

Surra Infection in Imported Camels: The First Detection in Southern Libya

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ABSTRACT

Camel trypanosomiasis is considered one of the most important veterinary health problems worldwide. A parasitological investigation was conducted for the diagnosis of trypanosomiasis using Giemsa-stained thin blood smears. A total of 130 blood samples were examined, of which 115 samples (88.4%) were negative, while 15 samples (11.5%) were positive for *Trypanosoma* spp. This study represents the first documented record of camel trypanosomiasis in southern Libya. An epidemiological survey was carried out in March 2023 to estimate the prevalence of *Trypanosoma* spp. infection among imported dromedary camels (*Camelus dromedarius*) in Sebha City, southern Libya. To date, no published studies have reported trypanosomiasis in this region. The results showed a higher prevalence of infection in male camels (6.9%) compared with females (4.6%). In addition, the infection rate was greater among male and female camels older than 10 years than among younger age groups. Microscopic examination of thin blood smears confirmed the presence of *Trypanosoma* infections regardless of age or sex. The findings of the present study indicate that trypanosomiasis is common in the investigated area. Considering these results, the potential health risks and associated diseases affecting camels warrant further attention and implementation of appropriate control measures.

مرض السُرّة في الجمال المستوردة: أول كشف وتسجيل للإصابة في جنوب ليبيا

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الكلمات المفتاحية

التريبانوسوما
داء التريبانوسوما في الإبل
الانتشار
علم الأوبئة
الدم

المخلص

يُعد داء المثقبيات في الجمال (Camel Trypanosomiasis) من أهم المشكلات البيطرية التي تؤثر على صحة الإبل على مستوى العالم. أُجريت دراسة طفيلية لتشخيص الإصابة بداء المثقبيات باستخدام مسحات الدم الرقيقة المصبوغة بصيغة جيمزا. وقد تم فحص 130 عينة دم، أظهرت النتائج أن 115 عينة (88.4%) كانت سالبة للإصابة، في حين كانت 15 عينة (11.5%) موجبة للإصابة بأنواع المثقبيات (*Trypanosoma* spp.). تمثل هذه الدراسة أول توثيق للإصابة بداء المثقبيات في الجمال بجنوب ليبيا. وقد أُجريت دراسة وبائية خلال شهر مارس 2023 بهدف تقدير معدل انتشار الإصابة بأنواع المثقبيات (*Trypanosoma* spp.) في الجمال العربية وحيدة السنام (*Camelus dromedarius*) المستوردة إلى مدينة سبها بجنوب ليبيا. وحتى الآن، لا توجد دراسات منشورة تناولت داء المثقبيات في هذه المنطقة. أظهرت النتائج أن معدل انتشار الإصابة كان أعلى في الذكور، حيث بلغ 6.9%، مقارنة بالإناث التي بلغ معدل الإصابة فيها 4.6%. كما سُجلت أعلى معدلات الإصابة في الذكور والإناث التي تجاوزت أعمارها 10 سنوات مقارنة بالفئات العمرية الأصغر سناً. وأكد الفحص المجهرى لمسحات الدم الرقيقة وجود الإصابة بالمثقبيات بغض النظر عن العمر أو الجنس. تشير نتائج هذه الدراسة إلى أن الإصابة بالمثقبيات تُعد شائعة في منطقة الدراسة. وبناءً على هذه النتائج، تبرز الحاجة إلى إيلاء مزيد من الاهتمام للمخاطر الصحية والأمراض المرتبطة بهذه العدوى في الجمال، مع ضرورة تعزيز برامج الرصد والمكافحة للحد من انتشارها.

Introduction

Trypanosomiasis comprises a group of zoonotic protozoan diseases that impact large populations of both humans and animals worldwide. Among these, surra—caused by *Trypanosoma evansi*—represents a major health challenge in regions dependent on camel husbandry, leading to substantial economic losses through impaired reproductive performance and elevated mortality rates [1]. Numerous episodes of camel trypanosomiasis have been documented globally, with some outbreaks resulting in the loss of thousands of camels [2].

African trypanosomiasis results from infection with several species of the genus *Trypanosoma* that affect both humans and animals. The causative agents comprise species belonging to different subgenera, including *Trypanozoon* (such as *Trypanosoma brucei brucei*, *T. brucei gambiense*, *T. brucei rhodesiense*, *T. equiperdum*, and *T. evansi*), as well as *T. vivax* (subgenus *Duttonella*), *T. theileri* (subgenus *Megatrypanum*), and *T. congolense* (subgenus *Nannomonas*). Collectively, these infections impose substantial economic burdens in endemic areas, especially across Africa, as a result

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of decreased livestock productivity, along with elevated morbidity and mortality rates [3,4]. In camels, the disease can manifest in either acute or chronic forms, with infections potentially persisting for months or even extending over several years [5]. In Egypt, camel trypanosomiasis is widely prevalent. Blood samples were collected from apparently healthy one-humped camels in different areas of Cairo and Giza to evaluate the occurrence of trypanosome infection. The study used both blood smear examination and PCR-based sequencing techniques [6]. The pathogenic effects of *T. evansi* infection in camels include anemia, progressive weight loss, weakness, decreased milk production, infertility, and increased neonatal mortality [7]. Surra, caused by *Trypanosoma evansi*, is a re-emerging disease that threatens camel production by reducing milk yield, weakening body condition, and lowering market value, leading to notable economic losses. A serological survey in Algeria identified key risk factors for infection using the CATT/*T. evansi* test [8]. Surra is one of the main reasons for abortion in camels [9]. Special strategies such as rapid multiplication and escape methods have been developed to develop altered surface glycoproteins (antigenic variation) as immunosuppression before the humoral response becomes effective [10]. Camels are well adapted to arid and semi-arid environments and represent an important economic resource in North Africa and the Sahara region. In Libya, particularly in the southern region of Sebha, large numbers of camels are regularly imported from neighboring countries such as Niger for meat production and pastoral purposes. The continuous transboundary movement of camels may facilitate the introduction and spread of infectious diseases, including *Trypanosoma evansi*. Despite the recognized importance of camel husbandry and the potential risk associated with animal movement, epidemiological data on camel trypanosomiasis in Libya remain scarce, with very limited information available from southern Libya. This lack of data constitutes an important knowledge gap that hinders the development of effective disease surveillance and control programs. Therefore, the present study aimed to determine the prevalence of *T. evansi* infection in imported camels originating from Niger and introduced into Sebha, southwestern Libya, using conventional Giemsa-stained thin blood film microscopy.

Methodology

Study Design and Study Area

A cross-sectional study was conducted in Sebha City, southwestern Libya, during March 2023. The study targeted imported one-humped camels (*Camelus dromedarius*) originating from Al-Bder, a well-known camel market in Niger from which traders from southern Libya frequently purchase camels for meat production and pastoral activities.

Sampling and Animal Information

A total of 130 imported camels were included in the study. The animals were selected at the time of their arrival and marketing in Sebha during the study period. Information regarding age and sex was obtained directly from the owners. Of the examined camels, 92 were males and 38 were females. The age of the animals was categorized into two groups: less than 2 years and more than 10 years.

Blood Collection and Microscopic Examination

Approximately 10 mL of blood was aseptically collected from the jugular vein of each camel using sterile tubes containing EDTA as an anticoagulant. The samples were transported to the Laboratory of the Zoology Department, Faculty of Science, Sebha University, for parasitological examination.

Thin blood smears were prepared immediately after sample

collection on clean glass slides. The smears were air-dried, fixed in absolute methanol for 2 minutes, and stained with Giemsa stain for 20–25 minutes. After rinsing with tap water and drying, the slides were examined microscopically. Each smear was initially screened under low magnification (10×) and subsequently examined under oil immersion (100×) for the detection and identification of *Trypanosoma evansi* based on its characteristic morphological features.

Study Limitation

The diagnosis in the present study was based solely on conventional microscopic examination of Giemsa-stained blood smears. Although microscopy is a simple and cost-effective diagnostic method, it has lower sensitivity than advanced diagnostic techniques such as polymerase chain reaction (PCR) and serological assays, particularly in cases of low parasitemia. Therefore, some infected animals may not have been detected.

Results

Infected camels with *Trypanosoma* spp. were 15 (11.5 %) (Table 1). Higher prevalence (6.9 %) of infested camels was males than that in females (4.6 %). The rate of positive infection was higher in both males and females aged over 10 years compared with those younger than two years and other age groups (Tables 1 and 2). The present study demonstrated that *Trypanosoma* infection was prevalent in the study area. Irrespective of age and sex, *Trypanosoma* parasites were microscopically detected in thin blood smears from the examined samples (Figure 1).

Table 1: Infection of *Trypanosoma* spp. among camels according to the sex

Gender	No. of camels Examined	No. of Infested camels
Male	92	9 (6.9 %)
Female	38	6 (4.6 %)
Total	130	15 (11.5 %)

Table 2: Distribution of *Trypanosoma* spp. infection across different camel age groups

Infested camels	Age group		Total
	< 2 Years	>10 Years	
Males	3	7	10
Females	2	3	5
			15

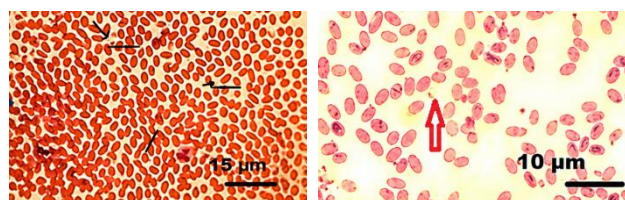


Figure 1: Hematological images showing *Trypanosoma* spp. (arrows) in the blood of infected camels.

Discussion

The occurrence of camel trypanosomiasis in the study area is likely associated with the presence of hematophagous flies, particularly *Tabanus* spp. and *Stomoxys* spp., which are recognized as the principal mechanical vectors of *Trypanosoma evansi*. Environmental and climatic conditions prevailing in arid and semi-arid regions of southern Libya

may favor the persistence and activity of these vectors, thereby facilitating parasite transmission among susceptible camel populations. In addition, the continuous movement of camels across borders between Niger and southern Libya may contribute to the introduction and spread of infection within the region. Camel trypanosomosis is an endemic disease in most camel-rearing regions of Africa and is predominantly associated with *Trypanosoma evansi* [11]. Camels represent one of the most important economic resources in many African countries where they are maintained in large populations [12]. The present study revealed a prevalence rate of 11.5% for *Trypanosoma* spp. infection among examined camels in Sebha, southern Libya. This finding represents the first epidemiological record of camel trypanosomiasis in this region, highlighting the presence and potential spread of the disease in southern Libya. The higher prevalence observed in males compared to females may be attributed to increased exposure to vectors due to their greater involvement in transportation and labor activities. In addition, the higher infection rate in older camels could be related to cumulative exposure to infection over time. The occurrence of trypanosomiasis in the study area may be closely associated with the presence of arthropod vectors, particularly ticks, which play a crucial role in the transmission of various hemoprotozoan parasites. These findings are supported by [13], who reported that ticks act as important vectors and reservoirs for a wide range of protozoan pathogens, contributing significantly to the spread of parasitic infections among camels. Furthermore, environmental and climatic conditions in arid and semi-arid regions, such as southern Libya, may enhance vector abundance and facilitate disease transmission, thereby increasing the risk of infection. Niger exports camels to several cities in southern Libya. In agreement with the findings of Saeeda and Mansour [14], which linked environmental contamination to anthropogenic activities and lubricant discharges in fishing zones, the present study emphasizes the importance of environmental factors in the occurrence and spread of animal diseases in the investigated area. To the best of our knowledge, this study represents the first report documenting *Trypanosoma* spp. infection in imported camels in Libya using stained blood smear examination. The present parasitological investigation provides strong evidence that camel trypanosomosis caused by *T. evansi* is highly prevalent among camels imported from Niger to Sebha City, southern Libya. An infection rate of 11.5% with *Trypanosoma* spp. was recorded in this study among imported camels, which is likely attributable to *Trypanosoma evansi* [15]. The prevalence rate recorded in the present study was found to be comparable to that reported by [16], who documented a 3.9% prevalence of *Trypanosoma evansi* infection in camels in Ethiopia. In contrast, a higher prevalence (12%) of camel trypanosomiasis was reported in western Niger [16]. Additionally, studies conducted in neighboring countries—including Chad [18], Sudan [19], Egypt [20,21], Algeria [22], Nigeria [23], and Tunisia [24] have reported higher infection rates of camel trypanosomiasis. Such variations in prevalence may be attributed to differences in diagnostic techniques, herd management levels, and seasonal factors. Regarding the sex of camels examined in the present study, males showed a significantly higher prevalence of *Trypanosoma* spp. infection compared to females. This finding contrasts with the reports of [25] and [26], who observed higher infection rates of *T. evansi* in female camels than in males. Conversely, the present result is consistent with previous studies by [27] and [28], which also reported a

higher prevalence in male camels. In contrast, other investigations found no significant differences in *T. evansi* prevalence between male and female camels [29,24]. Age-wise analysis revealed a statistically significant association between camel age and the occurrence of trypanosomiasis, with a higher infection rate recorded in camels older than 10 years compared to those younger than 10 years. These findings are in agreement with previous reports from Ethiopia [30-32]. The higher prevalence of *T. evansi* infection observed in older camels may be attributed to increased stress associated with their use in multiple activities, such as transportation of goods, in addition to suboptimal management practices [33,34]. This study assessed the prevalence of camel trypanosomiasis in camels imported from Niger to Sebha City, Libya, using conventional thin blood smear microscopy. The findings revealed that 15 camels (11.5%) tested positive for *Trypanosoma* spp., with a higher prevalence recorded in male camels (6.9%) compared to females (4.6%). The present study has some limitations that should be considered when interpreting the findings. First, the diagnosis of *Trypanosoma* infection was based exclusively on microscopic examination of Giemsa-stained blood smears, a method with relatively low sensitivity compared with molecular and serological techniques, particularly in animals with low parasitemia. Consequently, the true prevalence of infection may have been underestimated. Second, the study was conducted during a single sampling period and was limited to imported camels examined in Sebha City, which may restrict the generalizability of the findings to other regions of Libya. Future studies incorporating larger sample sizes, multiple geographic locations, and more sensitive diagnostic methods such as PCR are recommended to provide a more comprehensive understanding of camel trypanosomiasis in Libya. In addition, strengthening health surveillance and routine screening programs for imported camels, particularly in border regions and livestock markets, is recommended to support the early detection and control of *Trypanosoma evansi* infection and to reduce the risk of disease spread.

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