

Diseases and causes of mortality in a camel
(*Camelus dromedarius*) dairy farm
in Saudi Arabia

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ABSTRACT

The diseases and causes of mortality reported in this study were encountered, throughout one year (July 2001 – June 2002), in a dairy camel farm in Al-Qassim region, central Saudi Arabia. The farm was specialized in the production and marketing of pasteurized camel milk. The camel population in the farm at the study period was composed of 2316 adult and weaned calves besides 126 suckling calves. As camels are usually raised under extensive range conditions, the purpose of this study was to describe and discuss the diseases and causes of mortality that were encountered in intensively kept dromedary camels.

Throughout the period of study, 942 camels were affected with one or more disease condition giving a crude morbidity rate of 38.6%. The ten most common diseases encountered among the camels of the farm were mange (22.6%), mastitis (20.9%), camel dermatophilosis (18.7%), "*Heyam*" syndrome (Trypanosomiasis??) (14.5%), skin wounds and abscesses (4.2%), calf diarrhoea (4.1%), *Diazinon* toxicity (3.5%), snake bites (1.9%), respiratory complaints (1.8%) and papilloma virus infection (1.7%). Other diseases encountered included eye affections (1.2%), metritis (1%), uterine prolapse (1%), retained placenta (0.7%), bone fractures (0.6%), urea intoxication (0.5%), abortions (0.5%) and dystochia (0.4%).

During the period of study, 180 camels died giving a crude mortality rate of 7.4%. The most common causes of mortality recorded in the camel farm were "*Heyam*" syndrome (53.3%), *Diazinon* toxicity (15%), snake bites (10%), calf diarrhea (8.9%), undiagnosed cases (5%), bone fractures (3.3%), urea intoxication (2.8%), uterine prolapse (1.1%) and dystochias (0.6%).

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Introduction

Camels are the most capable animal species in utilizing marginal areas and in survival and production under harsh environmental conditions (Knoess, 1977; Gauthier-Pilters and Dagg, 1981; Hjort and Hussein, 1986; Abbas and Tilley, 1990, Schwartz, 1992). Many pastoral groups and communities in diverse ecozones throughout the world are depending on camels for their livelihood. This dependence consists of utilization of camel meat, milk, leather and wool, exportation of live camels, uses as an important sport and tourism resource in the Arabian Gulf countries and lastly the use of camels as animals for packing, transport and riding (Wilson, 1984; Abdurahman and Bornstein, 1991; Kohler-Rollefson *et al.*, 1992; Snow *et al.*, 1992).

In their natural desert habitat, where camels are usually raised particularly during the long dry season, camels are subjected to severe stress conditions which render them susceptible to many diseases and ailments (Abbas *et al.*, 1993; Agab, 1993). Although camels were considered in the past, and for a fairly long time, as resistant to many disease causing factors (Zaki, 1948; Dalling *et al.*, 1988), it has been proved that camels are susceptible, the same as other livestock or even more, to the common disease causing pathogens affecting other animal species (Wilson *et al.*, 1982; Abbas and Tilley, 1990; Saint-Martin *et al.*, 1992; Abbas and Agab, 2002).

In the last few years some new modes of camel husbandry practices were developed for the improvement of the traditional systems of camel keeping methods. These new trends included the establishment of peri-urban camel dairy farms for the commercial production of fresh or

pasteurized camel milk, camel fattening feedlots, formation of mobile ranches and breeding of racer camels (Mehia *et al.*, 1995; Abbas *et al.*, 1992a; Snow *et al.*, 1992; Abdul Rahim *et al.*, 1994; Abbas *et al.*, 1999).

In this communication the diseases which were encountered and causes of mortality in the camel population of a large dairy farm in Al-Qassim region of Saudi Arabia are reported and discussed.

Material and methods

Description of Al-Qassim region: This region lies in the central plateau area of the Kingdom of Saudi Arabia. It falls between Latitudes 26 and 28 North and Longitudes 43 and 46 East. It consists of vast regions of nearly flat plateaus and plains covered by an irregular veneer of weathered rock, sand and gravel that are interrupted by hills and ridges. As in most of Saudi Arabia, Al-Qassim region is hot and arid with sparse precipitation. The annual rainfall averages 100 mm and falls between January and May (**Al-Qassim Meteorological Station**). The temperature in summer averages 43°C while in winter it is as cold as 8° C. Vegetation is scant consisting mostly of xerophytic herbs and shrubs (Omer, 2002).

History of the farm: The camel farm under study was established in the year 1996 with an initial camel population of 6000 heads. The total population of the camel herd at the study period (July 2001) was 2442 heads of which 126 were suckling calves. The milking herd, which was composed of the lactating females and their suckling calves, was kept in the farm which was shared with other crop production activities. The milking herd was kept without grazing while the dry herd was allowed to graze freely in the range outside the farm premises without provision of supplementary feeds.

Data collection: All camels in the herd were ear-tagged for easy identification and follow up. Health and production records were kept for

all camels in the herd. The health condition of the camel herd was monitored on daily basis by a resident veterinarian. Sick animals were examined clinically for disease diagnosis. Samples were collected from sick camels, whenever needed, and taken to the farm laboratory for proper and confirmatory diagnosis. After prompt diagnosis, treatment was provided to the sick camels accordingly. Dead camels were opened for postmortem investigation to assess and define the cause of mortality.

Results

The different diseases that affected the camel population in the dairy farm and their percentages throughout one year (July 2001 – June 2002) are shown in Table 1. The ten most common diseases encountered throughout the year of study were mange (22.6%), mastitis (20.9%), camel dermatophilosis (18.7%), "*Heyam*" syndrome (Trypanosomiasis ??) (14.5%), skin wounds and abscesses (4.2%), calf diarrhoea (4.1%), *Diazinon* toxicity (3.5%), snake bites (1.9%), respiratory complaints (1.8%) and papilloma virus infection (1.7%). Other diseases encountered were eye affections, metritis, uterine prolapse, retained placenta, bone fractures, urea intoxication, abortions and dystochias.

Diagnosed causes of mortality during the year of study and their percentages are shown in Table 2. The most common causes of mortality can be arranged descendingly as follows "*Heyam*" syndrome (Trypanosomiasis?) (53.3%), diazinon toxicity (15%), snake bite (10%), calf diarrhoea (8.5%), undiagnosed causes (5%), bone fracture (3.3%), urea intoxication (2.8%), uterine prolapse (1.1%) and dystochias (0.6%).

Discussion

Records of diseases encountered in dairy camel herds are scanty in the literature. The results of the diseases encountered and causes of mortality among intensively raised dromedary camels presented in this study are urgently needed to draw the awareness and attention of practitioners and investors to these ailments. Mortality in camel populations was reported to be affected by age and the death rate was found to be higher in camels under six months of age (Khanna *et al.*, 1992; Agab, 1993). Mortality rates among camel calves were found to be ranging between 30% to 50% in Kenya (Bremaud, 1969), 26% in Tunisia (Burgmeister, 1975) and 30% in Somalia (Hussein and Hjort, 1988).

Mange, the most common disease encountered in this study, is one of the most serious diseases of camels. It is extremely pruritic and contagious skin condition caused by *Sarcoptes scabiei* var *cameli*, an ectoparasite with a wide host range (Higgins, 1983). The disease was previously described as the most important disease in free ranging camels in Saudi Arabia (Mustafa, 1984) and in Sudan (Agab, 1993). Since dairy camels are usually kept indoors and in close proximity, this contact favours transmission of the causative agent of mange and hence easy establishment of the disease in the herd. Sarcoptic mange causes serious disturbance to the affected animals which may stop grazing and reduce milk yield. As irritation increases, the camel rubs, scratches and bites the affected area in an attempt to alleviate the itchiness. The skin becomes excoriated, with increased hair loss and more scabs develop (Fig. 1). In severe forms of the disease most of the body surface becomes involved. If untreated, the animal rapidly loses condition and death may ensue (Higgins, 1985).

Although few reports are available in the literature, camel mastitis is not uncommon and is frequently seen in the field (Kapur *et al.*, 1982;

Obeid, 1983). Many microbial pathogens including *Streptococci*, *Staphylococci*, *Klebsiella pneumoniae* and *E. coli*, were isolated from clinical cases of camel mastitis (Kapur *et al.*, 1982; Quandil and Oudar, 1984). The high prevalence of camel mastitis reported in this study (21%) necessitates more attention to be paid to achieve better prevention and control of this serious production-depressing disease.

Camel dermatophylosis caused by *Dermatophilus congolensis* was described in camels in Kenya (Gitao *et al.*, 1990; Gitao, 1992), Sudan (Gitao *et al.*, 1998a) and Saudi Arabia (Gitao *et al.*, 1998b). The disease is characterized by extensive skin matting over the abdomen and hind limbs followed by scab formation (Fig. 2). Most of the skin may be covered by powdery crust with varying degree of alopecia and young camels tend to be more severely affected.

"Heyam" Syndrome was found to be the fourth common prevalent disease in the farm under study. This syndrome was described by the veterinary practitioners in Al-Qassim region to be due to trypanosomiasis. Trypanosomiasis was known as the major protozoal disease affecting camels and imposing considerable constraints on camel production throughout the tropics and subtropics (Mahmoud and Gray, 1980). In this study, however, it was not possible to demonstrate the causative agent, *Trypanosoma evansi*, in most of the blood samples examined in the farm laboratory. Neither the treatment was successful in most of the clinical cases using the known effective anti-trypanosomals such as *Naganol* (Suramin) (Bayer AG, Leverkeusen, Germany), *Cymelarsan* (Bis-4-melaminophenylarsine dihydrochloride) (Rhone-Merieux, Lyon, France) and *Antrycide* (Quinapyramine sulphate) (Rhone-Merieux, Lyon, France). It is strongly recommended and justified to investigate thoroughly into this syndrome and solve the difficulty characterizing the classical parasitological diagnostic techniques which often fail to detect the

causative agent, *T. evansi*, in the affected camels (Rae and Luckins, 1992). Other microbial disease conditions might be occurring simultaneously or might be the primary cause of this syndrome.

Abscesses involving the skin and adnexia of camels are frequently seen (Leese, 1927; Abbas and Omer, 2005). The lesions may incorporate the skin, subcutaneous tissue and commonly the lymph nodes. The invasion of these structures by pyogenic bacteria may be the result of tick or fly bites. Puncture wounds such as those caused by *Acacia* thorns, bites from small animals or secondary infections following diseases such as camel pox may also lead to abscess formation. Saddle and baggage sores are frequently encountered in working camels (Agab, 1993).

Camel calf diarrhea was among the common diseases affecting suckling dromedary calves resulting in high mortality rate among this age group particularly in intensively kept camel herds (Saint-Martin *et al.*, 1992; Schwartz and Dioli, 1992). Etiologically, the disease was caused by mixed infection with numerous microbes, notably *Salmonella* spp. and *E. coli* (Abbas *et al.*, 1992b; Bengoumi *et al.*, 1998). Other microbes involved in the aetiology of this disease include *Clostridium perfringens* (Ipatenko, 1974; El-Sanousi and Gameel, 1993), *Campylobacter coli* (Moore *et al.*, 2002) and rotavirus and adenovirus in association with enterobacteriaceae (Mahin *et al.*, 1983; Khalafalla and Mohamed, 1996). Certain traditional practices followed by some camel herding tribes such as colostrum overfeeding or colostrum withdrawal were incriminated as predisposing factors for diarrhoea in dromedary calves (Khanna *et al.*, 1992).

The high incidence of toxicity due to *Diazinon* was attributed to the misuse of this insecticide by the camel herders through administration via drinking water. However, the poisoning due to urea was caused by

accidental accessibility of the camels to this fertilizer in the farm as it was obtained for soil fertilization to improve crop yields.

Diseases of the respiratory tract, particularly pneumonia, were among the most important and commonly encountered diseases of camels (Abbas and Omer, 2005). Housing of camels in unsheltered pens (Chauhan *et al.*, 1986; Abbas *et al.*, 2002) as well as the long treks undertaken by camels during the rainy season were major predisposing factors (Schwartz and Dioli, 1992; Agab and Abbas, 1999).

Although papillomatosis was reported to occur fairly commonly in young camels (Khalafalla and Mohamed, 1996; Wernery and Kaaden, 1995), reports on the pathology of the disease are rare. The disease affects mostly young camels and causes nodular lesions, mostly around the mouth.

Affections and deaths of camels due to snake bites were previously reported in free-ranging herds particularly during night grazing as a result of poor and insufficient pasture resources (Agab, 1993). The high incidence of snake bites reported in this study happened in the first few months after moving the herd to the new farm site.

Diseases and clinical manifestations associated with pregnancy and calving such as dystochias, uterine prolapse and retained placenta were frequently encountered in camels (Ramadan *et al.*, 1993). Genital tract infections of the dam and difficult parturition were described as important causes of death in camels (Shalash, 1965). Abortion in camels, on the other hand, was reported to be associated with various pathological conditions such as salmonellosis, trypanosomiasis, campylobacteriosis or trichomoniasis (Wernery and Amjad Ali, 1989; Wernery, 1991; Wernery and Wernery, 1992). High incidence of abortion should be considered as one of the major factors limiting herd size growth and affecting herd productivity (Agab, 1997).

Accidents and long bone fractures were frequently associated with bad housing design (Figs. 3 and 4) or fighting between male camels for dominance. In young females, avulsion of both epiphyses of the forearm may arise in an attempt to escape from undesired mating (Satterfield and Lester, 1974). Most of the cases of bone fractures encountered in this study were terminated in emergency slaughter.

The eye affections encountered in this study included conjunctivitis, keratitis and corneal ulcerations. The main causes for these affections were traumatic injuries, lodging of dust particles during windy storms or due to microbial pathogens particularly *Moraxella* or *Neisseria* species (Ramadan, 1994).

It can be concluded that, most of the diseases and causes of mortality encountered in intensive dairy farms of camels could be controlled using better management strategies, particularly proper housing designing, close follow-up and simple common sense.

Table 1. Diseases encountered and number of camels affected in a camel dairy farm in Al-Qassim region, Saudi Arabia.

Serial number	Disease condition	Number and percentages of affected camels
1	Mange	213 (22.6)
2	Mastitis	197 (20.9)
3	Camel dermatophilosis	176 (18.7)
4	"Heyam" syndrome (Trypanosomiasis)	137 (14.5)
5	Skin wounds and abscesses	40 (4.2)
6	Calf diarrhoea	39 (4.1)
7	<i>Diazinon</i> toxicity	33 (3.5)
8	Snake bite	18 (1.9)
9	Respiratory complaint	17 (1.8)
10	Papilloma virus infection	16 (1.7)
11	Eye affections	11 (1.2)
12	Metritis	09 (1)
13	Uterine prolapse	09 (1)
14	Retained placenta	07 (0.7)
15	Bone fracture	06 (0.6)
16	Urea intoxication	05 (0.5)
17	Abortion	05 (0.5)
18	Dystochia	04 (0.4)
	Total	942

Figures between brackets are percentages.

Table 2. Number and causes of mortality among camels in a dairy camel farm in Al-Qassim region of Saudi Arabia.

Serial Number	Cause of mortality	Number and percentages of mortality
1	"Heyam" syndrome	96 (53.3)
2	<i>Diazinon</i> toxicity	27 (15)
3	Snake bite	18 (10)
4	Calf diarrhoea	16 (8.9)
5	Undiagnosed causes	09 (5)
6	Accidents and fractures (emergency slaughter)	06 (3.3)
7	Urea intoxication	05 (2.8)
8	Uterine prolapse	02 (1.1)
9	Dystochia	01 (0.6)
	Total	180

Figures between brackets are percentages.

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