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Camel Dermatophilosis in Kenya, Sudan and Saudi Arabia

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ABSTRACT

Camel dermatophilosis has been found in Kenya, Sudan and Saudi Arabia. Camel dermatiophilosis has been reported in Kenya from Samburu and Laikipia districts. In Sudan it has been described in outbreaks in the Butana region and in Saudi Arabia there were outbreaks in a commercial dairy farm in the Buraidah region. The clinico-epidemiological patterns and bacterial isolates were compared.

In all cases, it was found that camel calves were more seriously affected than adults. The disease affected most parts of the skin. Affected animals were weak and unable to feed properly. The fatality rates ranged from 0% in Saudi Arabia to 30% in Sudan. Confirmation of the disease was by bacterial isolation and histopathlogy. All the bacterial isolates had similar biochemical properties. In Saudi Arabia, however, mixed infection involving *Dermatophilus congolensis* and *Microsporum gypseum* were found in forty eight camels which had discrete circumscribed lesions. This is in contrast to the mainly confluent crusty hairless brown lesions caused by *Dermatophilus congolensis*. *Dermatophilus congolensis* is one of the conditions that impede camel production in the three countries.

Key words: Dermatophilosis, Skin, Camel calves.

INTRODUCTION

Pastoralists in Sudan and Kenya rear camels for milk and meat production. This is especially important in the dry season when other

livestock die or are unthrifty and the camel then becomes the only means of sustenance. Camel production is, however, difficult especially due to very high calf mortality, which can at times reach fifty percent (Samui and Hugh-Jones, 1990). One of the reasons for this calf mortality is disease and since the role of disease is little understood, it is imperative that disease, which affects camels, especially camel calves, be properly investigated.

The isolation of *Dermatophilus congolensis* from camels with skin lesions has been described in Kenya and recently in Sudan (Gitao *et al.*, 1990 and Gitao, 1992). In Saudi Arabia, camel rearing is performed on a commercial basis in some commercial farms. Since the climate and mode of rearing is quite different from that found in the tropics, it is important to compare the clinico-epidemiological pattern of camel dermatophilosis in the tropics to that in Saudi Arabia. The objective of this study was to determine the prevelance of dermatophilosis in camels in kenya, sudan and saudia arabia.

MATERIALS AND METHODS

Epidemiology

Laikipia and Samburu districts were chosen in kenya. Samburu district has three divisions: Lorroki in the southeast is a highland plateau with grassland and an extensive forest reserve. It receives a high rainfall of 400-500 mm per year and camels perform poorly with only about 749 camels being reared. Six hundred camels from different herds were examined. Baragoi is another division of lowland plains with mostly savanna vegetation, which receives an average of 300-350 mm per year of rainfall and is ideally suited for camels. About 2,585 camels are reared from which a total of 1,200 in different herds were examined. Wamba is the largest division with savanna vegetation and receives 400-450 mm per year of rainfall. It is suited for other livestock but recent land deterioration has led to the camel becoming important. About 2,070 camels are reared in this area. A total of 1,400 camels were examined. In these three areas, camels are reared by Samburu pastoralists, in herds of a few to 70 or more camels, in open grassland and are only enclosed at night in 'Bomas' or enclosures made of *Acacia* tree branches. There is no veterinary care for them.

Laikipia district receives an annual rainfall of 600-850 mm per year. Camels are reared in a few ranches. One ranch, the Olmaisor ranch, was selected and 600 camels were examined. In this ranch, camels were regularly weighed and examined for any ailment.

In both Wamba and Baragoi divisions of Samburu district, camels were examined over a two month period from March to April 1993. Camels in Lorroki division were examined in July and August, 1993. Camels in Laikipia were examined in October and November 1993. Examination during the dry season in the four areas was done in December 1993 and January-February 1994. A thorough physical examination for each camel was performed and blood obtained for serum preparation. Scabs were obtained from 100 infected camels. The Student's t test was used to compare infection rates from the different groups. The camels were classified as calves if they were one year old or younger.

In Sudan the Butana region is in eastern Sudan where camels are reared in a zone which lies approximately between latitude 14-17 °N and longitude 33-36 °E. About 20% of the total camel population in sudan is reared there under nomadic pastoralism in a zone that is 4% of the total area of the country. The rainfall is low to moderate (50-200 mm annually) and the vegetation consists of semi-desert grassland in the north and rich savanna alternating with grass areas to the south. In the study, 15 camel herds with a total population of 1,931 camels within the French-Sudanese Camel Research Project were examined once every month between September 1992 and December 1994. In 1995, reports were obtained from field veterinarians. These herds were numbered 1-15 and were located in six different localities, which were visited at different times as shown in Table 1. During each visit any disease condition was critically examined and samples obtained. Skin scabs were obtained from infected camels. A specimen was obtained from each of five camels that were infected from herds, no. 1, 2, 5, 8 and 11. The first two samples were obtained from adults while the others were obtained from camel calves.

The Al Qaseem region is a large farming area in Najd, 300 miles to the north of Riyadh, the capital city of Saudi Arabia. It is arid with temperatures varying from 2 °C in the winter to 50 °C in the summer. The annual rainfall in the region is 120 mm per year. The topography is that of a dry rocky desert where the rains fall in both winter and spring. Most of the area is under cultivation where

wheat, barley, dates and citrus fruits are grown using underground irrigation. In one privately operated dairy farm, 551 camels are reared intensively in pens but without shades and are exposed to sunlight and rain. Camels were examined once every week for disease conditions from February 1997 to May 1997. This was done by a thorough physical examination of every camel in a crush. Skin scabs from four infected adult camels; four infected young camels; three infected camel calves (< 1 year old) with discrete lesions and three infected camel calves with generalized lesions were examined.

Bacterial/fungal isolation

Scabs from all the infected animals were emulsified with Ringers' solution and then inoculated on Sheep Blood Agar (SBA) (6% Sheep blood agar, Oxoid nutrient agar and 0.4% Sodium chloride), Sabourauds' dextrose agar (Oxoid; Code CM41) plates. After 48 h of incubation, *D. congolensis* colonies were obtained on SBA and examined under low power microscopy. A loopful of the colony was emulsified with Ringers' solution stained with Gram, Giemsa and methylene blue stains and observed under oil immersion microscope. The organisms from the SBA plate were inoculated into sugar fermentation tubes, gelatin and litmus milk. The catalase test was performed by combining one colony from an SBA plate with a drop of 30% hydrogen peroxide on a glass slide and observing the evolution of bubbles.

Inoculating the emulsified organism from nutrient broth with a wire loop to obtain confluent growth tested disc plate antibiotic sensitivity. Sensitivity discs of 6 mm diameter (Biotec, England, KGL 2/4) were placed on each plate.

The zones of inhibition read qualitatively after incubation at 37 °C for 72 h. Skin scabs were inoculated into SDA (Sabourauds' dextrose agar; Oxoid; Code CM41) slants and incubated at room temperature (23-27 °C) for fourteen days. Needle-mounts from the colonies were stained with lactophenol cotton blue and examined under oil-immersion microscope.

Histopathology

The skin scabs were fixed in 10% formal saline, embedded in wax, cut at 5µ and stained with Haematoxylin and Eosin (H & E) and periodic acid-Schiff (PAS) for histopathological studies.

RESULTS

Kenya

The infection rate of camels with *Dermatophilus congolensis* was significantly ($P<0.05$) higher during the wet season (21.2%) than that during the dry season (14.5%) as shown on Table 2. Camel calves were significantly ($P<0.05$) more infected (23.1%) than adults (19%). There was no significant ($P<0.05$) difference between the infection rates of males (21.2%) and females (21.3%). There was little correlation between rates of infection with the different areas but the camel calves from Lorroki (33.3%) had significantly higher rates of infection than other areas.

The infections were mainly manifested as hair matting especially on the rump, flanks, neck and lower abdomen with no infections on the legs. Early lesions, on removal of the matted hair, revealed raw hyperemic areas with pus exudation. Other lesions had become thick brownish crusts of irregular size and were hairless. The lesions were more widespread and more serious in camel calves than that in adults.

Sudan

The disease was first noticed in February 1993 in two of the fifteen herds (herds 1 and 2). February in Sudan falls among the winter months. In these episodes, adults were affected and calves less than one year old were not affected. The numbers and percentages affected are shown on Table 1. Morbidity in the two herds was 50% and 75%, respectively. Among the adults, the lesions involved the hind limbs, abdomen and less frequently other parts of the body. There was extensive hair matting on affected parts. The hair mats would leave raw hyperemic crusts on removal. The crust later dried up to form white scabs about 1-3 cm in diameter. The disease took three to six months in many of the animals before healing.

Superficial lymph node enlargement was not common and appetite was not affected. No mortality was recorded among the affected adults but a morbidity rate of 12.5% was recorded.

In the rest of the herds examined, the disease involved 31.9% of camel calves, particularly those below 1 year. Adults were also involved but to a lower extent (8.2%). Especially in the years 1994 and 1995, it took an epizootic form and only one herd (No. 13) was spared from the infection. In the calves group, the disease was more severe and most of the body surface was affected especially the flank, chest and upper fore and hind limbs. Affected calves developed areas of alopecia and hair loss where extensive thick whitish dry scabs were formed. The general health condition was poor and appetite reduced. The regional lymph nodes were enlarged in most of the cases.

Saudi Arabia

An infection involving 131 camels out of 559 was found (Table 3). There were two types of infections depending on the types of lesions. In forty eight camels less than one year old, it was manifested as discrete well circumscribed, crusty hairless lesions of 1-2 cm in diameter. The lesions were located primarily on the neck and forelegs but there were a few on the shoulders. In the "Majaheem" breed, which is black in color, the lesions were especially prominent, as they were white in contrast to the color of the camels. Upon removal of the crusts, the skin was almost normal without erythema, inflammation or bleeding. In the second type of infection, 83 camels of varying ages were involved. The infections were diffuse covering the flanks, legs and the ventral aspects. Their was extensive matting of the hair and upon removal, raw hyperemic areas were revealed. In many cases, large brown crusts of variable sizes were present (Fig. 1). The young and growing camel calves had the highest percentage of involvement and had 50% or higher of skin involvement.

One of the observations during examination of the camels was that no tick had been found on any camel for the last five months.

Table 3. Lesions in different age groups of camels in Saudi Arabia

	Young (<1 yr)	Growing (1-4 yrs)	Adults (> 4 yrs)
Total Examined	252	48	259
No. Affected	98	19	14
Diffuse lesions	50	19	14
Discrete lessions	48	0	0
% Affected	38.9	39.6	5.4

Fig. 1: Growing camel with necrotic scabs on the flanks

Isolations

After 48 hours incubation, all the SBA plates inoculated had colonies typical of *D. congolensis.* The colonies were white, 1-2 mm in diameter, rough, convex with a crateriform shape and a 1 mm zone of complete hemolysis. The colonies were firmly attached to the agar. Under microscopy, the filamentous forms were many, but after several passages, coccoid forms showing both longitudinal and transverse divisions were present (Fig. 2).

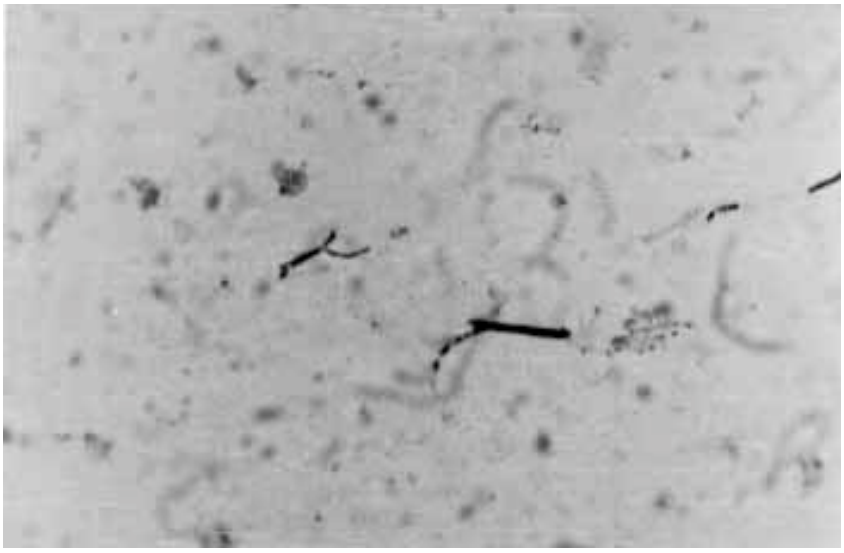

Fig. 2: Gram positive filaments of *Drermatophilus congolensis* with both tranvers and longtinal divisions as well as coccoi forms (x100)

The biochemical behavior was similar to that described before (Gitao, 1992). Fourteen samples from Saudi Arabia had a dermatophyte culture. The cultures were fast growing and had filled slants in 4 days. The colony was characterized by a dense surface with a thin white border. The center was white and fluffy. The reverse was pale to yellow with a tint of brown in the center. After aging, the colony became white cottony in the center. Microscopically, the lactophenol cotton blue slide revealed very

many large, ellipsoidal thin-walled microconidia with four to five cells (Fig. 3).

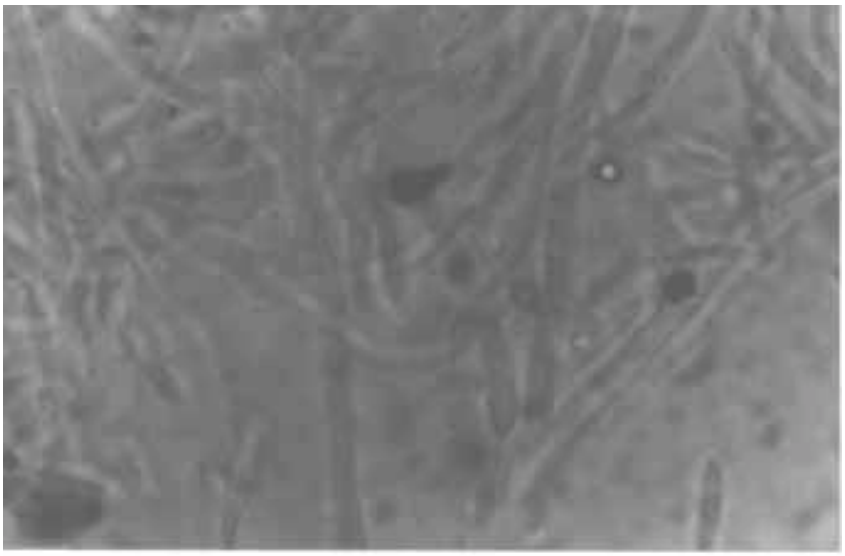

Fig. 3: A lactophenol cotton blue stained slide of *Microsporum gypseum* with characteristicic macronidia

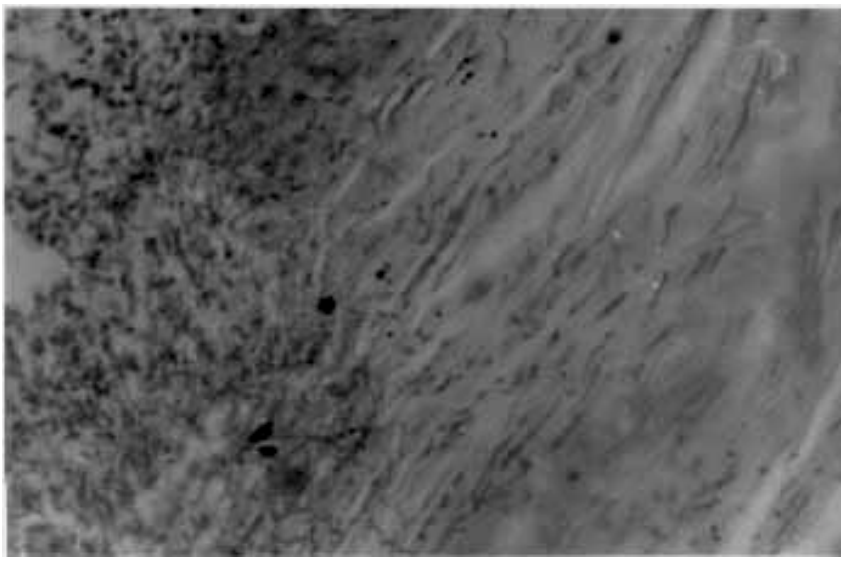

Fig. 4: A PAS stained section indicating both mycotic forms and *Dermatophilus congolensi*s filaments

Histopathology revealed congestion, hyperkeratosis with a lot of keratinaceous debris. The epidermis was thickened and the dermis diffusely infiltrated with polymorphonuclear leucocytes. The characteristics of the dermatophyte on direct smears, on SDA and pathological lesions were used to confirm the presence of *Microsporum gypseum*. Abundant D. congolensis filaments and coccoid forms showed transverse and longitudinal divisions invaded the keratinized layers. Sections stained with PAS revealed abundant mycotic filaments in the epidermis mixed with *D. congolensis* (Fig.4). These clinical, laboratory and pathologic findings were used to substantiate a diagnosis of a *Dermatohilus congolensis* infection mixed with *Microsporum gypseum.*

DISCUSSION

The infection of camels with *D. congolensis* has been described before in Kenya (Gitao *et al.*, 1990; Gitao, 1992 and Hyslop, 1980). The infection rates between the different age and sex groups in different areas were, however, not described. In this study, all camels had higher infection rates in the wet season as compared to the dry season. Camel calves had higher infection rates than adult camels and there was no difference between male and female infection rates. Only one area, Lorroki had significantly higher infection rates than others. This is the area with a high rainfall and bordering forest type of vegetation. In the bovine, higher levels of moisture are related to an increase in the prevalence of *Dermatophilus congolensis* infection (Khamiev, 1982 and Mancianti *et al.*, 1988).

There were no differences between the infection rates of ranch kept camels and free-ranging camels. Studies of bovines indicate the prevalence of *D.congolensis* was of little significance in commercial herds (Samui and Hugh-Jones, 1990). In the camel, both the traditional and commercial farms had similar rates of infections.

Camel dermatophilosis was found to be prevalent in the Butana region in Sudan initially in two herds involving adults. In the other herds examined, camel calves were more involved (31.8%) than adults (8.3%) and had more severe lesions. The outbreaks occurred in

eco-climatic conditions similar to those in Kenya (Gitao, 1992 and Hyslop, 1980). The lesions were more severe and more widespread in calves than recorded in Kenya (Gitao *et al.*, 1990 and Gitao, 1992) with a morbidity rate of 5-6% in Kenya as compared to 31.8% in Sudan. A high case fatality ranging from 10 to 30% was reported among the affected herd in Sudan.

There has been no report of the condition in the Middle East. *Microsporum gypseum* infection in camels has been reported (Boever and Rush, 1975 and Morrow and Compton, 1991). Other dermatophytes that have been reported in camels include *Trichophyton verrucossum* (Fadlelmula *et al.*, 1994), *Trichophyton schoenleinii* (Chatterjee *et al.*, 1978) and *Trichophyton* (Liyod, 1990). However, there has been no report of a mixed infection involving both *D. congolensis* and a dermtophyte, in this case *Microsporum gypseum,* in camels. In this study, 23.4% of a herd of camels in a dairy farm had a mixed infection of *D. congolensis* and *Microsporum gypseum.* Some animals had discrete and circumscribed lesions, which is characteristic of *Microsporum gypseum* infections (Boever and Rush, 1975) while others had confluent crusty lesions with hair matting which is characteristic of *D. congolensis* infection (Gitao *et al.*, 1990 and Gitao, 1992).

Both microorganisms were found in all the samples by direct microscopy, isolation and histopathology. This feature of joint infection is probably more common in the camels than documented, but may be related to the fact that most camels, especially in Africa, are reared in highly inaccessible areas with little veterinary input. Young camel calves and growing calves were the most severely affected. This is in agreement with the findings from both Sudan and Kenya (Gitao, 1992 and Hyslop, 1980) where *D. congolensis* was the only causative agent.

In the tropical countries in Africa, camels are reared in the open savanna grasslands or arid desert areas with sparse Acacia trees. During the night, they are kept in 'bomas' or enclosures made of bushes. In Saudi Arabia, the camels are kept in well-constructed pens, but the cold temperatures during the winter combined with wetting from the rains would contribute greatly to the spreading of *Dermatophilus congolensis,* especially on the flanks and ventral aspects of the camels.

One of the observations during examination was the absence of ticks on the camels. This is in contrast to findings in Kenya and

Sudan where the camels have very high tick loads (Khamiev, 1982) Even in those countries, however, *Amblyomma variegatum* was not among the ticks infesting the camels. In cattle and other animals, *Amblyomma variegatum* is suspected of being one of the agents involved in the transmission of *Dermatophilus congolensis* in camels.

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