Outbreaks of *Dermatophilus congoensis* infection in camels (*Camelus dromedarius*) from the Butana region in Eastern Sudan

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**Summary**
Natural *Dermatophilus congoensis* infection of camels has been reported in Kenya in semi-arid areas. Research is being conducted to discover how widespread the condition is in neighbouring countries with similar eco-climatic conditions. Severe skin infections of camels from the Butana region of Eastern Sudan were examined. The infections were first found in two herds of adult camels, of which 50%-75% of the animals were affected. In the other thirteen herds examined, camel calves were more likely to be infected (34%) than adults (8.9%), and lesions were more severe and involved most parts of the body. The lesions began as hair matting and later developed into hard crusts. The case fatality rate ranged from 10% to 30%. *D. congoensis* was isolated from the scabs. Camel dermatophilosis was found to be among the most serious problems faced by camel herders in the Butana region.

**Keywords**
Butana – Camels – Dermatophilosis – Sudan.

**Introduction**
Sudan is one of several Eastern African countries in which camels are reared. Unlike other neighbouring countries, however, there is a marked stagnation of camel numbers (11) as indicated by estimates that put the camel population at approximately 2.9 million (2), which is low considering the potential for the country. Camels mainly occur in Kordofan, Darfur and Butana, i.e., in the northern drylands of Sudan. Camel milk is an important staple for the pastoralists but there is also a big interest in slaughter camels, which are mainly young males, for high-price markets in Egypt, Libya and Saudi Arabia (11). As camels constitute the only livestock for export from Sudan, an examination of the factors that impede camel production is very important.

Cutaneous streptothricosis due to *Dermatophilus congoensis* is one of the major diseases in cattle in Sudan, and affects 15%-20% of the bovine population (12; H. Agab, personal findings). The antigenic homogeneity between different strains of *D. congoensis* (7) and the biochemical homogeneity of strains from different animals have been established (8).

Camel dermatophilosis has been reported in Kenya from both nomadic and commercially reared camels (4, 5). The presence or absence of this condition in Sudan must be established and its manifestation studied.

This paper, which results from the collaborative work between researchers in Kenya and Sudan, reports outbreaks of the disease in Sudan and compares the clinico-epidemiological findings from Sudan to those obtained in Kenya. The impact of the disease on camel husbandry is examined and the biochemical behaviour of the isolates from Sudan compared to that of isolates from Kenya.
Materials and methods

Epidemiology

In the Butana region in Eastern Sudan, camels are reared in a zone which lies approximately between latitude 14°N-17°N and longitude 33°E-36°E. Approximately 20% of the total camel population is reared here under a system of nomadic pastoralism in a zone that constitutes 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 savannah alternating with grassy areas to the south. In this 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. The herds were numbered 1 to 15 and were located in six different localities which were visited at different times, as shown in Table I. During each visit, any disease condition was critically examined and samples obtained. The objective of the project is to study the productivity parameters of dromedary camels in the Butana region of Sudan.

Bacterial isolation and histopathology

Skin scabs were obtained from infected camels. A specimen was obtained from each of five infected animals from herds 1, 2, 5, 8 and 11. The first two samples were taken from adults while the others were taken from camel calves. All were obtained from the flanks. The samples were 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. D. congolensis colonies were emulsified in saline and smears prepared on glass slides which were stained with Gram, Giemsa and methylene blue stains. Biochemical tests were performed as described before (6). The samples were also plated on Sabouraud's dextrose agar (SDA) which was incubated at 25°C for two weeks.

Skin biopsies from the five cases were also fixed in formalin, processed for histopathology and then stained with haematoxylin/eosin and periodic acid-Schiff (PAS) as described earlier (6).

Results

Dermatophilosis was first observed in February 1993 in two of the fifteen herds (herds 1 and 2). In Sudan, February falls among the winter months. In these episodes, adults were affected while calves less than one year of age were not affected. The numbers and percentages affected are shown in Table I. Morbidity was 50% in herd 1 and 75% in herd 2. Among the adults, the lesions were located on the hind limbs, abdomen and less frequently on other parts of the body. There was extensive hair matting on affected parts. The crusts later dried up to form white scabs approximately

Table I

The different groups of camels infected with Dermatophilus congolensis in fifteen herds of camels in the Butana region

<table>
<thead>
<tr>
<th>Herd No.</th>
<th>Sampling period</th>
<th>Adults in herd (No.)</th>
<th>Adults affected (No.)</th>
<th>Adults affected (%)</th>
<th>Calves affected &lt;1 year (No.)</th>
<th>Calves affected (No.)</th>
<th>Calves affected (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
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<td>25</td>
<td>50</td>
<td>10</td>
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<td>0</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>60</td>
<td>45</td>
<td>75</td>
<td>8</td>
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<td>0</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>70</td>
<td>4</td>
<td>5.7</td>
<td>12</td>
<td>5</td>
<td>41.7</td>
</tr>
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<td>4</td>
<td>B</td>
<td>112</td>
<td>3</td>
<td>5</td>
<td>8</td>
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<td>50</td>
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<tr>
<td>5</td>
<td>B</td>
<td>112</td>
<td>10</td>
<td>8.9</td>
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<td>12</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>230</td>
<td>20</td>
<td>8.7</td>
<td>40</td>
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<td>25</td>
</tr>
<tr>
<td>7</td>
<td>C</td>
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<td>4</td>
<td>44.4</td>
</tr>
<tr>
<td>8</td>
<td>D</td>
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<td>D</td>
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<tr>
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<td>D</td>
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<td>15</td>
<td>9.4</td>
<td>28</td>
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<td>25</td>
</tr>
<tr>
<td>11</td>
<td>E</td>
<td>220</td>
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<tr>
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<td>0</td>
<td>0</td>
<td>9</td>
<td>3</td>
<td>33.3</td>
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<tr>
<td>Total</td>
<td></td>
<td>1,057</td>
<td>207</td>
<td>12.5</td>
<td>274</td>
<td>87</td>
<td>31.8</td>
</tr>
</tbody>
</table>

A : September 1992-March 1993
B : April 1993-August 1993
C : August 1993-December 1993
D : January 1994-April 1994
E : May 1994-July 1994
F : August 1994-December 1994
1-3 cm in diameter. The disease took three to six months to disappear in many of the animals. Superficial lymph node enlargement was not common and appetite was not affected. No mortality occurred among the affected adults but a morbidity rate of 12.5% was recorded.

In the rest of the herds examined, the disease affected 34% of camel calves, particularly those less than 1 year of age. Adults were also affected but to a lower extent (8.9%). In 1994 and 1995 in particular, the disease took an epizootic form and only one herd (no. 13) was spared the infection. In the calf age-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 (Fig. 1). The general health condition was poor and appetite was reduced. The regional lymph nodes were enlarged in most cases.

The disease was first tentatively diagnosed as camel dermatophilosis and a mixture of sesame oil, sulphur powder and salicylic acid was used, but without response. The case fatality rate was reported to vary from 10% to 30% among the affected herds and was higher during the summer season.

An assessment of tick load on a random sample of 50 camels at three different times revealed that the number of ticks varied from 65 (+/-5) ticks per animal in the adults to 86 (+/-6) ticks per animal in the calves. The principal sites of attachment included under the tail, inside the ears and nostrils and under the legs. The main tick species identified were *Hyalomma dromedarii* (75.5%), *Amblyomma lepidum* (16.1%), *Rhipicephalus sanguineus* (6.5%), *H. marginatum rufipes* (1.6%) and *H. impetatum* (0.3%). *Amblyomma variegatum* was not found on the camels.

### Cultural characteristics

After incubation for 48 h, isolates of *D. congoensis* were obtained from each of the five specimens on cultured sheep blood agar plates. The isolates had the typical *D. congoensis* morphology of greyish white colonies, 1-2 mm in diameter, surrounded by a 1 mm zone of complete haemolysis. The colonies were rough, convex with a crateriform centre and were firmly attached to the agar. Microscopy revealed mainly filamentous forms, although coccoid forms with transverse and longitudinal division were visible after several passages. The biochemical behaviour was similar to that described earlier (6).

Two different saprophytic molds were also isolated on SDA from all five samples. One had purple colonies with round or irregular edges and a yellowish tinged background. Microscopic examination showed many hyphae and no discernible reproductive structures. The second mold was maroon in colour, fluffy, folded and had a brownish background colour. Microscopy revealed no discernible reproductive structures. The two were identified as

![Skin lesions on the affected camel calves](image)
Dermatophilus congolensis filaments, indicating transverse and longitudinal division, neutrophils and degenerative changes in the stratum spinosum (x1,000; periodic acid-Schiff)
saprophytes by their colony morphology and microscopic appearance.

**Histopathology**

Congestion, oedema and infiltration of the epidermis and dermal papillae by neutrophils occurred, followed by degenerative changes in the stratum spinosum. The keratinised layers and sebaceous glands were invaded by filamentous forms of *D. congolensis* which showed both transverse and longitudinal division (Fig. 2). There were hyphae which stained positively with PAS in the epidermis of two of the samples.

**Discussion**

Camel dermatophilosis was found to be prevalent in the Butana region, initially in two herds of adults. In the other herds examined, camel calves were more affected (34%) than adults (8.9%) and had more severe lesions. The outbreaks occurred in ecoclimatic conditions similar to those in Kenya (4, 6). The lesions were more severe and more widespread in calves than has been recorded in Kenya (4, 6), with a morbidity rate of 5%-6% in Kenya compared to 34% in Sudan. A high case fatality rate ranging from 10% to 30% was reported among the affected herds in Sudan.

In an ongoing field study on the major constraints of camel breeding in Eastern Sudan, this skin disease ranked second after diarrhoea as the most common disease among growing calves in the region (1). Camel producers regularly complain about the problem and enquire about preventive measures such as vaccination against the disease, which constitutes a serious health problem for their camels.

Bovine dermatophilosis has been strongly associated with the tropical bont tick, *A. variegatum* (3, 8, 9). A similar relationship has been described for goats with a severe skin infection (10). In camels, however, no *A. variegatum* was found, although heavy tick infestation was common in Kenya (5). Similarly, *A. variegatum* was not found among the identified ixodid ticks parasitising camels in the Butana area despite a heavy tick load. Other agents, such as tabanid flies, are suspected to be agents of transmission.

**Acknowledgements**

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Foyers d’infection par *Dermatophilus congolensis* chez des dromadaires (*Camelus dromedarius*) de la région de Butana, au Soudan oriental

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**Résumé**
Une infection naturelle par *Dermatophilus congolensis* a été signalée au Kenya chez des dromadaires des zones semi-arides. Des études sont en cours pour évaluer l’extension de la maladie dans les pays voisins aux conditions éco-climatiques similaires. Des lésions cutanées graves ont été observées chez des dromadaires de la région de Butana, au Soudan oriental. Des cas d’infection ont d’abord été décelés dans deux troupeaux de dromadaires adultes, dont 50 % à 75 % étaient atteints. Dans les treize autres troupeaux examinés, les jeunes dromadaires semblaient davantage atteints (34 %) que les adultes (8,9 %) ; les lésions étaient plus graves et recouvraient une bonne partie du corps. Les lésions étaient d’abord caractérisées par l’agglutination des poils (lésions « en pinceau »), puis par la formation de croûtes dures. Le taux de mortalité était de 10 % à 30 %. L’agent *D. congolensis* a été isolé dans les croûtes. La dermatophilose est considérée comme l’un des problèmes les plus graves auxquels soient confrontés les éleveurs de dromadaires dans la région de Butana.

**Mots-clés**

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Brotes de infección por *Dermatophilus congolensis* en dromedarios (*Camelus dromedarius*) de la región de Butana, en la zona oriental de Sudán

C.G. Gitao, H. Agab & A.J. Khalifalla

**Resumen**
Desde zonas semiáridas de Kenya se ha comunicado la presencia de infecciones naturales de dromedarios por *Dermatophilus congolensis*. Ahora se está investigando hasta qué punto la enfermedad se extiende en países vecinos de características ecoclimáticas similares. Se examinaron graves infecciones cutáneas de dromedarios de la región de Butana, al Este de Sudán. En un principio se detectó la infección en dos rebaños de dromedarios adultos, con un 50%-75% de los ejemplares afectados. En los otros trece rebaños estudiados, las crías no sólo presentaban mayor probabilidad de resultar afectadas (34%) que los adultos (8,9%) sino que exhibían lesiones más graves y extendidas a casi todas las partes del cuerpo. Las lesiones se iniciaban como un apelmazamiento del pelaje, para formar después costras duras. La tasa de casos con desenlace fatal oscilaba entre un 10% y un 30%. A partir de las costras se aisló *D. congolensis*. Pudo concluirse que la dermatofilosis figura entre los problemas más graves a los que deben enfrentarse los criadores de dromedarios de la región de Butana.

**Palabras clave**
References


