISTICAL ANALYSIS**

The statistical significance of differences concerning to antibodies against *Brucella spp.*, *Toxoplasma gondii*, CAEV, BDV, BVDV and bluetongue virus between Herd I and Herd II was evaluated by using chi-square test.

**Results**

Serological screening of the herds revealed that seroprevalence of Bluetongue, *Brucella spp.*, *Toxoplasma gondii*, Border disease and BVDV were 14.5%, 26.5%, 72.7%, 63.6% and 30.2%, respectively. All of the sampled goats were negative for CAEV antibodies. Detected seroprevalence values of these infections for sampled herds were presented in Table I.

Seroprevalence of toxoplasmosis presented the highest value in herd II with no significant difference between the two herds (Table I). Border Disease was the second abortive infection (63.6%) according to the serology, but none of the goats sampled were found positive for pestivirus antigens. The distribution of the seroprevalence of the different diseases was the same in the 2 herds except for Brucellosis and BVDV: Brucellosis was the third in herd I and BVDV the 4th while it was the inverse in herd II. In addition, there were significantly more seropositive goats for BT in herd II than in herd I. Differences among seroprevalence values of herds were significant only for bluetongue infection (p<0.001). Seventy two of sampled animals (62.0%) were detected seropositive for at the least one agent. A total of 10 goats in two herds had no detectable infections (3.6%). The infection rates were described in Table I and Figure 1.

**Discussion**

In the current study, some important reproductice diseases for goat breeding which causes loss of production and economical loss were investigated. Additionally, among these diseases, *Toxoplasma* and *Brucella* infections threaten the public health especially by ingestion of contaminated milk and milk productions. Socio-economical improvement of the people living in the area (farmers, merchants) could be effected adversely due to these diseases causes blocking in animal and animal products trade.

CAEV infection causes leucoencephalomyelitis, progressive arthritis, pneumonia and mastitis in both young and adult goats [37], and also infects genital tract tissues in all goats [18], although there is no data concerning to abortus and/or
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foetal abnormalities in goats. CAEV infection is widespread around the world [32]. In Turkey, seroprevalence of the infection were only reported as 1.9% in 1994 by BURGU et al. [9]. In this study, both the goat herds were negative for CAEV antibodies. It is probably for the restriction on marketing of goats.

Bluetongue (BT) infection caused a low productive fertilization, abortus and congenital abnormalities as described arthrogryposa-hydrancephaly, although several researchers reported subclinical problems [22, 29, 44]. The vector-climate and reservoir factors are most important in the epidemiology of BT infection [29, 40]. The virus is present in a broad band of countries extending approximately between 40°N and 35°S [29]. BT infection is transmitted by biting Culicoides spp. were identified: 57 species of those were only detected including C.imicola, C.obselotus in Turkey [15, 26, 29]. A total of 24 serotypes of BT virus have already been determined on the worldwide with only type 2, 4, 9, 16 recognized within Turkey [8, 16, 29]. ERTURK [16] reported a seroprevalence of 26% in goat sera from Diyarbakir province in South-eastern-anatolia region for specific anti-BT antibodies. On the other hand, seropositivity were also determined in several countries in the world [22, 29]. In present study, 14.5% of sampled animals have BT virus specific antibodies. However, the seroprevalence were 4.3% and 19.8% in herd I and II, respectively. The difference of the seroprevalence between herds was statistically significant. These differences could be discussed in relation with climatic conditions on living place, breed of goats and the presence of abortus in herd. The mohair goats in Siirt (Herd II) and the Norduz goats in Van (Herd I) originated from different geographical

| TABLE I. - Data and distribution of antibodies against 6 agents in two goat herds. |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| General Data                    | The Norduz goat of Van | The Mohair goat of Siirt |
| Location                        | Herd I (n:94)     | Herd II (n:181)  |
| Age                             | > 2              | > 2              |
| Remarks                         | Healthy          | Abortus in herd  |
| Sampling Time                   | February 2005    | July 2004        |
| Ratios of multiple infections   |                |                 |
| Animal No. (%)                  |                 |
| Toxoplasmosis                   | 63 (67)         | 137 (75.7)      |
| Bluetongue                      | 4 (4.3)         | 36 (19.9* )     |
| Border Disease                  | 56 (59.6)       | 119 (65.7)      |
| BVDV                            | 21 (22.3)       | 62 (34.3)       |
| Brucellosis                     | 29 (30.9)       | 44 (24.3)       |
| CAE                             | -               | -               |
| Mean seropositivity in two herds (%) |                  |
| Toxoplasmosis                   | 63 (67)         | 137 (75.7)      |
| Bluetongue                      | 4 (4.3)         | 36 (19.9* )     |
| Border Disease                  | 56 (59.6)       | 119 (65.7)      |
| BVDV                            | 21 (22.3)       | 62 (34.3)       |
| Brucellosis                     | 29 (30.9)       | 44 (24.3)       |
| CAE                             | -               | -               |

*The statistical differences were significant (p<0.001).

Bluetongue (BT) infection caused a low productive fertilization, abortus and congenital abnormalities as described arthrogryposa-hydrancephaly, although several researchers reported subclinical problems [22, 29, 44]. The vector-climate and reservoir factors are most important in the epidemiology of BT infection [29, 40]. The virus is present in a broad band of countries extending approximately between 40°N and 35°S [29]. BT infection is transmitted by biting Culicoides spp. were identified: 57 species of those were only detected including C.imicola, C.obselotus in Turkey [15, 26, 29]. A total of 24 serotypes of BT virus have already been determined on the worldwide with only type 2, 4, 9, 16 recognized within Turkey [8, 16, 29]. ERTURK [16] reported a seroprevalence of 26% in goat sera from Diyarbakir province in South-eastern-anatolia region for specific anti-BT antibodies. On the other hand, seropositivity were also determined in several countries in the world [22, 29]. In present study, 14.5% of sampled animals have BT virus specific antibodies. However, the seroprevalence were 4.3% and 19.8% in herd I and II, respectively. The difference of the seroprevalence between herds was statistically significant. These differences could be discussed in relation with climatic conditions on living place, breed of goats and the presence of abortus in herd. The mohair goats in Siirt (Herd II) and the Norduz goats in Van (Herd I) originated from different geographical

![Frequency of animals (%)](image.png)

FIGURE 1. - The status of none and multiple infections in two goat herds from the Eastern and South-Eastern Anatolia provinces of Van and Siirt, respectively.

![Table I. - Data and distribution of antibodies against 6 agents in two goat herds.](image.png)
regions and different husbandry practices. The province of Van is higher altitudes (5453 ft) than province of Siirt (2936 ft). The climate conditions in the province of Siirt is hot, and is humid especially during summer, due to the presence of more dam lakes; on the other hand, the climate conditions in the province of Van are much cold, especially during winter. The fly prevalence in the province of Siirt rise to maximum level especially in summer, compared to the province of Van. Statistical differences detected for bluetongue infection could be due to long liveliness of Culicoides spp. vectors in the province of Siirt because of climate conditions. This climatic situation should be affected the prevalence of bluetongue infection. On the other hand, the effect of breed on the seroprevalence of BT can not be speculated because, animals used in this study were from different locations and climatic conditions which effects adversely the evaluation of breed sensitivity.

Toxoplasma gondii causes more important reproductive disease in both human and all animals as a zoonotic protozoan. T.gondii infection is also seen widespread in the different countries in goats, and seroprevalence of T.gondii has been reported to range between 11.6 to 96.0% in goats [7, 27, 31]. The seroprevalence of T.gondii in goats was reported to be 51.6% for the first time in Turkey by Weiland and Dalchow [47]; this investigation included both mohair and hair goats. In the latter studies, the rates of seroprevalence were shown to range between 12.1 to 63.1% by several researchers in Turkey [5, 34]. In the province of Van, there is only one study in goats (33.3%) about prevalence of T.gondii [43], although seroprevalence of T.gondii in human was found to range between 63.1 to 73.3 in the province of Van [6, 13]. In the current study, the seroprevalence of T.gondii was found to be 72.7% in sampled goats. This rate were higher than the result by several researchers [5, 31, 34]. Additionally, seroprevalence of the infection in herd II (75.7%) were seen relatively higher than herd I (67.0%). Even though statistical importance were not observed, abortus cases often reported in herd II should be taken into consideration. As a matter of fact, high seropositivity (39.2%) determined in herd II for only T.gondii supports above observation.

Brucellosis is a zoonotic infection, and is transmitted by direct or indirect contact with infected animals, soiled pasture and corrals, ingesting infected milk and with semen from male to female animals [2, 4, 30, 35]. The goats, sheep, cattle and water buffalos are major animals in the spread among humans in Turkey [11]. Brucellosis is an important public health problem in particularly both regions due to traditional feeding habits such as usage of raw milk and milk products [39]. Ceylan et al. [11] reported that 27.2% of 558 tested humans were positive in SAT for Brucellosis in the province of Van. B.melitensis causes Brucellosis in small ruminants [4, 46]. This microorganisms also causes Mediterranean fever in human. Brucellosis in goats are endemic (0.9-27.7 %) in most countries in Mediterranean site, Middle East and Central Asia [1, 2, 12, 24, 41, 46]. In a seroepidemiological study conducted by Ministry of Agriculture and Rural Affairs in Turkey through out 79 provinces; 34958 cattle and 31044 sheep randomly sampled and Brucella prevalence were recorded as 1.43 % and 1.97 % , respectively. In the provinces of Siirt and Van, the prevalence of Brucellosis in sheep were 5.2 % and lower than 1%, respectively. But in the study goats were not taken into account [25]. In Turkey, seroepidemiological studies about Brucellosis were generally investigated in sheep and cattle [4, 17, 20, 25, 42, 46], rarely in goat, and only a few of them were conducted in the regions of Van and Siirt [20, 25, 42]. GURTURK et al. [20] examined 7 out of 11 sheep herd with the anamnesis of abortus and found that 30 out of 76 sera (39.47%) were seropositive in Van region. Thus, ESENDAL et al. [17] reported that among 250 ovine-caprine sera, 111 (44.0%) out of them were positive in SAT. There was only one research in the local goats in the province of Van and the rates of seropositivity to Brucellosis were detected 21.5% by Rose Bengal and Sat [11]. The current study presented that the ratios of infection in small ruminants in both areas were significantly higher than those from other regions of Turkey. There was not difference between herd I without abortus and herd II with abortus for the seropositivity rates of Brucella infections.

The studies with regard to pestiviruses are limited in such cases. BURGU et al. [10] reported that BVDV specific neutralising antibodies were detected in 25% and 21.5% of pregnant ewes and in post-partum ewes, respectively. In the present study, seropositivity ratios for BVDV and BDV in two different goat herds were 22.3%, 59.6% and 34.3%, 65.7%, respectively. However, high seropositivity observed for BDV could be due to cross reaction known between BVDV and BDV (unpublished data). High seropositivity determined for BDV shows that BDV infection is widespread and at least in herd II has some sort of role in the abortus cases as much as Brucellosis. When the rates of only one infection are evaluated, Toxoplasma and BDV specific antibodies are found at higher level than other infections in both herds. This result is not a certain finding with regard to importance of BDV infection for presence of abortus. Although pestivirus antigen could not be determined in both herds studied in the present study, determination of high percentage of BVDV and BDV seropositivity in non-vaccinated animals are the sign of natural infection.

Over sixty seven (67.4%) per cent of the samples were seropositive for two or more infection. Determination of certain infection time were impossible. However, high seroprevalence and plural positivity suggest influence between these diseases because of the development of clinical symptoms such as infection and abortus.

Conclusion

Evaluation of BT, BDV, BVDV, Brucella and Toxoplasma infections together or separately, had high seropositivity in goats. As a result, clinically presence of infections causing high level of abortus in goats were put forward in the light of findings obtained in the present study, and supporting datum on epidemiological information with regard to bluetongue infection were obtained. The current study is the first serological study with the detection of antibodies against different reproductive diseases in domestic goats of Siirt and Van. Thus, the results were very important for the diseases, local-
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isation and the local breeds, and beneficial to discuss the aspect in future studies.

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