Dermatophilosis in camels (*Camelus dromedarius* Linnaeus, 1758) in Kenya

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**Summary:** Natural dermatophilosis (caused by *Dermatophilus congolensis* Van Saceghem, 1915) has only recently been described in camels (*Camelus dromedarius*). Further work has shown that the disease is actually widespread. At the Ol Maisor farm where it was first diagnosed (in the Laikipia district of northern Kenya), detailed investigations have revealed that thirty camels (ten calves and twenty adult animals) were infected. The signs varied from mild to more than 50% skin involvement. Patches of wool on the rump were easily detachable with many hard, white crusts.

Similarly, another twenty camels from a totally different area of northern Kenya (Samburu district) were found to be infected with *D. congolensis*. Bacterial isolation was used to confirm the diagnosis.

At Ol Maisor farm, twenty sheep were also found to have severe dermatophilosis. There were scabs and many areas of wool shedding. The shed wool had crusts similar to those observed on camels. Experimental infection with *D. congolensis* isolated from camels was conducted, by means of scarification, on the skin of two goats. The same experimental infection was possible in two calves, taking two weeks to become established. After thirty days there were disseminated foci of infection on the heads of the calves, especially around the eyes. Although these findings cannot show the actual source of *D. congolensis*, it is possible that the same organism causes dermatophilosis in the different animals.

**KEYWORDS:** Camel – Dermatophilosis – Experimental infection – Kenya.

**INTRODUCTION**

Dermatophilosis (caused by *Dermatophilus congolensis* Van Saceghem, 1915) in camels (*Camelus dromedarius* Linnaeus, 1758) has only recently been described (6). Further examination has revealed that the condition is more widespread than previously thought. In this study, the disease is described and the extent of involvement in the field re-examined. As camels are normally reared in close proximity to other domestic animals, such as goats and cattle, it is important to examine the pattern of dermatophilosis in these three species. Natural outbreaks of the disease are described in sheep reared in an area where camel dermatophilosis was found. Experimental infection of bovine calves and goats with a *D. congolensis* strain isolated from camels is described.

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MATERIALS AND METHODS

Epidemiology

A visit was made to the Samburu district, which is one of the principal camel-rearing areas in northern Kenya. In this district, approximately 66,000 camels are reared by Samburu pastoralists in scattered homesteads. They are reared in close proximity to goats and cattle, although they stay in their own enclosures or bomas at night.

The Samburu district lies in a semi-arid region with an annual rainfall of approximately 500 mm. In this region, approximately 400 camels in various pastoral homes were visited and their skin condition examined. A thorough examination of all camels was performed at the Ol Maisor farm, where the condition was initially diagnosed. Approximately 500 camels are reared on this commercial ranch, together with sheep, goats and cattle. This farm is also located in a semi-arid area in the Laikipia district, with an annual rainfall of 500 mm.

Bacterial isolation

Skin scabs from suspected cases were obtained and the scabs emulsified with Ringer's solution before being plated on sheep blood agar plates as previously described (6). The plates were incubated for 48 h at 37°C and the cultures examined. Positive cultures were stained with Gram, Giemsa and methylene blue stains.

Inter-species infection

Two seven-month-old calves and two four-month-old goat kids which had no signs of dermatophilosis were selected for challenge with \( D. congolensis \) obtained from camels.

Four sites on both dorsal flanks of each animal were shaved and then cleaned with alcohol to remove body oils. Each site was scarified with sandpaper (grade 2) as described by Abu-Samra and colleagues (1), until hyperaemia without bleeding was seen. Graded doses of \( D. congolensis \) in ten-fold dilutions (\( 10^4 \) to \( 10^8 \) colony-forming units/ml) were applied on the scarified skin and wetting maintained for three days. Skin lesions were observed for two months after inoculation. Skin scabs were obtained from positive cases where dermatophilosis was established after experimental infection, and bacterial isolation was performed.

RESULTS

Epidemiology

Clinical camel dermatophilosis was found in twenty camels in the Samburu district. The signs varied from mild wool matting to extensive skin scabs over more than 50% of the skin (Fig. 1). The age groups affected varied from six-month-old camels to adult camels of approximately four years.

At the Ol Maisor farm, thirty camels of varying ages were observed to have varying stages of dermatophilosis. Clinical dermatophilosis was also found on twenty sheep, some of which were severely infected with thick grey scabs.

Bacterial isolation

\( D. congolensis \) was confirmed in fifty samples by bacterial isolation and staining (Fig. 2).
FIG. 1

Extensive scab formation due to dermatophilosis in a camel calf

FIG. 2

Beaded *Dermatophilus congoensis* showing filaments and zoospores with both transverse and longitudinal multiplication
Inter-species infection

Both the two calves and two goats had established signs at the site of experimental infection ten days later. Only the two lowest dilutions had established infection in both species. The scabs were characterised by encrustation with thick greyish scabs from which *D. congolensis* was isolated.

In both calves, disseminated skin lesions were found on the head thirty days after infection. In one calf, two lesions were found: one with a diameter of 5 cm on the right frontal bone just below the eye, and the other 6 cm in diameter just above the left eyelid (Fig. 3). In the other calf, a lesion 10 cm in diameter was found, involving almost the entire upper left eyelid (Fig. 4). All of these lesions were hard crusts which left raw hyperaemic areas on removal. *D. congolensis* was isolated from skin scabs obtained from these lesions.

**Fig. 3**

*Two Dermatophilus congolensis* lesions on the head of an experimentally-infected calf

**DISCUSSION**

Dermatophilosis has only recently been described in camels (6). The scope of the condition has not yet been ascertained, but it appears to be more widespread than originally thought. The disease occurs in several herds examined in the Samburu district, as well as in a commercial ranch in the Laikipia district, affecting camels of a wide range of ages (six months to four years). All of these cases occurred in semi-arid areas, although high rainfall and high humidity are known to predispose animals to dermatophilosis (13, 15). Camel calves are more susceptible than adults and if the
Dermatophilus congolensis infection on the upper eyelid of an experimentally-infected calf

condition is combined with malnutrition this may result in death. Adult camels are unlikely to suffer mortality but the condition may lead to reduced production. A large number of herds would have to be examined to determine the effects of age and sex on mortality.

Bovine streptothricosis is known to be of little significance in commercial herds and is more serious in traditionally-managed herds (9). Up to 5% of animals reared in these free-range conditions were seropositive and in Zambia rainy weather, vegetation type (e.g. grass savannah, woodland savannah, thorny bush) and the presence of ticks and biting flies were indicated as important factors in the appearance and course of dermatophilosis (14). These factors would also appear to influence camel dermatophilosis in the same way. The prevalence of bovine streptothricosis has been found to be higher among animals with *Amblyomma variegatum* ticks (4, 12). These ticks are abundant on camels, especially where they are allowed to roam freely with no tick control measures. Such ticks may also have dropped from the wild animals which live in these vast savannah lands. It would therefore be expected that free-range camels would have a higher incidence of *D. congolensis* than those on commercial ranches.

In cattle, the use of a single injection (20 mg/kg) of long-acting oxytetracycline is curative in 35.9% of cases; the less severe the infections, the better the results (10). Although not yet determined, similar responses would be expected from camels.

By contrast, ovine dermatophilosis is widely described in many sheep-rearing countries (2, 16). The lesions may occur widely over the body causing loss of condition and even death. The disease can cause a mortality rate of up to 6% (17). The most
important economic loss is due to blowfly strike on the dermatophilosis lesion (5). Although no deaths associated with ovine dermatophilosis were found in this study, it is possible that such deaths do occur.

Inter-species infection has been described previously, using *D. congolensis* strains from cattle (1). Camels, calves, goats, sheep, donkeys and rabbits were successfully infected locally by skin scarification with bovine isolates. It has been shown that *D. congolensis* strains differ in their pathogenicity (3, 7). The present study indicates that a *D. congolensis* strain from camels is just as effective in establishing infection in cattle and goats. In this study, disseminated lesions on the head were observed in two calves. In previous animal inoculations, disseminated infections were not established in ewes (11), rabbits, calves, goats, sheep, donkeys and camels (1), and sheep, guinea-pigs, mice and cats (8). The pattern of disseminated lesions is more consistent with the natural disease where the whole flank of the animal is affected. Disease spread generally occurs through contact, which was probably the case in this study, as the animals were observed to rub themselves on the infected flanks.

Since camels are reared alongside cattle and goats, it is important to establish the relationship between the species with regard to *D. congolensis* infection. Although it would be difficult to ascertain the source or cycle of *D. congolensis* infection in these species, it would be useful to compare the different strains isolated from different animals. Current efforts are aimed at comparing the different isolates.

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LA DERMATOPHILOSE DES DROMADAÏRES (*CAMELUS DROMEDARIUS* LINNAEUS, 1758) AU KENYA. – C.G. Gitao.

_Résumé_: L’infection naturelle des dromadaires (*Camelus dromedarius*) par *Dermatophilus congolensis* Van Saceghem, 1915, n’a été décrite que depuis peu. Des travaux complémentaires ont montré que la maladie est, en fait, largement répandue. Dans l’exploitation d’Ol Maisor, où cette affection a été diagnostiquée pour la première fois (district de Laikipia, dans la partie nord du Kenya), des recherches approfondies ont révélé que trente dromadaires (dix jeunes et vingt adultes) étaient infectés. Les signes ont varié entre des lésions discrètes et une atteinte de plus de 50 % de la surface cutanée. Au niveau de la croupe, la toison se détachait par touffes et celles-ci contenaient de nombreuses croûtes blanches et dures.

Dans une région totalement différente du nord du Kenya (district de Samburu), vingt autres cas d’infection par *D. congolensis* ont été rapportés chez des dromadaires. Le diagnostic a été confirmé par isolement de la bactérie.

Sur l’exploitation d’Ol Maisor, vingt ovins étaient également atteints d’une dermatophilose sévère. Les animaux étaient porteurs de croûtes et présentaient de nombreuses plaques d’alopécie. La laine détachée contenait des croûtes comme celles des dromadaires. Deux caprins ont été infectés expérimentalement, par scarification, en utilisant la souche de *D. congolensis*.
isolée des dromadaires. La même infection expérimentale a pu être réalisée chez
deux veaux. La maladie s’est manifestée au bout de deux semaines et, après
trente jours, les animaux présentaient des foyers infectieux disséminés au niveau
de la tête, particulièrement autour des yeux. Bien que ces résultats ne donnent
aucune information sur le réservoir réel de D. congolensis, il est possible que le
même agent pathogène soit en cause.

MOTS-CLÉS : Dermatophistose – Dromadaire – Infection expérimentale –
Kenya.

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DERMATOFILOSIS DE DROMEDARIOS (CAMELUS DROMEDARIUS LINNAEUS,
1758) EN KENIA. – C.G. Gitao.

**Resumen:** La infección natural de los dromedarios (Camelus dromedarius)
por Dermatophilus congolensis Van Saceghem, 1915, no se había descrito
hasta hace poco tiempo. Una serie de estudios profundizados ha revelado que
la enfermedad está actualmente muy extendida. Detenidas investigaciones
llevadas a cabo en la explotación de Ol Maisor (distrito de Laikipia, en el norte
de Kenia), donde se diagnosticó por primera vez esta afección, han revelado
que treinta dromedarios (diez jóvenes y veinte adultos) estaban infectados. Los
signos observados iban de lesiones cutáneas leves a lesiones involucrando más
del 50% de la piel. Del lomo de los animales se desprendían con facilidad
mechones de vellón con numerosas costras blancas y duras.

En una zona totalmente diferente del norte de Kenia (distrito de Samburu)
se señalaron igualmente otros veinte casos de dromedarios infectados por
D. congolensis. Para confirmar el diagnóstico se procedió al aislamiento de la
bacteria.

En la explotación de Ol Maisor se detectaron también veinte casos de
dermatofilosis aguda en ovinos, con presencia de costras y numerosas placas de
alopecia. En la lana desprendida se encontraron costras similares a las de los
dromedarios. Con la cepa de D. congolensis aislada de los dromedarios se
infectaron experimentalmente, mediante escarificación, dos cabras. Se logró
también del mismo modo la infección experimental de dos becerros. La
infección tardó dos semanas en manifestarse y, al cabo de treinta días, se
observaron focos diseminados de infección en las cabezas de los becerros,
especialmente alrededor de los ojos. Aunque estos resultados no revelan la
verdadera procedencia de D. congolensis, cabe pensar que el microorganismo
responsable de la dermatofilosis en los distintos animales es el mismo.

PALABRAS CLAVE: Dermatofilosis – Dromedario – Infección
experimental – Kenia.

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