ETHNOVETERINARY MEDICINE IN AFRICA

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Local knowledge, indigenous technical knowledge, people’s science, ethno-science, folk or traditional knowledge—whatever term is chosen, the wealth of empirical agricultural, ecological, medical, and other know-how that peoples around the world have gathered up and wisely stewarded through the centuries has increasingly attracted the attention and respect of conventional science. Particularly in the international development community, interest in local knowledge systems (LKS) has been stimulated by the alarming observation that rapid socio-economic, ecological, and technological change has led to the disuse or loss of sensitive, often site-specific bodies of knowledge, frequently along with their associated plant and animal species and unique technologies. At the same time, developers have come to realise that such knowledge systems hold much of practical value for mounting cost-effective, sustainable, environmentally benign, and socio-culturally workable initiatives to improve human livelihoods and well-being. (For overviews and examples of work in LKS see Brokensha et al., 1980; Warren et al., forthcoming; for a succinct survey of topics and issues, especially in agriculture, McCorkle, 1989a and the references cited therein.)

One branch of the burgeoning research and development (R&D) emphasis on LKS is the pioneering field of ethnoveterinary medicine: the study of folk beliefs, knowledge, skills, practices, and practitioners relating to the health care of animals, but always with an eye to practical development potential (McCorkle, 1989b, c). Although veterinary arts have evolved whenever and wherever people and animals coexist, as a named and recognised area of academic interest ethnoveterinary R&D has an even more recent history than have other branches of LKS research. With the exception of work in pharmacognosy, only in the mid-1970s did significant numbers of scientists begin systematically investigating this rich corpus of data and experience. Elsewhere the genesis, structure, and thrusts of ethnoveterinary R&D have been described in detail (McCorkle, 1986); and a preliminary overview of ethnoveterinary literature worldwide has been published (Mathias-Mundy and McCorkle, 1989). The present article instead presents an in-depth review of ethnoveterinary medicine in Africa, followed by a critical analysis from both social scientific and biological/technical perspectives of how this valuable but endangered body of knowledge can be put to work in agricultural development.

VETERINARY PRACTITIONERS AND CONCEPTS IN AFRICA

In most cultures, disease concepts apply more or less equally to animals and people. Given this congruency, it is little surprise that healers of people often treat livestock, too—and vice versa. Frequently they employ the same herbs, compounds, manipulative techniques, magical procedures, and so forth. Examples of healers documented as regularly and successfully treating animals include: Maasai laibon (Forde, 1968) and ol olbani (Schwabe,
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1978); Meru mugaa (Grandin et al., 1991) or Luo and Luhya muganga (McCorkle field research in Kenya); Arab toubib (Curasson 1947); Twareg marabouts (Wolfgang et al., in progress); seb-lalamro healers and measr or native camel veterinarians among the Beni-Amer of Ethiopia (Fre, 1989); Dinka atet, tiet, ran cau, ran wal (Schwabe and Kuojok, 1981); and ‘native animal doctors’ among the Awlad Kahil and Baggara Arabs of Sudan (Reid, 1930); the Wakamba of Kenya (Grandin et al., 1991), and still other groups, for whom the literature offers no specific title. In fact, rarely are veterinary and human aspects of traditional medicine very distinct in terms of their practitioners, concepts, materials, and methods (Mathias-Mundy and McCorkle, 1989).

Worldwide, two broad types of ethnomedical aetiologies can be distinguished: natural and supernatural. The former explain illness as the result of a disturbed physical equilibrium; the latter generally make reference to the actions of human beings believed to be sorcerers or witches, of agents such as gods, genies, evil spirits, etc., or of magical procedures. An example of a naturalistic medical system common in (especially Moslem) Africa is humoral pathology, rooted in the Greek theory of the four elements of earth, water, air and fire, plus hot/cold disease dichotomies.

Natural and supernatural explanations of illness are not, however, mutually exclusive. Almost every culture recognises both. For instance, Beni-Amer have four broad categories of livestock disease that represent a mix of natural and supernatural aetiologies. Diseases that cause sudden death are explained in terms of ‘density’ and ‘supernatural will’; the other categories (transmissible, chronic and curable/preventable) are defined by hot/cold and naturalistic features of the ailments they embrace and by stockowners’ ability to correct or control them (Fre, 1989). FulBe in Senegal recognise five types of livestock ailments: ‘fated’ pathological conditions; species-specific ills; contagious diseases; nutritional problems; and environmentally derived conditions (Bonfiglioli et al., 1988, in progress). The latter are seen as originating from pastures infested with parasites and poisonous plants, from other animals or insects, and from seasonal changes, as in the case of botulism and bloat. WoDaaBe ethnomedicine distinguishes ‘ills’—which are engendered by witchcraft, transgression of taboo, etc.—from specific ‘diseases’. The latter are in turn conceptualised as hot, cold or contagious (Maliki, 1981). Evidence suggests that, as applied to livestock, the hot category is comprised of endemic diseases (e.g. anthrax, blackleg) while parasitism, nutritional deficiencies and other chronic conditions constitute the cold category.

Most ethnomedical systems name and classify specific diseases primarily by their most salient symptoms, sometimes along with epidemiological and supernatural factors. As a result, scientifically different diseases may be lumped together in local classification systems, particularly when the ills in question share similar syndromes and/or epidemiological profiles. For example, the Twareg concept of azani, ‘too much blood’, in camels and Fulani notions of wilser, ‘bush disease’, in cattle each embrace multiple Western scientific aetiologies (Sollod, 1983; Wolfgang and Sollod, 1986). Conversely, the scientifically ‘same’ disease may fall into more than one category. For example, in the FulBe classification system noted above,
rinderpest is sometimes classified as environmentally derived, when it is suspected to have been transmitted by wild ungulates; sometimes as contagious; and sometimes as ‘fated’ (Bonfiglioli et al., 1988, in progress). Sudanese cattle owners give two different names to trypanosomiasis according to whether it is contracted inside or outside a tsetse area (Mustafa and Fawi, 1966). Turkana classify foot-and-mouth disease (FMD) as two different ailments: lojaala, an infection of the mouth, and ebaibai, wounds of the hooves (Ohta, 1984). In like vein, Samburu class peracute and acute forms of anthrax as different diseases. For understandable historical and epidemiological reasons, many Kenyan stockowners consider East Coast Fever (ECF, or theileriosis) a distinct ailment when it occurs in young versus adult cattle (Delehanty, 1990, in progress). Twareg consider shrikayst (a disease resembling clostridial infections such as blackleg and malignant oedema) highly contagious among cattle but non-contagious among donkeys (Wolfgang and Sollod, 1986). Further complicating the task of comprehending indigenous disease classifications is many groups’ habit of using metaphorical disease designations because they fear that uttering the ‘real’ names may trigger the ailment (e.g. Bonfiglioli et al., 1988; Maliki, 1981).

A number of studies have sought to characterise African healers’ or stockowners’ animal disease classifications. Ba (1982, 1984) details the clinical signs, ethnotherapies, and possible Western diagnoses of seventy-two ailments of cattle and other domestic animals among Mauritanian Fulani. Ibrahim (1986) does likewise for Nigerian Fulani definitions of helminthiasis, neurological disorders, streptothricosis, brucellosis, and trypanosomiasis. Wolfgang and Sollod (1986) describe and analyse traditional Twareg ethnodiagnoses and treatments of eleven diseases in cattle, seventeen in camels, twenty-one in goats and sheep, and three in donkeys (Wolfgang and Sollod, 1986; see also Wolfgang et al., in press). For thirty-seven livestock diseases Ohta (1984) and Dyson-Hudson and McCabe (1985) outline Turkana classifications, based mainly on clinical signs and post-mortem observations. Bah (1983) discusses various ailments in work oxen in Sierra Leone. Schwabe and Kuojok (1981) summarise Dinka knowledge of livestock diseases and describe the clinical signs and pathologies of five ailments, as well as some beliefs about them. Morvan and Vercruysse (1978) provide both local and scientific terms for livestock diseases among Mbororo and FulBe in Central Africa, as does Hussein (1984a) for Somali camel raisers.

Along with the examples given above, these studies suggest some of the difficulties of matching indigenous disease taxonomies with their corresponding scientific terms. They also illustrate the necessity of a multidisciplinary approach to understanding and working with African ethnoveterinary systems. In this regard, Delehanty (1990) provides a useful methodology for systematically disentangling ethnoveterinary terminological systems.
Pharmacology and Toxicology

Pharmacology is perhaps the most studied aspect of ethnoveterinary medicine. Worldwide, a significant percentage of ethnopharmaceuticals has proven biochemically active (Mathias-Mundy and McCorkle, 1989). In Africa, research suggests, as much as 30 per cent of ethnobotanicals may be effective against the livestock diseases they are used to treat (Ibrahim, 1984; Ibrahim et al., 1984; Niang, 1987). It is impossible here to mention, much less document, the thousands of plant species and other materia medica in Africans' vast veterinary pharmacopoeia. However, certain plant genera and other substances seem to be widely utilised in many parts of the world, including Africa. A few examples are: species of Aloe, Cassia and Solanum; the genera Combretum and Mitragyna; garlic, a multi-purpose botanical; tobacco, a folk remedy throughout many parts of Africa that is especially common as an ecto- and endoparasiticide but which has many other uses as well; urine, which is almost universally employed as a disinfectant and which figures in numerous ethnothterapies; and ashes and salt (e.g. Arowolo and Awoyele, 1982; Chavunduka, 1976; Fre, 1989; Ibrahim, 1986; Minja, 1984, n.d.; Morna et al., 1990; Ohta, 1984; Porter et al., 1988; Puffet, 1985; Shata, 1976, and many more. For specific examples of the use and efficacy of such items see below; for greater detail, Mathias-Mundy and McCorkle, 1989).

The mode of preparation of ethnoveterinary medicines varies according to the active ingredient to be extracted, the route of administration, and the medical intent (prophylaxis or therapy). An overview of the literature shows that African healers and stockowners prepare infusions, decoctions, powders, drops, fumes, pastes, and ointments from plant, animal, mineral, and other substances in their copious veterinary ethnopharmacopoeia. These may be administered topically; as drenches, vaccinations, or suppositories; through smoke, vapours, or massages; or intranasally.

African pastoralists control an equally vast fund of knowledge and skills when it comes to toxicology. They know what conditions (death, or merely abortion, blind staggers and other neurological disorders, depraved appetite, etc.) different poisonous plants cause in what quantities in which species, sexes, and ages of livestock, as well as what ills such plants can be used to combat (e.g. Ba, 1982; Bonfiglioli et al., 1988, in progress; Ibrahim, in progress; Ibrahim et al., 1983; Hussein, 1984b; Kerharo and Adam, 1964; Mares, 1954; Nur, 1984). Twareg and other groups also have effective techniques to train their stock to avoid poisonous plants (Köhler-Rollefson, in progress).

However, many toxic plants are considered to have beneficial effects when taken in small quantities. For example, Mauritanian Fulani say the fruit of Balanites aegyptica causes a bloody diarrhoea that is easily confused with coccidiosis; but they use the thorns, buds, and leaves of this tree to treat snake bite in livestock (Ba, 1982). Some Twareg blame ingestion of Balanites leaves for a small-ruminant disease characterised by fever and jaundice. But Twareg and other groups successfully treat livestock skin diseases and ectoparasites with the kern oil of Balanites (Porter et al., 1988;
Wolfgang and Sollod, 1986). Chadian agropastoralists use the leaves in combination with cattle urine to heal sores and wounds (Baharani, 1989); and Beni-Amer employ the finely ground bark to cure eye diseases and footrot (Fre, 1989).

Herders everywhere are experts on forage flora, toxic or otherwise. Many pastoral and agropastoral peoples can name every plant found in their rangelands and pastures, describe its palatability to different species, its seasonality, nutritiousness, toxicity if any, and medicinal or other benefits (e.g. as galactagogues). For Africa, this kind of expertise in rangelands and forage resources has been documented among Beni-Amer, Egyptian Bedouin, Fulani, Nuer, Pokot, Somali, Turkana, WoDaaBe, Zaghawa, and still other groups (Ba, 1982; Barrow, 1988; Elmi, 1984; Evans-Pritchard, 1938; Fre, 1989; Hobbs, 1989; Maliki, 1981; Morgan, 1981; Niamir, 1990; Tubiana and Tubiana, 1975).

**Vaccination**

Many pastoral societies of Africa long ago invented their own vaccinations for infectious diseases. Fulani, Maasai, Mauritanian Moors, Somali, and WoDaaBe (Ba, 1982; Larrat, 1940; Leeflang, 1991; Maliki, 1981; Mares, 1951; Schwabe, 1978; Wolfgang, 1983; Yilma, 1989) have all developed effective (Herbert, 1974) vaccinations for contagious bovine pleuropneumonia (CBPP). Typically, infected lung tissue is placed in an incision in the nostrils or forehead; the incision may then be dressed with mud or other materials. When the wound festers, the tissue is removed and the wound is debrided and cauterised. Fulani report that this inoculation protects the animals for a year. While some of these techniques produce a lesion that may take months to heal, especially if the wound becomes septic (Mares, 1951; St Croix, 1972), they do avoid the undesirable side-effects of some commercial vaccines. Given in the neck, the latter can cause the skin to slough off; given in the tail, they can result in necrosis and loss of the wain of the tail (Beerling, 1986; Gonda, 1989).

Using lung tissue, urine, faeces, or milk from infected animals, Fulani, Somali, Toucouleur, and Twareg prepare useful vaccines against rinderpest (Larrat, 1940; Mares, 1954; Wolfgang, 1983). Interestingly, in eighteenth-century Europe, similar inoculations were unsuccessful. They 'worked' only for calves of cows that survived rinderpest, i.e. calves that acquired passive immunity from their dams' colostrum (Herbert, 1974).

Various pastoral groups also vaccinate for FMD, using material from the feet, tongue, or udder of infected animals. Nigerian Fulani, for example, scratch the epithelium of the tongue with a thorn dipped in the fluid from a blister on the tongue of an infected animal (Leeflang, 1991). For bovine brucellosis, an effective traditional immunisation consists of rubbing material from an aborted foetus into an incision in the tail (Schillhorn van Veen, in progress). Bantu peoples of Kenya sprinkle their cattle with the blood of animals dead of blackleg (Wagner, 1970). This can be beneficial in so far as animals often have skin wounds or other portals of entry for such crude vaccines (Schwabe, 1978). Arabs have an effective camelpox vaccine made of powdered scabs from infected animals (Curasson, 1947; Higgins, 1983). Still other ills for which traditional vaccinations have been reported...
among African stockowners include pasteurellosis, contagious caprine pleuropneumonia (CCPP), contagious ecthyma, and sheep pox (Larrat, 1940).

**Surgery**

*Wound care.* All stock-raising peoples have appropriate methods of wound care. Dinka dress fresh wounds with urine and cattle-dung ash—both sterile materials. Along with cloth and medicinal leaves, cobwebs and snakeskin are commonly used throughout Africa to dress wounds. Dinka, Twareg and other peoples expertly suture wounds using (e.g.) cotton thread or giraffe, cattle, horse, and donkey hair (Schwabe and Kuojok, 1981; Wolfgang and Sollod, 1986). The Datoga of East Africa close blood-letting wounds with mud (Berger, 1938, cited in Schinkel, 1970), as do Bedouin camel herders for fly-blown lesions (Higgins, 1983). Maasai healers cleanse livestock wounds with hot water and then suture them with thorns and tendons. They cauterise chronic lesions, remove injured eyes, and close intestinal and stomach wounds with fine tendons (Schwabe, 1978). Twareg and Turkana also surgically remove infected or abscessed tissue (Wolfgang and Sollod, 1986; Ohta, 1984). Nigerian Fulani have demonstrated dramatic surgical skills, as when they successfully replace the unperforated intestines of a gored animal (St Croix, 1972).

*Cauterisation.* Cauterisation is an ancient, routine, and multi-purpose technique in Africa. Most Nilotic cattle cultures cauterise to halt bleeding, heal chronic wounds and hoof problems, and prevent horn development in calves (Schwabe, 1978). Rightly or wrongly, Baggara, Beni-Amer, Berbers, FulBe, Fulani, Somali, Twareg, Zambian farmers and others cauterise for a wide range of ailments that spans anthrax, trypanosomiasis, rickettsiosis, theileriosis, epizootic lymphangitis, epilepsy, botulism, scabies, bloat, diarrhoea, toothache, fevers, eye infections, digestive problems, poor appetite, retained placenta, muscle pains, lizard bites, abscesses, tick infestation, phlebitis, mastitis, arthritis, myiasis, sprains, and general unthrivingness (Ba, 1982; Beerling and Mumbuna, 1988; Bonfiglioli et al., 1988; Burgemeister, 1975; Cunnison, 1966; Delehanty, 1990; Fre, 1989; Maliki, 1981; Ohta, 1984; Wolfgang, 1983; Wolfgang et al., in progress, and other summarised in McCorkle, 1986).

Cauterisation techniques and patterns vary across cultures and by disease within cultures. For example, Burkinabe Fulani make tiny burns over and around sprained areas. This technique is similar to the pin-firing of racehorses in Western veterinary medicine (Wolfgang, 1983). Twareg and Somali burn certain patterns on the skin of diseased animals to increase blood circulation to the area and to kill infectious organisms in the blood (Marx, 1984; Wolfgang and Sollod, 1986).

*Bloodletting.* Like cauterisation, bloodletting is a widespread practice dating back at least to the first century BC in Egypt (Schwabe, 1978). In contemporary Africa, bleeding may be accomplished by puncturing the jugular vein, piercing a vessel over the eye, making small incisions in the
skin, or slitting or cutting the tail or ears (Allan, 1965; Dahl and Hjort, 1976; Evans-Pritchard, 1937; Dupire, 1962; Hartmann, 1869, cited in Schinkel, 1970; Marx, 1984; Monod, 1975; St Croix, 1972). Maasai, Kikuyu and other African pastoralists shoot an arrow from a special bow at close range into the jugular (Leakey, 1977; Schwabe, 1978; Wagner, 1970). Maasai, Fulbe, and other peoples believe that bleeding serves to 'drain away' sicknesses via the expulsion of 'bad', 'black', or 'dead' blood (Bonfiglioli et al., in progress). Limited bloodletting may in fact be helpful in some cases in that, like cauterisation, it produces localised stimulation of the haematogenetic and immunogenetic systems.

**Castration.** Castration may be accomplished through open surgery or bloodless methods. Burkinabe Fulani use both (Wolfgang, 1983). Nuer, Dinka, Twareg, Nigerian Fulani and Somali usually employ open surgery on large animals (Evans-Pritchard, 1937; Schwabe and Kuojok, 1981; St Croix, 1972). But some Somali castrate their small ruminants by crushing the spermatic cord or by applying a red-hot needle to the testicles (Bernus, 1979; Hussein, 1984b; Mares, 1954). Turkana have three castration methods: open surgery; biting off the seminal duct without injuring the scrotum; or crushing the seminal cord as do Ethiopian cattle owners (Ghirotti and Woudyalew, in progress; Ohta, 1984, 1987). Kikuyu castrate bucks by cauterisation (Leakey, 1977).

Pastoralists generally castrate during the dry season, when the chances of infection and mortality are less (e.g. Bernus, 1979). Zambian stockowners run their cattle through cold water after the operation (Beerling, 1986). Other groups use various floral and faunal preparations to cleanse, disinfect or pack castration wounds (Elmi, 1984; Marx, 1984). Finally, Mauritanian Fulani temporarily 'castrate' their small ruminants by lodging the testicles under the abdominal skin. In the breeding season the testes can be let down again and the animals regain their virility (Ba, 1982).

**Obstetrics.** Effective obstetric procedures attested in the African literature include: rectal correction of foetal position and rectal removal of persistent corpus luteum; episiotomy, embryotomy, and fetotomy; Caesarian section; manual separation of retained foetal membranes; treatments for retained placenta; and replacement of prolapsed uteri (e.g. Ba, 1982; Fre, 1989; Heffernan, 1990; Köhler-Rollefson, in progress; Schwabe, 1978; Schwabe and Kuojok, 1981; Wolfgang, 1983).

**Other surgical techniques.** African healers or herders have been known to perform successful trephining of cysts (Higgins, 1983), amputations, and dental procedures on livestock (Porter et al., 1988). Scarification and tattooing of animals are practised by some peoples for aesthetic, identificational, ideological, and/or ethnomedical purposes. More widespread surgical techniques include nose-ringing, dehorning, rumen trocarisation for bloat, and skilled bone setting (Ba, 1982; Bonfiglioli et al., in progress; Malik, 1981; Schwabe, 1978; Wolfgang, 1983; Wolfgang and Sollod, 1986). Dinka atet, for example, correct compound fractures in their cattle, sometimes grafting in a piece of cattle or giraffe bone (Schwabe and Kuojok, 1981).
Dinka also perform cosmetic horn surgery, in which they train the horns of selected bulls using a religious operation that is at least 4,500 years old (Schwabe, 1984, 1987). Samburu train horns by fracturing the bull's skull with special ritual stones or by tying the horns with a rope (Jones, 1984).

Selected management practices

**Herding strategies and disease prevention.** African herding strategies typically embody what has been termed an ecological approach to disease prevention (Ford, 1971; Schillhorn van Veen, 1986, in progress), in contrast to the Western world's emphasis on eradication. Nomadic or transhumant pastoralists' intra- and inter-annual movements are made not only to search out forage and water. Their itineraries are often also designed to avoid normal or exceptional build-ups of filth and disease agents in camps, grazing grounds, and watering sites, and to skirt seasonal, locational, or aperiodic threats of disease and/or disease-bearing pests and wildlife (Schillhorn van Veen, 1986; Asad, 1964; Bayoumi, 1966; Fre, 1989; Higgins, 1983; Leeflang, 1991; Stenning, 1959, and others listed below).

One such general strategy is to graze, move, or water stock at times of the day, night, or year when pests are least active or abundant (e.g. Köhler-Rollefson, in progress). For example, a common practice during the worst of the fly season is to graze animals at night, when the insects are less active. Another strategy is to turn stock out to pasture only after the morning dew has dried (e.g. Ndamukong et al., 1989; van Raay and de Leeuw, 1974). This forestalls stock ingesting the larvae of many harmful species of endoparasites because the larvae, which typically concentrate at the top of damp grass, retreat to the soil level as the grass warms and dries. Stockowners likewise try to avoid grazing their animals in swamps and floodplains, where the mud and dampness promote footrot and provide a favourable habitat for disease-bearing flies or the snails that vector economically destructive parasites like liver flukes. Another common strategy to reduce a herd's risk of parasitic infection is mixed grazing. Since different livestock (e.g. cattle, camels, small ruminants) rarely share the same endoparasites, the likelihood or the quantity of species-specific infectious agents being ingested by one species is reduced by its companion species in the herd (Schillhorn van Veen, in progress).

Obviously, most African stockowners appreciate the role of insects and other invertebrates in the spread of disease. For example, Fulani correctly link trypanosomiasis with tsetse fly bites (Ibrahim et al., 1983). Somali camel herders further distinguish between acute and chronic trypanosomiasis, and they associate two different diptera species with these conditions (Leese, 1972, cited in Diiriye, 1984). Stockowners generally make every effort to avoid areas where these flies abound. Herders also recognise that ticks transmit many diseases, and Beni-Amer, Maasai and other tribes distinguish different species of ticks. Indeed, many African pastoralists knew long before white settlers that ticks vector such diseases as redwater in cattle and heartwater in sheep. Thus 'While the world's experts dallied with this mystery, settlers ... lost countless thousands of sheep and cattle from these two scourges' (‘Fulahn’, 1933: 127). But African herders merely
continued their normal practices of avoiding grazing grounds and shade trees filled with ticks and of covering heavily infested spots with thorn bushes to prevent animals from rolling there (Bah, 1983; Delgado, 1979; Marx, 1984; Schwabe, 1978; Wolfgang, 1983).

African herding strategies often reflect a highly sophisticated understanding of contagion and immune responses. For example, Fulani may move upwind of herds infected with FMD in order to avoid contagion; or they may move downwind so as to expose their animals to FMD, knowing that a mild case confers immunity. Only after an outbreak of FMD in Britain in the early 1970s did Western veterinary science discover that the FMD virus could be transmitted aerially over great distances, as from France to Britain (Schillhorn van Veen, 1988). Yet many pastoral groups of Africa have long known that wind or 'odours' can carry this and other contagious diseases (e.g. Bonfiglioli et al., 1988). Another example of pastoralists' immunological savvy is Baggara adoption in the 1950s of a commercial tissue-culture vaccine that provided two years' protection against rinderpest. Towards the end of the second year, when the vaccine's effect was on the wane, Baggara intentionally exposed their commercially inoculated animals to rinderpest (Gillespie, 1966). They correctly calculated that the resulting mild infection would confer permanent immunity—at no additional cost!

As another strategy to limit contagion, Dinka, Maasai, Nuer, and other groups place some of their cattle in other persons' herds (Evans-Pritchard, 1938; Schwabe, 1978). Among Sérèr farmers of Senegal, a single family may spread its animals across as many as a dozen villages (Péllissier, 1966). This dispersal strategy ensures that, in the event of an epidemic, at least some of the herd will survive. Another strategy to forestall the threat of contagion attendant upon the acquisition of new animals is to bring them into one's herd only during the dry season (when many diseases are less prevalent) or to acquire stock only from people whose herds and management systems one knows (Knight, 1974, and various personal communications to McCorkle).

When a contagious disease does strike, many groups—including Awlad Kahil Arabs, FulBe, and Somali, among others—promptly separate sick from healthy animals (Bonfiglioli et al., in progress; Dupire, 1962; Marx, 1984; Reid, 1930). Zaghawa do not allow their sick animals close to wells (Tubiana and Tubiana, 1977). Nigerian Fulani warn neighbouring stockowners and then use separate pastures and watering places; rangelands infected with endemic diseases such as blackquarter and anthrax, whose spores survive for long periods in the soil, are not used for two years. Also, wherever rinderpest or CBPP has broken out, Fulani do not graze their herds for two months (St Croix, 1972). Burkinabé Fulani use thorn bushes to cordon off areas where animals have died of blackleg; the bushes are then burned during the dry season (Wolfgang, 1983). Senegalese FulBe bury all stock dead of contagious disease, to forestall healthy animals' coming into contact with contaminated carcasses or bones (Bonfiglioli et al., in progress). Kababish Arabs, Turkana and indeed virtually all stockowning peoples are well aware that animals can infect each other by using the same watering, grazing, resting, and rolling places (Asad, 1964; Ohta, 1984).
Pest, parasite, and predator control. In addition to the herding strategies noted above, African stockowners have a wide array of effective mechanical, managerial, and ethnopharmacological techniques to combat the many pests and parasites that plague their livestock.

Mechanical and managerial techniques include such actions as: lighting smudge fires to drive off insects (Bah, 1983; Delgado, 1979; Evans-Pritchard, 1938; Ford, 1971; Law, 1980; St Croix, 1972); regularly fumigating animal quarters and camps, often with medicinal plants (HPI, 1990; Ibrahim et al., 1983; Porter et al., 1988); daily removing ticks by hand, or by burning, piercing, or snipping (Beerling and Mumbuna, 1988; Fre, 1989; Marx and Wiegand, 1987); repeatedly driving stock through a river, to loosen ticks and wash off the dirt and dung that attract flies (Beerling and Mumbuna, 1988); and seasonally burning rangelands, purposely overgrazing pastures, or chopping down vegetation so as to destroy the habitats or breeding grounds of pest populations (Ford, 1971; 'Fulahn', 1933; Köhler-Rollefson, in progress; Schillhorn van Veen, in progress).

Indigenous poultry protection techniques in Nigeria include: planting tobacco around flocks’ roaming range to discourage pests such as soldier ants and snakes; and painting chicks with brightly coloured natural dyes, so as to ward off hawks (Ajayi, 1990). In some parts of Africa, stockowners also rely in part on ethological methods of pest control, in the form of both domestic and wild bird species that feed on annoying or disease-bearing insects and ectoparasites in livestock quarters or on rangelands. Unfortunately, owing to the widespread introduction of highly toxic commercial pesticidal dips with long residual effects, some of the beneficial species of wild birds (e.g. certain varieties of oxpecker) have been driven to virtual extinction (Glen-Leary, 1990).

Useful home remedies for ringworm, mange, lice, and other parasitic skin problems are extremely common throughout Africa. They are based on ingredients such as: dried animal dung, mud, ash, charcoal, urine, sulphur, detergent, DDT, sawdust, cobwebs, kerosene, used motor oil, gunpowder, liquor, soaps, tars, oils, fats, butters, and innumerable plant preparations using saps, juices, roots, bark, flowers, fibres, etc. (e.g. Arowolo and Awoyele, 1982; Beerling and Mumbuna, 1988; Brown, 1989a, b; Evans-Pritchard, 1938; Fre, 1989; Köhler-Rollefson, in progress; Marx, 1984; Morgan, 1981; Morna et al., 1990; Porter et al., 1988). Many of these ingredients also figure in effective indigenous anthelmintics, which may be used both therapeutically and prophylactically (e.g. Ibrahim et al., 1983). Other ethnopharmacological prophylaxes include, e.g., applying effective, home-made fly repellants, especially before traversing a tsetse belt (Dalziel, 1937, cited in Ibrahim, 1986; Law, 1980), and purging with salt or salty plants, which is said to act as a natural anthelmintic and/or to cause ticks to drop off (Bernus, 1977). An example of one such tick-control drug is a Twareg drench based on a mixture of salt and six pulverised fruits. Reportedly, this treatment causes the ticks to fall off within two days. Like many African stockowners (e.g. Arowolo and Awoyele, 1982), Twareg consider this anti-tick drench and others of their home remedies equal or, in this case, superior to the Western drug equivalents; but herdsmen note that the fruits are often difficult to obtain (Wolfgang and Sollod, 1986).
Dietary supplementation. Well-nourished stock are more resistant to parasitism and other ailments. So stockowners always endeavour to provide their animals with supplementary minerals, edible earths, tonics, special feeds or other nutritious items—at the very least, during certain seasons or to special classes of animals. In addition to forestalling illness, dietary supplementation can enhance appetite, growth, libido, fertility, milk, meat, and fibre-production, or still other desirable qualities.

In West Africa, for example, potash is added to horse feed as a general health supplement (Law, 1980). During droughts, Somali feed their camels watery roots (Mares, 1954); their stud camels regularly receive ghee, sesame oil, and other delicacies to increase virility (Hussein, 1984a). Nigerian Fulani give their cattle a traditional mineral supplement in the form of limestone potash; this is placed on top of old termite mounds, which are also high in mineral content (Waters-Bayer, 1988). Salt is provided by grazing stock on salty forages or soils, feeding them rough salt or salty earths, or watering them at salty wells (e.g. Bernus, 1979; Higgins, 1983; Hussein, 1984b; Mares, 1954; Marx, 1984; Niamir, 1990). Throughout Africa, fruits, milk, gruel, special browses, weeds, hays, and crop by-products and residues (e.g. stovers, chaffs, spoiled grain, cottonseed) are fed during seasonal forage bottlenecks and/or to special species or classes of animals such as horses, draught animals (oxen, donkeys, camels), milch cows, calves whose dams do not produce enough milk, lactating ewes, and rams being fattened for ritual or sale (Behnke and Kerven, 1984; Glazier, 1982; McCorkle, personal observation; Niamir, 1990; van Raay and de Leeuw, 1974; and many more).

Reproduction and breeding. Like other aspects of animal husbandry, management of reproduction and breeding has implications for animal health. To take the most obvious example, the timing of mating is important in ensuring neonate survival (not to mention conception and maternal health). Young born during or near the end of the dry season, when dams’ nutritional status is poorest, are at especial risk. Thus, to synchronise breeding seasonally in their sheep, Baggara and some Fulani tie off the penis or employ the reversible castration method described earlier (Ba, 1982; Reid, 1930; Schinkel, 1970). Twareg either tie or sheathe the penis (Bernus, 1979; Sollod et al., 1984). Somali and Maasai control mating by putting aprons on their rams, or by subdividing flocks by sex and age (Mares, 1954; Schinkel, 1970).

African pastoralists’ knowledge of reproductive physiology is, to say the least, extensive. Fulani, Nuer, and WoDaaBe all have means of detecting when their cows are in heat (Ba, 1982; Evans-Pritchard, 1937; Maliki, 1981). WoDaaBe employ different names for heat periods depending on the interval between them; they also know that freemartins are often sterile. Both WoDaaBe and Fulani recognise subtle physiological changes that accompany pregnancy and imminent birth. Somali can reportedly detect pregnancy in female camels within eight to fifteen days of mating via a complex of astute ethological observations (Elmi, 1989; Nur, 1984). Without laboratory analysis no Western veterinary experts can match this skill. Somali acumen in camel reproduction and breeding is further evidenced in
their language, which includes at least twenty-five technical terms relating to these functions (Siyad, 1984).

With regard to breeding, stockraisers throughout Africa have a solid working knowledge of genetics. The Bodi of Ethiopia, for example, "... have constructed their own folk genetics by ... countless observations and cognition of crossing and the resultant hybrids from generation to generation" (Fukui, 1988: 1). Likewise for Beni-Amer (Fre, 1989). Nuer tracking of cattle pedigrees is nothing short of obsessive (Evans-Pritchard, 1940). Criteria for the selection of breeding animals naturally differ across cultures and species, but they usually take into account features of both the individuals to be bred and of their forebears. Criteria may include: general strength, hardiness, or size; body and horn conformation, posture, coat colour; milk or fibre production; character or temperament—e.g. docility, maternal behaviour, fight, fright, and flight responses; libido and fertility, including such considerations as proclivity to twin or to produce female progeny; and, of course, tolerance of disease (Ba, 1982; Beerling, 1986; Beerling and Mumbuna, 1988; Elmi, 1984, 1989; Evans-Pritchard, 1937; Maliki, 1981; Monod, 1975; Niamir, 1990; Wolfgang, 1983).

Africans' attention to genetics and breeding has led to the development of a number of stress-, drought-, and disease-tolerant breeds. The list for cattle is impressive and centres on the various dwarf and shorthorn breeds of West Africa. To name just a few, these include: the famous N'Dama, originally of the Fouta Djallon plateau of Guinea but now found throughout the forest areas of west and west central Africa; the Baoulé race of the coast (ILRAD, 1985); the dwarf Muturu and Bunaji or 'White Fulani' cattle (Bayer, 1989; Ford, 1971) of Nigeria; the Nuba dwarf Koalib breed in Sudan (Mustafa and Fawi, 1966); and the Boran of Kenya—all of which are reportedly trypano-tolerant; plus the Nguni of Swaziland (Gittens, 1990a, b) which, along with some Nigerian breeds, may be resistant to heartwater as well. Less is known about disease tolerance in other species, although Djallonké sheep and dwarf races of West African goats are apparently trypano-tolerant and generally hardier (ILCA et al., 1979).2

Medico-religious practices and beliefs
Ethnomedical systems for both human beings and animals are usually related to magic, religion, and cosmology (McCorkle, 1986; Schwabe, 1978). Only conventional Western science maintains a strict division between natural and supernatural approaches to health care, even though both coexist in virtually all cultures. Yet even in the Western world, when hospitalised for a serious operation (a naturalistic procedure), people may also make vows to saints, offer up prayers, and purchase masses, votive items, blessings, and so forth, supernatural practices to help ensure a successful outcome and a speedy recovery. Similar behaviour in veterinary health care is attested throughout Europe today (Mathias-Mundy and McCorkle, 1989).

Not surprisingly, in Africa, too, supernatural practices often accompany natural ones comparable to those of Western veterinary medicine. A good example is castration. While stockowners around the world use largely the same panoply of castration techniques as veterinarians, many peoples sur-
round this operation with social and religious acts. These may involve lengthy and elaborate ceremonies, as in the Maskal day festivities, dating back some 500 years, among Ethiopian highlanders (Ghirotti and Woudaiew, in progress). In addition to castration, other management, therapeutic, or prophylactic procedures are often combined with special healing, protective, or fertility rites (e.g. Larrat, 1939), or with less elaborate actions such as uttering prayers and incantations or fashioning amulets and fetishes. Such supernatural ‘reinforcements’ are used to help ward against disease, injury, straying, predation, rustling, witchcraft, the evil eye, and other threats (e.g. Abu-Rabia, 1983; Beerling and Mumbuna, 1988; Jones, 1984; Larrat, 1940, 1941; Maliki, 1981; Morgan, 1981).

Many societies in Africa also practise sympathetic magic, a common feature of ethnomedical systems worldwide. Based on the principle of ‘like affects like’ and dating back to the dawn of humankind, sympathetic magic refers to techniques that are employed because of a perceived similarity to characteristics of an illness or to certain organs and anatomical features. An example is Nigerian Fulani’s treatment of scorpion stings with Heliotropium indicum because this plant’s blossoms resemble the scorpion’s tail (Ibrahim, 1986). African pastoralists also use many plants with thick, juicy leaves or milky sap to promote lactation because of these items’ resemblance to the udder or to milk (ibid.; Nwude and Ibrahim, 1980; St Croix, 1972). To increase fertility, WoDaaBe feed their cows salt and grain mixed with date or Lawsonia inermis stones because the stones resemble the shape of the female sexual organ (Maliki, 1981).

Such medico-religious or magical understandings and idioms often embody solid factual knowledge, however. For example, the WoDaaBe fertility feedings described above have more than just symbolic value. Deficiencies such as avitaminosis or malnourishment can cause temporary sterility in livestock, but this condition is readily remedied with natural vitamin and feed supplements. Similarly, Hausa and Fulani in Nigeria provide an optimum mix of feed grains to their broody hens and chicks; and their poultry management strategies are extremely sensitive to the diverse ethology, biology, and genetics of differing species (chickens, guinea fowl, ducks)—even though flock owners’ careful management practices are in large part motivated by theological and moral beliefs (Ibrahim and Abdu, in progress). To take one further example, herders’ stated rationale for avoiding places where highly contagious diseases have broken out is often that such areas are inhabited by evil spirits; but this supernatural emic in no way impairs the etic efficacy of this astute management strategy (Schillhorn van Veen, in progress).

In sum, medico-religious or magical understandings of disease aetiology can at times lead to effective therapeutic or management action. For practical scientific reasons, therefore, supernaturally motivated practices cannot truly be separated from other aspects of ethnoveterinary medicine. The separation seems especially artificial for ethnopharmacology, where many remedies used for putatively magical or symbolic reasons have proved biomedically effective. Both emically and etically, the line between natural and supernatural is thin (Mathias-Mundy and McCorkle, 1989; McCorkle, 1986); hence studying one without the other is scientifically indefensible.
Limitations of ethnoveterinary medicine

Not all ethnoveterinary practices provide effective or ideal solutions to all animal health problems—any more than does Western veterinary science (see below). Ethnomedicine, too, has its limitations.

First, the collection, preparation, and administration of traditional medicines can sometimes be more inconvenient and time-consuming than Western ones (Fre, 1989; Wolfgang, 1983). However, many stockowners often consider that the extra travel expense and time involved in obtaining Western drugs of uncertain quality, availability, or applicability, and/or having to deal with unscrupulous vendors or livestock agents, is not worth the effort (Grandin et al., 1991; Mathias-Mundy and McCorkle, 1989; Nuwanyakpa, 1989). Thus many people prefer their home remedies.

Second, ethnopharmacology appears to be less effective than modern antibiotics in treating many bacterial infections; overall, ethnoveterinary techniques seem inadequate for coping fully with highly infectious diseases such as rinderpest, FMD, and CBPP or CCPP. Certainly, management measures such as avoidance, quarantine, herd dispersion, and so forth are helpful, particularly when disease pressure is intermittent and/or localised. But they cannot by themselves halt epidemics. Moreover, preventive measures that minimise the prevalence of infectious disease in one species may not work for others (Marx and Wiegand, 1987). More promising solutions seem to lie in Western vaccines, perhaps with improved indigenous immunisation or a combination of the two (see below).

Third, while purely religious therapies are often remarkably effective in human beings because of their psychosocial and psychosomatic benefits, their practical value in ethnoveterinary medicine is questionable. Placebo effects in domestic animals are a non sequitur. But what about—to borrow the words of an anonymous reviewer—a master’s ‘tender loving care’ and concerned attention? Evidence on this point is scant, although Pavlov and others have demonstrated benign effects on animal physiology (such as slowing and regularising of heart rate) as a result of stroking and petting (Beck and Kenyon, 1991). However, supernaturalistic ministrations do at least comfort the worried stockowner, and they frequently serve important social and ideological functions, as well.

Fourth is a more immediate concern: the fact that some traditional veterinary practices and beliefs—natural or supernatural—can be actively harmful to animals or humans. For certain diseases, for instance, Twareg wrongly withhold drinking water from ailing animals (Wolfgang and Sollod, 1986). Dinka, unaware that anthrax is communicable to people, eat the flesh of diseased animals and thus endanger human lives (Schwabe and Kuojok, 1981). And surgery on anthrax-ridden animals can be dangerous to uninformed practitioners.

Fifth, as healers and herders themselves readily confess, ethnodiagnosis is often poor. It is hampered by local people’s lack of basic information which only sophisticated modern technology can provide. Treatment and prevention logically follow from diagnosis, but many infectious and parasitic diseases share very similar clinical signs and syndromes. Such diseases
can be definitively diagnosed only through laboratory analysis or necropsy. As anyone who has made many frustrating return trips to doctors and hospitals can attest, even Western scientific medicine frequently has difficulty making accurate diagnoses. How much more difficult, then, is ethnoveterinary diagnosis, where the patients cannot describe their ills and where the principal diagnostic tools may consist of little more than visual, tactile, and olfactory observations?

Potentials of ethnoveterinary medicine
Despite the foregoing caveats, the literature reveals many potentials in ethnoveterinary medicine, including a number of techniques that are familiar to Western veterinarians. As for unfamiliar procedures, one must beware of dismissing them out of hand because they seem irrational or 'superstitious'. Many folk techniques that seem bizarre to Western eyes may in fact have practical veterinary value and/or constitute highly rational adaptations to local infrastructural and economic conditions. Examples include dietary supplementation to promote fertility, feeding minerals on termite mounds, and using urine as a disinfectant in lieu of other prohibitively expensive and inaccessible antiseptics.

Western medicine should take a harder look at local practice. Because Western-trained veterinarians are accustomed to having ready access to powerful commercial drugs, indigenous alternatives may never have been adequately examined or tested scientifically—much less analysed in their full ecological or socio-economic context. Laboratory and field research may well reveal solid scientific explanations for the efficacy and appropriateness of much of ethnoveterinary technology. In the absence of scientific data, Western analysts must beware of ethnocentrism. Impartial analysis of ethnoveterinary knowledge and practice is important because of their development potential. Melding ethno- with Western veterinary medicine can prove superior to forced imposition of the latter with needless losses of knowledge in the former—the approach so often adopted by livestock development projects in the past. There are at least two broad ways to integrate and build upon the strengths of each of these medical traditions.

Working with local knowledge. Ceteris paribus, ethnoveterinary medicine has the advantage of being cheaper, more accessible and readily understood, and better adapted to local realities, than Western-style veterinary medicine (e.g. Ghirotti, in progress; Ibrahim, 1990; Stem, in progress). An example is the proven effectiveness of many local treatments for mange (Mathias-Mundy and McCorkle, 1989). Developers can integrate such ethnoveterinary savvy into research design, implementation, and extension, to the immediate benefit of Third World stockraisers. This can be achieved by teams of stockowners and social and biological/technical scientists working together to understand, test, and enhance traditional treatments. Thus local people can prepare more reliable home therapies and prophylaxes, in the process freeing themselves from alien, uncertain, and often impossibly expensive external sources of veterinary inputs. Scientists and developers can also collaborate with healers or communities to help organise the controlled harvesting or cultivation of medicinal plants,
to ensure adequate and equitable supplies (Minja, n.d., Nuwanyakpa et al., 1990). Furthermore, such initiatives can give rise to new rural industries in ethnopharmaceuticals or reinforce existing ones.

At a broader level, however, in the present authors’ opinion, what does the literature suggest about which elements of ethnoveterinary medicine are most readily applicable in livestock development? Certainly, local methods of wound care, basic surgical and obstetrical procedures, and many indigenous anthelmintics and treatments for skin diseases are suitable. Although bloodless methods of castration may sound cruel and are occasionally unsuccessful, they do prevent tetanus—always a danger in open surgery, especially in the tropics. Cauterisation is known to be useful for, e.g., lameness, sprains, muscle strains, chronic lesions, vaccinations, castrations, and still other operations.

The foregoing list covers a wide spectrum of health problems, thus suggesting the breadth of possible applications. In Africa many of the most common livestock ills are non-specific diseases that can be effectively treated with traditional remedies or with simple interventions that informed stockowners can themselves apply. While commercial vaccinations and drugs may be needed to help combat epidemics and fatal viral diseases, the economic and production importance of such problems has greatly decreased relative to other ailments—most notably, endoparasitism and diseases transmitted by external parasites (e.g. ticks, which vector ECF, anaplasmosis, and babesiosis), but also respiratory ills and nutritional deficiencies (Haan and Bekure, 1991; Halpin, 1981; Perry et al., 1984; Quesenberry, 1991; Sollod, 1981; Sollod and Stem, 1991).

Of course, in any medical system, prevention should take precedence over curing, because curing is rarely economical (Chavunduka, 1984). Most authorities consider prevention and improved husbandry the most feasible approach to disease control in Africa (Schillhorn van Veen, 1984). Here, too, ethnoveterinary medicine has much to offer.

Perhaps most dramatic are indigenous vaccination techniques. They offer exciting opportunities for blending Western and non-Western veterinary savvy to generate truly appropriate technology for confronting some of the continent’s most frightening livestock diseases. An excellent example of how such ‘technografting’ (Ibrahim, 1990) can be achieved is a new vaccina-virus rinderpest vaccine developed with state-of-the-art recombinant gene technology (Yilma, 1989, 1990). Despite the fact that, beginning in 1962, the largest disease eradication programme in the history of veterinary medicine was mounted to combat rinderpest, this ancient plague has been on the upsurge. While indigenous immunisations can be effective, when an epidemic strikes, they are often difficult to apply promptly and universally. Eradication campaigns using conventional commercial vaccines fall foul of essentially the same problem, in that the majority of African nations lack sufficient funds, trained personnel, and the basic laboratory, cold-chain, and transport infrastructure for such vaccines’ widescale production, proper preservation, and efficient delivery. Even the cost of needles and syringes is prohibitive for most African countries! With the new vaccine, however, once stockowners have had a single calf inoculated, they can themselves produce all the vaccine they require, using
age-old techniques already familiar to them. The calf’s skin is scarified; then, just as in traditional immunisation for poxes, the resulting scabs are collected, dried, powdered, and scratched into the skin of the other animals to be protected. As the creator of this new/old technology points out, ‘Nothing needs to be invented or reinvented to . . . produce large quantities of vaccine cheaply in developing countries . . . Inoculation . . . has precedence in the culture of African . . . herdsmen [and they] could readily adopt the practice of independently inoculating’ (Yilma, 1989: 485).

Traditional husbandry practices, too, have much to offer in that they often reflect sensitive environmental adaptation that contributes to disease prevention. Examples given earlier include: dietary supplementation; astute herding and animal acquisition strategies; quarantine and carcass disposal procedures; numerous methods of pest, parasite, and predator control; and selection for stress- and disease-tolerant breeds of livestock. Indeed, in the opinion of many experts on veterinary medicine in Africa, this last strategy constitutes the single most effective and economical response to most epidemic livestock diseases on the continent. As with ethnothepies, local management practices with prophylactic potential should be thoroughly studied and, wherever valid, offered as alternatives or complements to Western management dogma in livestock development.

Successfully working with local husbandry systems requires understanding not only the ethnoveterinary technology but also the sociocultural systems pertaining to animals. In most societies the care given to different species and classes of animals does not depend solely upon their economic value. The creatures’ ideological status, perceived relationship to human beings, and multiple contributions to social and cultural life, are also important considerations. Many veterinary and husbandry strategies are dictated by these perceptions, rather than by purely profit-oriented motives (Mathias-Mundy and McCorkle, 1989). Developers must therefore comprehend such values and attitudes in order to assess what kinds of interventions stockowners would be interested in. Livestock professionals must also take care not to insult or denigrate local disease and other belief systems. Otherwise their recommendations are likely to be rejected. In fact, employing local veterinary terminology, concepts, and illustrations can be a boon to developers. For example, a livestock immunisation programme in Mali was readily accepted by herders because it was explained to them in terms of their traditional vaccination techniques (Woillet, 1979). At the broadest level, if developers have only an imperfect understanding of the sometimes vital etic correlates of emic aspects of animal husbandry, ill-considered recommendations can unbalance delicate pastoral adaptations and thus imperil the social, cultural, and even physical survival of the very people they seek to serve (McCorkle, 1989a, c).

Working with local people. Work in medical anthropology has clearly demonstrated that co-operation between traditional and Western-trained medics can make for more effective delivery of human health care in general, but especially in remote, rural, dispersed-settlement, or nomadic contexts (e.g. Cosminsky and Harrison, 1984; Harrison and Cosminsky, 1976). A well known example is China’s ‘barefoot doctors’ programme.
The same principles can be applied to the delivery of animal health care services, via training in targeted aspects of basic Western veterinary medicine for traditional healers, herder experts, or stockowners and stockowner or community associations.

Indeed, across the last five years alone, a startlingly large number of such training and extension programmes have already been proposed and/or implemented in Africa, to test the efficacy and outreach of a decentralised corps of barefoot veterinarians, paravets, veterinary scouts, BAHAs (barefoot animal health assistants), or community animal-health first-aid workers—as they have been variously termed. Such initiatives have been implemented in the Rangeland Development Project (RDP) in Ethiopia (Sandford, 1981); with Twareg and WoDaaBe in the Niger Range and Livestock Project, or NRLP (Loutan, 1984; Sollod et al., 1984; Sollod and Stem, 1991; Stem, in progress; Swift and Malikı, 1984; Vu Thi and Stem, in press); on the Ethnoveterinary/Fulani Livestock Development Project of Heifer Project International (HPI) in Cameroon (De Vries, 1990; Nuwanyakpa, 1989; Nuwanyakpa et al., 1990); as part of the ACCOMPLISH (Action Committee for the Promotion of Local Initiative in Self-Help) programme among Mundari and Dinka in Sudan (Almond, 1987, 1991; Gonda, 1989); on the Ishtirak project in Chad (Baharani, 1989; Ishtirak, 1990; Malikı and Bahram, 1988); among pastoralists of the Ferlo in Senegal (Dieye, 1989); and in more than a dozen Intermediate Technology Development Group and/or Oxfam-funded efforts among Borana, Meru, Pokot, Samburu, Somali, Turkana, Wakamba, and other groups in Kenya (anon., 1989, 1990, 1991; Emuria, 1990; Grandin, 1985; Grandin et al., 1991; Iles and Young, 1991; ITDG, 1989a, b, 1990; Young, 1990). Still more such initiatives in the Central African Republic, Ivory Coast, Mali, Somalia, and Zaire are catalogued in Haan and Bekure (1991).

These programmes of necessity take different forms, depending upon many factors: the state of formal-sector health care services in the country; the remoteness, nomadism, etc., of the client population; the level of indigenous veterinary knowledge (which predictably varies across pastoral, agropastoral, and cultivator populations); stockowners’ confidence in outsider as against insider skills; ethnic tensions or even civil war; and numerous other context-specific considerations. Overall, however, programmes can be classed into three broad types. Healers or selected stockowners can receive in-depth training, whether as practitioners and/or as keepers of veterinary drug stores; alternatively, many individuals can be trained less intensively at the community level; or some combination of these two approaches can be taken.

A recent cross-cultural survey of experience to date with selected para-veterinary programmes clearly demonstrates several key components of all such initiatives if they are to be successful (Quesenberry, 1991). One indisputable requirement is that local people have a say in the selection of trainees. Also, training must emphasise practicals and relate to problems perceived by producers themselves. Of course, sessions need to be synchronised with trainees’ intra-annual or other work routines. Instruction should always be conducted in the local language and, wherever possible, should employ local concepts of disease causation, classification, therapy,
etc. In this regard, booklets like those prepared by Jallo (1989) in Fulfulde are useful—although, interestingly, trainee literacy is not a prerequisite of programme success (Quesenberry, 1991; Sollod and Stem, 1991). All authorities further agree that essential to successful paravet programmes are: a baseline study to identify existing veterinary knowledge, practices, and services (both ‘ethno-’ and official) vis-à-vis major animal health needs in the locality; reliable sources of medicines and other supplies; some form of programme record-keeping, monitoring, and evaluation; and follow-up or refresher training for paravets. Finally, the paravets’ Western-educated counterparts—such as field agents of the government livestock service or trainers from private voluntary organisations—also require training. They must learn the basic ethnomedical concepts and veterinary vocabulary of their clients, be schooled in both the richness and the lacunae in ethnoveterinary knowledge, and become proficient in useful local treatments, prophylaxes, and husbandry practices. Thus all veterinary workers gain new skills, mutual respect, and better working relationships.

Most students of the African veterinary scene agree that decentralised cadres of paravets can provide a critical and much needed link between stockowners and government veterinary and other services. Thus a key concern in the design of paravet programmes is how to interlink macro, meso, and micro levels of health care delivery systems—roughly corresponding to national government/scientific, provincial or district/technical, and local/producer levels (Quesenberry, 1991). A number of extension proposals have further suggested that certain types of local healers could provide health care for humans as well as animals, especially where there is a long-standing tradition of such integrated practice (Schwabe, 1981, in progress; Schwabe and Kuojok, 1981). At the same time, healers or trained paravets can strengthen epidemiological surveillance, thus allowing the government livestock service to target its scarce resources and veterinary interventions more efficiently and accurately (ibid.; Sollod and Stem, 1991).

To test the latter idea, a benefit/cost comparison was made of a conventional mass vaccination campaign in Sudan versus a disease surveillance system combining traditional healers with formal-sector resources (veterinary services, slaughterhouse and project field personnel, foreign donors, laboratory and other facilities). This study concluded that such a syncretic surveillance system would be far cheaper than mass vaccination. Moreover, the study found that this approach would greatly improve the veterinary infrastructure by better linking animals and their owners in the field with government veterinary institutions, via local healers or paravets (Zessin and Carpenter, 1985).

These conclusions are borne out in the experience of the NRLP vetscout programme. Using pictographic reporting forms, fifty-five Twareg and WoDaaBe vetscouts spread over an area of approximately 50,000 km² kept monthly records of diseases they encountered and treated among nomads’ herds. The records were collected at a centrally located livestock service facility, where only one trained employee was needed to enter them regularly into a computerised database. This approach provided the government with an invaluable—but highly cost-effective and thus sustainable—animal disease surveillance system and stock inventory tool while simultaneously
developing local human resources and participation at the same time as it increased herd productivity (Sollod and Stem, 1991).

The HPI ethnoveterinary project mentioned at the start of this section illustrates how many of the foregoing considerations and applications can be integrated in a paravet programme. Mounted in mid-1989, this effort was triggered by... frustrations over the high cost and erratic supply of “modern” veterinary drugs... and over the inadequacy and unreliability of “modern” veterinary services (Nuwanyakpa, 1989: 2). A highlight of this initiative is the creation of an Association of Traditional Veterinary Doctors. Along with livestock service and HPI personnel, these indigenous professionals hold seminars on the relative advantages of traditional and modern veterinary techniques plus demonstrations on methods of collection, preparation, storage, and administration of ethnoveterinary medicines. There is also cross-training of traditional and modern veterinary workers, and the former collaborate with the latter in an epidemiological surveillance network. Moreover, as a result of project efforts, Cameroon has now made it national policy to train paravets in rural areas. Meanwhile the project is systematically collecting taxonomic and other information on more than 100 animal, mineral, and vegetable materials traditionally used to treat twenty-nine economically important diseases of cattle, plus ethno-diagnostic data on these ailments. To protect fast-disappearing botanical *materia medica*, the project is also establishing zonal nurseries. Throughout, attention is given to all three types of animal health care—preventive, curative, and promotive—and to women as well as men stockraisers.

The many potential advantages of paravet programmes are evident. In contrast to livestock workers from urban or other-culture backgrounds, native paravets speak the local language; they know stockowners’ lifeways and ethnoveterinary systems; they are comfortable living in the ‘bush’, where they are much more accessible than formal livestock services; and they can usually win client confidence more easily, especially when the local community has had a direct hand in their selection. Other benefits include: cost savings on personnel, vehicular, and other expenses in the formal livestock service; relatedly, the decentralisation of distribution systems, which makes key pharmaceuticals much more widely and readily available; enhanced herder participation and self-reliance in animal health care; the incorporation of useful traditional knowledge and practice into training for both paravets and official veterinary workers; and increased two-way communication between stockowners and their government. It is testimony to the need and desire for such programmes that, within five months of the establishment of a paravet programme in one village in Senegal, fifteen other villages independently approached the sponsor to ask for assistance to do the same in their communities (Dieye, 1989).

However, paravet programmes are not problem-free (see virtually all the foregoing references), any more than are government health care agencies. Indeed, the two systems face a number of the same constraints, including how to strike a balance among preventive, promotive, and curative services (e.g. Leonard, 1987). In addition, the design of a paravet programme requires especially careful thought in: selecting appropriate participants; clearly defining the paravets’ tasks and role *vis-à-vis* the livestock service...
and their co-herders; designing context-sensitive training curricula; planning for and funding on-going supervision and periodic retraining; establishing a fair and workable remuneration system for the paravets, plus credit systems for their clients; dealing with legal restrictions on drugs; and more.5

CONCLUSIONS AND RECOMMENDATIONS

The spectrum of ethnoveterinary materials and techniques in Africa is wide. Some are comparable to Western ones while others seem strange to foreign eyes. Based on the data presented in the preceding pages, however, some broad recommendations for both present and future needs in the study and utilisation of ethnoveterinary medicine can be offered.

First, detailed interdisciplinary research on the past or present existence, efficacy, socio-cultural acceptability, and economic viability of specific ethnoveterinary medicines, techniques, and practices is needed in order to ascertain which ones can be of practical advantage in livestock development. In general, to collect, record, and comprehend local knowledge and its associated semantic systems accurately, both social and biological/technical scientists are needed (McCorkle, 1989a, b; van Raay and de Leeuw, 1974). Particularly useful for ethnoveterinary R&D is a combination of the time-tested field interview methods of anthropologists and linguists with the clinical skills and laboratory expertise of veterinarians. Investigations specifically in ethnopharmacology should include: identification of traditional materia medica and their availability; precise description of their mode of preparation, posology, administration, and so forth; and laboratory and clinical screening of these substances’ pharmacological activity and effectiveness. All these efforts should be followed by participatory on-farm field testing of improved home remedies—another arena in which interdisciplinary collaboration is imperative.

To ensure the highest probability of pay-off for the least cost, identification of promising drugs or husbandry measures should begin with a simple but thorough review of both oral and written literature. ‘Best bets’ will logically be comprised of materials and health care and husbandry practices that, in addition to being recommended by healers and stockowners, repeatedly surface in the scientific literature within or across disciplines—including all the agricultural and medical (human as well as animal) sciences and the ethnographic and linguistic record.

Second, we strongly recommend that proven traditional drugs, therapies, and preventive measures be promptly integrated into formal veterinary curricula and outreach programmes via instruction in ethnoveterinary medicine for both students and professionals in this field. Also included should be the study and appreciation of Africa’s wealth of hardy, disease-tolerant breeds of livestock of all species. Such LKS instruction serves multiple purposes. In addition to instilling in both present and future veterinary practitioners a respect for and understanding of indigenous practice, it furnishes them with more, and often more flexible or cost-effective, health care methods. At the same time it alerts them to be on the lookout for potential new discoveries in ethnomedicine as they go about their work, whether in the field or in the laboratory.
Third, local healers and/or stockowners can be trained in the basic concepts and methods of Western veterinary (and possibly human) medicine. Models range from full integration of such paravets into formal veterinary services to various co-operative or collaborative arrangements between Western-style and traditional practitioners, including the latters' participation in much-needed epidemiological intelligence networks.

Fourth, working guidelines and more specific recommendations need to be elaborated for facilitating planners' decisions on whether and how to integrate ethnoveterinary practices and practitioners into development schema, taking into account country- or culture-specific circumstances. In fact one such effort is already under way (Quesenberry, forthcoming). As signalled by the explosion of initiatives like those of the ACCOMPLISH, HPI, ITDG, NRLP, Oxfam, RDP, SR-CRSP, and other programmes, however, increasing numbers of agricultural developers, planners, and governments have already begun to appreciate and act on the importance and usefulness of understanding, respecting, integrating, and applying local knowledge and practice in animal health and husbandry.

Fifth, and relatedly, there remains a pressing need for comparative research to assess critically the relative feasibility and desirability of Western, indigenous, and syncretic options in animal health care under varying cultural, socio-economic, ecological, and political as well as biomedical and epidemiological conditions. We urge that Western veterinary medicine take a harder look not only at its ethnoscientific counterpart but also at itself. The costs and potential perils of seemingly superior Western veterinary treatments—such as antibiotics or highly toxic chemical dips and other commercial pesticides with long residual effects—need to be carefully weighed against any alternatives that ethnoveterinary R&D might offer. For example, World Bank benefit/cost studies of cattle dipping programmes in central Africa have found that, figured on a per-head basis, programme expenses surpass annual revenue per animal; furthermore, the treatments often make little difference to productivity (Haan and Bekure, 1991). The return on investment in pricey exogenous drugs is even more dubious for smallstock. And, increasingly, the economic justification for many kinds of mass treatment programmes in extensive production systems is being called into question. Moreover, there is an overarching danger to both human and animal health from the profligate or haphazard use of alien medicaments—the spectre of chemoresistance and the evolution of new strains of the very diseases that such dips and drugs are employed to combat (ibid.; Baharani, 1989; Sollod and Stem, 1991). A related peril is the loss of economically valuable disease tolerance—including both short-term acclimatory responses and long-term genetic adaptations—that can result from the irregular or mistaken application of, or over-reliance on, powerful exogenous drugs.

In the face of the chronic foreign-exchange shortages, inflation, and civil strife, much of Africa runs the risk of a dangerous and unsustainable drug dependence. The implications for the political economy of struggling African nations that rely heavily on stockraising need to be carefully examined vis-à-vis alternative or complementary health care approaches. As Ford (1971: 492) warns, unsustainable, high-cost techniques of disease
control—such as 'mass injection of curative or prophylactic drugs, or by blanket spraying with insecticides, or by large-scale felling of vegetation, or destruction of wildlife'—can create situations that are even more dangerous than no services at all. The devastating results of the collapse of mass control techniques have already been documented in the aftermath of Zimbabwe's struggle for independence (Lawrence et al., 1980) and in war-torn Ethiopia (Fre, 1989). Nor is this to mention the broader environmental impact and human health risks of wide-scale reliance on potent chemical drugs and agrotoxins.

Indeed, the African landscape is littered with exogenously designed and imposed, socio-economically infeasible, and hence failed or poorly implemented livestock development projects. Even seemingly successful initiatives that rely solely on alien technology and knowledge have generally proved unsustainable once donor support ends. Many Third World stockowners cannot afford to buy expensive commercial drugs for their children, much less their animals; even if they can, such imports are not always regularly available in unstable Third World economies and polities; or they may not exist at all, if international pharmaceutical companies deem the number of 'paying customers' insufficient for the development or continued production of a given drug (Ibrahim, 1990; Köhler-Rollefson, in progress).

Fortunately, many ethnoveterinary techniques are nearly as effective as, and much cheaper, more accessible, and more readily comprehended than, their Western-world equivalents. To the extent that Africa can draw upon its own, indigenous fund of veterinary knowledge and practice, to that extent, too, stockraisers and governments alike will benefit. Hence the importance of a 'knowledge of local knowledge' (McCorkle, 1989a). A clear understanding of LKS increases communication and information exchange between development personnel and their clients, encourages the latter's participation in their own development, and enables scientists, extensionists, planners, and government policy-makers to design and implement programmes that are more socio-culturally, economically, and technologically appropriate.

Looking ahead to the future, integrating ethno- and Western veterinary medicine could well help to save money, energy, and natural resources. The ecological approach of African veterinary medicine furnishes some instructive lessons in low-input, environmentally sound, and sustainable agriculture. Moreover, as we have seen, scientific appreciation of the ethnoveterinary pharmacopoeia can add impulse to the maintenance of biodiversity via the protection or cultivation of the world's fast-disappearing botanical resources, both sylvan and domesticated. As Minja (n.d.: 18) and other researchers have found during recent field investigations in ethnopharmacology, it is becoming increasingly difficult to locate even a few samples of plants that 'used to be just in the back yard'.

In the context of all the foregoing concerns, rescuing and applying ethnoveterinary information cannot but be beneficial. This is not to say that ethnoveterinary medicine is generally superior to Western methods or that it should indiscriminately replace them. It is to say, however, that ignoring this rich corpus of traditional knowledge and its practitioners would be
foolish. As we saw in the example of new vaccine development, the pragmatic blending of Western and local know-how offers hope of truly appropriate technology—in stark contrast to the larger history of development assistance in Africa. As both human and livestock populations continue to grow in Africa, a synergistic combination of the two medical traditions, with each informing and strengthening the other, could only improve the overall quality and accessibility of animal health care and productivity, and hence the well-being of African peoples and nations who rely upon livestock as a vital part of their social and economic existence.

NOTES

1 Much of the present article builds upon this earlier overview, an award-winning bibliography that presents a forty-eight page analysis of ethnoveterinary medicine worldwide, followed by 237 annotations of works spanning five continents, seven decades, and five languages—all cross-referenced by author, animal or plant species, disease, clinical signs, modes of treatment, geographical area, ethnic group, and still other topics. Also included are precise page numbers for all information cited, plus the addresses where fugitive literature can be obtained. The bibliography can be purchased from CIKARD for US$20.50 (foreign orders £22.50). However, the present article goes beyond this earlier effort, to draw upon additional materials collected for a second such volume, currently in progress. The authors make no claim that the present review of African ethnoveterinary medicine is exhaustive. Because of the fugitive nature of many of the documents involved and because of the long-term, on-going nature of this research, many additional items (notably in early colonial and French veterinary literature) have yet to be located and examined. Also, the authors would welcome readers’ suggestions for further references.

2 For a possible explanation of the fixation on cattle in the literature on African animal husbandry see McCorkle (in press).

3 An excellent illustration of this approach is SR–CRSP work in Peru (Bazalar and McCorkle, 1989; McCorkle, 1989c).

4 A bonus benefit is that the vaccine is equally effective against peste des petit ruminants (PPR).

5 It is not possible to describe and analyse all the pros and cons of paravet programmes here. Mathias-Mundy and McCorkle have prepared a more comprehensive and critical discussion of such programmes, based on a worldwide review of paraveterinary initiatives to date. A preliminary draft of this paper is available as Mathias-Mundy and McCorkle 1991.

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Abstract

Local knowledge systems have won growing attention and respect within conventional science and in the international development community. Such systems have usually resulted from centuries of local people’s empirical observation and experience and typically are highly ecologically sensitive. The information they embody and their associated materials and techniques can be of immense practical value in mounting cost-effective, socio-culturally and politically workable, environmentally benign, and thus sustainable, initiatives to improve human livelihoods and well-being. The present article overviews one pioneering branch of research and development for the continent of Africa: ethnoveterinary medicine. Indigenous healers, ethno-aetiologies, ethnopharmacology and toxicology, vaccination and surgical skills, and selected health-related husbandry practices are described. These data are then analysed from both social scientific and biological-technical perspectives, to identify limitations and potentials in putting African veterinary expertise to work in truly appropriate agricultural development. The authors conclude with recommendations for both immediate and future directions in the study and utilisation of this corpus of valuable, but endangered, knowledge.

Résumé

Les pratiques des connaissances locales sont de plus en plus considérées et respectées au sein même des sciences conventionnelles et du monde du développement