Introduction

Camels can live in areas that are inhospitable to other domestic animals and are therefore an important factor in the capacity of humans to survive in and make use of these drier regions. Camels provide milk, meat, wool, hides and skin, and their dung is used for fires. They are used for riding and transport, they are a means of investment and long-term savings, they are a source of prestige for their owners, and there is a large market for trade in live camels. Sales of surplus milk, livestock or livestock products are sources of cash income for pastoral families. Camels are slaughtered for consumption and during ritual occasions.

The camel seems to be spared from the devastating epidemic infections which threaten other livestock species in the same region, e.g. rinderpest, contagious pleuropneumonia and foot and mouth disease, the animal is however affected by many other diseases, some of which are unknown to date. Camel diseases that are shared with other species of livestock are comparatively well-known, while other camel-specific diseases, although well-known to pastoralists for generations, still remain a mystery to the scientific community.

Somali herders are renowned for their use of ethno-veterinary knowledge in matters of livestock health and husbandry (1, 4, 14). This knowledge is a valuable resource that can help in the identification of previously unrecognised livestock diseases. These diseases need to be studied and characterised for appropriate cures to be developed. This paper provides observations on and clinical descriptions of five camel diseases, namely, Lahaw-Gaal, Firaanfir, Laaba, Jajabsa and Yudleye, which are not described, or are poorly described in the literature.

Materials and methods

The observations and clinical descriptions of the diseases provided in this paper, as well as their names, are from north-
eastern Kenya and are shared by other ethnic Somali herders in Somalia, Ethiopia and Djibouti. During the study, routine diagnostic work and interviews with livestock keepers were conducted according to normal veterinary practice. Interviews included case histories for sick camels, livestock keeper descriptions of clinical signs, the local name for the disease and local views on epidemiology, treatment and prevention. Complete records of the number of camel herds examined and keepers interviewed were not kept, but the interviews of key respondents were recorded and participatory workshops were held to discuss the results. Physical examinations of the sick camels were carried out whenever possible.

To investigate the relationship between Yudleye and trypanosomosis, 0.5 ml of blood was collected from the jugular veins of ten affected camels from three different locations, and placed in vacuum tubes containing ethylenediamine tetra-acetic acid. The samples were then examined for the presence of trypanosomes, as wet smears and after concentration of any trypanosomes by the micro-haematocrit centrifuge technique (20). If an animal was found to be trypanosome-positive, giemsa-stained thin smears were prepared from fresh blood samples and were then examined in an attempt to identify the Trypanosoma spp.

Results

Lahaw-Gaal

A disease known in Somali as Lahaw-Gaal, which translates as ‘camel fever’, affects herds in north-eastern Kenya. This disease occurs during the rainy season when there are large populations of mosquitoes. The disease affects mostly adult animals. The illness is only marked for three to seven days but the effects thereof last longer.

The main signs of Lahaw-Gaal are high fever, lameness, swollen feet, swollen eyelids, rough coat, reduced milk yield, a watery consistency of the milk, and abortion. Pastoralists in the endemic area practice no traditional treatment of this disease. Injections of broad-spectrum antibiotics produce no improvement. Since the herdsmen believe that mosquitoes transmit the disease, they try to minimise mosquito-camel contact by avoiding mosquito-infested areas, using smoke as a mosquito repellent in the enclosure at night, and, recently by using ‘pour-on’ insecticides.

Firaanfir

There is a wide belief among ethnic Somali pastoralists in the Horn of Africa that the naked mole-rat (Heterocephalus glaber) bites camels and that camels bitten by these rats develop a serious disease known to the herdsmen as Firaanfir (the Somali name for the mole-rat). The main signs of Firaanfir are depression, high fever, swelling of the bitten area (which is often the belly, between the udder and sternum, and, in male camels, the penis [Fig. 1]). If left untreated, Firaanfir develops into a chronic debilitating disease. Firing is a common traditional method of alleviating the effects of Firaanfir. The swollen area is encircled with a red-hot iron before crosses are made inside this circle, leaving permanent, brand-like markings. Five camels suffering from Firaanfir and allegedly bitten by naked mole-rats recovered fully after each was given a single injection of a long-acting broad-spectrum antibiotic.

Fig. 1
A male camel showing swelling of the abdomen allegedly caused by the bite of a naked mole-rat

Jajabsa

Jajabsa, which literally translates as ‘the one that breaks up’, is a disease of pregnant camels during the later stages of gestation and is characterised by paralysis of the hind legs. The disease affects all camel breeds, but the most susceptible is the ‘horr’ breed, known for high milk yields. Most animals recover after parturition but complications, such as dislocation of the hip joint and piercing of the hipbone through the skin, occasionally occur. Animals that develop complications are often killed. The only treatment known to pastoralists is firing on both sides of the pelvic area and around the tail (Fig. 2), but this treatment is not likely to be very effective.

Laaba

After the El-Niño phenomenon of 1997-1998, when the north-eastern province of Kenya received eight to ten times more rainfall than the annual norm, there was an outbreak of a disease called Laaba. The disease was reported in camels from areas of this province where heavy tick populations were present. Laaba, literally ‘the one that twists’, is a disease of camels characterised by unco-ordinated movements or unsteady gait, and paralysis of the hind legs, resulting in recumbency. During recumbency, the necks of some camels twist into an ’S’ shape (hence the name Laaba). The animals that develop this ‘wry-neck syndrome’ (Fig. 3) often do not recover and subsequently die, whereas those that do not
develop a twisted neck usually recover after a recumbency of three to seven days. Laaba occurs periodically and generally, as in the 1998 outbreak, after unusually heavy rains.

Pastoralists attribute the disease to a particular type of tick (which they call the Laaba tick), since outbreaks of the disease cease when herds leave tick-infested areas. In Kenya, the district veterinary officer for the Wajir district, Dr M.H. Yussuf, recently collected ticks from recumbent camels suffering from Laaba and these were identified as *Rhipicephalus appendiculatus* by the Kenya Agricultural Research Institute in Maguga (M.H. Yussuf, personal communication). The ticks attach to the lower parts of the legs of animals in pasture and then spread to other parts of the body, particularly under the tail, the udder and the head, as the infested animals sink into sternal recumbency. The only treatment measure attempted by pastoralists is the removal of ticks from the camels, either manually or by use of acaricides.

**Yudleye**

The term Yudleye is a description of an emaciated animal aimlessly moving or jolting forward. Pastoralists associate Yudleye with insect bites and the disease is common after heavy rains when camels are exposed to high and prolonged challenge from biting flies. In the earlier stages, Yudleye resembles trypanosomosis, with affected animals presenting with a rough coat, intermittent fever, progressive emaciation, loss of hair from the tail and a characteristic smell of urine. The animals subsequently develop a nervous disorder, considered by pastoralists as madness, and stray from their herds, stop eating, lift their heads unusually high and walk through normally effective barriers such as those forming the traditional thorn-bush enclosures. Loss of appetite causes the normally large and extended bellies of the camels to become reduced in size and the animals appear much sleeker, like breeds of racing camels.

Trypanosomes were detected in the blood samples of seven of the ten camels examined. On the basis of morphological characteristics, all the parasites detected were identified as *Trypanosoma evansi*. In addition, all ten Yudleye cases investigated recovered fully after treatment with a single, standard dose of either isometamidium chloride or quinapyramine sulphate. Similarly, trained community-based
animal health workers reported to have successfully treated over 200 cases of Yudleye with the above trypanocidal drugs (I. Farah, personal communication).

Using specimens previously identified by the Welsh Museum of Natural History in Cardiff, Wales (7), flies taken from camels at various Yudleye-affected locations in the north-eastern province of Kenya in 1998 were identified as Pangoninae (Pangonia [Stenophera] zonata), Tabanidae (Tabanus taeniola and Atylotus agrestis) and as unidentified species of Haematopota, Stomaxys and Ceratopogonidae (biting midges).

Discussion

Lahaw-Gaal

The epidemiology and clinical manifestations of Lahaw-Gaal indicate a mosquito-borne viral disease. Another such disease, bluetongue, affects mostly sheep and goats but camel infections with the virus remain sub-clinical (5). Lahaw-Gaal has many similarities with and is closely related to or identical to the cattle disease known as bovine ephemeral or three-day fever. Catley and Mohammed (3) reported a disease called Laxawgal in Somalia, characterised as a mild respiratory disease only, but which still fits the term 'camel fever'.

Firaanfir

Several observations support the view of pastoralists that naked mole-rats are implicated in the transmission of this disease. The mole-rat, which has a poor thermo-regulation system, is attracted to the warmth of recumbent camels, particularly the area between the hind legs and the sternum, and probably bites in defence as the camel, irritated by the rat, moves in search of a more comfortable position. The four sharp incisors and powerful jaw muscles of the naked mole-rat, which feeds on hard roots and tubers, are quite capable of wounding a camel. Other rodents may transmit pathogens to mammals when they bite. The bites of Rattus spp., for example, may transmit the micro-organisms responsible for rat-bite fever in humans (13). The fact that camels suffering from Firaanfir generally respond well to treatment with antibiotics adds further weight to the possibility that Firaanfir is caused by micro-organisms transmitted through the bites of the mole-rat.

Jajabsa

The main characteristics of Jajabsa (sudden onset, paralysis, recumbency and recovery after parturition) resemble those of the fairly common condition of cattle and small ruminants known as ante-partum paralysis, although this problem has never been described in camels.

Laaba

The distribution of Rhipicephalus appendiculatus (which is the vector of the protozoan blood parasite Theileria parva that causes East Coast fever in cattle) is normally limited to the relatively wet, high and coastal areas of Kenya (17). However, during years of above-average rainfall, this tick species is known to spread to normally arid and semi-arid areas (in which most camels are kept), disappearing from these areas as they become dry once again (16, 21). In 1998, for example, as a result of the heavy rains and floods caused by El-Niño, Rhipicephalus appendiculatus spread into many parts of the north-eastern province of Kenya, reaching as far as Mandera on the border with Somalia and Ethiopia.

Although tick-borne paralysis has been reported in camels in Somalia (18) and Sudan (15), the phenomenon of twisted necks of affected camels has never previously been linked to ticks. Twisting of the neck, however, has been associated with the disease, thought to be a nervous disorder, called Shimbir in Somali or ‘wry-neck syndrome’ (9, 19). Tick paralysis and ‘bent-neck syndrome’ are reported to be the second most common causes of mortality in summer among the camels of the Butana plains in Sudan (2). In Sanaag, herders associated shilincas (Rhipicephalus evertsi evertsi) with camel paralysis – they called the disease ‘muglo’ (3).

Plant poisoning due to Capparis tomentosa (the Somali vernacular name is Gomorr or Gomboor) should also be mentioned at this point. The symptoms of poisoning caused by the plant may last as long as two weeks. The animal loses co-ordination and collapses after three to four days. Poisoning by Capparis tomentosa was implicated as the prime cause of the bent-neck syndrome (or ‘wry-neck’) by Idris et al. (11) who attempted to produce a similar condition by experimentally dosing camels with the leaves of the plant.

Based on the above, the ‘wry-neck syndrome’ might not therefore be a specific disease or ailment, but a common manifestation of several factors (multi-factorial genesis) that affect the central nervous system. The possible bacterial role of at least some of these was suggested when many purulent meningoencephalitis cases were encountered during random screening of camel diseases in Somalia (O. Abdurahman and F. Jama, 1997, unpublished data). Unfortunately, the material examined was from abattoirs and the clinical history of the cases could not be retrieved.

Yudleye

Trypanosomosis is widespread in most camel-rearing countries of the world and is usually considered to be the most important disease of camels (6, 7, 10). Somali pastoralists distinguish two forms of the disease, namely, a chronic form (Dhukan or Salaf) associated with biting flies other than tsetse, and an acute form (Gandi) transmitted by tsetse flies (12). Camel owners in north-eastern Kenya generally have a good understanding of the
Aetiology of trypanosomosis and use several long-held and time-proven strategies to minimise vector-camel contacts. Pastoralists avoid areas infested with biting flies, allow their camels to graze at night, use smoke as a fly repellent and now also use pour-on insecticides. In most years, these strategies are sufficient to curtail the spread of the disease in the herds. As with ticks, however, exceptional weather, such as that caused by El-Niño, may permit unusually large populations of biting flies to develop, to persist for periods of more than a year and to spread to unusual areas such as the open plains. At such times, the routine strategies of pastoralists may not be effective enough to prevent a major outbreak of camel trypanosomosis.

Although over 90% of pastoralists in the north-eastern province of Kenya treat camels suffering from trypanosomosis themselves, their knowledge of modern veterinary drugs and their ability to use such drugs safely and effectively are rather poor (8). Abuses and quackery such as under-dosing (caused, for example, by splitting a dose intended for one animal between four or five camels) or the use of the wrong route of administration (such as the intravenous inoculation of all injectable drugs) are widespread. The owners of all ten animals checked for trypanosomes claimed that they had treated the animals with quinapyramine sulphate, but all were found to have received doses of the drug that were far too small. Unsurprisingly, the owners reported that their ‘treatments’ resulted in a rapid but slight improvement followed by a relapse seven or eight days later.

Yudleye is one of the very few camel diseases that puzzle even experienced herders. Some consider the disease to be a form of trypanosomosis, whereas others (because of the indications of central nervous system involvement, the failure of ‘treatments’ with trypanocides, the common occurrence of the disease in only a few animals in large herds, and the apparent association of the disease with heavy rains), regard it as a separate entity. Schwartz and Dioli (19) reported, confusingly, that ‘Yudle’ is the Somali name for rabies. Although signs of madness may be observed in some animals with late-stage Yudleye, aggressiveness and salivation which characterise animals with rabies do not seem to occur. Rabies (Warabow in Somali) is also well known to pastoralists and is not commonly seen in camels in the area. Yudleye or Yudle does appear to be a form of trypanosomosis, but further studies are required to shed more light on this disease.

This paper has been presented in the hope of initiating thought-provoking discussions among veterinarians and practitioners working with similar groups. The lives of the people in the Horn of Africa are inextricably linked with their livestock and they have developed knowledge in animal husbandry and diseases. Such indigenous knowledge, when integrated with scientific knowledge, is invaluable for preventing, diagnosing and treating disease efficiently and economically. The reconsideration of traditional medical systems is also justified when modern medicine is too expensive and often beyond the reach of most camel producers, who are mainly pastoralists. Scientists must incorporate traditional knowledge and ethnoveterinary care of animals in their development plans. This will not only result in acceptability and affordability, but will probably also enhance efforts to make veterinary practices and the animal health delivery systems in pastoral areas both attainable and sustainable.

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Observations de maladies peu connues du dromadaire (*Camelus dromedarius*) dans la Corne de l’Afrique

M.F. Dirie & O. Abdurahman

Résumé
Animal relativement robuste, le chameau est moins sensible aux nombreuses maladies qui sévissent parmi les autres espèces élevées dans les mêmes régions. Cependant, il n’est pas rare qu’il contracte d’autres maladies, dont certaines sont toujours inconnues. Voilà des siècles que les éleveurs nomades des zones arides et semi-arides du Kenya et des autres régions de la Corne d’Afrique gardent leurs troupeaux de chameaux. Ils ont été confrontés à une multitude de maladies nouvelles, auxquelles ils ont donné un nom. Toutefois, l’origine de la plupart de ces maladies (Lahaw-Gaal, Firaanfir, Laaba, Jajabsa et Yudleye, par exemple) reste un mystère.

Les auteurs rapportent les observations des éleveurs nomades relatives à plusieurs maladies des chameaux du Nord kenyan. Ces observations offrent des pistes fascinantes pour les vétérinaires contemporains qui s’efforcent de caractériser ces maladies et d’en établir l’étiologie pour leur trouver des traitements efficaces. En outre, les auteurs livrent quelques exemples du savoir et des pratiques etno-vétérinaires qui pourraient contribuer au développement de la santé et de la production animales en Afrique.

Mots-clés

Observaciones sobre enfermedades poco conocidas de los camellos (*Camelus dromedarius*) en el Cuerno de África

M.F. Dirie & O. Abdurahman

Resumen
El camello es un animal relativamente resistente y menos susceptible a muchas enfermedades que otras especies ganaderas que comparten el mismo hábitat. Ello no es óbice para que contraiga numerosas dolencias, algunas de las cuales aún se conocen. En las zonas áridas y semiáridas de Kenia y otros países del Cuerno de África, los pastores llevan siglos ocupándose de rebaños de camellos y observando y bautizando gran número de nuevas enfermedades. Todavía se desconocen, sin embargo, las causas exactas de muchas de estas patologías, que tienen nombres como Lahaw-Gaal, Firaanfir, Laaba, Jajabsa o Yudleye. Los autores dan cuenta de las observaciones de los pastores sobre algunas de las enfermedades observadas en los camellos del norte de Kenia. Esa información proporciona indicios intrigantes a los veterinarios que están intentando definir y caracterizar la etiología de las enfermedades con el objetivo último de dar con tratamientos eficaces contra ellas. Los autores ofrecen también ejemplos de conocimientos y usos etnoveterinarios que podrían resultar útiles de cara al desarrollo de la sanidad y la producción animal en África.

Palabras clave
References


