

Bacteria Isolated from Equine Wounds

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ملخص البحث

أجريت هذه الدراسة علي الفصيلة الخيلية في ولاية شمال كردفان لمدة عام أثناء فصول السنة المختلفة، أجريت عمليات إستنبات 116 مسحة لمختلف أنواع الجروح في 93 حمار و 23 من الخيل لعزل البكتيريا الهوائية. عزلت 131 معزولة من الحمير و 27 من الخيل. أكثر أنواع البكتيريا التي عزلت هي العنقودية الذهبية (*Staphylococcus aureus*) والمكورة المعوية الروثية (*Enterococcus faecalis*). كما عزلت العصوية الصلبة *Bacillus firmus* و أنواع من اللستريا (*Listeria spp.*) من الحمير فقط. عزلت 158 معزولة بكتيرية أثناء فصول السنة المختلفة، أكثرها كانت في فصل الصيف (63 معزولة)، كما عزلت أغلب هذه المعزولات البكتيرية من جروح السرج (Saddle wounds).

Summary

This study was conducted in North Kordofan State during the different seasons of the year. A total of 116 swabs from different wound types of 93 donkeys and 23 horses, were cultured for aerobic bacteria. More bacterial isolates were obtained from donkeys (131) than horses (27). *Staphylococcus aureus* and *Entrococcus faecalis* were the most dominant species. *Bacillus firmus* and *Listeria spp.* were isolated from donkeys only. A total of 158 bacterial isolates was obtained during the different seasons of the year, the majority of which (63 isolates) were isolated during summer. These isolates were mainly recovered from saddle wounds.

Introduction

Donkeys and horses provide a useful means of transport in rural areas of North Kordofan State besides their usage for other purposes. Nomads use donkeys and sometimes horses to manage their animals during their migration at the rainy and dry seasons. Most of the wounded animals receive no veterinary care and the case may be aggravated by continuous work. In the Sudan, reports on equine wound infection are meager.

This study was carried out to identify the aerobic bacteria associated with wound infections in equines in relation to species, season of the year and type of wound.

Materials and Methods

Sampling and bacteriological isolation and identification:

This study was conducted in North Kordofan State during different seasons of the year; the samples were collected from veterinary clinics, animal markets and from nomadic animals. A total of 116 animals (93 donkeys and 23 horses) with different wound types, (saddle, incision, fistula, open abscesses, cauterization, abrasion, puncture and laceration wounds) were bacteriologically investigated.

Swabs from the wounds were transported in an ice box and cultured onto Blood and MacConkey Agars. Purification of the isolates was done by subculture onto Nutrient Agar. Identification was performed by cultural, morphological and biochemical characteristics according to Barrow and Feltham (1993).

Results

Isolation of bacteria according to the animal species:

One hundred and fifty-eight bacterial isolates were isolated from both animal species; 131 were isolated from donkeys and 27 from horses, which included *Kurthia* species; an unusual *bacterium* that was found in contaminated wounds.

The number and species of the bacterial isolates in relation to the animal species are shown in Table 1. *Staphylococcus aureus*, *S. epidermidis*, *Enterococcus faecalis*, *E. faecium* and *Bacillus licheniformis* were dominant. *Bacillus firmus* and *Listeria* spp. were isolated from donkeys only, likewise *Kurthia* species, *Micrococcus roseus* and *Bacillus cereus* were isolated from horses only.

Frequency of bacterial isolates in different seasons:

cold dry season:

Forty-six bacterial isolates were isolated during winter. *S. aureus* (12) was the dominant bacterial species isolated, followed by *E. faecium* (8), *B. licheniformis* (7) and *E. faecalis* (6). Other bacterial species were also isolated (Table 2).

Hot dry season:

Sixty-three isolates were obtained. *S. aureus*, *S. epidermidis*, *E. faecalis* and *B. licheniformis* were isolated in comparatively equal

frequencies. No isolation of *Micrococcus roseus*, *M. varians*, *Streptococcus salivarius* and *Pediococcus* spp. was made.

Table 1: Number of bacterial species isolated from each equines species

Isolated bacteria	Donkeys(N ₂)	Horses(N ₂)	Total
<i>Staphylococcus aureus</i>	22	9	31
<i>Staphylococcus epidermidis</i>	15	3	18
<i>Enterococcus faecalis</i>	29	2	31
<i>Enterococcus faecium</i>	17	1	18
<i>Bacillus licheniformis</i>	15	1	16
<i>Bacillus firmus</i>	5	-	5
<i>Bacillus cereus</i>	-	2	2
<i>Streptococcus salivarius</i>	1	-	1
<i>Streptococcus pyogenes</i>	5	3	8
<i>Streptococcus bovis</i>	1	-	1
<i>Streptococcus equinus</i>	1	-	1
<i>Gemella haemolysans</i>	2	1	3
<i>Aerococcus viridans</i>	5	1	6
<i>Actinomyces pyogenes</i>	5	-	5
<i>Arcanobacterium haemolyticum</i>	1	1	2
<i>Corynebacterium ulcerans</i>	1	-	1
<i>Listeria species</i>	4	-	4
<i>Kurthia species</i>	-	2	2
<i>Micrococcus roseus</i>	-	1	1
<i>Micrococcus varians</i>	1	-	1
<i>Pediococcus species</i>	1	-	1
Total and percentage	131(82.91%)	27(17.09%)	158

Rainy season:

During this season, 49 bacterial isolates were obtained, of which *E. faecalis* represented by 16 isolates and *S. epidermidis* and *S. aureus* by 9 isolates each (Table 2). Many other bacterial species were isolated in variable numbers, while some species were not isolated compared to the other seasons.

The frequency of bacterial species isolated in different seasons of the year reflected a high prevalence rate of *E. faecalis* and *S. aureus* (19.39%), *S. epidermidis*, *E. faecium* (11.39% each) and *B. Licheniformis* (10.13%).

Isolated bacteria compared to the type of wounds:

The main type of wound that was found in both donkeys and horses was the saddle wound. *S. aureus* (31 isolates) was the

dominant species of bacteria isolated. From saddle wounds, *S. aureus* was isolated from 14 donkeys and 9 horses. *Enterococcus faecalis* was isolated from donkey saddle wound (13 isolates) and not from horses. eleven isolates of *S. epidermidis* were obtained from donkeys and two from horses. In donkeys, cauterized wounds harboured seven bacterial isolates where *S. aureus* and *E. faecalis* were dominant (2 isolates each). From abrasion wound, *E. faecium*, *E. faecalis*, *S. aureus*, *S. epidermidis*, *B. Licheniformis*, *Actinomyces pyogenes*, *Arcanobacterium haemolyticum* and *listeria* spp. were isolated. Bacterial isolates from all other types of wounds showed the least isolates. Results are shown in Table 3.

Table 2: Frequency of isolation of bacterial species in different seasons of the year.

Bacterial species isolated	Season (no. isolated)	No. isolated (cold dry season)	No. isolated (hot dry season)	No. isolated (rainy season)	Total no. and prevalence (%)
<i>Staphylococcus aureus</i>		12	10	9	31(19.62%)
<i>Staphylococcus epidermidis</i>		-	9	9	18(11.39%)
<i>Enterococcus faecium</i>		8	7	3	18(11.39%)
<i>Enterococcus faecalis</i>		6	9	16	31(19.62%)
<i>Bacillus licheniformis</i>		7	9	0	16(10.13%)
<i>Bacillus firmus</i>		3	1	1	5(3.16%)
<i>Bacillus cereus</i>		0	2	0	2(1.26%)
<i>Actinomyces pyogenes</i>		1	3	1	5(3.16%)
<i>Aerococcus viridans</i>		0	1	5	6(3.79%)
<i>Listeria species</i>		2	2	0	4(2.53%)
<i>Gemella haemolysans</i>		1	2	0	3(1.93%)
<i>Kurthia species</i>		0	2	0	2(1.26%)
<i>Micrococcus roseus</i>		1	0	0	1(0.63%)
<i>Micrococcus varians</i>		0	0	1	1(0.63%)
<i>Streptococcus equinus</i>		0	1	0	1(0.63%)
<i>Streptococcus bovis</i>		0	1	0	1(0.63%)
<i>Streptococcus pyogenes</i>		4	2	2	8(5.06%)
<i>Streptococcus salivarius</i>		0	0	1	1(0.63%)
<i>Corynebacterium ulcerans</i>		0	1	0	1(10.63%)
<i>Arcanobacterium haemolyticum</i>		1	1	0	2(1.26%)
<i>Pediococcus species</i>		0	0	1	1(0.63%)
Total		46	63	49	158

Discussion

Equines are considered to be the most important draught animals especially in some towns and rural areas of the Sudan. In this study, there was a variation in animal population in the areas investigated, which was clearly reflected in the number of samples collected. The population of donkeys is larger than that of horses.

Wounds due to trauma and, sometimes, inhumane care constitute the main problem. Moreover, treatment for most of the infected wounds may prove costly. To the best of our knowledge, no systemic attempts were made in the Sudan to study the cause of equine wound infections to plan for its proper treatment. This study is the first of its kind in North Kordofan State and resulted in the isolation of 158 isolates that belonged to, at least, 21 species of 13 bacterial *genera*, during the different seasons of the year (46 isolates in winter, 63 in summer and 49 in autumn). Seasonal distribution of the isolates obtained is nearly equal, except in the rainy season. This may be due to the variation in number of samples tested and difficulties in collection.

This study shows that the main type of wound observed is saddle wound (n=59), which may be due to continuous irritation of the animal's back; this is justified by the fact that most of the equines in the area examined are used for riding or for pulling carts.

Staphylococcus aureus and *E. faecalis* are among the potential pathogens isolated from wounds and this is in agreement with Ellis *et al.* (1998). The staphylococci associated with wound infections were also previously reported (Beers and Berkow, 1999). *E. faecium* that represents the third isolate in frequency of isolation was also isolated from human wounds (Murry, 1990). Enterococci were reported to be associated with surgical wound infections, (Murray, 1990) and are mainly nosocomial microbes; their exact role in veterinary practice needs further investigation. The isolation of many commensal microflora such as *S. epidermidis*, *B. cereus* and *M. roseus*, is in line with the findings of El Abdeen (2001) who isolated them from contusions of sheep skins.

It is noticeable that many bacterial species were either isolated at low frequency or not at all, particularly in cold dry season whereas the reverse occurred during the hot dry season. The latter finding may be attributed to dust and high number of house-flies,

which enhance contamination, in addition to the heat stress and low nutritional levels in summer.

It is quite logical that the majority of the bacterial isolates were isolated from donkeys in summer. It could be concluded that *S. aureus*, *S. epidermidis*, *E. faecalis* and *E. faecium* are the most dominant isolates and that saddle wounds harbour a large number of bacterial species.

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Table 3: A comparison between wound type and bacterial isolate obtained from

Animals Types of wounds (No examined)	Donkeys								Horses						
	Saddle wound (42)	Incised(4)	Fistula (2)	Open abscess (18)	Cauterization (5)	Abrasion (11)	Haematoma (1)	Puncture (5)	Laceration (5)	Saddle wound (17)	incised (1)	Open abscess (2)	Fistula (1)	Cauterization (1)	Laceration (1)
Bacterial species isolated															
<i>Staphylococcus aureus</i>	14	-	-	3	2	2	1	-		9	-				
<i>Staphylococcus epidemidis</i>	11	-	1	2	-	2	-	-		1	-		1		
<i>Enterococcus faecalis</i>	13	3	1	5	2	5	-	-			1		1		
<i>Enterococcus faecium</i>	8	1	1	1	1	4		1		1	-				
<i>Bacillus licheniformis</i>	6	3		4		1		1		1	-				
<i>Bacillus firmus</i>	1	1		2	1						-				
<i>Streptococcus salivarius</i>	1	-	-	-	-	-		-			-				
<i>Streptococcus bovis</i>	2	3	-	-	-	-				3	-				
<i>Streptococcus pyogenes</i>	1	-	-	-	-	-					-				
<i>Gemella haemolysans</i>	-	1			1	-					1				
<i>Bacillus cereus</i>	-										-		1		1
<i>Aerococcus viridans</i>	4			1						1	-				
<i>Actinomyces pyogenes</i>	1					1		1		1	-		1		
<i>arcanobacterium haemolyticum</i>	-					1				1	-				
<i>Corynebacterium ulcerans</i>	1										-				
<i>Listeria species</i>	2			1		1					-				
<i>Kurthia species</i>	-										-	2			
<i>Micrococcus roseus</i>										1	-				
<i>Streptococcus equinus</i>	1										-				
<i>Micrococcus varians</i>	1										-				
<i>Pediococcus species</i>	1										-				
Total isolates	68	12	3	19	7	17	1	3	0	19	1	3	3	1	1