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PREFACE

The Dryland Husbandry Project (DHP) is an effort to bring together a variety of stakeholders in pastoral development, to identify and develop strategies for addressing the crisis of African drylands in the nineties. A network approach will be used to raise issues of mutual concern to researchers, practitioners and, above all, pastoralists, with particular emphasis on sustainable service provision and water management. For further details of the research project see the back page.

The Regional Office of DHP, OSSREA, has taken the initiative to launch a **DHP Publications Series** for the Dryland Husbandry Project with the view to exchange and share opinions and experiences on issues of dryland husbandry in the Horn of Africa Sub-region in general and in the DHP areas in particular. The **DHP Publications Series** is a forum where researchers in the Dryland Husbandry Project and others inform the research and academic community, the policy makers, interested individuals and institutions the results of their action-oriented and participatory research. It is also a forum where para-vet training experiences, trials research results, ethno-veterinary practices, workshop findings and the relevance and use of indigenous knowledge in the project areas are presented and discussed.

This is the second issue of the Dryland Husbandry Project (DHP) **Publications Series**. The first issue (**DHP Publications Series No. 1, November 1996**) was on Dryland Husbandry in the Sudan. This issue contains the proceedings of the papers presented at the first National Workshop on **Dryland Husbandry in Kenya**. The workshop was held in the DHP-Kenya area, in the premises of the Institute of Dryland Research, Development and Utilization (IDRDU) at Kibwezi, University of Nairobi in April 1996. These papers, we believe, could provide the reader information on the status of knowledge on dryland husbandry in Kenya. This publication could also serve to encourage people with interest to do more with people in the pastoral and agro-pastoral areas in Kenya. OSSREA is convinced that in order to understand and to be on top of the problems in the dryland areas in Kenya, more attention and collaborative work both by researchers and policy makers together with the people at the grassroots is timely and vitally important.

Tegege Teka, Editor

I. Introduction

Indigenous knowledge is local knowledge derived from interactions between people and their environment, which is characteristic of all cultures. It spans the entire range of human experience, including history, linguistics, art, economics as well as technical aspects, agriculture, medicine, natural resources, engineering and fishing (Kroma, 1995).

The literature on indigenous knowledge is very vast and is indicative of a wide range of human activities which utilize complex but implicit scientific principles. The exclusion of such knowledge from development activities has had disastrous consequences all over the world where outsider knowledge has been imposed without regard to local knowledge (Cashman, 1989; Atte, 1992).

Pastoralism is an ancient form of animal production integrated or complemented with agriculture or without such supportive activities. The remoteness of the areas occupied by pastoralists from urban centres as well as the continuous mobility inherent in the system have operated to endow pastoralists from urban centres as well as the continuous mobility inherent in the system have operated to endow pastoralists with a high degree of self-reliance (Allen, 1965). Not only is self-reliance a necessity, but also a certain degree of pervasiveness or conservation towards innovations originating from outsiders is witnessed. This is perhaps a control against the catastrophic potential of trial and error situations, specially when the vested problem concerns important natural resources, such as pasture, water and animals.

The indications of the foregoing analysis is obvious. It implies that pastoralist targeted development efforts should stem from a close understanding of the socio-economic, socio-psychological and technical predilections of the particular groups. The concepts, thoughts and aspirations of the local community should be a guideline. The actual efforts by pastoralists to maintain and improve their system component should be taken into consideration, as they reflect the potential of the community for development.

Development agencies and researches should also benefit from an understanding of the survival strategies of pastoralists. It is also of paramount importance to study the various tactics or responses adopted by pastoral communities against state disturbance in the ecosystem or in any of the factors influencing the system, such as drought, diseases, civil conflict, etc.

In Africa, ethnoveterinary practice has been studied by several workers over the century. Janzen (1981), Mathias-Mundy and Mc Corckle (1992) as well as Pool (1994) have given excellent reviews of the history and evolution of these researches. There is a consensus among researchers about the need and significance of recording and evaluating the different therapeutic and control procedures adopted in the deserts and forests of Africa, away from international or modern western influence. Since pastoralists have survived over centuries, essentially on their own, many of their healing or preventive procedures, having also evolved over millennia should have logic, utility and acceptance (Mc Corckle, 1986). Any effort that aims at the provision of better services to the highly mobile, extensively scattered pastoral communities, the existing local or native methods of meeting these services should be given first consideration. These efforts can then be utilized in an improved and expanded manner to meet the increasing demands of the growing market-oriented trend in the pastoralist production system.

Present-day national demands of increased cropping and industrialization in many third world countries also put great demand on the pastoral economy. In the midst of these developments, it is possible that traditional methods of value could be lost and the pastoral community would be faced with the problem of having to cope without being genuinely incorporated into these developments.

In this monograph, an attempt is made towards recording and elucidating several aspects of the ethnoveterinary activities of pastoralists, mainly camelmen in North-eastern Sudan. The study was inspired by previous researches in the same area, during which we felt the tremendous wealth of information expressed by pastoralists on animal physiology, nutrition, diseases, and therapeutic and toxic

plants (Abbas and Musa, 1986; Agab and Abba, 1995; Agab, Abbas and Le Hognre, 1993). In addition, pastoralists in the area have indicated a set of constraints facing their mode of living and animal diseases ranked highly among these constraints (Abbas et al., 1993). It was thus of interest to study the local efforts pertaining to disease control in the area, with emphasis on camels. It is hoped that this and similar studies will lay the basis for future developments regarding the provision of veterinary and health services to the pastoral community in the study area.

II. Materials and Methods

1. Study Area

The observations and interviews reported in this study were conducted in the North-eastern deserts of the Sudan, including the Butana plains, Gash delta and the Southern frontiers of the Nubian desert (Atbara River basin). However, most of the work concerns Butana as a traditional home of camel pastoralists in North-eastern Sudan (see Map Annex 8).

Butana is situated well within the arid zone of the Sudan and occupies an area of approximately 120,000km² and lies between Latitude 13° 40' N to 17° 50' N and Longitude 32° to 36° E. Butana consists of five subregions, namely the North, Central, Southern, Western and Eastern subregions. The largest are the Central (Butana proper) and Northern subregions. The Western region is a narrow strip of land along the Blue Nile while the Eastern subregion adjoins the Atbara River. Most of the Butana is a series of flat easily flooded plains interspersed by few hills. Towards the west, the Butana is separated from the Nile valley by a discontinuous series of hills. Geographically Butana consists of the Nubian series (sandstone and mudstone) in the West and North and of the rocky Precambrian basement complex in the centre, south and eastern regions. There are at least two distinct soil types in the Butana; namely a red sand or loamy sand soil over the Nubian series and a brown heavy soil over the basement complex (Saint-Martian et al., 1992).

Over most of the Sudan, the prevailing climate is a tropical continental climate, ranging from sub-equatorial conditions in the South to desert in the North. In the Butana region the climate is influenced by the north and south oscillations of the boundary of the Intertropical Convergence Zone (ITCZ) between dry northerly winds and moist southerly winds. This ITCZ reaches its northern limit in summer (rainy season) and its southern limit in winter (dry season). The duration of the rainy season (June-September or October) is determined by the southerly winds. Most of the rains are in the form of showers or thunderstorms. Early in summer and up to the advent of rains, sandstorms are very common. Another characteristic of rainfall in this region is its variability from one year to the other, estimated by Abu Sin (1970) to have a coefficient of variation as high as 45% in most of the area and 20% in the smaller southern part (Annex 1).

During the last decades, Butana has been subjected to severe overgrazing due to the convergence of several tribes into this area which is famous for its open grazing potential. This trend increased specially after abolishing the "native administration". The latter used to provide range management regulations which were respected by host tribes and herders specially those not residing in Butana. The spread of cultivated land to occupy most of the Southern Butana has also increased the grazing pressure on the drier western and northern subregions (Suliman, 1985).

According to El-Hassan (1981) the highly nutritive *Blepharis edulis* (Siha) is the climax vegetation of the Butana if no or little grazing takes place. This highly palatable and nutritious plant has now virtually disappeared (Suliman, 1985). Gradually, *Aristida* spp. (Gow), *Cymbopogon nervatus* (Nal) and *Schoenefldia gracilis* (Dembelab) dominate (Pflaumbaum and Kirk, 1992). Many unpalatable grasses appear to be on the raise, e.g *Ocimum basilicum* (Rehan), specially in the more fertile central and southern regions and *Brachiaria lata* (Taffa) just north of rainfed cultivation schemes. According to

pastoralists the latter plant cannot be grazed when young, which could explain its vigorous spread (Soliman, 1985).

In the Southern subregion, the basement peneplain is characterized by an extensive woody cover comprising mainly *Acacia mellifera* (Kitir), *Calotropis procera* (Usher), *Capparis decidua* (Tundub) and grasses. The adjacent zone further north is characterized by grassy areas with an estimated plant cover of 65%, while the woddy vegetation in this subregion could be found only in *Wadis* (Shallow basins). Further to the north the grass cover eventually decreases to grassy patches with an estimated grass cover of 25%, comprised mainly of *Aristida spp.* and *Panicum turgidum* (Tumam). Trees in this subregion feature *Acacia tortillis* (Seyal) and *Capparis decidua* (Tundub). Both trees produce highly nutritious pods and browsing foliage or twigs (Abbas and Musa, 1986) [Annex 2]

In years of good rainfall, the Butana is an extensive field of green grasses, legumes and young trees (Fig. 1). However, in years of bad rainfall there is almost complete failure of perennial or annual plant growth (Fig. 2).



Figure 1: Butana Range in a Good Year (1996)



Figure 2: Butana Range in a Below-average Year (1990)

2. Animal Husbandry in the Butana and Adjoining Regions

Livestock ecology and management procedures practiced by pastoralists utilizing Butana, Gash and Atbara rivers range were the subject of an extensive survey conducted by a team of researchers from Sudan (Camel Research Unit) and France (IEMVT). The methodology and findings of this research have been presented (Abbas *et al.*, 1992). A brief account is given herewith. A total of 822 herds were surveyed during the rainy season and an interdisciplinary set of data was collected. Whereas 85% of the surveyed herds belonged to individual owners, 15% were multiple owners who practiced group herding. There were at least four herding strategies adopted by the pastoralists utilizing Butana range (Abbas *et al.*, 1992). The four systems differed significantly in several factors, notably, herd size moving as one group, level of sedentarization, the use of labour, owner's supportive activities, camel uses, dry season feeding, and the variable species composition of the herd. The overall predominant feeding strategy was the use of Butana range in the rainy season and either crop residues or riverain or coastal habitat (Red Sea, Atbara River, Gash, Rahad) during the dry season. In this regard, 395 herds out of a total of 708 (56%) had come to Butana from outside (Red Sea region, Eritrea, Gash, Nile, Gezira etc..) of whom 269 (38%) were classified as transhumant and 126 (18%) were nomadic (Maillard, 1992). They left Butana around September-October admittedly because of lack of water. This usually leaves most of the range for exploitation by Butana resident pastoralists who usually have much smaller herds of livestock (camel, sheep, goats and cattle). Butana residents obtain water from Haffirs up to December-January in favourable years (Fig. 3), shallow wells in stream beds, and a few tube wells throughout the year. A clear trend towards specialization was noticed with increasing interest in feedlotting of camels (and sheep) and the rearing of racer camels to make use of the growing demand for meat and sport animals in the Gulf and Saudi Arabia as well as Egypt. Analysis of herder's age structure and owners' backgrounds disclosed that pastoralism is still found profitable by many tribes, attracting new investors, some of whom were former traders and expatriate farmers (Le Horgre, 1993).

During the rainy season, there is tremendous mixing between diverse cultures in the Butana. This results in sharing of experiences and inputs on different aspects of animal breeding, husbandry and diseases. Added to the antiquity of pastoralism among the Butana people, the enrichment that could be realized as a result of these encounters would indeed make keen healers knowledgeable and informed about practices originating far away in the continent. Additionally, healers in the area use soil and plant sources not available locally. These are provided by pastoralists or herders from West Africa or Ethiopia, and are also availed by numerous traders (Attarin Sing Attar) of herbs who are found in the marketing centres of Kassala, Gedaref, Omdurman, Eddimer and New Halfa.



Figure 3: Camels are watered from Haffirs well after the rainy season. The plastic sheet is for protecting water from contamination and for salt addition

3. Ethnoveterinary Practice Data Collection

Information about various aspects of ethnoveterinary practices in the study area was collected by direct interviewing of known healers who accepted to share their knowledge and to explain at length the foundations of their practices. In the first few hours of encounter with each healer, base-line data was collected about the healer, sources and speciality (Annex 3, Annex 7).

Following sessions were centred on recording in detail the various inputs of each healer's practice as well as the theoretical or philosophical notions. In general, healers were interviewed (and visited) at least three times over a six month period. These visits were made to coincide with the two main seasons: the rainy season (July-September) and the dry season (November-April). This breaking of the time schedule allowed an excellent variation in the healers undertakings, coinciding with remarkable seasonal change in the ecosystem as a whole. It also allowed the sampling and demonstrating (by the healers) of different plants with attributable healing (or toxic) potential.

A total of 15 well-known healers (all men) were interviewed in Butana, Gash and Nile Province (see results and Annex 3). The information collected was very diverse and a lot of effort was necessary to

summarize the different views and formulae presented by these healers. Five healers were the subject of intensive study and repeated visits.

A. Herders Knowledge

Only those herders who were willing to allocate some of their time for lengthy interview were approached. Herders-predominantly managing camel herds were asked to relate the signs and local nomenclature adopted to refer to specific diseases. They were also asked whether they would prefer to contact a traditional healer or a veterinarian in case of trouble and whether they preferred traditional or universal (western) medicines. Herders were also asked to relate their experiences relevant to the aetiology and risk factors for certain diseases. Each herder was also asked to recall his own experience in handling diseased animals and if need be, whether he will carry out any surgical interventions. A total of 56 herders were thus interviewed in the same areas where healers were encountered. These interviews extended from 1992 to 1996 (Agab and Abbas, 1995).

B. Plant Taxonomy

Several plants mentioned or utilized by the healers were sampled (leaves, flowers [\pm seed], stem, root) and were compressed in locally made presses for taxonomic purposes. Speciation was carried out at the Departments of Botany, Faculty of Science and Faculty of Agriculture, University of Khartoum. In a few instances the seeds had to be germinated under controlled conditions so as to ascertain a specific ecotype or species.

C. Nutrition and Biochemical Analysis

A few plants with therapeutical-nutritional potential were desiccated (leaves, pods or seed) and analysed following conventional procedures. Such analysis included vitamin A, protein and ash content. The anthelmintic potential of some plants, a commonly encountered observation, was subjected to laboratory examination using on-going projects at the Department of Veterinary Medicine, Faculty of Veterinary Science, University of Khartoum. The latter researches will be presented separately when experiment and analytic work are completed.

III. Results

1. Traditional Healers

A. Social and Personal Data

Annex 3 summarizes information on some personal characteristics of the interviewed healers. Age of the 15 healers ranged between 40 and 76 years and their locations covered Butana (7), Gedaref (2), Nile province (3) and Kassala-Gash Province (3). Nine of the interviewed healers were resident in their respective locations and sick animals (or people) were brought to them, while the other six were transhumant or nomadic pastoralists who are thus available to herders on the field. While 8 of the healers specialized in animals, the other 7 consulted human patients as well. There was no clear cut pattern for this division in relation to residence status or tribal origin, although there was a tendency for nomadic and transhumant healers to handle both man and animals. Only four healers could deal with both surgical and medical (internal) problems, three of them were resident and only one was a nomad. Eight of the healers practice only medicine while two healers are specialized surgeons. One of these is a resident who consults both man and animals while the other is a transhumant who practices only on animals. Although citizens as well as healers spoke of much younger colleagues in the surrounding desert, none of these was encountered. In the Butana as well as in Gedaref, female healers with outstanding reputation were also mentioned but they could not be located for interview. The healers included in the sample had from 5

to 50 years of experience in practice. This proves that healers begin their practice quite early and continue to gain experience throughout their lifetime. No healer in the sample mentioned dropping the practice in the past, nor considering such a move in the future. None of the interviewed healers considered western medicines a threat because of the ready availability of the healers services to the pastoral community and the relative cheapness of the traditional inputs. Some healers claimed that many of their diagnosis were confirmed by veterinarians (or physicians) and a few healers had professional encounters with personnel from the veterinary or health departments in the cities of north-eastern Sudan. All interviewed healers admitted the increasing demand on their knowledge and services; they quoted the high prices of Western medicines and unavailability in the desert as reasons.

B. Background and Resources

Out of the 15 healers only 6 could write and read Arabic, two of these with obvious difficulty. The latter had gone to Koran school in neighbouring villages or when in town (with family). As regards the source of knowledge on diseases and therapy the healers informed that there were four main sources of initial interest or continued education, namely (a) father, grandfather or uncle (4 healers); (b) a non-family clan member (3 healers); (c) a non-clan member with whom the healer was employed in the past (2 healers) and (d) personal initiative and observation, try and error encounters (6 healers). The family apprenticeship category (a) included almost all of the elder healers (numbers 1, 3, 4 and 6) while the self-initiated healers (category d of 5 healers) were predominantly young (or starting) practitioners (numbers 2, 9, 10, 12, 15).

All interviewed healers informed that they had benefitted in one way or another from the experiences of other healers and had based a lot of their trials on the outcome of consultation or instruction by former healers in the locale, sometimes a healer in a distant camp of town. All healers admitted that these visits were very beneficial and were often crucial in setting them on the right path in their practice.

Healers will respond positively to outpatient calls if transported and these calls almost always involved patients that could not be mobilized, such as fractured animals, dystocias or extremely moribund individuals.

The inputs utilized by healers were quite diverse and include surgical tools, plant products or whole plants, certain soil ingredients, honey, urine, hair, salt, animal fats, certain pharmaceuticals e.g. acaricides, antihelmentics, camphor, coffee bean, meat broth, sesame oil.

The specific procedures used in the treatment of certain conditions will be detailed further. The uses of some of the mentioned inputs as well as their rationale will also be highlighted.

Most of the healers admitted that they were usually compensated for their efforts by small payments of cash or gifts of clothes, coffee, sugar or occasionally a young animal. However, all of the interviewed healers owned animals and/or cultivated seasonal plots. Healers in the Nile Province also owned small date orchards or cultivated permanent alfa-alfa stands.

C. Surgical Interventions

The most commonly requested interference involved dystocias, fractures or muskulo skeletal problems, chronic abdominal pain and infertility. Fire-use in the form of cauterization or branding is the commonest intervention for both skeletal problems as well as chronic abdominal pain, abscesses and non-specific or unyielding conditions. Dystocias are relieved manually, as much as possible, by pulling and pushing back and forth of the foetus and mother until the crisis is resolved. This is the first intent specially when the foetus is alive. The healers speak very clearly of "akwardly positioned foetus" and describe numerous well known abnormal presentations at term. When the foetus is dead, healers recommend embryotomy and practiced it usually with a short bent knife. The foetus is lacerated cautiously around the shoulder or hip

joints depending on presentation. However, a few admitted the use of antiseptics such as soap on dettol, while some used unboiled water.

Another commonly handled problem is uterine prolapse. Apart from the lack of anaesthesia or antiseptics (or pesseries) the procedure is the same as recommended in Western Veterinary practice. The uterus is washed several times with water or urine and debris removed manually and is then returned into the pelvis and the animal raised onto its feet. The vulva is then sutured using thread or gauze and a rather large needle (Fig. 4). One healer (No. 2, Nile Province) had attempted relieving dystocia in a goat by caesarian section, but the animal died two days post-operatively, most probably from gross contamination or peritonitis. The healer opened the abdomen by a razor blade, took out twin foeti which were saved, and sutured the uterus wound then the abdominal muscle wound (together with the skin and subcutaneous wound) using a thin needle. He concluded that this intervention was better than waiting for foetal parts to appear externally where pulling could be attempted, because in his view "pulling is for saving the dame, never the offspring". Corrective relief of dystocia is also practiced without too much pulling. This is usually carried out by well experienced healers who patiently replace malpresented parts. Healers admitted that pulling was too painful and was almost always associated with uterine prolapse or rupture. The later is a fatal episode, specially under desert conditions.



Figure 4. Surgical procedure for the correction of uterine prolapse in a camel cow. The bifurcate thin stick is sometimes inserted on top of the suture line to hold the vulva

Infertility is a common problem specially in camels, cattle and equines. Healers described a surgical procedure of debirdement of the vagina (which they call circumcision) and of the uterine body (they call it removal of meat plug). In both procedures a short curved, dull knife is introduced into the vagina and gentle abrasions are induced until clean blood is obtained. Then a small amount of salt water is delivered after which the vulva is clasped between two hands for about half an hour. This procedure is reminiscent of older methods of uterine debridement to remove granulation tissue, uterine hypertrophy or lesions of chronic endometritis. The healers admitted that "circumcision" works well for equines but not so well for bovines, for which they ascertain uterine debridement as a better operation.

Castration is very often practiced on lambs and bullocks and rarely camels. The intention is to improve the temper of the animal intended for labour use (camel, cattle) or to hasten fattening (sheep). For this purpose two procedures are employed. The common method is to fall the animal down, expose the testicles, put a thick log to support them from underneath and to apply a strong, sudden blow by a blunt iron rod on the spermatic cord just above the scrotal sac. This crushes the spermatic cord at the point of pressure which leads to a severe local (focal) inflammation and consequent occlusion. In the second, less traumatic, but less commonly employed method, the scrotum is held firmly in the hand, the two testicles are well grasped together, then a strong string is tied firmly at the scrotum head. The animal is tethered and observed for several days until the testicles swell. The string is released after 4-5 days after which the animal is declared castrate. This procedure is practiced commonly on lambs while the former procedure is practiced on camels and cattle. One healer and three herders (owners) had standard sheep castration burrdizos which they purchased from veterinary suppliers.

i. Musculoskeletal Interventions

Most of the surgical procedures evolve around the treatments of lameness and fractures in both man and animals. The healers invariably show a good degree of diagnostic accuracy. They take a long time in examination and palpation, in addition to testing the flexion and extension (responses) of joints. History and symptoms reported by the patient or animal attendant constitute the vital component of diagnosis and in the absence of X-ray machinery, the diagnosis of fractures or cracks and their differentiation from other traumatic episodes requires great experience.

A procedure of an "open plaster" is adopted for the setting of fractures. This procedure allows for treatment of fractures almost anywhere in the limbs and even when there are open wounds or lesions in the vicinity. The procedure is referred to as "Gabira": straight small sticks (bamboo, date palm, acacia) are smoothed and flattened on one side. Then they are perforated or knotted at each end. Strings made from skin strips (cattle or goat skin) or plastic robing are tied at the ends or passed through the holes of the wood supports. The whole Gabira is then assembled on the fracture site, with its center precisely fixed on the fracture point or line (Fig. 5). Some Gabiras are made for sprains and these do not employ wood sticks, but a mesh woven from dome tree or palm leaves. The mesh holds firmly after drying.

Several conditions affecting the musculoskeletal systems are treated by cauterization. These include almost all non-fracture (joint or muscle) conditions, such as acute arthritis, bog-spavin (equines, man) bent-neck (camels), hygroma's (cattle, camel), lumbago (man, donkeys).

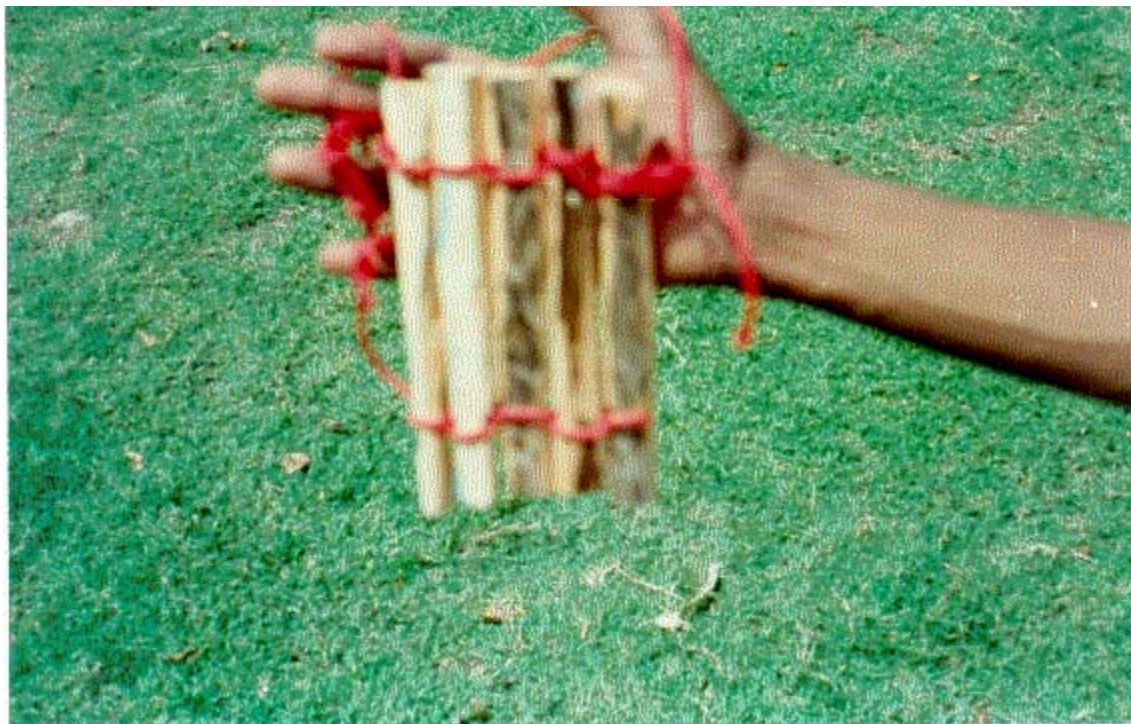


Figure 5. Gabira, or wood plaster, is made from flattened sticks which are held together by plastic roping or leather

A simple operation is practiced for the treatment of certain types of lameness in camel which are caused mainly by tendon problems leading to insufficient flexion/extension. Most of these problems appear to be congenital as the conditions are commonly encountered since early life and the operation is usually performed on young animals. In the procedure, a long rather large needle, heated as for cauterization, is used to pierce the skin and is then pushed between tendon and the suspected muscle or between tendon and bone attachment. The needle is left in that location for sometime, about 5 - 10 minutes, then pulled out and the animal is released. In another version, a thin leather or tendon string is inserted into the punctured tissue and is left there as a foreign body. The irritation caused in the tendon and vicinity results in an acute focal inflammation, which will eventually heal (by second intention) causing scar tissue to pull together the tendon and muscle or bone attachment and afford more strength during flexion or extension.

ii. Cauterization

Cauterization deserves special handling as it is a commonly employed healing practice. The use of fire brands is ancient and well entrenched in the pastoral system in the Sudan. Pastoralists believe that even infectious conditions can be relieved by firing. Healers do not hesitate to apply fire even to very sensitive organs, but the intensity and tools used for different organs or lesions vary considerably. Most commonly, cauterization is carried out by a glowing-hot iron bar of 10-30mm diameter which is pressed firmly on the skin for 20-30 seconds until the skin turns white. This is called ripe cautery. Unripe cautery is avoided as it leads to inflammation of chronic duration with a tendency towards wound infection, whereas ripe cautery heals uneventfully in a matter of 2-3 days.

The theory behind cauterization appears to be kin of the counter-irritant principle in which chronic intractable inflammatory conditions are converted (by such irritant substances as iodine, mercury salts, ammonium etc.) into the acute stage. This stimulates the circulation and calls into action the phlogistic activity of many cellular and humoral components of the body defence mechanism (i.e. the immune

system). However, in the pastoral system cauterization is often employed on experimental basis for new or undiagnosed conditions. Such conditions include chronic diarrhoea, kidney problems, chronic endometritis, chronic mastitis, chronic cough and similar debilitating conditions (see Fig. 6).

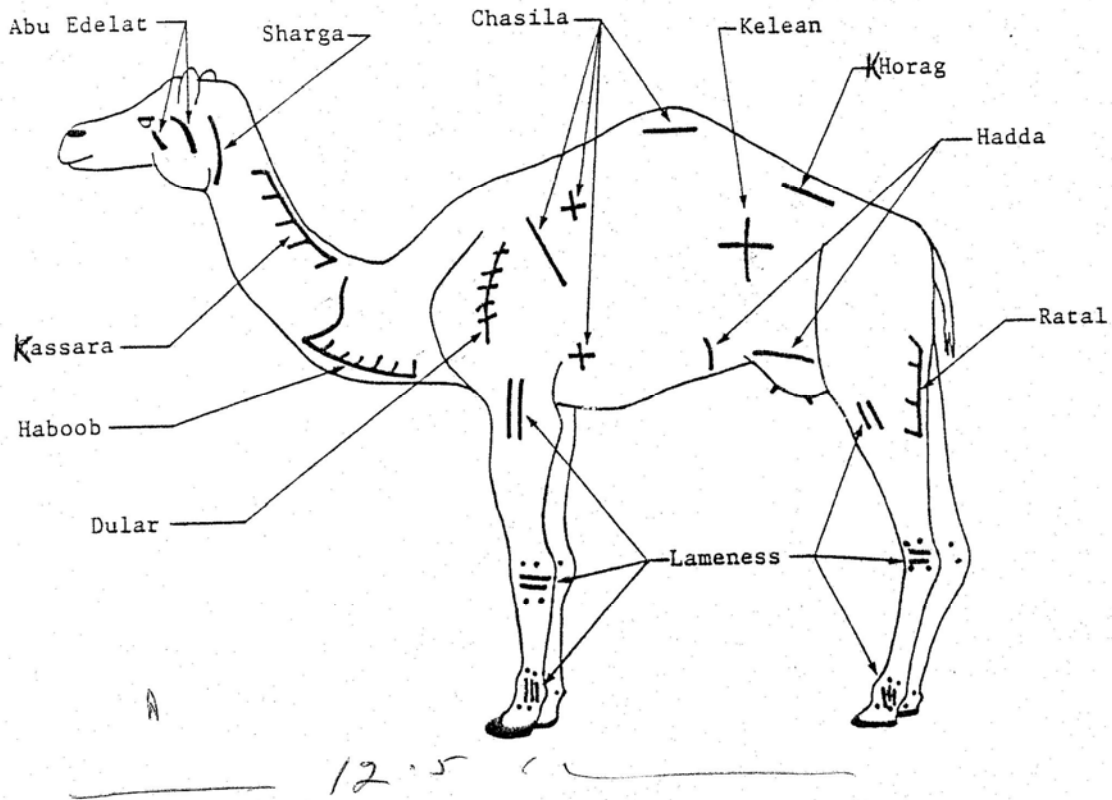


Figure 6. Points of cauterization employed on the camel for treatment of different conditions

It is interesting to note that the points of cauterization, rather than its rationale or outcome, disclose a genuine observational ability by particular healers (Figs. 6, 7, 8, 9). The points upon which cautery is applied usually correspond to the organs involved in a pathological process, specially kidney problems, respiratory conditions (organ specific cautery) and musculoskeletal ailments. Cauterization is also practiced for the removal of broken or injured horns, in hoof trimming and in the radical treatment of abscesses. It is also a useful intervention in removal of fibroma and fibrosarcomas, papillomas and organized swellings.

However, a lot of cauterization appears to be a palliative last resort tool. In such cases cauterization indicated helplessness or "empty shelf" in the face of particular problems and has no benefit, specially in conditions affecting internal organs such as the kidneys, liver, uterus, udder and the gut. However, the fact of preciseness in determining the source of the lesion should be maximized and healers should benefit from an introduction or general therapeutics orientation with the aim of replacing most of cauterization regimens by medical approaches utilizing plants and other locally available therapeutics.

For traders and breeders interested in replacement stock, fire brands are usually indicative of chronic intractable illness and such treated animals are usually avoided or purchased for slaughter.

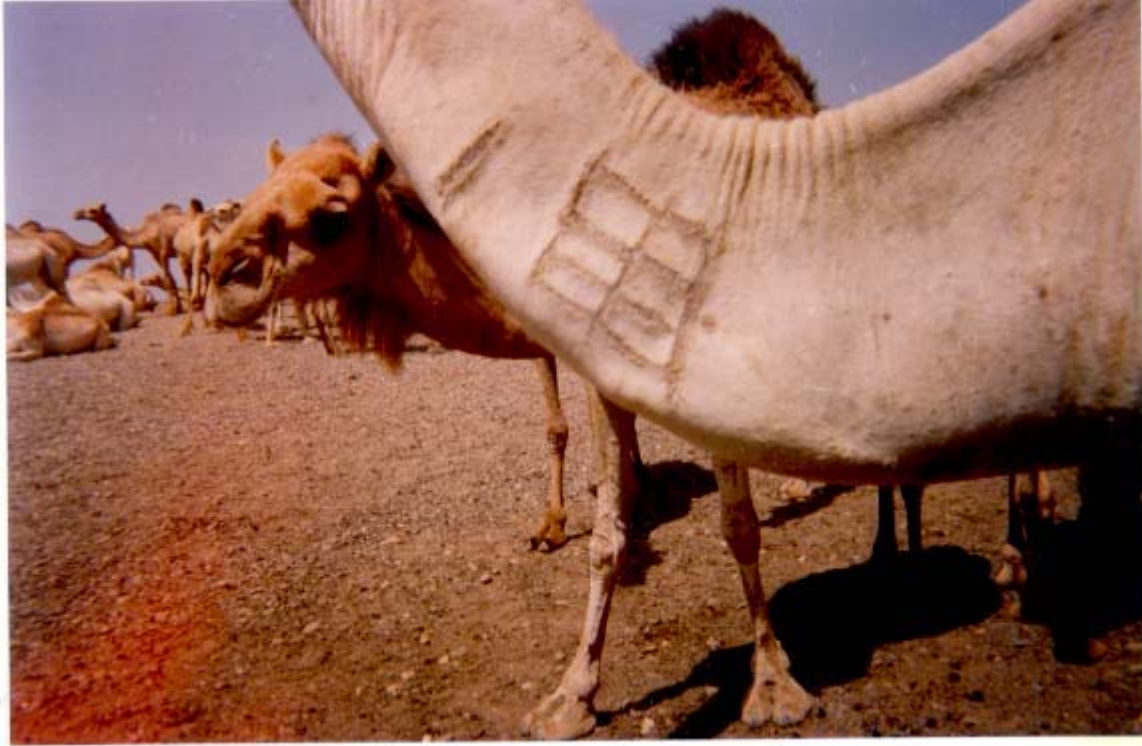


Figure 7. Cauterization for Haboob syndrome in an adult camel



Figure 8. A case of Kassara (Bent-neck syndrome) showing cauterization at points of deformity.



Figure 9. Cauterization for the treatment of contagious skin necrosis, a bacterial disease. Note the demarkating effect of cautery

D. Phytotherapy

This is by far the most interesting aspect of the traditional healers practice. Plants and plant products constitute the bulk of a healers' treatment arsenal. A review of the literature indicated many plants indigenous in Sudan have a diversity of proven therapeutic utility. In addition, healers often used or described healing properties of plants not found in the Sudan or in the study area. In this regard, botanics imported from India or obtained from the high rainfall savannah zone to the south of the study area constituted an important addition to locally available plant resources. Quite a large list of plants are commonly mentioned to be used by healers in the study area. Efforts are still carried out to forward a comprehensive list of all mentioned plants and their stated usage, taxonomy and availability. However, certain plants deserve more emphasis as they are more commonly used and have been in use for successive generations. This category includes plants and plant preparations that are now used also in other parts of Sudan for treatment of certain conditions in both man and animals.

i. Acacia nilotica (pods)

Locally known as (garadh), *Acacia nilotica* pods are an omnipresent component of any healers pharmacy. The pods are collected from March through June or July, dried and stored in baskets, skin bags or jute sacs. They can be purchased in all urban markets and are storable for long periods. *Acacia* pods are rich in tannic acid and this substance accounts for the wide use of the pods in commercial tanning. Tannin also accounts for most of the medicinal usage of *A. nilotica*, as deseeded pods contain about 30% of tannin.

In the Sudan "garadh" is used as a powerful astringent. A decoction is made of whole pods and is administered orally for severe diarrhoea with instant response (Fig. 10). It is also used externally in

powdered form for fever, measles and purulent wounds. Garadh is also used as a fumigation and mouth gurgle with excellent results against corryza, rhinitis and sore-throat in both man and animals.

The seed is powdered and is applied to purulent wounds specially fistulous ones. The author has used garadh powder as the sole disinfectant in a deep fistulated abscess in a young camel with uneventful recovery and quick healing. A paste is made of acacia pod, *argell*, *Hinna* and table salt for chronic arthritis and sciatica.

Garadh is sometimes used in drench form (see powder or decoction) for the treatment of helminthiasis, but this appears to be a limited practice.



Figure 10. A herder drenching a young camel with *Acacia nilotica* pod decoction for diarrhoea treatment

ii. Striaga hermonthica

Striaga (loc. Buda) is parasite on sorghum and maize. The leaves and flowers are a strong antifothing agent with a level of activity closely equivalent to that of standard bloat preparations containing methyl silicone. The dried plant material is powdered and is administered orally twice or three times for bloated sheep, cattle and camels. The preparation also has a mild but sustained laxative effect. The potentialities of stringa have been confirmed by numerous field and hospital observations.

iii. Cassia senna

Senna (loc. Senemecca) is an ancient well established purgative and vermifuge for tape worms in both man and animals. Most of the activity is concentrated in the leaves which are shade dried and made into soup or broth, sometimes with addition of a few ounces of minced meat. The purgative effect ensues after about one hour and continues for a whole day. A lot of intestinal contents are thus voided, along with any parasites. Sometimes overpurgation occurs and strong black tea is recommended as antidote.

iv. Colocynthis vulgaris

Locally known as Handhal, *Colocynthis sp.* is a desert creeper which grows to fruit well after the rainy season. The fruit bulb is very bitter and is claimed to have antihelminthic potential. However, the commonest use of Handhal is in the making of tar which is well reputed as a treatment for mange specially in camels. The animal is barracked, well-controlled and all of the skin is smeared (Fig. 11). The treatment is usually repeated two or three times after which the lesions disappear.



Figure 11. Tar made from *Colocynthis vulgaris* has been applied to this shaved young camel for mange treatment

Handhal tar is also used for dressing finished skin intended for water-bags. This gives such containers a life-long flavour and is said to prevent contamination or insect attack and damage of the container.

v. Calatropis procera

Calatropis (loc. Ushar) is a very common shrub which grows post climax all over the deserts and semi-deserts of the Sudan. It is an evergreen, leafy plant. Although animals avoid consuming green leaves, the latter are readily eaten and eagerly sought by all livestock when dry. The attention of researchers was drawn to the utility of this tree in the draught years (1983-1984) when pastoralists started to crop it for fodder. Nutritive analysis (Annex 4) proved the plant to be not only a good quality roughage, but a concentrate with protein as high as 20% (Abbas *et al.*, 1993).

Pastoralists however, use the plant in droughty years for correction of vitamin A deficiency in livestock specially camels. The herd is diagnosed as deficient when a few individuals, specially young calves begin to show signs of night blindness (loc. gahar) reflected by their inability to respond to dam's calls or stumbling on objects or fencing with pointless blowing (Agab, Abbas and Le Horgne, 1992). Then the

flock is forced into a field of ushar kept there for five days to feed only on the green leaves of the shrub and is then taken for watering. Usually the signs disappear completely at least for the whole season.

vi. *Cymbopogon nervatus* (loc. Nal)

This plant grows plentifully during the short rains (June) in Butana and quickly reaches a grazable stage of 20-30cm length before most of the other species. Nal is not grazed after it reaches a height of 60cm or above because of low palatability. However, Nal at its early growth stage is known to be a potent acaricide. Herders inform that the grazing of Nal at this immature stage leads to the total ridding of animals (specially camels) of all their tick burden.

vii. *Jatropha curcas* (loc. Habat Al-Muluk)

Jaatropha is exogenous to the study area, a western African native, and is obtained commercially through traders (Attarin). The seeds are a strong anthelmintic, specially active against round worms (Haemoncrosis) which are by far the most troublesome endoparasites in the study area. A grown-up adult camel or cow is given 7-10 seeds which are finely crushed and orally administered, while lambs are given 3-4 crushed seeds.

viii. *Artemesia herba-alba* (loc. Sheeh)

This perennial plant, native to the deserts of the Sudan, is used for its antispasmodic and carminative actions in the form of herbal tea made from leaves. The shoots are used against mixed worm infestation in man and small ruminants, but is particularly indicated for tape worms, specially camels and sheep.

ix. *Albizia anthelmintica* (loc. Gurf Eldud)

Albizia is native to the high rainfall savannah to the South of the study area and is obtainable through herb traders. The plant is a potent anthelmintic active mainly against tapeworms. The active principle is concentrated in the bark which is the most actively sought part. The bark is powdered or soaked in water for several hours, strained and administered orally.

x. *Citrullus colocynthis* (Humaidh, or Handal)

This is a common plant in both desert and riverain habitats of the semi-arid zones and possesses several medicinal properties.

The fruit is purgative and carminative and is used to ease gastric and intestinal pains or distension. A topical application of the bulb and seed decoction is used as anti-inflammatory in painful oedema (strings or bites) and for splenic enlargement (in man).

xi. *Cuminum cyminum* (Cummon Aswad, Habat El-Baraka)

This is among the most commonly used plants in traditional medicine. Only the seeds have wide application and are either used whole or crushed or extracted into a thick brownish oil, which is available commercially.

The whole seed is given for intestinal disturbances particularly flatus, diarrhoea and colic and appears to be a strong intestinal antiseptic. The crushed seed is made into a paste and is applied externally for fevers, headache and corrhyza or rhinitis. A few drops of the oil are administered with water for

abdominal pain, uteritis and nephritis. The oil is rubbed onto the chest for cough as well as externally applied of sore-throat, tonsillitis and sinusitis.

xii. Balanites aegyptica (loc. Higlig, Laloab)

Native throughout the semi-desert and low-rainfall savannah, balanites fruit is edible for both man and livestock and is relished in the desert. Therapeutically the fruit sap surrounding the kernel is used as a purgative. A lot of effort is undertaken to isolate the juicy part of the fruit in order to prepare appropriate amounts for treatment.

The fruit juice is also indicated for chronic cough. A powder is made from the leaf and bark and is used for abscesses, especially in the soles of feet and the undersides.

xiii. Cymbogon proximus (Maharaib, Hamaraib)

This perennial grass grows abundantly in certain locations (depressions, peripheral to other species) in which it assumes colonial dominant position and rarely grows as individual stands. The leaves are collected and either used fresh or stored and used over-seasonally. It has an excellent lemon like flavour and is a common flavouring agent for tea, milk and dura bread (kisra). The commonest use of the plant is the decoction of the leaves which has strong spasmolytic action. It is thus dispensed for colic, during birth, for headache, gastro-enteritis and metritis in both man and animals. In man it is a well known hypotensive and sedative specially in hepatitis. In animals, it is also used in equine colic, lactic acidosis, emaciation and inappetence.

xiv. Trigonellum foenum graecum (Fenugreek, loc. Hilba)

Hilba is not known in the wild, but is actively cultivated along the northern outreaches of the Nile. It is quite an expensive crop and has wide use as food, in pastry and in the special feeding of nursing mothers.

Therapeutically Hilba is used against gastritis, gastro-enteritis, retained placenta and non-specific colics. It is used all over the Sudan for these therapeutic potentials and its use is recommended by traditional herders for improving the appetite and acceptability of numerous feeds or therapeutics.

Hilba is used also externally, as a paste, to ripen abscesses and to ease the pain of swollen lymph glands. It is also applied on joints and heavy muscles for arthritis and muscle cramps.

xv. Zingiber officinale (Ginger, loc. Zangabil)

Ginger is derived from the rhizomes of *Zingiber officinale* which is a herbaceous perennial grown as an annual crop. The dried rhizomes may be scraped or peeled before drying and are esteemed for their aroma, pungency and flavour. Ginger is used in folk medicine as a carminative and stimulant to the gastrointestinal tract and externally as a rubefacient and counter-irritant.

xvi. Allium sativum (Garlic, loc. Toom)

Garlic is widely used medicinally in both humans and animals. It is a potent sedative for tooth ache, and is also strong antiseptic in mouth gurgles, it is crushed and applied externally as an expectorant and as febrifuge. In man, it is recommended for the treatment of ulcers and as ear drops for otitis. In both man and animals, it is eaten or orally administered for snake bites.

xvii. Hibiscus trionium (wild okra, loc. Waikat)

Besides its use as a common food, the Hibiscus fruit is dried and ground into fine flour, mixed in small amounts in worm water and is administered orally for a mild but sustained laxative effect. It is increasingly used in bloat, especially during the rainy season when large amounts of succulent legumes are consumed. Some herders recommended the use of okra for expelling of abdominal foreign bodies, especially plastic bags that are becoming an annoying problem even for pastoral livestock.

xviii Hyphaene thebaica (loc. Dom)

The composite leaves of this large tree contain thin, long brown-reddish filaments situated between leaflets and at the base of the leaf. These filaments are collected in large amounts and are macerated in water (1-2 days) and a brown-reddish extract is collected after straining. The aqueous extract is used as an eye wash for conjunctivitis and keratoconjunctivitis on animals and for trachoma-like diseases in children.

xix. Acacia mellifera (loc. Kitir)

This tree grows abundantly in the camel range and is a very important source of browse.

The pods and the bark are made into a thick infusion and animals are drenched for endoparasites.

xx. Cucurbita pepo (Pumpkin, loc. Garaa)

This common garden vegetable is associated with a lot of respect by healers. They often say that it was Prophet Mohammed's favourite food. The seeds are dried and are storable for long periods without damage. A decoction is made of seeds and is indicated for dysentery (bloody diarrhoea) in young stock and for giardiasis in children. It is also a well respected stomach sedative.

xxi. Aristolochia bracteata (loc. Um Galagil)

This is a small forb that grows in clay soils. The leaves are ground when fresh and a paste is made and is applied locally for scorpion stings. It is also occasionally used as a strong emetic in cases of pesticide poisoning. The plant is naturally very poisonous and is not grazed by any animal species.

xxii. Clitoria ternatea (loc. Erg Elagrab)

The plant is abundant in Central and Western Sudan. The seeds are highly toxic. The root powder is applied locally to scorpion stings.

xxiii. Azadirachta indica (loc. Neem)

This tree, introduced into the Sudan from India during colonial times is used medicinally by resident healers in Gedaref, Kassala, New Halfa, Eddamer etc. The leaves are made into a paste which is applied to contusions, abscesses and lacerations with excellent and painless healing. No scar formation follows healing by Neem paste, which is a unique outcome. Dry leaves are used to ward off insects in store houses (grains, flour etc.). The seed is used for malaria treatment as a drench. The sun-dried seed is also macerated overnight and is used to treat scabies and ringworm in camels and other stock.

E. Other treatments

1. **Urine:** occasionally used as antiseptic to wash hands, prolapsed uters, wounds. Sometimes camel urine is indicated for humans with chronic abdominal pain, hepatitis, chronic diarrhoea. A claim is made of antidiabetic action for camel urine but no proof could be obtained.
2. **Special rock (Atroun of Jardiga):** are special bitter tasting calcaceous soils obtained from certain locations, specially in the Nubian desert. The rock apparently contains a lot of bicarbonate, calcium and salt (sodium chloride). It is given in drinking water to improve the appetite and as a vermifuge in camels. In man, it is a widely used antacid, specially Jardiga.
3. **Salt:** a very commonly used ingredient, on its own or in mixed preparations. It is always present in skin preparations intended for the relief of musculoskeletal pains in worm drenches, in colic and poor appetite. Salt is commonly offered to camels (and occasionally other stock) to improve body condition. It is widely believed that salting animals prevents mange and helminthiasis.
4. **Sesame oil:** sesame oil is used externally for treatment of non-specific alopecia and mange-like lesions. It is also used to soften callus tissue around sensitive organs (e.g. udder, eyes). It is also used as a softener with tar for painting mange lesions. Internally, sesame oil is a common treatment for Habbob syndrome, an ill-defined disease characterized by chronic emaciation, weakness and eventual abscessation in the shoulder and abdominal regions. Sesame oil is also indicated for indigestion, bloat and worm infestation. Sesame oil is also administered intranasally for rhinitis, sinusitis and chronic cough (Fig. 12).
5. **Animal fats:** fat is collected after slaughter (goats, cattle) and is preserved pressed in small cans. It is extensively used for allergic skin eruptions, to soften callus, and specially to massage udders that have begun to harden (fibrosis) as a result of chronic mastitis. It is also applied to newly lactating camels to ease milking and prevent trauma from swelling. Ostrich fat is used for traumatic tendonitis leading to acute flexion with excellent results in humans. As it is an expensive item, purchased at considerable cost from traders coming from the south, it is not used on animals. Instead, ghee from goats (Samna) is used as an emollient for sprains, contusions and spasms specially those involving tendon structures in both man and livestock. Eagle-marrow or fat, a rare item, has been mentioned by one healer as a treatment for eye lesions such as glaucoma and cataract. It is applied as eye drop or topical irrigation. Ghee from goats, sheep or cattle, is fed occasionally to racer camels, to reduce their appetite for roughage and to give an energy rich alternative. Racer camels, of course, should not get fat, nor should they have a bulky stomach.



Figure 12. Camel drenched -intranasally- with sesame oil for treatment of sinusitis. Note also previous cautery, indicating chronicity

2. Herders' Knowledge and Practices

This part of the study emerged from interviews and encounters with herders in the study being conducted since 1992 (Abbas *et al.*, 1993; Agab and Abbas, 1995; Le Horgne, 1993). In this section, a brief account will be given of these aspects, but the local and symptomatologic accounts of diseases will be detailed.

Camel herders usually treat affected animals on the spot on the basis of an initial diagnosis. The only difference from a healer's intervention is that the particular herder will treat only his own animals. If this initial treatment does not work, a healer in the vicinity is then consulted, often transported to the sick animal or the sick animal is walked up to the healer. Healers in remoter sites, who could be more knowledgeable are approached and specially in case of valued animals (camels or milk-cow).

Herders have a meticulous organ specific diagnosis under which all diseases eventually come to be sorted out. Thus "nafas" or respiration trouble could be further divided into several categories: there is "Sharga" which denotes aspirations, causing chronic cough, then "nihas", which denotes pneumonia; reeh, referring to bronchopneumonia; abu-Nikhairat refers to rhinitis. This also applies in digestive tract diseases in which organ specific as well as age specific conditions are differentiated (see Annex 5). Musculoskeletal and locomotory abnormalities assume great importance in camels, and this is reflected in the wealth of the herders vocabulary which includes about 12 different terms each denoting a specific condition.

The local nomenclature of diseases also indicates an appreciable knowledge of anatomy, and is a proof of the claim made by herders, namely that they often open-up an animal after death to perform a post-mortem. For example, the conditions referred to as abu-glaib (hydropericardium) or mahfoura (brain

abscess or encephalitis) cannot be confirmed without post-mortem. Experience gained from such an examination of a typically affected animal is invaluable in making a correct diagnosis of future cases.

Herders are also prolific in relating diseases signs and symptoms and record with clarity the sequence of disease events and often correctly classify illness as regards the involved organ or system. A good inventory of knowledge exists among herders of the symptomatology of important diseases such as calf diarrhoea, night blindness, abortion, mange, pneumonia, locomotory disturbances and Trypanosomiasis. The diagnosis of the latter disease by signs of weakness, anaemia, watery eyes, inappetence and finally by the characteristic urine smell is universal among camel herders in Butana, and only very few fail to correctly diagnose this disease.

A group of unidentified (and non-system specific) diseases are grouped under the ambiguous "haboob" (= "wind") syndrome. This leads to disparity in symptoms or signs considered diagnostic of the particular disease, disease outcome, treatment outcome and individual animal tolerance.

Herders are far less resourceful and far more impatient to their interventions than healers. They rarely use medicinal plants, but instead resort to antibiotic injections (usually oxytetracycline) for almost all conditions - as a first resort. For example, a herder inexperienced in the traditional diagnosis of trypanosomiasis by urine smelling will begin by using oxytetracycline, then an anthelmintic and would finally consider the diagnosis of trypanosomiasis when the animal continues to lose weight. However, emergency interventions such as in dystocia, bloat or uterine or rectal prolapsed are readily ventured. Most herders gain experience in dealing with these and similar other conditions by the time they are fully responsible for a whole herd.

Herders are extensively knowledgeable about pastures and know in detail the species, growth stage, and season, location and signs of toxicity of several plants, which are strictly avoided (Annex 6).

Herds usually avoid cauterization, which they admit is the work of specialists. But it is interesting to note that it is the herder (or animal owner) who actually recommends or demands the application of fire in most instances and that the healers usually accept to do so following herder/owner request. There are of course instances when the healer is the initiator of this intervention, but it is very common to learn from a herder that he is taking a particular animal for cauterization by a specific healer.

Another problem with herder practice is the lack of caution in demanding conditions such as abortion. Herders rarely use an antiseptic alternative and apart from urine, the use of an antiseptic analogue is not recorded. The scarcity of water in the desert is obviously a limiting factor. Sometimes faulty injections, using unsterile syringes have lead to animal fatality (Fig. 13).



Figure 13. Fatality in camel as a result of phlebitis due to faulty intravenous inoculation by the herder

A. Vaccination

Pastoralists in Butana area commonly vaccinate their animals (sheep, cattle) against foot and mouth disease (FMD) by applying either effusion and or crusts from clinically affected animals to the mouth of healthy ones. This leads to mass infection and a mild disease of the whole flock followed by self-cure and some degree of immunity. This is considered better than the natural epidemic in which a few individuals fall sick every day, with an outbreak lasting several weeks.

Another disease for which vaccination is carried out is the (fearful) contagious pleuropneumonia of cattle (CBPP) and small ruminants (CCPP). However, sometimes the outbreak is actually of haemorrhagic septicemia (HS) but the pastoralists treat it as CBPP because of close pathologic and epidemiological similarity. A characteristically sick lamb or calf is sacrificed and its lungs sliced into small pieces. Two methods are employed. Either thorns are pierced into the slices (dispensed to different flocks), left there for about ten minutes, then taken out. Three thorns constitute an inoculum, and are held firmly together to form one pointed head, and inserted several times into the skin of ears, neck, abdomen or the thigh. The other method uses the whole slice which is inserted in an incision under the tail or in the dewlap of cattle. The wound usually rots in a few days, after which it is either cauterized or washed with urine or rubbed with salt or acacia pod (Garhad) powder.

So far, there are no records of vaccination attempts in camels, although the Veterinary Departments continuously embark on vaccination against anthrax and haemorrhagic septicemia in cattle.

B. Other Disease Control Procedures

The mobilization of herds from certain ecozones during the rainy season serves as a sound procedure for the avoidance of insect borne diseases notably trypanosomiasis babesiasis, theileriasis and mud related

diseases such as foot rot. During drought spells as occurred during the early eighties and again in 1990, pastoralists had to venture deeper into the neighbouring savannah belt and stayed for a considerably long period before they came back to the Butana. This led to huge losses from diseases among camels and other stock and interviewed pastoralists complained strongly of fly borne diseases, tick infestation and mud.

Another tactic is the prompt segregation of sick animals in an individual herd as well as the avoidance of such herds in which infection is known to have occurred. This applies particularly to diseases such as mange, ecthyma, pox, pneumonia and abortion.

When camels are on pasture specially during the rainy season a high rising grassless spot is usually chosen to rest the animals on at night. This is done to avoid night active insects and snakes.

A strategy is also adopted in order to lessen worm exposure during the rainy season. Namely, camels are not allowed back into the pasture until the sun is well up and most of dew has evaporated. This strategy is a reflection of an outstanding epidemiologic understanding of the environmental associations of endoparasitism. Most larvae of nematode helminth parasites climb on grass leaves during the cool hours and stay there to be picked by foraging stock. As the day warms up they climb down to seek shade and humidity. Early morning grazing is strictly avoided during the rainy season, but is actively encouraged during the dry season, when the parasite threat is no longer a worry. Herders also shear young camels routinely to protect them against lice or tick infestation (Fig. 14).

Pastoralists utilizing the winter range of the Red Sea drive their camels into shallow sea water and force them to wade for several hours while pouring sea water on their back, face, udder and belly. This promptly rids camels of all their tick burden. Pastoralists claim that it also acts as a prophylaxis against mange. Several camels were observed after such an exercise and it was confirmed that most ticks, particularly adult or engorged ones have fallen off or died (and dried in situ) a few hours after the bath.



Figure 14. Young camels are routinely sheared to control ectoparasite infestation

C. Supplementation and special feeding

Pastoralists in the area are fully aware of the value of good feeding in disease prevention and performance excellence. Camels that are intended for race competitions receive special diets and are not allowed to graze freely. A mouth mask made from Dom fiber is always worn and is only removed during feeding or watering. These young camels, specially of the famous Anafi breed are hand fed on sorghum seed, dates immersed in butter, sesame seed, salt, and very small amounts of green grasses on *acacia* leafage and pods.

Some keen pastoralists undergo great trouble to seek locations with adequate numbers of certain trees (namely: *caparis decidua*, *ziziphus spinach*, *Acacia Albida*) specially during the dry season. In these locations fruits and pods are collected and are fed to lactating and pregnant females or the principal riding camel while the whole herd is allowed to browse for several days. The confinement of camels affected by night blindness to *calatropis* fields for several days has been mentioned earlier. An important aspect concerns the deliberate withholding of colostrum from young camel calves in the belief that it is extremely harmful. Pastoralists strongly hold that if fed colostrum at their leisure, camel calves would develop an uncontrollable gastroenteritis with fatal outcome. They usually isolate a recently calved calf close to their tent and feed it very small amounts of colostrum from its mother. Then the camel cow is milked and the colostrum discarded.

D. Aetiology and disease theory

Pastoralists in the study area are aware of the multifractional nature of disease. They distinguish between diseases caused by or contributed to by different aetiological agents or environmental factors and those caused by nutritional problems. For example, Trypanosomiasis is known to be an insect transmitted problem by the noxious stomoxys and tabanid flies, heartwater to be tick-borne, pneumonia to be an agent transmitted through contact around wells and markets, mange to be introduced into the herd by a sick animal and so on. They, however, fall short of naming these agents as the direct causes of the diseases. They observe, instead that the vector is accused. Due to lack of any awareness of the microbial (or microscopic) world, the pastoralists cannot be blamed. In fact, they should be commended for their shrewd observations and associations. This proves that pastoralists are aware of the infectious (and transmissible) nature of many diseases, a good step towards further information. Knowledge of the cause of diseases by deficiency in certain nutrients is exemplified by the correction of night blindness by the forceful feeding of affected animals the unpalatable green foliage of *calotropis procera*; the feeding of limestone to unthrifty camels and sheep; salting of camels heavily parasitized with worms; the special feeding of pregnant animals.

Another aetiological category concerns the widely prevalent knowledge about toxic plants in the rangelands. Pastoralists show extreme sensitivity about toxic plants and strictly avoid such infested pastures. The information is also passed around and these locations are avoided until the risk is over. Plant toxicity assumes greater importance early in the rainy season when plants are just emerging and the high risk pasture composition are not yet known. High risk pastures include far-lying locations to which pastoralists are forced to move during droughty years. The disease locally known as Kassara (Fig. 8) is an example of a condition in which toxicity by a shrub - *Capparis tomentosa* - found in the clay plains of the high rainfall savannah is an example. Cases were reported during the summer, usually in herds coming back from the southern savannah range and was rarely seen in resident herds.

E. Disease terminology

The pastoral vocabulary is astonishingly rich in relation to pathologic terms, patho-anatomic relations, symptomatology, abnormal behaviour and genetic quality of livestock, particularly camels. These latter animals are always regarded with respect by Butana pastoralists and are often spoken of and referred to as mankind. Camel health assumes great importance. Pastoralists also observe that camels withstand

diseases and that if a camel succumbs to an illness it will be very difficult to get it up again. For this reason, camels are always watched and checked daily. Herders would easily identify all sick animals in their herd and considerable time was spent during field visits to examine sick camels upon herder's request. Herders speak of camels as "foolish" animals that could come into trouble if not watched, specially during migration in new grounds and during seasonal changes (or Fawasil).

The different terms used to classify diseases in Butana and surrounding area are listed in Annex 5.

The prefixes "Abu- or "Um-" precedes some organ or lesion or sign specific conditions and has similar connotation to the Latin suffix "itis" which denotes organ specific involvement (usually inflammation as a basic pathologic process). Thus Abu Kilian stands for nephritis (Kilia = kidney), Abu-Nikhirat for rhinitis (nakhara = nostrils or nose); and so on. However, many conditions, as is the case in modern science, do not follow this simple system and their names derive from principal symptoms, seasonal trend or vector. Examples include mange (Jerreb = skin roughness "extreme"); abortion (interruption; ighadd = prematurity); kassara (breaker); ruttal (heaviness, muscles, limb). Although different ethnic groups utilized the Butana range, including diverse cultures such as Rashidis, Bani-Amer, Lehwee, Shukryia etc., they all commonly identified most of the disease, particularly the important or prevalent ones with similar or identical terms. Rashidis and Beni-Amer usually had parallel terms for most conditions but commonly adopt Butana terminology. The Hadendewa and Bishariin had terms originated from Tibdawet, a completely independent language. Those of them interviewed knew only very few diseases by their common Butana terminology.

IV. Discussion

In the foregoing sections, encounters with ethnoveterinary healers were presented and the outcome of numerous interviews and discussions held with camel herders in the Butana area recorded. These surveys revealed the wealth of information that exists among healers and herders, as well as their interest in many aspects of animal husbandry, therapy and prophylaxis. These encounters also revealed the viability and acceptance of traditional healing practices by a wide range of clients, including both resident and mobile populations.

A. Healers

It is clear that the interest into animal healing is more of a personal choice, rather than an inherited or mandatory role imposed by the family or clan. This is reflected in the fact that most interviewed healers had their initiation (and training) through individuals who were not family members. Some were self initiated and more or less had no instructors; they frequently consulted senior healers in the vicinity. Although 15 healers were only interviewed, the community usually spoke of many more healers including women whom they recommended for interview. It actually appeared that each sizeable village or camp had at least one healer to whom the pastoralists resort for advice or help in health related matters. Although the age of healers interviewed in this study indicates clear skewness towards older individuals, this is apparently due to research bias, as the interest was to interview highly knowledgeable healers as stores of what could be considered more ancient practices as well as the ability to explain interventions, terminology, animal merits, ecologic or environmental factors and historic experiences. This appeared to be an unnecessary bias, since younger healers were by no means less knowledgeable than their older colleagues. In fact, some younger healers appeared more resourceful and had a better understanding of some interventions as well as larger coverage of professional duties (surgery, phytotherapy, husbandry, poetry etc.).

However, the effect of age in the pastoral society in the Sudan is obvious. Herders and livestock owners invariably valued older healers over younger healers. The interventions and materia medica of healers reveals the huge potential of ethnoveterinary practice. The rationale of several surgical procedures has been discussed while presenting these procedures, such as cauterization, puncturing, and fracture

correction. These procedures revealed sound understanding of anatomic relations and a suitable diagnostic ability. It appears that healers (as well as herders) benefit a lot from the occasional post-mortem examinations performed on dead animals, particularly during an outbreak or as a result of brief illness (sudden death).

One healer who had cauterized a young camel calf for diarrhoea admitted that he would no longer recommend such a procedure for that disease. This valuable knowledge occurred after he opened up that calf and noticed the grossly inflamed intestine. He mentioned that cauterization was not good for such heavily inflamed organ, that sedatives were better, such as fenugreek, black cummin or acacia (garadh). Most of the healers in the area treat both man and animals using essentially similar techniques. This is in line with the observations of Forde (1968), Schwabe (1978) and Grandin *et al.*, (1991) who report similar trends among Masai, Dinka and Meru tribes.

Ethnoveterinary practice is a dynamic rather than a static activity. This is revealed by the continuous addition of newer items to both materia medica and surgical interventions. It is also noticed that some healers are beginning to resort to the use of modern pharmaceuticals such as antibiotics and anthelmintics, perhaps, as a result of the observation of their higher efficacy in comparison with phytotherapeutics. In this regard, herders were more pragmatic and more commonly employed Western therapeutics than healers. However, the high cost and relative difficulty in renewing supplies encourages both healers and herders to resort to traditional less effective inputs. This is particularly noticeable in the treatment of pneumonia for which antibiotics, if available will first be used. *Despite its valuable contribution towards disease control, ethnoveterinary practice has certain limitations (Mathias-Mundy, 1992; Wolfgang, 1983).*

The diverse items needed to meet the numerous illnesses, particularly plant items, require a great effort to collect and preserve for future use. The absence of specialized traders "Attarin" in the community makes the effort almost equal to that of obtaining Western medicines from urban centers. This leads to reliance on plants available locally and perhaps also seasonally, which is a great limitation. This is also a possible explanation for the wide (and sometimes haphazard) use of firing, even for infectious diseases (Mathias-Mundy and Mc Corkle, 1989; Pflaumbaum and Kirk, 1992).

Another limitation is gross contamination to both healer and patient, due to the lack of an antiseptic and the healers (and herders) limited use of soap, salt and boiled water. This aspect is particularly serious in lieu of certain diseases such as brucellosis, salmonellosis (Agab and Abbas, 1995), anthrax (Schwabe and Kuojob, 1981) and numerous other conditions. In this regard, the handling of cases of dystocia was often followed by death of mothers due to septicaemias resulting from operative contamination. However, given the situation and the circumstances within which traditional healers operate, it is only fair to admit their genius in meeting the demands and requests of their clients. Even the best veterinarian will be utterly helpless in the desert if he or she is not equipped with an arsenal of supplies and diagnostic aids, to respond to these requests for assistance. Such a situation often occurred to the author. Apart from writing a prescription for the pastoralist to collect next time he is in town, nothing else could be done for complaints as simple as keratoconjunctivitis or eczema.

B. Herders

Camel herders are universally known for their hardiness and extreme observational ability (Reid, 1930; Allan, 1965; Cunnison, 1966). This perhaps stems from the fact that camels need close watching at all times. The camels' sense of "home" appears to be very limited, and indeed given the large, extensive and markless deserts in which it survives, it can easily be lost either in groups or as individuals. Specially during the short rains (June-July) the desert swarms with bands of 2-3 men (sometimes a single youth) riding for days and nights in search of lost camels.

The herders in Butana have an exemplary record of the camels' physiologic, behavioural and pathologic characteristics. Beside knowing individual animals closely, they keep an excellent mental record of

pregnancy history, calving history and production potential of their breeding stock (Abbas *et al.*, 1992). Their knowledge on diseases affecting camels can be illustrated by the list of (over 50) terms used to denote various conditions and the differentiation of several conditions not by symptom or sign only (system specificity) but also by the affected organ (organ specificity). This diagnostic ability, most probably, stems from close observation which allows the herder to follow the sequential development of many diseases. For example, lameness has at least about six causes (or source points), cough at least three, and stomach pains at least four origins. The local terminology is indicative of the aetiology, anatomy or the pathognomic symptomatology of each condition. Sometimes, it indicated the most important contributory factor, such as "reeh" to denote pneumonias occurring during wind seasonal change of direction. Since information is passed orally, there appears to be no barrier in communication between herders and healers. This could account for the extensively shared knowledge between the two groups on many aspects of anatomy-physiology and diseases, range, and the environment. Since healers were in most instances former herders (some are still herders/owners) it is perhaps safe to conclude that the present-day herders will feature some candidates, who if given the relief from having to herd daily, could become excellent healers.

Encounters with some (very few) herders often made our work in veterinary researchers a lot easier. These herders were reliable, compassionate towards animals, specially the sick, and kept excellent record of case outcome or progress. A lot of help is expected from these herders in on-going efforts to evaluate some candidate phytotherapeutics, as well as diagnostic efforts to elucidate some ambiguous conditions affecting camels such as the ill-defined "Haboob" syndrome, bent neck and certain types of ataxia in camels.

In our efforts to create closer links with pastoralists, a series of paravet training courses have been designed and an Arabic booklet describing major diseases and their treatment has been prepared (Abbas, 1995). So far three 1-2 month sessions in which about 75 young men were trained, were held in co-operation with several NGOs: (Save the Children's Fund, USA; Area Development Scheme, Butana (UNDP); Dryland Husbandry Project (OSSREA, EPOS) and Plan Sudan (Kassala). It is hoped that these youth could continue to be interested in field practice, and bridge the gap between herders, healers and the Veterinary Departments. It is envisaged that these paravetes will be followed up in one way or another to further evaluate the contribution of this activity towards better disease control, and to see if conflicts or co-operation arise between them and traditional healers.

C. Phytotherapy

Many of the botanics reported in this study have also been mentioned by other researchers to be used medicinally in other parts of the world.

Ginger, produced largely in India, is used universally for its carminative and aromatic stimulant effect to the gastrointestinal tract and externally as a rubefacient, and has also a reputation as an aphrodisiac in India and the Far East (Pursaglove *et al.*, 1981). The commercially available dried gingers have been reported to contain oils (15-30%) (Winterton and Richardson, 1965; Connel, 1970), while the pungent principle gingerol is in the range of 17-30% (Nambudri *et al.*, 1975). Hikino *et al.* (1983) described the anti-emetic contents and uses of ginger methanolic extract in Chinese folk-medicine, while Bone *et al.* (1990) reported that ginger root was superior as an anti-emetic to metaclopramide treatment. Yamahara *et al.* (1988) found that orally administered acetone extract of ginger (terpenoid) prevented experimentally induced gastric lesions by 97%. Endo, Kanno and Oshirnd (1990) reported on the antiprotozoal activity of certain ginger extracts. The latter findings are in line with the pastoralist use of ginger decoction as a gastric antiseptic and protectant. However, most of these activities can be concentrated in certain derivatives of the ginger rhizome and some extraction effect is needed to accentuate the effect of these treatments.

Garlic (*Allium sativum*) has been recognized as an antimicrobial (growth) inhibitor by many workers. For example, El-Ashi (1996), Abdel Nassir *et al.* (1983), El-Nima *et al.* (1983) and Chen *et al.* (1985) have all

found growth inhibitors against a range of microbes including *El Coli*, *Bacillus cereus*, *Micrococcus spp.* and others in aqueous extracts of garlic. In addition, Sutabhana et al. (1992) reported strong anti-fungal action as well as aflatoxin production inhibition by garlic extract on the common pollutant fungus *Aspergillus flavus*. These findings were confirmed by recent research (Pai and Platt, 1995). Garlic extract also had anti-platelet aggregation action which could explain its use as a mucosal sedative (Srivasta, 1984).

Balanites aegyptica is also extensively used by Sahelian pastoralists to treat skin diseases and ectoparasites for which the kern oil is used (Porter et al., 1988); snake bites by the leaves and buds (Ba, 1982); while the pastoralists in Eritrea were reported by Fre (1989) to use the bark powder for eye diseases and foot rot.

Jatropha curcus was previously handled as a toxic plant whose feeding resulted into severe hepatotoxicity in Nubian goats (Adam, 1978). However, subsequent researches, aided by ethoveterinarian accounts repositioned this plant well in the African materia medica with potent anthelmintic action against round worms (Oliver-Beaver, 1986).

Along this line, the use of *Albizia athelmenthica* as an anthelmintic is well supported by research findings in which rat models were employed (Galal, 1984; Galal et al., 1991). *Calotropis procera* promises to be a plant of multiple benefits in the arid zones (Fall, 1989). As confirmed by proximate and mineral analysis, this shrub is a store of numerous nutrients at acceptable therapeutic levels (Abbas, Tayeb and Suleiman, 1993). Many of the species of *Cassia* such as *C. Senna*, *C. occidentalis*, *C. tora* are used in traditional medicine in tropical Africa for the treatment of worms, infection, constipation, pleurisy, oedema, ring worm and eruptive skins conditions (Watt and Breyer-Brandwijk, 1962; Oliver-Beaver, 1986). Seeds of *C. tora* and *C. occidentalis* possess strong antimicrobial activity against *Staphylococcus aureus*, *Bacillus subtilis*, *B. proteus* and *Vibrio cholerae* and against the fungi *Aspergillus flavus*, *A. niger* and *Trichophyton metagrophytes* (gaind et al., 1966; Shah et al., 1968; Quadry and Zafar, 1978).

Azadirachta indica (Neem) proved to be an important multipurpose tree. In Asian countries the sun-dried seeds are used extensively to control pests in household and stored cereal grains, a usage identical with that in the study area (Jotwani and Circar, 1965; Rembold, 1984). Oil extracted from the seeds is used in both man and animals as an anthelmintic, in ringworm, scabies, abdominal ulcers, rheumatism and muscular pains (Fernando, 1982; Ketkar and Ketkar, 1976).

The literature on botanics used in different parts of the world is very extensive. More research is needed to compare the international use of various plant species, as well as to identify those with promising potential as candidate for future pharmaceuticals. However, one cannot pass on this issue without remarking on the concordance in ethnomedicine and ethnoveterinary medicine between diverse groups of people who live in different geographic locations (and continents). This should draw more attention from the international research community towards validating and promoting successful ethnoveterinary and ethnomedical components. Future research should concentrate also on the phytochemical properties, toxicity as well as specific therapeutic traits of known ingredients derived from candidate plants.

V. Conclusions and Recommendations

The survey of traditional healers and camel herders in Butana and its vicinity revealed the existence of a large school of ethnoveterinarians and eco-researchers whose activities are service oriented and who depended predominantly on locally available resources.

While ethnoveterinarians forward an invaluable service to the pastoralist community, they stand helpless in the face of several diseases, and are also captive to some wrong concepts. The amount administered in phytotherapeutic treatment reduces the effective dose an animal can receive conveniently, thus reducing the concentration of active ingredients (e.g. antibiotic, anthelmintic) and in some cases subjecting the sick animal to the potential of toxicity.

Both healers and herders have a strong diagnostic capability and succeed to correctly classify (camel) diseases as regards their organ or system origin. However, their aetiologic classification lacks precision as they have no knowledge of the microbial world.

The following recommendations are suggested to further understand ethnoveterinary practice in the area and to evaluate its efficacy, constraints and future prospects:

a. Certain phytotherapeutics need further researches to identify their therapeutic potential and toxic profiles under controlled experimental conditions. This should also afford a good degree of chemical analysis in order to arrive at reliable therapeutics using local resources. Candidate items include *Albizia anthelmintica*, *Calotropis procera*, *Artemesia*, *Cymbopogon nervatus* and *Balanites aegyptica*.

b. Training and orientation of traditional healers is urgently needed, specially, in hygiene and disinfection, birth assistance and minor surgery. These courses could be arranged in a regional Veterinary Department in the vicinity of Butana and need not be as exhaustive or inclusive as the presently on-going Dryland Husbandry Project paravet training programmes, but they need to be separated. These courses should bear in mind the rather good professional background of the candidate. Following accreditation, a healer could be incorporated into the research and extension branches of the Veterinary Department and could operate as further instructor and advisor for the much younger paravets. The role of healers in the provision of veterinary services to the pastoral community should be tapped.

c. A branch dealing with ethnoveterinary practice should be established in each provincial Veterinary Department. This section should register the individual practitioners operating in villages and camps and monitor their contribution, research findings and constraints. This linkage affords closer operational relationship with local communities. Since healers are usually well respected and routinely visited by herders and livestock owners they can assist appreciably in disease monitoring. They can also be excellent extension agents, with reciprocation or feedback from pastoralists concerning drug efficacy, new developments in breeding, nutrition and animal husbandry.

d. It will be interesting to compare these observations with parallel studies of the ethnopractices among sheep and cattle keepers, essentially different pastoralists, who could have evolved different methods of disease control. It could also give more light if it especially considers cattle pastoralists who spread far south into the richer savannah zone. The ecological set up in this zone might afford a richer faunal exposure and availability of the physiotherapeutics.

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Annexes

Annex 1: Rainfall Data in Central and Southern Butana

1980-1995 (in mm/year)

Year	Central Butana (New Halfa)	Southern Butana (Gadaref)
1980	438.5	675.4
1981	534.0	638.7
1982	226.5	710.0
1983	169.7	482.1
1984	39.8	322.0
1985	210.6	744.7
1986	172.3	604.0
1987	78.8	473.0
1988	231.6	584.0
1989	76.2	761.3
1990	33.4	371.9
1991	90.1	406.0
1992	386.0	643.0
1993	242.1	391.0
1994	179.3	401.0
1995	318.1	509.0

**Annex 2: Comparative Nutritive Analysis of Some Shrubs and
Trees Commonly Browsed by Camels**

Species	Protein	Ash	Nitrogen	Fat	Cellulose
			free extract		
Panicum turgidum	5.3	9.7	43.2	1.4	31.9
Capparis decidua	8.4	5.2	35.7	0.7	37.5
Acacia chrenbergiana	2.5	8.4	39.5	1.8	40.9
Acacia mellifera	5.7	7.6	42.3	1.6	36.7

**Annex 3: Personal data on 15 Interviewed Healers in Butana and
Adjoining Area**

No.	Name	Tribe	Location	Age	Mobility	Speciality	Duration in practice (years)
1	Homeida Abdel	Manasir	Nile	55	Resident	A (m+s)	20
2	Gadir Hassan	Manasir	Nile	40	Resident	A+M (m)	18
3	*Mubarak Ali	Goali	Nile	76	Resident	A (m)	50
4	Ballal	Beja	Kassala	65	Resident	A+M (m)	30
5	El Amin El-Tai	Beni Amir	Kassala	40	Resident	A (m)	10
6	Mansour Okad	Rashidi	Kassala	60	Nomadic	A+M (m)	38
7	Mukhtar Omer	Rashidi	Gedaref	50	Nomadic	A (s+m)	25
8	*Saleem Suelin	Fellata	Gedaref	60	Resident	A+M (s)	30
9	Salama Maatoq	Shukria	Subaq	45	Transhu-	A (s)	8
10	*Abubakar El-Tom	Lehwi	(Butana)	50	Mant	A+M (m)	10
11	Musa Adam El-Nur	Leshwi	Showak	66	Transhu-	A (s+m)	5
12	Ali M. Zein	Araki	Mansoura	40	Mant	A (m)	15
13	*Sh.E. Elttag	Kawahla	Banagir	55	Resident	A+M (m)	20
14	Musa	Shukria	Banagir	60	Nomadic	A (s+m)	8
15	Ismali Ahmed Omer	Lehwi	Sadda	45	Resident	A+M (m)	
	Sulaiman El-Zaki		Odeid		Resident		
	*Abdalla M. Ali				Nomadic		
	Shaa Aldin						

A= Animals only * Healers selected for

M= Man only intensive study

A+M = Man + animals

(s) = Surgery only

(m) Medicine only

(m+s) Medicine and surgery

Annex 4: Proximate Nutritive Analysis of *Calotropis procera*,

a Promising Feed Resource for Arid Zones

Component	Percentage
Dry matter	94.62
Ash	20.88
Crude protein	19.62
Oil (EE)	2.25
Fibre: ADF	43.6
NDF	19.46
Calcium	0.02
Magnesium	5.14
Phosphorus (PO ₄)	0.59
Zinc	0.08
Manganese	0.20
Iron (Fe)	0.04
Copper	could not be detected
Vitamin A (carotene)	27.3*

* Vitamine A in mg/100gm (spectrophotometry)

Annex 5: Nomenclature Adopted by Butana Pastoralists to Identify

Camel Diseases

Local term	Pathologic equivalent	Special meaning of local term
Guffar	Trypanosomiasis (in camel)	Lethargy, off-food
Dubbana	Trypanosomiasis (in cattle)	Fly-diseases
Ruttal	Lameness (hind quarters)	Limb-heariness
Khorag	Diarrhoea (in calves)	Perianal soiling
Gahar	Night-blindness	Night-blindness
Hadda	Mastitis	Lumpy organ (haddaya)
Suffair	Jaundice	Yellowness
Khadar	Heart water	Letharg, paralysis
Ighadh, Ughal	Abortion	Interruption, too quickly
Chasila	Saddle sore, specially shoulders	?

Kelean	Nephritis	Kidney involvement
Sharga	Chronic cough, aspiration	Aspiration
Haboob	Septicaemia	Wind (gas)
Arag, Sarah	Lameness (non-specific)	Lameness, unsteady
Dular	Witter-fistulae	?
Abu Edelat	Parotitis	Straightened, erected glands
		(swollen and hard)
Garab	Mange	Excessive skin roughness
Dood, Hilaa	Helminthiasis	Worms, starved, terrified
Gurad	Tick-infestation	Ticks
Nafas	Respiratory trouble	Respiration is affected
Batun	Abdominal pain	Stomach and intestinal trouble
Kassara	Bent-neck syndrome	Neck-bend; neck fracture
Abu-Laban	Posterior paralysis (complete) - copper deficiency	Milk-borne disease
Sabba	Hip-joint luxation	Falling; pourig
Dibab	Circling disease (encephalitis)	Hill-forming gait; slow walking in circles
Kolab	Rumenitis; tympany (gaseous)	Bloated organ
Simee	Parotid - lymphadenitis	?

Annex 5. Cont.

Local term	Pathologic equivalent	Special meaning of local term
Um-Rikaiba	Knee hygroma (infected)	Knee-involvement
Daraj	Tendonitis (achilles)+	Slow walking
Arra	Alopecia (neck and shoulders)	Nakedness
Jadary	Pox	Pocks; nodules
Kofar	Listlessness	Depressed; hungry
Soos	Foot-rot	Rooting
Gamol	Lice-infestation	Lice
Nasour	Tooth-fistula	Open channel
Mamsouka	Constipation, with colic	Held; Obstructed (flow)
Duah or Hada	Otitis	?
Abu-Naffar	Photophobia	Seclusion; Self-isolation; avoidance
Abu-Roos	Pharyngitis	Head affection (swelling)
Ragat	Alopecial (focal)	Spotted-skin
Habis	Lympadenitis (cervical)	Distnded; ready to discharge
	with caseation	

Abu-Glaib	Hydropericardium	Heart involvement
Hadad	Elbow Myo Arthritis	Muscle cramps, tremore, weakness, fatigue
	(after racing)	
Fahada	Stomatitis (viral)	?
Maila	Encephalitis?	Inclination; lateral deviation
Razzaz	{psteropr Ataxoa (during sitting act) Hind muscular tremors	Falling-sitting; shalling; razzaz=showers
Habab	Papillomatosis	Cilia (filaments)

Annex 6: Some Toxic Plants Encountered in Butana

Area (1995)

Botanical name	Local name
Aristolochia bracteolata	Um Galagil
Cadaba rotundifolia	Kurmut
Cassia occidentalis	Sim Eldib
Chrozophora plicata	Terba
Crotalaria saltiana	El-Sifira
Lotus arabicus	Birseen El Bahar
Solanum nigrum	Enad Eldib
Sorghum halepense	Addar

Annex 7: Ethnoveterinary Practitioners: Personal Data

A: Personal Information

1. Serial No. 2. Name 3. Age.....
4. Locattion: village Town
- Province..... Tribe
5. Duration in practice
6. Spcilaity: Animal only Man and animals
- single species surgery only
- medicine only mixed
7. Background Formal education.....
- Koran school
- Family member apprenticeship

8. Use of: plants; soils; rocks

surgical tools; urine.....

9. Mobility (calls): None10km 30km

>30km.....

B: Communal and Opinion:

1. Is traditional medicine (utility):

declining..... Increasing.....

2. Is modern medicine a threat?

3. Would you advise the use of certain modern items in specific

conditons.....

Give examples.....

4. Can traditional and modern medicine work together?.....

5. Would you accept training in modern medicine?.....

6. Would you train others in traditional medicine?.....

7. What are your practice constraints?

.....

.....

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Annex 8: Map: Butana Plains, Sudan

