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Diseases of Camels (Camelus dromedarius) in Somalia and Prospects for Better Health

Omar Sh. Abdurahman and Set Bornstein

Diseases diagnosed in camels (Camelus dromedarius) in Somalia are mentioned and described, together with an outline of traditional knowledge of such diseases and healing practices. The difficulties of interpreting the significance of sero-epidemiological studies of camels using methods originally designed e.g. for cattle are discussed.

Although camel disease research is still in its infancy, there is ample scope to improve the health and production of the animals by introducing extension services including disease prophylaxis, treatment, and better management.

Introduction

Camels are particularly known to be hardy animals, very well adapted to the harsh arid and semi-arid conditions in which they are usually husbanded. The camel seems to be spared from the devastating epidemic infections like rinderpest and foot and mouth disease, which threaten other live-stock species.

There are few known infections of an epidemic nature which affect camels (e.g. camel pox). Ticks are commonly found on camels and although tick infestations can be heavy, none of the common tick-borne diseases infecting cattle and small stock have yet been found to seriously infect camels. However, camels have only recently attracted the interest of the scientific community. Thus, rather little is known of the biology (physiology, nutritional requirements, disease spectra, husbandry, etc.) and the management of this domestic animal, even though it is and has been of enormous importance to man in drylands.

Systemic studies of the diseases of Somali camels are lacking. However, some efforts have been made to elucidate what infections camels can contrive by using sero-epidemiological surveys. This indirect approach is unsatisfactory unless it is coupled with other diagnostic methods for the

identification and isolation of the pathogen, which preferably should be done during disease outbreaks (when the animals are showing clinical symptoms, which could then be correlated to the infection of that particular pathogen isolated). This has, according to the literature, only been accomplished with few diseases, e.g. trypanosomiasis.

There are other drawbacks when using diagnostic methods that are more relevant for other animal species, especially when these methods have not been tested experimentally on the animal species of interest, in this case, camels. Serological studies on Toxoplasma gondii, Brucella abortus, Parainfluenza 3-virus, Bovine Viral Diarrhoea virus, etc., have been done on camels using methods relevant for cattle (Burgemeister et al., 1975; Bornstein, 1988).

In recent years, two pathogens of zoonotic and reproductive importance to cattle and sheep, respectively, have been isolated from camels, *B. abortus* and *T. gondii* (Al-Khalaf and El-Khalad, 1989; Hagemoser et al., 1990). High antibody titres against these two pathogens have earlier been reported from camels. However, the significance of these findings (prevalence etc.) could not be clearly interpreted. Other difficulties are encountered in the serology employed against some pathogens, e.g. *Brucella abortus*, which

can show cross reactions to other *Brucella* species and to different strains of *Yersinia enterocolitica* (Ahvonen et al., 1969). *Y. enterocolitica* serotype 09 was isolated from camels showing high antibody titres against *B. abortus*. However, *B. abortus* could not be isolated from any of the camels (Sunaga et al., 1983). Information on many of the diseases described from Somalia originate from sero-epidemiological surveys and slaughter house material. Complementary information and data is needed particularly from the field. In addition, significant information can also be generated through informal discussions with owners and participant observations.

The Somali herding communities have through generations accumulated thorough experience of husbandry, management, and diseases of camels. Traditional healers have their concepts of causes of disease. They recognize certain diseases to be transmitted by insects and ticks and have some understanding of the infective nature of some diseases. Nevertheless, other diseases are considered a result of envy, evil eye, or unhealthy weather, etc. Likewise, the Somali healers have their own traditional remedies based on the above concepts. Charms, herbal remedies, cauterization and bleeding are used. Brand-marks are commonly seen on domestic animals on various parts of the body. There is a wide range of plants used both per os and externally. Some other pathological conditions, wounds and fractures, are traditionally treated by the owners.

In the traditional healing practice, the prevention of disease is employed. There are those who are respected for their skill in preventing diseases. They can recommend that the herdsmen should avoid taking the animals to certain places known to harbour tsetse flies, or where anthrax is common, or where diseased herds are or have been present. Although traditional healing systems are still widely practised, modern veterinary medicine introduced during the colonial period has been gaining ground and is preferred for some particular disease entities, i.e. trypanosomiasis. In many other

instances, although the traditional medicinal practices are not satisfactory, "modern" alternatives are not at hand due to poor infrastructure and veterinary organisation (lack of veterinarians and poor supply of adequate drugs throughout the country, particularly in remote areas, and lack of equipment and transport). This has led to a wastage of drugs, and to incorrect choice, dosage, and administration of drugs, all of which leaves the animal owner frustrated.

Diseases Reported to Occur in Somalia

Trypanosomiasis (Gol, Dhukaan)

Among the camel diseases known in Somalia, trypanosomiasis is the most feared and widespread. Although well known in its classical form, the many names for the disease show the confusion in the herders' minds by the many and different clinical manifestations of this periodically febrile chronic disease. It is characterized by recurrent fever, anaemia, emaciation and oedema. Abortions and premature births are also reported. The casual organism is *Trypanosoma evansi*. Other trypanosomes (*T. congolense* and *T. brucei*) are reported to infect camels (Pelligrini, 1948). Of 3000 Somali camels examined for trypanosomiasis, 160 were infected with *T. evansi* and only one each with *T. congolense* and *T. brucei* (Dirie et al., 1989). The tabanids *Philoliche zonata* and *P. magretti* are incriminated as the major vectors of the disease in Somalia. Camel owners can diagnose the disease in its classical form. They claim that they can diagnose the disease by the particular smell of the urine of sick animals. This ability to diagnose trypanosomiasis by the odour of the urine is known and practiced by many camel breeders around the world.

Sarcoptic mange (Cadho)

This disease is common in camels and is recognized by many to be second to trypanosomiasis in importance. It is caused by *Sarcoptes scabiei* and is characterized by pruritus and dermatitis. There is loss of hair

(alopecia). The skin becomes wrinkled and crusty (hyperkeratosis). The affected animal loses condition and weight. The mite can be difficult to isolate. It is claimed that the disease can be cured by local application of traditional medicinal plants such as *Vernonia mogadoxensis* (*gagabo*), the extract of which has been alleged to be effective against the disease when tried on infected goats (Guleed et al., 1987/88). However, herders do appreciate modern methods of cure (acaricides including Ivermectin).

Camel pox (*Furuqa geela*)

Camel pox often manifests itself as a benign disease, but it can be very serious in young animals especially during the rainy season. It is caused by an *Orthopox virus* and spread by direct and indirect contact. The disease is characterized by fever, followed by the development of a rash on the body, particularly where the skin is thin (lips, head, neck, limbs, mammary gland, genitalia and the anal regions). Lesions usually appear on the mucous membranes of the mouth with swelling of the lips and the formation of papules. Papules turn into vesicles, then into pustules on which crusts form. At times lesions can develop into deep ulcers, though the crusts usually fall off leaving pock marks (Kritz, 1982).

Camels suffer severe irritation and are unable to graze (particularly thorny bushes), which leads to loss of condition and reduced milk yield. Camel owners attempt to protect young animals by taking the crust from infected animals, mixing and diluting it with fluid and then rubbing this mixture on the pricked lips of the young animals.

Camel Contagious Ecthyma

Contagious ecthyma in camels is a benign (mild) disease caused by a parapoxvirus. It is characterised by localised poxlike skin lesions with high morbidity and no mortality. There are few reports of this disease from Somalia (Moallin and Zessin, 1988).

The symptoms can sometimes be confused with camel pox. Poxlike lesions develop often localised and sometimes generalised.

Pustules and scabs can be seen on the head particularly around the lips and nostrils. In some generalised cases the head is oedematous (swollen) and so are the mandibular and cervical lymph nodes.

The infection seems to occur often during the rainy seasons and is seen mostly in young animals, 6 months–2 years old. Recovered animals do not get the disease again. Confirmation of the diagnosis is by finding the parapox virions in electron microscopy.

Camel Papillomatosis

Wartlike skin lesions are often seen in abundance around the lips and nostrils in young animals (6–18 months). In older animals warts can be found in other areas of the body, e.g. on the teats. The warts are caused by a papilloma virus (Munz et al., 1990). Mixed infection of warts and contagious ecthyma is sometimes found.

Anthrax (*Kud*: Sudden death)

This disease is reported in camels in Somalia (Mares, 1954) and unlike in cattle, the disease usually runs a protracted course in camels with painful swelling of the superficial lymph glands and glands at the base of the neck. It occurs during the rainy season and at times the outcome can be fatal. Camel owners try to avoid grazing areas known to harbour the disease and if an animal dies of anthrax, a thorny bush enclosure is built around to prevent spread of the disease. Attempts to cure the disease are made with charms and cauterisation of the swollen glands.

Salmonellosis

Salmonella organisms have been isolated from apparently healthy camels from the field and slaughter house material (Andreani et al., 1980; Hayles, 1986). An outbreak of salmonellosis due to *Salmonella choleraesuis* has been reported in northeast Somalia (Cheyne et al., 1977). Affected camels showed fever, enlarged lymph glands, intermittent attacks of diarrhoea and haemorrhagic gastroenteritis. In Somalia, sick animals with little or no chance to recover are usually slaughtered and eaten for meat. Food

poisoning due to Salmonella can therefore be a possible public health hazard (Cheyne et al., *ibid.*).

Tuberculosis (Urug, Feero)

This disease, although comparatively rare, has been reported to affect Somali camels (Angrisani, 1962; Pelligrini, 1946) and is chiefly a disease of old camels. The disease is characterized by progressive debility and coughing. Pathologically, the principal lesions appear in the thoracic cavity with caseous nodules and granulomatous masses in the lungs. Caseous nodules may appear in liver, spleen and lymphnodes. Mycobacterium bovis has been isolated from cases of tuberculosis in Somali camels. Most of the tuberculosis in humans in Somalia is of the human type (Angrisani, 1962).

Tetanus (Kojiso)

According to herders this disease affects camels occasionally. There is one only clinical case reported in Somali camels (Mares, 1954).

Contagious Skin Necrosis (Maco)

Contagious skin necrosis in camels is usually a disease of the adult and is characterized by necrosis of the skin, abscess and sinus formation, and enlargement of lymphglands. Peck (1938 and 1939) first reported the disease in northern Somalia. He described extensive lesions which may appear on any part of the body and associated them with salt deficiency. Edelstein and Pegram (1974) found lesions mostly situated in the centre of the gluteal region and less frequently in the skin of inguinal, perineal and lower cervical regions. Streptococcus agalactiae was incriminated as causing the skin lesions. However, other bacteria have also been isolated from contagious skin necrosis, e.g. Staphylococcus aureus, Corynebacterium spp., and Dermatophilus sp. (Wernery and Ali, 1990; Sarkisov et al., 1989). Gitao, et al. (1990) isolated Dermatophilus congolensis from skin lesions in Kenyan camels with a disease resembling contagious skin necrosis.

Nervous disorders

There are several syndromes reported to affect Somali camels and recorded under different names, including Posterior paralysis, Rabies like virus, Tick paralysis/tick toxicosis (*laaba, gubdow*), Twisted neck (*shimbir*), etc. These syndromes are characterized by marked disturbances of the nervous functions.

Two types of shimbir are classified as *shimbir madax* (twisting of the neck) and *shimbir calool* (colic like symptoms).

Posterior paralysis is a paralysis of the hind limbs where the animal sits and is unable to stand. This is thought to be caused by tick toxins.

Muscular tremor, madness and sometimes generalised paralysis are seen in the so-called "rabies like virus disease". The aetiology of the above conditions and their clinico-pathological features are not well known. However, the possible bacterial role of some can not be ruled out as many purulent meningoencephalitis cases were encountered during a random screening of camel diseases in Somalia (Jama and Abdurahman, 1987, unpublished data). Unfortunately, the material was from abattoirs and the clinical history of these cases could not be retrieved. Guleed and Bornstein (1986) claimed a successful treatment of a shimbir case by administering high doses of vitamin B6.

Sarcocystis

Camels are the intermediate host of Sarcocystis cameli and are infected by the ingestion of sporulated oocysts passed in the faeces of dogs, the final host (Hilali, 1980). The characteristic sarcocysts are found, usually at postmortem examinations, embedded in the striated muscles of the heart, diaphragm and oesophagus. Histological examination of the heart muscles of 199 camels revealed a prevalence of four per cent (Jama, 1987, unpublished data). Using trypsin digestion technique and histological examination of heart, oesophagus and diaphragm, Borrow et al. (1990, manuscript) found 82.5 percent infested with Sarcocystis spp. of 200 slaughtered camels in Mogadishu. Alden

and Bergvall (unpublished data) found serologically (ELISA) a prevalence of 5 percent positives in 234 sera from camels of Somalia including 80 of the 199 camels investigated by Jama (*ibid.*).

Coccidiosis (Gut dwelling coccidia)

There is no record of clinical coccidiosis in camels. *Eimeria cameli* and other *Eimeria* infections have been reported from camels in Somalia (Cankovic, 1984), mostly from observations on apparently healthy camels. Reports of clinical coccidiosis with diarrhoea and loss of condition are lacking. Many undiagnosed episodes of enteritis, particularly in young and neonatal camels, could have been due to coccidiosis.

Helminthiasis (Goryaan, Caal)

Helminth parasites are common in camels in Somalia and data on the parasitic fauna of camels is available (Cankovic, 1984). Camels are frequent hosts of cestodes such as *Monezia* and *Stilesia* species. Hydatid cysts of *Echinococcus granulosus* are commonly found in lung, but less so in livers (Macchioni et al, 1984; Abdurahman, 1987). *Cysticercus dromedarius* has been less often recorded. Infestations by *Trichostrongylidae* and *Trichuridae* are often widespread (*Haemonchus longistipes*, *Mecistocirrus dimorphus* and *Trichuris globulosa*).

In general, gastrointestinal parasites are known to cause ill-thrift in camels. However, there are no systematic studies of the disease conditions caused by helminths in camels and other ruminants in Somalia. Many of the above parasites have been recovered from apparently healthy camels in the field or from slaughtered camels.

Ticks (Shillin)

Ticks belonging to *Amblyoma*, *Hyaloma* and *Rhipicephalus* species are common among camels in Somalia (Cankovic, 1984). These ticks feed on the camels, causing debility and anemia. However, their role as disease vectors are considered to be less important in camels than in other animals.

Ringworms (Cambaar)

Ringworm usually occur in young camels under three years of age and is characterized by localized thickening of the skin. Lesions appear often as circumscribed, crusty and hairless, distributed over the head, neck, shoulders and limbs.

Trichophyton dankaliense is reputed as the cause of ringworm in Somali camels (Dalling, 1966). However, the status of *Trichophyton dankaliense* has been questioned (Ainsworth and Austwick 1973). The most common dermatophytes found in camels are *Trichophyton verrucosum* (Kuttin et al., 1986). Other species less commonly identified in camels are *Trichophyton mentagrophytes* and *Microsporum gypseum*. Mixed infection of skin pathogens (e.g. *Trichophyton* sp. and *Sarcoptic scabiei*) are common, making a correct diagnosis and treatment difficult.

Mastitis (Candhobarar)

Like other dairy animals, camels are susceptible to mastitis. The clinical disease is well recognized and feared by the owners because of its striking effect on the milk yield, the offspring and the family. However, it has in the past been ignored by veterinarians. The habit of not boiling camel milk in almost all camel rearing communities poses a certain threat to the consumer.

Mastitis is characterized by physical, chemical, and bacteriological changes in the milk, and by pathological changes in the glandular tissue. The most important changes in the milk include discoloration, the presence of clots and large number of cells (leucocytes). Symptoms of clinical mastitis include fever, pain, poor appetite, swollen udder and supramammary lymphnodes.

In chronic mastitis, hardening of the udder, abscess formation and reduced milk yield of the affected quarter is the rule. Detailed studies on the aetiology and epidemiology of camel mastitis are lacking. However, the few available reports suggest that similar pathogens as in the cow (Barbour et al., 1985) are also involved in the camel. Abdurahman, et al. (1991) found a prevalence of over 10 per cent of clinical

mastitis among camel herds in southern Somalia. Arush, et al. (1984) reported a prevalence of 13.5 percent in 140 apparently healthy (subclinically infected) camels.

Abortions (*Dhicis*)

Information concerning diseases causing abortions are from serological surveys against *Brucella* spp., *Leptospira* spp. and *Toxoplasma gondii*. Low seroprevalence rate of antibodies against *Brucella abortus* have been reported among camels in Somalia (Bornstein, 1988). These prevalences cannot be correlated with the reality in the field. *Brucella* organisms have been isolated from camels in Kuwait (Al-Khalid and El-Khalid, 1989). The disease is suspected of causing abortions.

Serological screening of camel sera revealed the presence of antibodies against leptospira organisms (Farina and Sobrero, 1960). However, in the absence of suggestive clinical, pathological and epidemiological evidence, these tests indicate that Somali camels have been exposed to *Leptospira* sp. infections. A more recent study on 176 camel sera did not show antibodies against *Leptospira* sp. (Hayles, 1986).

A wide range of animal species, including man, are intermediate hosts of *Toxoplasma gondii*. Cats are the final host.

Results from serological surveys revealed that Somali camels are exposed to *Toxoplasma* infections (Bornstein, *ibid.*). However, it is difficult to interpret the significance of these results (see introduction).

There is a report of acute toxoplasmosis in a zoo camel in the USA (Hagemoser et al., 1990) in which numerous tachyzoites were found in the cytoplasm of neutrophils and macrophages of fluid from the pleural cavity. Serology showed high antibody titres. The history of the case indicated mild dyspnoea, anorexia and abortion of a near term foetus. *Toxoplasma gondii* infection has been implicated as a cause of abortion in a number of animal species. The suggested role of the parasite as a cause of abortion in camels is still doubtful.

Pneumonia (*Dhugato, Oof*)

Pneumonia in camels may arise from specific lung diseases such as tuberculosis and verminous (parasitic) pneumonia, or from choke as a result of drenching medicines or other fluids after the applications of traditional cures, as well as other primary and secondary pathogens. Exposure to cold and wet weather, and debility from any cause can predispose to pneumonia. Hence, lung oedema and pneumonia are usually the end result in camels debilitated by trypanosomiasis and other impairing diseases. Antibodies against Parainfluenza 3 virus were found to be prevalent among Somali camels (Frigeri et al., 1979; Bornstein, *ibid.*).

Abdurahman (1987) reported pulmonary lesions (hydatid cyst 6%, fibrosis 3.7%, pneumonia 2%, and abscess 0.3%) among 300 slaughtered camels in Mogadishu. Hansen, et al. (1989) found silicate pneumoconiosis among Somali camels. A positive correlation between dust laden macrophage aggregates in the lungs and pulmonary fibrosis not related to other chronic lung diseases was found. The clinical significance of these findings is not known.

Inflammation of the soft palate (*Doobo-barar*)

This is a condition peculiar to male camels because of the animals ability to protrude their soft palate beyond their lips during the rutting season. Sharp objects like thorny bushes or fighting (common during rut) can cause injury leading to infections. The throat becomes swollen and the animal is unable to swallow and may have difficulty in breathing.

Diarrhoea (*Shuban, Daab*)

Diarrhoea is prevalent among calves. No proper investigations have been conducted of the problem in Somalia. The causes of calf diarrhoea in Somalia are thus not known. They can be due to viral, bacterial and parasitic infections as well as nutritional (sudden change of browse, poisonous plants) and poor management practices.

Lymphadenitis

(*Qererbarar, Ganjobarar*)

Abscesses in the pre-pectoral lymphglands, at the base of the neck, is quite a common finding in almost every camel. It is said that it can sometimes cause fever and maybe lameness.

Abscesses in other superficial lymphglands like the pre-scapular and pre-cruial are also common.

Myasis (*Sangal*)

The presence of the larvae of the nasal botfly *Cephalopina titillator* in the nasal cavity is very common and can cause considerable irritation and sometimes difficulty in breathing. Infested camels attempt to get rid of the larvae by violent sneezing.

Conclusions

Although there is a long way yet to fully understand the disease panorama and other production constraints of camels in Somalia, there is enough basic knowledge to suggest and formulate preventive and therapeutic regimes in enhancing the camel industry. Proper extension services, together with a functional veterinary service could do wonders (Rutagwenda, 1982).

A veterinary coverage of the most common disease problems, coupled with mineral (nutritional) supplementation in needed areas, would considerably increase the production. For the common known diseases like trypanosomiasis, drugs are available both curative as well as prophylactic. Infestations by ectoparasites, particularly *Sarcoptes scabiei*, but also ticks, could be reduced with the help of modern drugs. So, too, the ill effects of high endoparasite burdens, particularly in young animals.

There are several ways to organize adequate veterinary and extension services to pastoral and agro-pastoral areas, such as nomadic animal health auxiliary personnel or bare-foot veterinarians (Talib, 1991), and regular visits by a motivated veterinarian with basic diagnostic equipment. However, whatever method is chosen, the service must be

regular, reliable, and take into consideration the local skills and experiences available.

A well-functioning veterinary service will also include appropriate disease diagnostic facilities to conduct disease surveys, investigate outbreaks, and hopefully suggest applied research in relevant fields. In general, improved health coverage, and applied health research may reduce production losses and contribute towards the betterment of the herding communities.

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