

Aerobic Bacteria Associated with Contagious Skin Necrosis in the One-humped Camel (*Camelus dromedarius*) in El Showak and El Gadaref areas, El Gadaref State, Sudan.

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ملخص البحث

إجريت هذه الدراسة لعزل البكتيريا الهوائية الممرضة من أربعين عينة قبيح لمرض نخر الجلد الساري من الإبل بمنطقتي القضاريف والشوك. أجرى حصر للنسبة المئوية والتردد لأنواع وأجناس البكتيريا المعزولة وهي ثلاثة عشر نوع تنتمي لثمانية أجناس من البكتيريا. أكثر هذه الأنواع وجوداً هي العنقودية الذهبية والتي وجدت بمفردها أو مع أنواع أخرى لكل من الأجناس الأتية الشعية، العنقودية الوندية، العنقودية المعوية، الإشريكية، الزائفة، السالمونية والعنقودية. اتضح أن الذكور والإناث من الإبل قابلة للإصابة بالمرض لكن الحيوانات التي عمرها أقل من خمس سنوات أكثر قابلية للمرض من الكبار.

Summary

The present study was carried out to isolate bacteria from 40 samples of contagious skin necrosis in camels from Alshowak and El Gadaref areas, El Gadaref State, Sudan. The percentage and frequency of isolation of various bacterial genera and species was recorded. Thirteen species were identified that belonged to eight different genera. The dominant bacterial species encountered in contagious skin necrosis was *Staphylococcus aureus* (32.36%) present either as a single isolate or mixed, in variable frequencies, with other bacterial species that belonged to the genera, *Actinomyces*, *Bacillus*, *Corynebacterium*, *Enterobacter*, *Escherichia*, *Pseudomonas*, *Salmonella* and *Staphylococcus*.

Both female and male camels were susceptible, but young animals (< than 5-years-old) were more susceptible to infection than elder ones.

Introduction

The camel has a low susceptibility to diseases but skin involvements, like contagious skin necrosis, dermatitis, wounds, abscesses or similar problems are commonly observed (Rutter and Mack, 1963; Semushkin, 1968; Edlesten and Pegram, 1974; Domenech *et al*, 1977). The disease was first described by Cross (1917) who rated it second to sarcoptic mange in terms of importance as a camel skin disease. Higgins and McGrane (1986) have reported that contagious skin necrosis is a common disease in all camel-raising habitat. It is highly contagious but not fatal and camels are susceptible (Falah *et al*, 1990). However, Yagoub (1996) has found that young camels less than 5 years old more susceptible to infection (74.8%) than those over 5 years (25.2%).

The pus exudate is considered to be the source of infection to the rest of the herd. Different workers have isolated many organisms from skin lesions (Leese, 1927; Curasson, 1936; 1947; Domenech *et al*, 1977; Falah *et al*, 1990; Yagoub, 1996; Sulieman and Bakhiet, 1997) and not a single bacterial agent has been incriminated to be the main cause of the disease. *Staphylococcus aureus* was isolated from wounds and abscesses in camels (Qureshi *et al*, 2002; Qureshi and Kataria, 2004; Kirketerp-Møller *et al*, 2008), whereas *Pseudomonas aeruginosa* was less frequently encountered. Kalka-Moll *et al* (2008) isolated *S. aureus* from subcutaneous abscesses.

This study was aimed at the isolation of bacteria from samples of contagious skin necrosis in camels from El Gedaref State in the Sudan.

Materials and Methods

Samples collection:

Fourty pus samples from camels that manifested lesions of contagious skin necrosis, were collected with sterile absorbent swabs and labeled with date of collection, sex, age and location. These samples were collected from El Gedaref State during the cold and hot dry seasons.

Isolation and identification of bacterial agents:

Primary isolation of aerobic bacteria was done by direct dipping of the swabs into Nutrient Broth, sub-culture onto Nutrient Agar was done by transferring growth from liquid medium with a loop or using sterile Pasteur pipette. The plates were aerobically incubated at 37°C for 24 hrs. Pure cultures of bacteria were obtained by subculturing Gram-positive organisms onto Blood Agar and Gram-negative bacteria onto MacConkey Agar. The identification of bacteria at the genus and species levels was carried out as described by Balows *et al* (1992) and Barrow and Feltham (1993)

Results

Sixty-eight aerobic bacteria were isolated from the pus swabs. They belonged to 8 genera and 13 species (Table 1; 2). Gram-negative rods were identified as *Enterobacter* species, *Pseudomonas aeruginosa*, *E coli* and *Salmonella choleraesuis* (Fig.1). *Bacillus* spp. encountered were *B. pantothenicus*, *B. sphaericus* and *B. cereus* (Fig. 2). Staphylococci were identified as isolates of *S. aureus*, *S. auricularis* and *S. epidermidis* (Fig.3). The abscess was 2-5 cm in diameter with hard and dry scab-like centre. It occurred mostly on the shoulder and neck. It was rarely to find more than one or two affected camels in the same herd.

Table1: Frequency of isolation of members of bacterial genera from contagious skin necrosis lesions in camels in El Gadaref State.

No	Genus	Total No. of isolates	Percent (%)
1	<i>Staphylococcus</i>	28.00	41.18
2	<i>Bacillus</i>	16.00	23.53
3	<i>actinomyces</i>	07.00	10.30
4	<i>Enterobacter</i>	06.00	08.82
5	<i>Pseudomonas</i>	04.00	05.88
6	<i>Escherichia</i>	03.00	04.41
7	<i>Corynebacterium</i>	02.00	02.94
8	<i>Salmonella</i>	02.00	02.94
	Total	68.00	100.00

% is calculated from the total number of bacterial isolates identified.

Table 2: frequency of isolation of bacterial species from contagious skin necrosis lesions in camels in El Gedaref State.

No	Bacterial species	Total No. of isolates	Percent%
1	<i>Staphylococcus aureus</i>	22.00	32.36
2	<i>S. auricularis</i>	04.00	05.88
3	<i>S. epidermidis</i>	02.00	02.94
4	<i>Actinomyces pyogenes</i>	07.00	10.3
5	<i>Corynebacterium pseudodiphtheriticum</i>	02.00	02.94
6	<i>Pseudomonas aeruginosa</i>	04.00	05.88
7	<i>Escherichia coli</i>	03.00	04.41
8	<i>Salmonella choleraesuis</i>	02.00	02.94
9	<i>Enterobacter cloacae</i>	04.00	05.88
10	<i>E. sakazakii</i>	02.00	02.94
11	<i>Bacillus cereus</i>	02.00	02.94
12	<i>B. pantothenicus</i>	09.00	13.24
13	<i>B. sphaericus</i>	05.00	07.35
	Total	68.00	

% is calculated for total number of bacterial isolates identified.

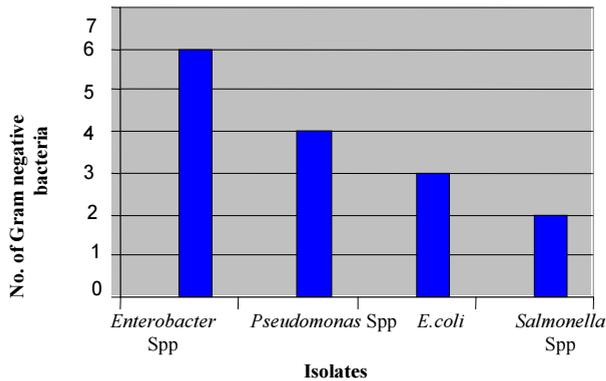


Fig. 1: The frequency of isolation of the different *Bacillus* spp from contagious skin necrosis in camels in El Gedaref State.

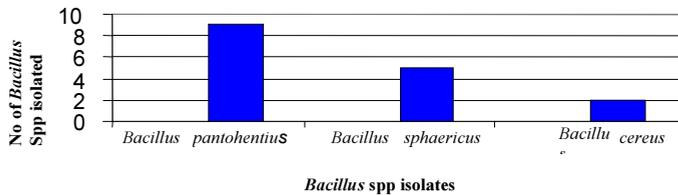


Fig. 2: Involvement of aerobic Gram-negative rods bacterial isolates in contagious skin necrosis lesions in camels in El Gadaref State

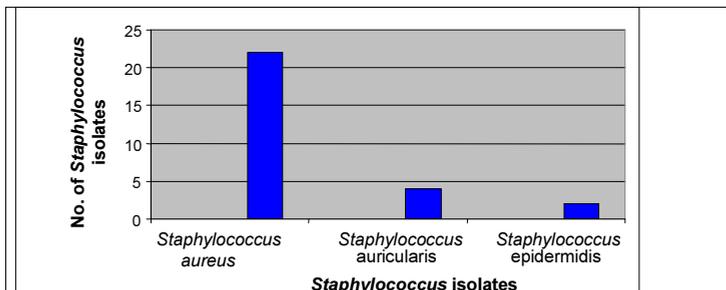


Fig. 3: Involvement of *Staphylococcus* Spp in contagious skin necrosis in camels in El Gadaref State.

Discussion

Contagious skin necrosis of camels has been reported in Sudan, Somalia and Egypt by Yagoub (1996), Edlesten and Pegram (1974) and Azitoun (2007), respectively. Isolation of *Staphylococcus* spp from contagious skin necrosis in camels in the present study supports the earlier finding of Falah *et al* (1990), Yagoub and Mohamed (1996) and other workers who incriminated staphylococci as responsible for causing pyogenic skin infections in the camel (Notherlfer *et al.*, 1994; Wernery, 1999 & 2000; Abubakr *et al.*, 1999; Kataria, 1999).

Staphylococcus aureus was isolated in a large number in this study. Isolation of *S. epidermidis* has been reported before in the camel (Qureshi *et al.*, 2002). *S. auricularis* has not been reported before although the latter authors reported other *Staphylococcus* spp like *S. saprophyticus*, *S. caprae* and *S. lugdunensis*. Yagoub and Mohamed (1996) isolated *S. albus* (Now *S. epidermidis*) from contagious skin necrosis of the camel. The isolation of

Staphylococcus spp in this study confirms their role as causative agents of pyogenic infection in the camel.

The isolation of *Corynebacterium* spp is in agreement with Domenech *et al* (1977) and Yagoub and Mohamed (1996). They are also considered to be some of the most important agents that cause suppurative lesions and abscesses in camels (Abubakr *et al*,1999; Tadesse and Molla, 2002).

The present study shows 23.53% occurrence of *Bacillus* species in the skin necrosis of camels; this is higher than the finding of Yagoub and Mohamed (1996) who encountered *Bacillus* occurrence as 10.3%. They are mostly saprophytes and widely distributed in nature, having little or no pathogenic potential and are rarely associated with diseases. However, *B. cereus* has been reported from cases of mild to severe necrotic or gangrenous infection of wounds (Tuazon *et al*, 1979).

Four isolates were identified as *Pseudomonas aeruginosa* (5.88%). This is similar to Qureshi *et al* (2002) who reported 6.81%. This organism was isolated by Ismail *et al* (1990) in non-draining abscesses in camels. It is considered by Abubakr *et al* (1999) to be one of the major bacterial invaders of internal abscesses.

Eleven isolates were identified as members of the family *Enterobacteriaceae* and they constituted a high proportion (16.17%) of the total isolates. The isolation of *E. coli* in this study supports the earlier finding of Yagoub and Mohamed (1996). Isolation of enterobacteria may generally be attributed to poor hygiene or due to direct contamination by faeces. Further investigations into the epizootiology of contagious skin necrosis in camels and isolation of associated organisms in other camels breeding habitat in the Sudan are warranted.

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