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RESEARCH ARTICLE

Evaluation for Some Bacterial and Viral Abortions of Dairy Cattle Farms in Burdur District of Turkey

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Summary

In this study, the presence of antibodies to *Brucella abortus, Chlamydophila abortus, Coxiella burnetii,* Bovine herpesvirus-1 (BHV-1), Bovine viral diarrhea virus (BVDV) and Bovine herpesvirus-4 (BHV-4) were investigated in dairy cattle herds with abortion history in Burdur province, Southwest region of Turkey. The blood samples were collected from 932 dairy cattle ≥2 years of age from 10 herds not vaccinated against for mentioned infections and all of the serum samples were tested for *B. abortus* by ELISA. Seronegative herds for *B. abortus* were investigated for *C. burnetii* and *C. abortus*. While seropositivity for *B. abortus* and *C. burnetii* were detected 25.3% (236/932) and 10.2% (19/186), antibodies against *C. abortus* was not detected. Seronegative herds for *B. abortus, C. burnetii* and *C. abortus* were analysed for antibodies to BHV-1, BVDV and BHV-4 and seropositivity were found as 43.5% (40/92), 81.5% (75/92), 42.4% (39/92), respectively. BVDV antigen was determined in 2.2% (2/92) of the samples. As a result, we determined that *C. abortus* is not an important agent causing abortion in dairy herds in Burdur, but the seropositivity of *B. abortus, C. burnetii,* BHV-1, BVDV and BHV-4 are high. Thus, the herds should be tested for these infections regularly and control measures must be taken.

Keywords: *Abortion, ELISA, Dairy cattle, Brucella abortus, Chlamydophila abortus, Coxiella burnetii, Bovine herpesvirus-1, Bovine viral diarrhea virus, Bovine herpesvirus-4*

Burdur Yöresinde Süt Sığırı İşletmelerinin Bazı Bakteriyel ve Viral Abortlar Yönünden Değerlendirilmesi

Özet

Bu çalışmada, Türkiye'nin güneybatı bölgesinde yer alan Burdur ili'nde yavru atma problemli süt sığırlarında *Brucella abortus, Chlamydophila abortus, Coxiella burnetii,* Bovine herpesvirus-1 (BHV-1), Bovine viral diarrhea virus (BVDV) ve Bovine herpesvirus-4 (BHV-4)'e karşı antikorların varlığı araştırıldı. Kan örnekleri araştırılan enfeksiyonlara karşı aşılanmamış 10 sürüden 2 yaş ve üzeri 932 hayvandan toplandı. Serumlar önce *B. abortus* yönünden ELISA ile test edildi. *B. abortus* negatif bulunan serum örnekleri *C. burnetii* ve *C. abortus*'a karşı antikorların varlığı yönünden araştırıldı. *B. abortus* ve *C. burnetii* için pozitiflik sırasıyla %25.3 (236/932) ve %10.2 (19/186) belirlenirken, *C. abortus* antikorları tespit edilemedi. *B. abortus, C. burnetii* ve *C. abortus* negatif bulunan sürülerde BHV-1, BVDV ve BHV-4'e karşı antikorların varlığı araştırıldı. Seropozitiflik bu hastalıklar için sırasıyla %43.5 (40/92), %81.5 (75/92), %42.4 (39/92)olarak belirlendi. BVDV antijen ise örneklerin %2.2'sinde tespit edildi. Sonuç olarak, *C. abortus*'un Burdur'da süt sığırı işletmelerinde aborta neden olan önemli bir ajan olmadığı, *B. abortus, C. burnetii,* BHV-1, BVDV ve BHV-4'ün seropozitifliğinin yüksek olduğu belirlendi. Bu nedenle, sürülerin bu enfeksiyonlar yönünden düzenli olarak test edilmesi ve gerekli kontrol önlemlerinin alınması gerektiği sonucuna varıldı.

Anahtar sözcükler: *Abort, ELISA, Süt sığırı, Brucella abortus, Chlamydophila abortus, Coxiella burnetii, Bovine herpesvirus-1, Bovine viral diarrhea virus, Bovine herpesvirus-4*

INTRODUCTION

Bovine abortion is a significant cause of economic losses in dairy cattle herds [1]. Although the cause of abortion depends on several factors including idiopathic, metabolic or hormonal abnormalities, nutritional deficiencies, trauma and infections, the infectious agents including bacterial, viral, fungal and protozoan agents are the most important

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factors associated with abortions among dairy herds worldwide [2,3]. The infections causing abortion may vary, presumably due to climate, production types, management practices and geographic factors in different regions [4]. Effective preventive measures for abortions require not only prompt and accurate diagnosis, but also understanding of the multicausal factors involved [5].

The aim of this study was to investigate *Brucella abortus*, *Chlamydophila abortus*, *Coxiella burnetii*, Bovine herpesvirus-1, Bovine viral diarrhea virus and Bovine herpesvirus-4 infections of dairy cattle herds with abortion history.

MATERIAL and METHODS

Samples

This study was conducted in 10 dairy cattle herds with abortion history in Burdur province, Southwest region of Turkey. Blood samples were collected from 932 dairy cattle ≥2 years of age. Blood samples were taken into tubes without anticoagulant. After clotting, the tubes were centrifuged, and the serum samples were separated and kept at -20°C until used. All of the serum samples were tested for *B. abortus* by ELISA. The seronegative samples for *B. abortus* were investigated for *C. abortus* and *C. burnetii* by ELISA. After, seronegative herds for *B. abortus, C. burnetii* and *C. abortus* were analysed for antibodies to BHV-1, BVDV and BHV-4. Leucocyte were obtained from blood samples, taken into tubes with EDTA, by centrifugation at 2.500 rpm/25 min. and stored in deep freezer at -20°C till used. All of animals were not vaccinated against BHV-1, BVDV, BHV-4 and *B. abortus* before.

Antibody Detections in Sera by ELISA

Presence of antibodies against *B. abortus, C. burnetii* and *C. abortus* (Institute Pourquier, France), BHV-1, BVDV and BHV-4 (Bio-X Diagnostics, Belgium) were investigated by ELISA. The tests were carried out according to the kit procedure.

BVDV Antigen - ELISA

The kit of BVD/MD Antigen Mix Screening ELISA (Institute Pourquier, France) was used to determine the existence of antigen in the leucocyte samples. The test was carried out according to the kit procedure.

RESULTS

The seropositivity for *B. abortus* was found in 25.3% (236/932) of the sera. While seropositivity for *C. burnetii* was found in 10.2% (19/186) of the samples, *C. abortus* was not detected in any of the sera (0/225). In seronegative herds for *B. abortus, C. burnetii* and *C. abortus*, seropositivity for BHV-1, BVDV and BHV-4 were found as 43.5% (40/92), 81.5% (75/92), and 42.4% (39/92), respectively *(Table 1)*.

Antibodies rates of BHV-1 + BVDV + BHV-4, BHV-1 + BHV-4, BHV-1 + BVDV and BVDV + BHV-4 were 21.7% (20/92), 21.7% (20/92), 40.2% (37/92), 37% (34/92), respectively. Also, the rates at which cattle were detected for both BHV-1 + BVDV (antigen) + BHV-4 and BHV-1 + BVDV (antigen) were 1.1% (1/92) *(Fig. 1)*.

BVDV antigen was only detected as 2.2% (2/92) in the leucocyte samples in aborted cattle.

Table 1. *The rates of seropositivity for B. abortus, C. burnetii, C. abortus, BHV-1, BVDV, BHV-4 in dairy cattle herds with abortion history*

Tablo 1. *Abort hikayesi bulunan süt sığırı işletmelerinde B. abortus, C. burnetii, C. abortus, BHV-1, BVDV, BHV-4'ün seropozitiflik oranları*

Bacterial and Viral Agents	Number of Serum Samples	Positive	%
B. abortus	932	236	25.3
C. burnetii	186	19	10.2
C. abortus	225	0	0
BHV-1	92	40	43.5
BVDV	92	75	81.5
BHV-4	92	39	42.4

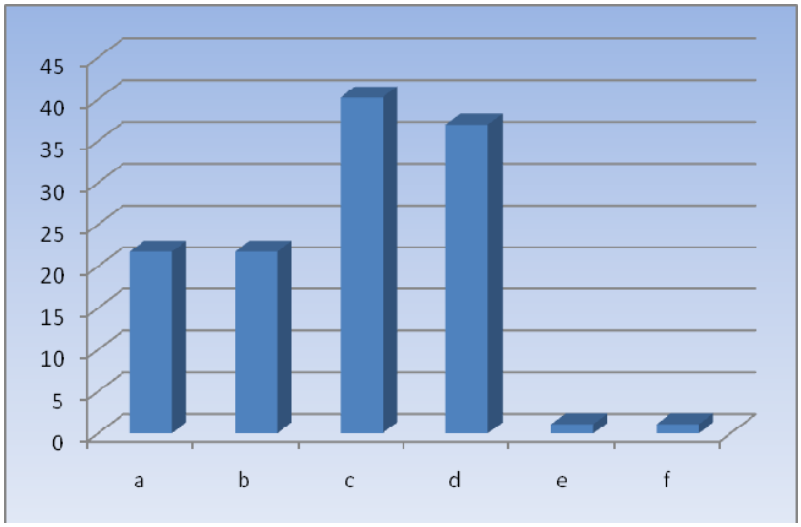

Fig 1. Multiple infection rates of BHV-1, BVDV and BHV-4 in dairy cattle herds with abortion history

(**Ab:** Antibody, **Ag:** Antigen **a:** BHV-1 (Ab) + BVDV (Ab) + BHV-4 (Ab), **b:** BHV-1 (Ab) + BHV-4 (Ab), **c:** BHV-1 (Ab) + BVDV (Ab), **d:** BVDV (Ab) + BHV-4 (Ab), **e:** BHV-1 (Ab) + BVDV (Ab-/Ag+) + BHV-4 (Ab), **f:** BHV-1 (Ab) + BVDV (Ab-/Ag+))

Şekil 1. Abort hikayesi bulunan süt sığırı sürülerinde BHV-1, BVDV and BHV-4 için çoklu enfeksiyon oranları

DISCUSSION

Abortion has caused serious economic losses worldwide. Regional differences in the prevalence of abortion-causing diseases can be a result of a variety of reasons such as methods of herd health management, climate, types of cattle operations, feed, vaccination programmes, geographic factors, number of pregnancies and sanitation [1,4]. Brucellosis is also very common and an economically important zoonotic disease in Turkey [6,7] and worldwide [8,9]. In this study, the seropositivity for *B. abortus* was found to be 25.3% in dairy cattle herds with abortion history in Burdur province. The prevalence studies for *B. abortus* have been conducted in different parts of Turkey by researchers [6,7,10]. In these studies [6-9], prevalence have changed from 1.4% to 18% and quite low than this study. There is one study related with the seropositivity of brucellosis in dairy cattle herds with abortions problems in Burdur which reported the rate of brucellosis as 10.1% by Rose Bengal plate test (RBPT), and 6.8% by serum agglutination test (SAT) during 2007-2008 [11]. This study results was rather lower than present study. The reason of this may be due to higher sensitivity and specificity of ELISA compared to RBPT and SAT. Seroprevalance of brucellosis was reported in between 3.3-22.2% in other countries [8,9]. We thought that these differences may originate from factors such as use of different detection methods, climate, vaccination programmes, sampling method of animals, intensification of animal movements due to the high potential of the region and lack of herd screening for *B. abortus*. This study supports researchers who state that prevalence of infections causing abortion may be affected by the mentioned factors [1,4,12].

Abortions caused by *Chlamydophila* spp. in cattle are rather widespread worldwide and are generally associated with *C. abortus* infections. Because Chlamydophila infections are not considered as a major threat to the cattle industry in Turkey, there are less studies of cattle than sheep or goats [13,14]. In this study, the antibodies for *C. abortus* can not be detected in blood serum samples of cattle. In the South East part of Turkey, seroprevalance of *C. abortus* was determined to be 8.3% in aborted dairy cattle [15]. The seroprevalance for Chlamydophila infection was also reported in between 0.4-57% in other countries by ELISA [16-18]. *Chlamydophila* spp. was not responsible from abortion cases of cattle in this region, because positive serum samples were not detected.

In this study, the prevalence of *C. burnetii* was 10.2%, while studies conducted in different parts of Turkey have results ranging from 4.3% to 44.5% in cattle herds with abortion problems [19-21]. Özyer et al.[19] reported that the seropositivity of *C. burnetii* was 44.5% in cattle with abortion history by complement fixation test (CFT). The seropositivity of *C. burnetii* was 22.6% in Erzurum [20] and 16.3% in 16 locations of Eastern Turkey [21] by ELISA. In Aydin, Kirkan et al.[22] were found that *C. burnetii* was 4.3% in cattle by polymerase chain reaction (PCR). The prevalance of *C. burnetii* infection was found between 5% and 44.9% in other countries [23-25]. The seropositivity of *C. burnetii* was found in 39% of cattle by indirect fluorescence in Zimbabwe [23]. Serbezov et al.[24] reported that the occurence of *C. burnetii* was 5% to 31% in cattle by CFT in Bulgaria. The seropositivity was determined 44.9% in dairy cattle of Northern Italy by ELISA [25]. These differences may be associated with the differences of sensitivity and specificity of diagnostic methods used for diagnosis of *C. burnetii* infections.

In the present study, the seropositivity of BHV-1, BVDV and BHV-4 was found to be 43.5%, 81.5% and 42.4%, respectively. The presence of BHV-1 antibodies detected in 25-60% [4,26,27] and for BVDV were detected 75-80% [28,29], for BHV-4 were found 36-88% [30-32], in aborted cattle. However, there are also contradictory studies [33-35]. But, Kale et al.[36] investigated presence of BHV-1, BVDV and BHV-4 infections in 204 dairy cows 3 to 5 years of age that aborted at 5-7 months of gestation in same area [36]. They found lower rates of BHV-1 (21.6%), BVDV (25.5%) and BHV-4 (29.4%) seropositivity than the current study. As a result, there has been an increase in the infections of BHV-1, BVDV and BHV-4 in the region. In Kars, Yildirim et al.[37] reports that the seropositivity of BHV-1 and BHV-4 were found 61.4%, 29.3% by ELISA and the presence of BVDV specific antibody was found 52.9% by virus neutralization test in aborted cattle. The seropositivity of BHV-1 and BVDV are higher than this study. Often, no obvious clinical signs are seen in herds with fetal losses due to BVD virus and abortions occuring days or several weeks following maternal infection. In the study, seroprevalance of BVDV antigen was detected as 2.2% in aborted cattle. Research has shown <10% of abortion is related to BVDV [38,39]. The seroprevalence of BHV-1, BVDV and BHV-4 had higher levels than that of other studies which viral and bacterial mix in the study [40]. However, there are also higher seroprevalence results [41] than seen in the study. Results of this study indicate that BHV-1, BVDV and BHV-4 are a significant viral cause of abortion in the area. Bovine abortion can be caused by several pathogens and evidence of multiple agent involvement has been indicated [42]. Furthermore, in the research, while seroprevalance of BHV-1 + BVDV have the highest and 40.2%, BHV-1 + BVDV (negative antibody/positive antigen) + BHV-4 and BHV-1 + BVDV (negative antibody/positive antigen) was the lowest and 1.1%. In context, it is important to point out that in mixed cases it is extremely difficult to establish the actual agent responsible for the abortion [27].

In conclusion, we determined that seroprevalence of *B. abortus*, *C. burnetii*, BHV-1, BVDV and BHV-4 in dairy cattle farms in Burdur were higher than those in other parts of Turkey, but *C. abortus* is not a major agent causing abortion in cattle population in the region. Thus, the herd surveys should be performed regularly for such infections in the region.

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