

Case Report

A case of Brucellosis with neurological and dermatological findings in a thoroughbred Arabian horse

ABSTRACT

Brucellosis, a zoonotic infection, exhibits varying prevalence across different geographical regions, with a notable incidence in Mediterranean countries, contributing to considerable economic losses. This study focuses on an 11-year-old purebred male Arabian horse, presenting symptoms including weight loss, weakness, environmental indifference, joint swelling, and diverse dermatological manifestations despite sufficient feed intake. A pivotal clinical observation from anamnesis and examination is the animal's inclination to lean its head against walls or fixed objects. In conjunction with hematological and biochemical analyses, the Brucella Rose Bengal plate test (RBPT) and serum agglutination test (SAT) were conducted, revealing seropositivity for brucellosis in the patient. Consequently, it is imperative for professionals in the equine breeding sector, particularly clinical veterinarians, to adhere to biosafety protocols concerning brucellosis cases exhibiting atypical clinical symptoms in horses. Proper diagnostic methods should be employed to assess suspicious cases, underscoring the significance of safeguarding both public and animal health.

Keywords: *Brucella*, horse, dermatologic, neurologic

INTRODUCTION

Brucellosis constitutes a significant zoonotic infection affecting both humans and diverse animal species, prevalent in various regions worldwide, particularly in Mediterranean countries, despite successful eradication efforts in certain nations (Corbel, 1997; Pappas et al., 2006). *Brucella* species, characterized by a Gram-negative, non-spore-forming, non-encapsulated, immotile, aerobic, and facultative anaerobic small rod morphology, play a crucial role in the etiology of the disease (Morgan et al., 1990; Quinn et al., 2011; Lotfi et al., 2022).

The clinical manifestations of brucellosis in animals encompass symptoms such as mastitis, diminished milk yield, calving difficulties, infertility, and arthritis, leading to substantial economic losses (Aydın, 2006). Additionally, brucellosis poses a notable threat to public health, being transmissible to humans both directly and through the consumption of contaminated foods. Consequently, there exists a correlation between the prevalence of brucellosis in humans and animals that share the same geographical region and maintain contact with each other (Aşkar et al., 2013). The horse, since its domestication, has played a pivotal role in contributing significantly to military, social, and economic aspects of human society. In view of the close relationship between horses and humans in daily life, cases of brucellosis in these animals are deemed a noteworthy risk that merits consideration for human health (Ribeiro et al., 2008; Silva et al., 2022).

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Dermatologic and neurologic symptoms in horse

Brucella abortus, *B. suis*, and *B. canis* predominantly account for brucellosis cases in horses. The infection can be transmitted through various routes, both direct and indirect, involving contaminated materials, encompassing digestion, inhalation, and mating (Alexander et al., 1981; Godfroid, 2002). Brucellosis in horses typically exhibits a latent progression, with animals that appear clinically normal demonstrating a positive antibody titer. Nonetheless, certain horses may manifest nonspecific symptoms such as weakness, depression, muscle stiffness, intermittent fever, and movement disorders. Notably, occurrences of bursitis, carpal bursitis, tenosynovitis, osteomyelitis, osteoarthritis, and, infrequently, reproductive disorders may also be observed (Cohn et al., 1992; Ocholi et al., 2004; Cvetnic et al., 2005; Amini et al., 2024). In humans, neurological and dermatological symptoms in brucellosis infection have been reported in limited cases. However, cases presenting with neurological and dermatological lesions in horses are exceedingly rare. We aim to present this case report to veterinary clinicians for consideration.

CASE HISTORY AND FINDING

The subject of this case study was an 11-year-old purebred male Arabian horse, obtained from a local equestrian and traditional horse archery facility in the Soma district of Manisa, and brought to the Internal Medicine Clinic at Balıkesir University, Faculty of Veterinary Medicine. The horse's medical history included reported symptoms of weakness, malaise, and a tendency to lean its head against the wall (Figure 1) despite maintaining normal appetite.

Upon clinical examination, several notable findings were observed, including hair loss with itching in the tail region, wounds in the left fossa paralumbalis region (Figure 2) and left hind foot tarsal joint region, a mixed hair structure, and polyarthritis in both the forelimbs and hindlimbs, which exhibited partial spontaneous drainage.

Furthermore, superficial lymph nodes were within normal limits, the conjunctival mucosa showed slight dirtiness, hyperemia, and a slightly yellowish tint. Physiological parameters were measured, revealing a pulsation rate of 40/min, respiration rate of 8/min, and a body temperature of 37.4°C.



Figure 1. For a long time, tendency to lean its head against the wall.



Figure 2. Extensive dermatologic lesions.

Native parasitologic examination identified the presence of *Strongylus* spp. eggs. For comprehensive hematologic, biochemical, and serologic analyses, blood samples were obtained from the vena jugularis, utilizing 8 mL K3 EDTA and 8 mL dry biochemistry tubes. The results of the complete blood count and biochemical analyses are detailed in Table 1 and Table 2, respectively.

Table 1. Hemogram analysis results.

Parameters	Result (Reference ranges)
RBC ($10^6/L$)	7.97 (6.8-12.9)
HGB (g/dL)	12.3 (11-19)
HCT (%)	36.44 (32-53)
MCV (fl)	46 (36-50)
MCH (pg)	15.5 (12.3-19.7)
MCHC (g/dL)	33.9 (31-39)
WBC ($10^3/L$)	15.25 (5.4-14.3)
LYM ($10^3/L$)	2.07 (1.5-6.0)
MON ($10^3/L$)	0.58 (0-1.5)
NEU ($10^3/L$)	12.58 (2.3-9.5)
EOS ($10^3/L$)	0.03 (0.1-1)
BAS ($10^3/L$)	0.00 (0-0.5)
LY (%)	13.5 (17-68)
MO (%)	3.8 (0-14)
NE (%)	82.5 (22-80)
EO (%)	0.2 (1-8)
BA (%)	0.0 (0-3)
PLT ($10^9/L$)	162 (90-350)
PCT (%)	0.13
MPV (fl)	8.2

Abbreviation: RBC: Red blood cell, HGB: Hemoglobin, HCT: Hematocrit, MCV: Mean corpuscular volume, MCH: Mean corpuscular hemoglobin, MCHC: Mean corpuscular hemoglobin concentration, WBC: White blood cell, LYM: Lymphocyte, MON: Monocyte, NEU: Neutrophil, EOS: Eosinophile, BAS: Basophile, PLT: Platelet, PCT: Plateletcrit, MPV: Mean platelet volume (Turgut, 2000).

Table 2. Biochemical analysis results.

Parameters	Result (Reference ranges)
GLU (mg/dL)	35.7 (62-134)
ALP (U/L)	88 (143-395)
TP (g/dL)	6.1 (5.6-7.6)
GGT (U/L)	19 (6.0-32)
AST (U/L)	141 (160-412)
ALT (U/L)	2.2 (34-113)
BUN (mg/dL)	10.18 (10-24)
CREA (mg/dL)	0.10 (0.4-2.2)
BUN/ CREA	101.81
ALB (g/dL)	1.8 (2.6-4.1)
GLOB (mg/dL)	4.30 (2.6-4.0)
ALB/GLOB	0.42

Abbreviation: GLU: Glucose, ALP: Alkaline phosphatase, TP: Total protein, GGT: Gamma-glutamyl transferase, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, CREA: Creatinine, ALB: Albumin, GLOB: Globulin (Turgut, 2000).

The serum sample was analyzed by Rose Bengal plate test (RBPT) and serum agglutination tests (SAT). Test antigens were obtained from Istanbul Pendik Veterinary Control Institute. Both tests were performed according to the conventional method. The results were compared with positive and negative control sera and evaluated by naked eye. RBPT was performed on a clean slide using 30 μ L of serum and antigen. A positive result was observed in approximately 2 min (Figure 3). SAT was performed in 8 tubes and the titer was determined as 1/160 (Morgan et al., 1990; İlhan et al., 1999).

**Figure 3.** Rose Bengal plate test (RBPT) +++ in horse serum.

DISCUSSION

Brucellosis, recognized as a zoonotic infection, exhibits global prevalence, particularly in Mediterranean countries, and is associated with substantial economic repercussions (Acosta-González et al., 2006; Acosta-González et al., 2009). Research on animal brucellosis has predominantly focused on cattle, sheep, and goats, with investigations into etiological, pathogenic, epidemiological, diagnostic, and preventive aspects (Khan and Zahoor, 2018; Rossetti et al., 2022). Contrastingly, studies on horses primarily emphasize epidemiological data, a trend attributed to the comparatively lesser impact of brucellosis on equine reproductive health, resulting in a reduced

economic burden (Ribeiro et al., 2008; Sanchez-Villalobos et al., 2010; Tahamtan et al., 2010).

A study conducted in Pakistan aimed to assess the seroprevalence of brucellosis and analyze hematological and biochemical parameters in positive animals. Among the 50 horses that tested positive by RBPT and SAT, the mean WBC value was 8.25 ± 2.79 ($10^9/L$), total protein 8.57 ± 0.78 g/dL, ALT 28.18 ± 5.71 U/L, AST 236.82 ± 22.80 U/L, and ALP 92.36 ± 13.84 U/L. In this particular study, a horse was identified as positive for brucellosis based on RBPT (+++++) and SAT (1/320), with corresponding values of WBC 15.25 ($10^9/L$), total protein 6.1 g/dL, ALT 2.2 U/L, AST 141 U/L, and ALP 88 U/L. A comparative analysis of findings between the two studies reveals the consistent use of the same serological diagnostic methods (RBPT and SAT), while hematological and biochemical parameters exhibit partial similarities. Discrepancies in these parameters may be attributed to the fact that only one animal was tested in the present study, or could potentially be linked to variations in breed, diet, and age among the animals tested in both studies.

Brucellosis typically does not manifest with typical clinical signs in horses. However, affected animals may exhibit serofibrinous inflammatory reactions and, occasionally, purulent localized lesions in tendon sheaths, ligaments, bursae, synovia, joints, and shoulders (Dorneles et al., 2023). The distinctive clinical finding in the current study was the neurological symptom observed when the animal leaned its head against the wall. Notably, literature on brucellosis in horses does not commonly report neurological findings. Conversely, central nervous system (CNS) involvement is rarely observed in human brucellosis cases, raising concerns regarding prognosis (Tuncel et al., 2008; Maji et al., 2020).

The prevalence of human neurobrucellosis is reported to range between 1.7% and 10% worldwide and between 2.7% and 17.8% in

Turkey (Maji et al., 2020; Bodur et al., 2003; Heper et al., 2004). In the present study, the sole neurological symptom observed was the animal's head position against the wall. On the other hand, *Equine Herpesvirus Type 1* (EHV-1) in horses commonly induces respiratory symptoms, abortions, and various neurological manifestations, varying from ataxia to paralysis of the forelimbs and hindlimbs (particularly hindlimbs), fecal and/or urinary incontinence, tail paralysis, and blindness (Jackson and Kendrick, 1971; van Maanen et al., 2001; Borchers et al., 2006; Gryspeerdt et al., 2011). As a result of the clinical observation and gain of anamnesis on the horse farm, no findings or disease history related to EHV-1 were determined. This observation underscores the importance of considering such manifestations among the clinical symptoms of brucellosis in horses, particularly for clinician veterinarians.

When the literature on the subject was examined, no study was found with dermatologic findings caused by brucellosis in horses. However, in human studies, cutaneous skin lesions have been reported in 5%-10% of *Brucella spp.* positive patients. (Berger et al., 1981, Ariza et al., 1989). In a study analyzing a total of 436 human brucellosis cases, 27 (6.1%) of the patients reported diffuse erythematous and papulonodular lesions. (Ariza et al., 1989).

The dermatological findings observed in this study could be attributed to alternative causes or potentially serve as symptoms associated with brucellosis, a condition rarely observed in horses. Conducting further studies on the subject would contribute to a more comprehensive interpretation of the results.

CONCLUSION

Brucellosis remains a threat to both public and animal health across numerous regions globally, with the exception of some countries. While the infection induces significant clinical signs in farm animals like cattle, sheep, and goats, it does not typically manifest typical clinical signs in

horses. Consequently, individuals involved in horse breeding, particularly clinician veterinarians, play a crucial role in safeguarding public and animal health by exercising caution. It is imperative for them to evaluate cases with an appropriate diagnostic method, especially when faced with suspicious circumstances.

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Ethical statement or informed consent: In accordance with the "Clinical applications for diagnostic and therapeutic purposes" mentioned in Article 1 of the "Regulation on the Working Procedures and Principles of Animal Experimentation Ethics Committees" published in the Official Gazette No. 28914 in 2014, all examination materials evaluated in this study were obtained from the samples taken for diagnostic purposes during routine health examination from horse brought to Balıkesir Veterinary Faculty Animal Hospital, Internal Diseases Polyclinic by animal owner, again with the permission of animal owner.

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