AN INTRODUCTION TO ETHNOVETERINARY RESEARCH AND DEVELOPMENT

CONSTANCE M. McCORKLE Department of Rural Sociology University of Missouri-Columbia Columbia, MO 65211

ABSTRACT.-One of the newest directions in ethnobiology, ethnoveterinary research and development (ERD) is no more than a decade old. As this label suggests, ERD constitutes the systematic investigation and application of folk veterinary knowledge, theory, and practice. Common topics in the field include: veterinary ethnosemantics and ethnotaxonomy; ethnoveterinary pharmacology, manipulative techniques, and magicoreligious operations; appropriate methods of veterinary extension; and folk management of animal health in the context of the livestock production system as a whole, and its relation to larger ecological, socio-organizational, economic, ideological, and political structures. As "veterinary anthropology," this latter approach characterizes the core of both present and future ERD. Largely stimulated by international livestock development concerns, anthropologists and veterinarians have joined forces to tackle the real-world complexities of ethnoveterinary systems from a holistic but comparative and productionsystems-specfic perspective which gives equal attention to emic and etic analyses of animal health-care problems and their solutions. With the integrated knowledge this interdisciplinary endeavor yeilds, developers can more readily design and implement socioculturally acceptable and ecologically and economically sound interventions to improve animal health and productivity-and with it, the well-being of human groups whose livelihood depends in whole or in part upon animal husbandry.

INTRODUCTION

Ethnoveterinary research and development (hereinafter ERD) constitutes such a "new direction" in ethnobiology that as yet there is not even consensus on a label for the field. "Ethnozootechnics" has been suggested as one possibility (Schillhorn van Veen, pers. com.). Sollod and Knight (1983) and Sollod *et al.* (1984) have coined the epithet "veterinary anthropology." And here I opt for the more generic rubric that forms the title of this review. If labeling this domain of study is somewhat problematic¹ defining it is even more so. Its boundaries are diffuse, shading off at the edges into a variety of different disciplines and subdisciplines in both the hard and the "soft" sciences, and in both "pure" and applied research. If ERD cannot be easily bounded disciplinarily, neither can it be expediently defined—as sometimes done for other "fuzzy" fields—as "whatever an 'ethnoveterinarian' does." No such creature exists!

However, as Sollod *et al.*'s (1984) label indicates, the principal actors in ERD are veterinarians and anthropologists, working both singly and jointly. The latter are almost exclusively sociocultural anthropologists, although occasionally a folklorist, linguist or even an archaeologist may investigate a topic directly or tangentially related to animal health. Among veterinarians, a number of fields are represented: epidemiology, immunology, parasitology, pathology, pharmacology (or pharmacognasy) and physiology. There is also room in ERD for contributions from: many of the biological sciences, e.g. botany, ecology, ethology, entomology, zoology; certainly from specialists in animal



The ethnoveterinary researcher on the job. Above, riding the range: interviewing alpaca herders about veterinary techniques and animal management practices, while also observing forage and water conditions and examining general herd health. Below, the author [unseen] photographs Andean stockowners as they discuss the relative efficacy of folk versus "modern" remedies for the many ills afflicting their sheep.

husbandry, range science and water management; and at the level of veterinary policy, planning, and extension, from rural sociologists, economists, agricultural economists, communications experts and others.

Given this range—both actual and potential—of researchers and their research orientations, a strict definition of ERD is difficult and perhaps not even desirable. However, a very broad definition can be offered: ERD constitutes *systematic* research and development which takes as its principal subject or its major departure point *folk* knowledge and beliefs (theories, taxonomies, definitions, diagnoses, etc.), practices, technology and resources, social organization and so forth pertaining to any aspect(s) of *animal health* among species raised or managed by human beings.

In this definition I have opted for the term "folk" (or in Francophone writings, "populaire") rather than, e.g., "traditional" or "indigenous" merely in the interest of historical precision. The latter two terms frequently appear in ERD titles, but a people's veterinary beliefs and practices are not always entirely or demonstrably traditional or indigenous. Instead, they may represent a melange which incorporates elements from other ethnic groups and/or from modern veterinary science. In the latter regard, folk systems may have absorbed these elements [albeit often imperfectly] through word-ofmouth diffusion, by contact with commercial livestock operations, or from veterinary extension services. In fact, as extension efforts intensify, folk veterinary medicine around the world tends to become ever more syncretic.

Leaving aside this minor terminological point, as for "aspect(s) of animal health," these naturally incorporate all features of livestock production systems which can impact—whether positively or negatively, directly or indirectly—upon the physical condition of the animals being managed. At the broadest level, this includes all husbandry techniques involving: feeding, watering, range and pasture management; manipulation of breeding, reproduction and herd composition and dynamics; housing and supervision; prevention, control, curing of disease and, relatedly, sanitation in all management operations; and harvesting of animal products. From an emic perspective, supernatural husbandry techniques—like reproductive, protective, or propitiatory rites and magical cures for animals—must also be included in this list. Ultimately, too, the larger ecological, economic, political, sociostructural and ideological contexts of the animal production system itself are implied in ERD in its fullest formulation—at which point it in truth becomes "veterinary anthropology."

Having dealt at least provisionally with labeling and defining ERD, the next step is to identify the corpus of work falling within its purview. Here, the definitional qualifiers "principal," "major," and especially "systematic" come into play. Desultory references to folk veterinary beliefs and practices or related husbandry techniques can be found scattered throughout many works. These include: ethnographies² of peoples whose livelihood depends upon animals; accounts by travelers, missionaries, former colonial authorities or other officers (e.g., de St. Croix 1972); writings in medical anthropology;³ archaeological treatises;⁴ field-based studies in veterinary medicine and range management;⁵ and still others.⁶

Naturally, all such sources of information should be consulted by the ERD researcher in preparation for work among a given ethnic group or on a specific animal health issue. However, they do not fit any definition of ERD *per se*. Either their treatment of matters ethnoveterinary is asystematic, anecdotal, and very much subordinate to a different principal topic (the most common case); or their data base falls wide of the "folk" mark. Just the opposite is true of the works reviewed here. As a first effort at drawing together ERD worldwide, the following introductory review is perforce non-comprehensive.⁷ Nevertheless, the studies referenced and discussed below do constitute the bulk of the literature to date, and they accurately represent the variety of thrusts in the field.

DISCUSSION

ERD background, development, and goals.—With one qualification, studies which take folk veterinary beliefs and practices as a primary topic of scientific investigation first began to appear in the mid-1970s. In veterinary medicine this statement is qualified by the longstanding study and use in veterinary pharmacology and pharmacotherapy of herbal remedies for animals (e.g. Bairacli-Levi 1984; Schillhorn van Veen, pers. com.). In anthropology, however, it seems to be unqualified—despite an established interest in the study of domesticated animals from a number of perspectives (Shanklin 1985b). Between the mid-70's and now, ERD can indeed be said to have burgeoned. Predicatably, it is difficult to arrive at many generalizations about the field overall. Researchers come from a variety of countries and disciplines; their research issues, emic/etic emphases, and theoretical approaches (where these exist) vary accordingly; their geographic areas of investigation girdle the globe; the species involved can include any animal domesticate or semi-domesticate; and, of course, the field itself is still in a phase of rapid growth and change.

Where this decade of diversity acquires coherent focus, definition and purpose, however, is in the arena of international livestock development and extension. Here, ethnoveterinary research has as its explicit, overarching goal the enhancement of livestock productivity through improved management of animal health, as informed by an understanding of folk veterinary medicine and related husbandry techniques. Largely with the impetus from development projects like the Small Ruminant Collaborative Research Support Program (SR-CRSP) and the Niger Range and Livestock Project, as of the 1980's a handful of "core" works and workers in ERD have emerged.

This core of ethnoveterinary endeavor is characterized by its holistic, systemsanalysis, and therefore interdisciplinary orientation. That is, it recognizes the importance and interconnectedness of the physical, cultural, social, economic, political and historical matrices in which animals and their owners are embedded. It therefore seeks to integrate findings from correspondingly appropriate but disparate disciplines in the biological and social sciences [after Sollod *et al.* 1984:285-286]. Additionally but not distinctively, core ERD emphasizes the need for firsthand field research among stockowners themselves, under real-world husbandry conditions, in order to arrive at any meaningful comprehension of this systemic complexity on the ground. To this end, it draws heavily upon anthropological method and theory, combining these with the technical skills and knowledge of animal scientists. It is, in fact, "veterinary anthropology."

This core thrust in ERD has come to the fore only in the last five years, and it clearly charts the course of the field's future growth. As noted earlier, to date it has almost exclusively involved veterinarians and sociocultural anthropologists. And mainly due to present policy priorities in international development, it has so far concentrated upon herd animals (cattle, sheep, goats, alpaca, llama) in Africa and, to a lesser extent, Latin America.

In contrast, the first half of the field's formation displays a greater diversity in researchers, species and geographic locales, although many of the research topics are the same. These "diverse" studies continue to increase⁸ in quantity and quality, and much of the data they produce are immediately relevant to core ERD concerns. But again, they are differentiated by their more delimited and disciplinary-specific research goals and approaches. In this respect, the holistic, systemic and ultimately practical thrust of core ERD has lent fresh meaning to the congeries of studies in the field as a whole, placing them into a more unified heuristic framework.

The following discussion is organized by general topical areas which have been addressed in any part of ERD to date. Throughout, the relevance of each area to development and extension is highlighted. The topical categories themselves are not discrete; they merely serve as an organizational device. Many studies in fact span a variety of categories. Due to their holistic orientation, this is particularly true of core works. In such cases, studies are often cited and/or discussed in several sections.

Veterinary ethnosemantics⁹ and ethnotaxonomy. I begin with this area because it forms the backbone of almost any endeavor in ERD. The importance of even the most basic semantic and taxonomic researches for determining and analyzing indigenous veterinary and husbandry concepts and how these guide behavior, for identifying different types of native veterinary practitioners, and for communicating with stockowners and extending new health-care information and techniques to them is recognized by virtually every core work.

The major theme in such research has been the relationship between folk and scientific taxonomies—especially in the domain of livestock diseases, where an in-depth, empirical appreciation of the shape, scope and accuracy of a people's etiological, anatomical, physiological, diagnostic, curative and epidemiological knowledge is essential before developers can even begin to evaluate what, how, and if native veterinary practices should be altered. A considerable number of ERD studies therefore devote attention to trying to sort out and "match up" folk disease identifications and/or taxa with their scientific equivalents (Ba 1982, Grandin 1985, Ibrahim 1984, Ohta 1984, Maliki 1981, McCorkle 1982a, 1983b, Sollod 1983, Sollod *et al.* 1984, Wolfgang 1983, and Wolfgang and Sollod 1986; possibly also *Cabrol 1984 and *Noirtin 1975).

Predictably, this is not an easy task. Medical science classes diseases according to the etiological information afforded by sophisticated laboratory analysis. In contrast, at least pending practical necropsy, folk disease distinctions typically rely on the recognition of morbid signs, more rarely on epidemiology, sometimes on sorcery, or on any combination of these. Moreover, as Ohta (1984) points out, when pathogenic explanations for disease are lacking, it is often difficult to distinguish "disease names" from "terms of symptom" since both may reference morbid signs. Further complicating this picture is the fact that, as among the Twareg of Niger (Wolfgang and Sollod 1986), the same morbid condition may have several appellations depending upon the species afflicted. The result is that a single folk disease category—like *q'icha* 'diarrhea' among the sheep and camelids of the Quechua of Peru (McCorkle 1982a), wilsere 'bush disease' among the cattle of the FulBe of Upper Volta/Burkina Faso (Wolfgang 1983), or azania 'too much blood' among Twareg camels (Wolfgang and Sollod 1986)-often glosses a wide array of etiologically distinct ailments. Conversely, folk classifications may also assign the scientifically "same" disease to different categories on different occasions, based on varying configurations of the clinical, epidemiological and supernatural information available to the native diagnostician and on the species involved.

Nevertheless, it is clear from these and other studies that pastoral peoples possess a rich store of knowledge about many livestock diseases. To take but one example, Schwabe and Kuojok (1981) describe the extensive appreciation of cattle diseases (and of bovine anatomy and physiology) held by traditional Dinka healers and stockowners. This lore derives from practical experience—e.g., personal observations of clinical signs, sacrificial dissections and specific instances and modes of contagion—coupled with a "rational empirical process" (Schwabe and Kuojok 1981:237) which integrates these and other sources of information. Still, as nearly all researchers of ethnoveterinary epistemology have remarked, some of the resulting folk surmises, explanations and curative or preventive actions are "incorrect in major or minor parts" (Schwabe and Kuojok 1981:237).

Simple semantic and taxonomic investigations can help to pinpoint where stockowners could most benefit from increased etiological and epidemiological infor**McCORKLE**

mation, more astute diagnoses, and new treatment, prevention and control options. For the same reason, research into other semantic domains of the animal production system (Anderson 1978, Ba 1982, Flores-Ochoa 1978, Maliki 1981, McCorkle 1983b, Meneses T. in progress) is valuable insofar as many husbandry practices impact upon the occurrence and spread of livestock diseases. Finally, all such research is critical for effective communication between stockowners and development/extension workers. As so many authors have pointed out, the labors of both groups would be eased if they can learn to comprehend and utilize each other's veterinary concepts, techniques and vocabulary.

Ethnoveterinary pharmacology.—This is the investigation of a people's use of plants and other materials in preventing and treating animal diseases, wounds, fractures, in encouraging fertility, appetite, productivity, and so forth. Most core studies make at least mention of this very basic aspect of veterinary care, and some go into considerable detail [Ba 1982:55, 87 ff.; Maliki 1981:47 ff.]. Works whose specific focus is the ethnoveterinary pharmacopoeia can range from the folkloristic to the "high tech." Many have an essentially descriptive aim—ie., identification of the materials, their appellation, categorization, acquisition, preparation, indication, administration (including both natural and supernatural operations) and reported efficacy.

Such works may take a purely ethnographic approach. An example is Brisebarre's (1984a) study of the therapeutic use of boquets hung in the sheepfolds of Cevennes, along with her examination of more empirical curative applications of plant and other materials to Cevenol ovines (Brisebarre 1978). Alternatively, descriptive studies may have a more strictly pharmacological end in view, as in Nwude and Ibrahim's (1980) detailing of 92 plant species employed in traditional veterinary medicine in Nigeria for every type of domestic livestock (possibly also *Gourlet 1979). Likewise for Chavunduka's (1976) identification of 53 plant species of ethnoveterinary medicinal importance in southern and eastern Africa, along with their uses, preparation and administration. For veterinary pharmacologists, identification and description are but the first steps toward controlled scientific screening of local plants in order to establish their real utility if any, optimal dosages, and effective frequency of application (e.g. Ibrahim *et al.* 1984, *Mourier-Ballon 1983).

While research of this sort can add useful new drugs to the modern veterinary pharmacopoeia, its ERD importance lies in improved folk pharmacotherapy which is culturally appropriate, economically feasible and consistently available. At this level, its relevance to development and extension is evident. An example is provided by the SR-CRSP/Peru. Building upon existing ethnoveterinary pharmacological knowledge, the project has worked with one peasant community in the central highlands to test the efficacy of a wild tobacco as a botanical for ovine ectoparasites (Bazalar and Arevalo, in progress]. As per the longstanding and widespread use of nicotine-based parasiticides in both folk and modern veterinary medicine [Schillhorn van Veen, pers. com.], initial trials have proved successful; and work is now being done to establish the minimum effective compound and to secure supply of the plant (Fernandez 1985). The project also plans to test these tobacco compounds in combination with tarwi (Lupinus mutabilis) water. Tarwi is a bitter, alkaloid-laden legume which is edible only after prolonged steeping. The trials Bustinza Ch. (1985) performed on this indigenous cultigen's use in southern Peru as a folk cure for ectoparasites of alpaca have already demonstrated its efficacy. Working in conjunction with SR-CRSP social scientists, project veterinarians are conducting similar trials on other plant materials in the ethnopharmacopoeia which are employed to combat ovine endoparasitism (Arevalo and Bazalar, a, b, in progress). Throughout, emphasis is placed on compounds and applications which can be readily prepared and comprehended within the peasant community itself.

Ethnoveterinary manipulative techniques.—This topic is distinguished from pharmacotherapy above and magico-religious procedures below by its primarily mechanical nature—although no such distinctions may be drawn emically. Of course, all these approaches may be used conjointly—as when a stockowner surgically cleans and then sutures a wound, poultices it, and offers up a prayer for the animal's speedy recovery. For convenience, here I lump vaccination and other prophylactic measures with the healing arts—bonesetting, surgery, wound treatment, chiropractic-like manipulations and, at least in China (Metalie 1984), acupuncture. As before, ERD's concern is to identify and describe, discover the emic rationale for, and evaluate the appropriateness and effectiveness of such manipulations.

Ethnoveterinary prophlaxes may be of an essentially empirical, managerial sort, e.g.: smudge fires to drive away disease-bearing pests; manual removal of ticks; avoidance of infested pastures and unclean water; quarantine of contagious individuals; mineral feedings; protection from extremes of weather; and general sanitation measures like cleaning, disinfecting or rotating animal quarters. They may also include various magicoreligious performances, taboo observances and so forth [see below]. But a more classic example of ethnoprophylaxis is traditional vaccination. For instance, some FulBe vaccinate their cattle against rinderpest by inserting a bit of lung from an infected animal into an incision in the nose, leaving the material in place until the wound festers; others inject a solution in which the lung tissue has been soaked (Wolfgang 1983:58). Fulani (Ba 1982:75) and WoDaaBe (Maliki 1981:60) follow similar procedures for bovine pneumonias. Upon completion of the vaccination process, WoDaaBe also excise the rotting flesh and cauterize the wound.

As a healing art, cauterization appears to be a routine and multi-purpose technique among all Sahelian pastoralists. For example, FulBe treat livestock sprains with a series of tiny burns in the sprained area---much like the "pinfiring" performed on Western racehorses with leg problems, to increase blood flow to the injured part (Wolfgang 1983:57). FulBe, Fulani, Twareg, and WoDaaBe, whether rightly or wrongly, all use branding in treating a galaxy of ills. Across the three ethnic groups, these ills include, e.g.: anthrax, trypanosomiasis, rickettsiosis, epilepsy, edemata, botulism, scabies, bloat, diarrheas, toothaches, fevers, blows to the body, digestive and hoof ailments, muscle pains, sprains and lizard bites. Venesection or bleeding is another popular healing art in African veterinary practice. All of the foregoing authors plus Evans-Pritchard (1969), Ohta (1984), Schwabe and Kuojok (1981), Wolfgang and Sollod (1986) and others note its use.

Bonesetting and wound-treatment skills are found in folk veterinary toolkits worldwide—as are, too, effective surgical and obstetric techniques. These latter run the gamut from relatively simple operations (such as marking, castration, excision of tumors, certain amputations) through a variety of obstetric procedures [e.g., episiotomy, Caesarean section, embryotomy] to complex cosmetic surgery like horn training [Schwabe 1984].

Magic, religion and ethnoveterinary medicine.—This topic has received considerable attention in ERD for a variety of reasons. Admittedly, it is precisely the sort of exotica which anthropologists dote on, and it readily captures the veterinarian's curiosity as well. More importantly, however, magico-religious beliefs and practices appear to form a part of folk veterinary systems everywhere; and in many, emic distinctions between natural and supernatural matters in animal health are blurry.¹⁰ If for no other reason than its pervasiveness, the supernatural must be acknowledged in any ERD study aspiring to a holistic, systems-analysis approach. As an overarching ideological construct, the supernatural can impinge upon every facet of livestock production.¹¹ However, from an examination of the literature, magic and religion seem to figure most prominently in two areas pertaining to animal health: in the supernatural promotion of livestock

fertility and productivity; 1^2 and more significantly, in ethnoetiology—which in turn informs folk diagnosis, treatment and prevention of animal disease and accident.

Maliki (1981:65 ff.) presents one of the most thorough-going descriptions of a people's supernatural pastoral repertoire. Writing on the WoDaaBe of Niger, he discusses: fertility, protective and curative rites for animals; hexes, curses and broken taboos which can bring on livestock disease and accident; divination procedures for predicting herd misfortunes; "good and bad luck" days for performing veterinary and other management operations; and more.

McCorkle's (1983b) treatment of these same phenomena for the Peruvian Quechua is equally detailed. However, in addition to describing these Amerind's panoply of supernatural explanations for animal ills, she seeks to analyze them etically. The Quechua etiological category of "evil winds" is illustrative. Indeed, "winds" are common etiologies in a number of folk veterinary systems, including FulBe, Fulani, Twareg and WoDaaBe. This comes as little surprise since certain livestock diseases in fact can be transmitted aerially (e.g., anthrax, foot and mouth disease, rinderpest) and/or promoted by environmental stresses (e.g., a variety of respiratory ailments). Among the Quechua, however, ethnodiagnosis of attack by an evil wind may or may not correspond with any plausible scientific equivalent. Sometimes this diagnosis appears to gloss plant poisoning; sometimes it references a tumorous growth; at still other times, it cannot be linked to any specific clinical signs. Nonetheless, it can often lead to appropriate prophylactic or treatment measures—e.g., keeping animals away from the haunts of evil winds *cum* toxic plants, or surgically removing tumors.

Whether etically translatable or not, as already noted, magico-religious belief and practice figure in folk veterinary systems worldwide, in both developing and developed milieux. To illustrate, Wolfgang (1983) mentions FulBe magical techniques for controlling, avoiding, or curing certain cattle diseases and ethnoetiological agents such as genies. Ibrahim (1984) comments on "spirits" and "the unseen" as explanations among Nigerian Fulani for livestock diseases with unknown (microscopic) causes and neurological signs. Chavunduka (1976:8) notes Manyika tribal beliefs in ancestor spirits and "evil dreams" as origins of disease. "Evil beings" plague Turkana livestock (Ohta 1984). Recurrent themes in Kimball's (forthcoming) observations on Brunei Malay ethnoveterinary practice are magio-mechanical techniques to ward off disease-causing hantu spirits, and Islamic prayers such as the "neutralizing harm verse" to forestall various kinds of livestock problems. For Irish stockowners, Shanklin (1985) describes evil-eye theories of animal ills, and their associated ritual and behavioral precautions. Brisebarre (1978, 1984b) and others (cited in Brisebarre 1985b) document a pantheon of French "veterinary saints" to whom provincials still turn to bless, protect, cure and multiply their livestock. And Brisebarre (1985c) analyzes the principles of sympathetic magic behind French stockowners therapeutic use of boquets. Finally, many of the foregoing and other studies (e.g., Schwabe and Kuojok 1981) further indicate what social types of individuals (priests and shamans, sorcerers, herbalists, smiths, heads of household or lineage, wives, etc.) are traditionally responsible for the various supernatural-as well as naturalistic—operations related to animal well-being.

For development and extension, the importance of understanding supernatural aspects of folk veterinary systems is threefold. The most obvious consideration is a diplomatic one. If ERD personnel ignore, belittle, or worse still, unwittingly outrage indigenous ideology, their work is not likely to meet with much success. A second consideration is that sometimes magico-religious practice and idiom in fact embody practical veterinary and management acumen. Treatments like feedings of saint-blessed salt (Brisebarre 1984b) are potentially effective for some maladies; and seemingly *outre* ethnoetiologies like "evil winds" (McCorkle 1982a) can nevertheless dictate appropriate curative or preventive action. Developers must therefore be careful about dismissing

"superstitions" out-of-hand. Third, extension efforts can directly build upon an understanding of the supernatural in folk veterinary systems. Useful management techniques can be reinforced with added information as to how genies, spirits, evil winds/dreams/eyes or what-have-you accomplish their nefarious aims; and new skills can be introduced in a cultural idiom which makes sense to stockowners or at least does not threaten ideological, and related sociostructural, integration.

Ethnoveterinary extension.—With regard to social structure—and as Halpin (1981), McCorkle (1982a), Schwabe and Kuojok (1981), and others have pointed out—one of the most logical choices for recruiting and training effective veterinary extension personnel is local healers who have traditionally dealt with animal (or human) health problems. These specialists or semi-specialists typically share the same language and culture as their clientele; already enjoy their confidence and esteem (albeit to varying degrees); occupy a recognized role in the ethnomedical system; and often control a wide range of empirical medical skills and knowledge. Identifying these individuals, their established domains of practice, their real expertise, and their potential as veterinary extension workers is yet another important task in ERD.

Along the lines proposed for use of traditional healers in human health care in many developing countries (e.g., Dunlop 1975), Schwabe and Kuojok (1981) emphasize that, with some training and organization, such individuals could provide effective and relatively cheap grassroots delivery of basic health services to livestock, and possibly even to humans. Halpin (1981) advises that these "barefoot vets" can be drawn from among stockowners as well as healers. He further notes that a trained coterie of camplevel veterinary extensionists could be particularly effective in nomadic areas, where other types of delivery are so problematic for so many reasons (cf. Imperato 1974). In developing nations, these "paravets" could additionally function as a unique component in a "badly needed disease intelligence system" (Schwabe and Kuojok 1981:237) and as accurate interpreters of stockowners' primary veterinary "troubles, constraints, fears and aspirations" [Halpin 1981:5]. As these authors point out, such information would in turn permit more rational design, performance and evaluation of livestock disease control programs.

Grandin (1985), Halpin (1981), Loutan (1984), D. Sandford (1981), S. Sandford (1983), Schwabe (1980), and Schwabe and Kuojok (1981) all offer suggestions and observations on how selection, training, supervision, motivation and remuneration, logistics, supplying, reporting and accounting procedures, and etc. of paravets can or has been organized vis-a-vis: multilinguistic realities; complex national government and local social structures—including household, camp, village-chief, interethnic and common-interest group organization; the veterinary worker's specific role within and responsibility to these structures; epidemiological profiles; and animal management and movement patterns. Summarizing the lessons learned from the Niger Range and Livestock Project's pilot paravet program, Loutan (1984) provides a particularly thorough and insightful case study which addresses a majority of these issues.

Animal health and livestock production systems research.—All of the foregoing considerations and topics are implied in this final category, which embodies the core of current ERD. Works in this vein may naturally differ in their topical emphasis and scope, often depending upon the author's disciplinary training and subdisciplinary interests. They may highlight veterinary, management, or socioeconomic and sociocultural aspects of the animal-health and production-system issues examined. They can also vary in their primary, immediate goals of research: thorough-going description, disciplinary theorybuilding and validation, policy planning, advocacy of a given research design, or investigation of a specific animal-health question. However, all studies in this group share two defining features: an explicit recognition of the holistic, systemic complexity of the phenomena under study; and an ultimate commitment to making research results useful for livestock development and extension.

Among the first works in this group to reach print is Maliki's (1981) report on WoDaaBe cattle herders in central Niger. The range of topics he treats is indicative of these studies' holistic outlook. To illustrate as briefly as possible, he details: herd composition, dynamics, and ownership and use rights, along with all Fulfulde semantic distinctions in race, sex, age, reproductive and productive state, and personal names for cattle, plus additional categorizations for sheep and camels; every aspect of basic animal management such as pasturing/mineral-feeding/watering patterns and selection/ breeding/fertility/gestation/abortion/calving/milking; WoDaaBe description and classification of plants according to their palatability and nutritive value for the different animal species and at different stages of plant growth, plus their veterinary medicinal and other uses, similarly for identification of livestock diseases and other health problems-their ethnoetiology, the clinical signs herders recognize, the specific cures and controls they seek to apply, herd movements during the eight emic seasons of the pastoral year and their impact upon the social groupings and activities of families, camps and clan; relatedly, the role of animals in rites of passage, friend-and kinship, social status and recreation; harvesting, consumption and distribution of all pastoral products; magical beliefs, songs, proverbs, origin myths and etc. pertaining to herds; and still more-all with precise transcriptions of the hundreds of lexemes in the WoDaaBe herding vocabulary, Ba's (1982) treatise on the "veterinary arts" among Sahelian Fulani (Peul) follows a similar format, but with a tighter focus on veterinary and related management practices, and a more limited discussion of social, economic and cultural correlates of Fulani animal husbandry. Both studies are essentially descriptive.

McCorkle (1983b) covers largely the same topics as Maliki-plus others such as the social organization of labor for herding (1982b), and management issues in sheltering, shearing, docking, castration and predator control (1983a)-for Quechua Indians of Peru. However, she has a theoretical as well as a descriptive aim; to correct neofunctionalist analyses of agropastoral subsistence systems. Using a New World data base to refine and validate the cross-cultural applicability of a "dialectic" model of preindustrial agropastoralism in Europe, she demonstrates how Andean herding and cropping stand in a simultaneously complementary and competitive relationship to each other. In the process, she outlines how veterinary care, in particular, is constrained by the low productivity and multiple competing demands of paleotechnic agriculture. Under their present "meat and potatoes" production system, this leaves Andean peasants short of land, labor, capital, technology and technical information for significantly increased attention to herd health problems—certainly insofar as intensive, costly, "tech-fix" solutions derived from Western commercial practice are concerned. For livestock development and extension, McCorkle further discusses some of the systemic potentials and problems posed by ecological, sociostructural, and sociopolitical factors relating to, eg., communal land tenure and pasture/field usufruct rules, traditional reciprocal labor patterns and centuries-old ethnic dominical mechanisms. The ultimate implication for livestock development is that only a global, systems analysis which acknowledges the dialectical tensions between preindustrial cropping and herding can forestall the error of "robbing Peter to pay Paul"-i.e., of upping pastoral production at the expense of agriculture, or vice versa.

The paramount concern of Wolfgang's (1983) work among the FulBe of west-central Upper Volta is to arrive at specific recommendations for veterinary extension and policy planning. To this end, she focuses her research on three major areas: (1) FulBe classifications, etiologies and treatments [both folk and Western] for cattle diseases, plus herders' own assessment of the socioeconomic impact of different diseases; (2) the

current structure and functioning of animal health-care delivery services in the region; and (3) a survey of the country's major veterinary diagnostic laboratory facilities. Additional topics of investigation include certain non-disease-related health problems of cattle and (especially in Sollod *et al.* 1984) women's role in maintaining herd wellbeing. Findings from all these areas inform Wolfgang's final recommendations for veterinary extension and policy in Upper Volta (now Burkina Faso).

A sampling of these recommendations is of interest because they reflect needs common to many developing countries. One is an immediate improvement in epidemiological information, so that planners can concentrate scarce resources on the most prevalent, economically damaging livestock diseases. Another is educational outreach to correct folk misunderstandings about and consequent misuses of expensive Western drugs. A closely related concern is to remove communication, and even simple translation, barriers between stockowners and extension agents—a problem which, theoretically at least, could be resolved by incorporating some herdsmen into the livestock service, as has been done in other parts of Africa. Finally, Wolfgang notes a need for modest improvements in regional laboratory diagnostic facilities, and in other technological and infrastructural aspects of health care delivery. Throughout, however, she emphasizes that including stockraisers themselves—both women and men—as substantive participants in the extension process should greatly enhance diagnostic, delivery, and treatment effectiveness and cost-efficiency.

Sollod *et al.*'s [1984] aim is somewhat more didactic and programmatic than that of the foregoing studies. These authors seek, first, to define and codify the exciting new trend in ERD which tackles animal health and production system research through "veterinary anthropology." Then, drawing upon the fieldwork of Sollod and Knight (1983) [a veterinarian and an anthropologist] among herding groups of central Niger, plus Wolfgang's investigations (which were in part supervised by Sollod), they demonstrate how this fusion of perspectives and methodologies can greatly enrich analyses of patterns, problems, and control options in livestock health.

Sollod and Knight's Niger research is particularly instructive. There, the interdisciplinary team was able to relate epidemiological profiles of livestock diseases-their incidence, prevalence, seasonality and geographic distribution-directly to differing systems of animal production (Twareg versus WoDaaBe) and to specific husbandry practices within these systems which promote or discourage expression of a given ailment. These practices, in turn, were linked to concrete ecological, cultural, commercial and subsistence parameters of Twareg and WoDaaBe life. For example, it was found that stressrelated pneumonia and protein-caloric inanition were severe problems among WoDaaBe, but not Twareg, sheep. This finding was related to the seasonal timing of ovine births. The Twareg control breeding through penile sheath ligation of rams, thus ensuring that ewes do not give birth towards the end of the dry season, when forage is scarce and nutrition poor. In contrast, the WoDaaBe—who consider themselves to be cattle herders expend little effort of any sort on their sheep. The only "control" they exercise on breeding is sales of rams in response to market demands for mutton, especially at the time of the annual Id festival. Depending on whether this moveable feast falls before or after the first breeding season, WoDaaBe ewes and their lambs suffer or thrive accordingly (after Sollod et al. 1984:291).

The veterinary anthropology which these authors espouse highlights the dynamic interplay of endogenous and exogenous determinants of disease—the latter defined as factors external to etiological agents or their hosts. The contextualized, culture-specific information which this comparative stance yields is critical for the design of successful development and extension programs because "It makes possible the use of nonmedical approaches to animal health which include marketing and management interventions, and allows the use of a simplified package of veterinary commodities for each proMcCORKLE

duction system" [Sollod *et al.* 1984:292]. It has long been recognized, and repeatedly demonstrated, that changes in management alone are sufficient to control many livestock diseases. Yet as Schillhorn van Veen (1984:306-308) has observed, despite the fact that such interventions can be highly beneficial at relatively low cost and risk, management is rarely defined for indigenous stock operations. The interdisciplinary, holistic and production-systems approach of veterinary anthropology works to fill this definitional and empirical lacuna.

Finally, by virtue of its holistic, production-systems orientation, Shanklin's (1985a) work among farmer-stockowners of northern Ireland also falls in this last group of studies. The ethnoveterinary portion of her monograph is designed to test a single hypothesis: "that if different types of animals are kept in a given environment, susceptibility to disease will be a factor in the decision to keep a specific type of animal and selective breeding will be largely determined by this consideration" (Shanklin 1985a:215). To this end, she marshals comparative data on bovine as versus ovine production with regard to: stabling, pasturing, seasonal supplemental feeding, both folk and scientific veterinary knowledge and care, breeding practices, land and labor requirements, economic value and market outlets, government regulation and historical shifts in these and other production parameters. Her larger aim is to review theoretical debates in ecological anthropology relating to the adaptive value of traditional and non-traditional elements in the animal production.

CONCLUSIONS

ERD is still in its infancy—or perhaps with the appearance of conceptually and disciplinarily more integrative papers like Schillhorn van Veen (1981, 1984), Sollod *et al.* (1984), and the present review—its early adolescence. As is to be expected of a young area of research, many ERD works are still focused on the descriptive level; and across the field as a whole, there is a healthy diversity of topics and approaches. Again, where this diversity finds a unifying form and function, however, is in international livestock development. Here, ERD is of critical importance because without improvements in animal health (and nutrition), rarely can any improvements in livestock productivity be achieved. In response to this need, a contemporary core of development-oriented ethnoveterinary research has emerged.

Within this core, a number of shared themes, methodologies, and perceived needs for future research can be distinguished. First and most salient, of course, is an emphasis on the "ethno" in ERD. As recognized for other development sectors (*cf.* Brokensha *et al.* 1980), a thorough-going understanding of and respect for folk veterinary knowledge, concepts, practice and practitioners is a must. While clearly not all elements of ethnoveterinary (and their associated management, sociostructural, and etc.) systems are accurate or effective, their ensemble represents a rich resource for developers seeking to enhance animal health and productivity in ways which are readily comprehensible and culturally acceptable to the client audience and which are ecologically and socioeconomically sound. In other words, existing folk practice and belief should always be the starting point for veterinary research, development and extension—as, indeed, they were in the evolution of Western veterinary medicine.

Second, as we have just seen, there is an invigorating move in ERD towards analyzing veterinary development issues within a holistic but comparative and production-systems-specific framework. Production systems or subsystems may be defined by culture area, ethnic group, agroeconomic sectors (e.g. cropping versus herding, sale versus subsistence), intraethnic household characteristics, species or other parameters like ecozone. This new dynamic in ERD has brought with it an explicit recognition that the constellation of endogenous and exogenous variables impinging upon animal wellbeing ultimately lies beyond the ken of any one technical or social science. Ideally, research into the complex, real-world coordinates of livestock health should therefore be carried out by concerted interdisciplinary action. Veterinarians and anthropologists have together risen to this challenge, and there is both room and need for collaboration with other disciplines, as well. Such research naturally calls for in-depth field-based studies rather than just laboratory analyses "divorced from the realities of pastoralism" (Sollod *et al.* 1984:285). In this regard, the usefulness of time-tested methods of anthropological fieldwork is undisputed in ERD. Likewise for the ethnographic expertise and the emic, bottom-up perspective of anthropology.

In the findings and hypotheses of animal health and production systems research to date, some consensus on development and extension strategies is also emerging. To wit, that educational, managerial, marketing, and other such interventions may often prove more appropriate, economical, and effective than modern drug therapy, eg., as applied in mass vaccination and treatment schemes. In the rush to implement costly top-down, "tech-fix" programs which offer immediate short- term benefits, developers, policy planners and stockowners alike may lose sight of longer-term drawbacks to such solutions in third-world countries. These drawbacks can include: ecological degradation and depletion, as from overgrazing; relatedly, escalating social and political tensions over competition for scarce feed and water; spasmodic breakdowns in veterinary supply and delivery lines due to an unstable economy and/or government, or to infrastructural inadequacies; political and financial machinations within the livestock service; loss of genetic tolerance to disease in stock, and increasing drug resistance in vectors and etiological agents; and more. (For an interesting case study of some of these problems, see Lawrence et al. 1980.) There is also agreement in core ERD on the wisdom of employing local healers and stockowners themselves as extension agents or assistants, although equally it is recognized that their use is not problem-free and requires careful selection and organization.

As for future research needs, there is a clear consensus on the vital necessity of everywhere acquiring more, and more accurate, epidemiological data—data which must be collected, compared and analyzed in both emic and etic terms. This very basic sort of information is obviously imperative if valid correlations are to be drawn between patterns of livestock disease and the physical and human ecologies which animals and their keepers inhabit. It is also imperative for meaningful communication between stockowners and ERD personnel.

Beyond the need for improved epidemiological information, I would like to add several other areas which I perceive as requiring more attention. One is the formal, ethnoscientific study of folk classifications for livestock diseases/etiologies/cures, types of pastures and rangelands, species and races of animals, and so forth. To the best of my knowledge, ERD investigations of ethnobiological categories have so far been carried out largely by individuals inexpert in the rigorous procedures of formal linguistic analysis. Yet such analyses, we know, can reveal not only the underlying logic of folk conceptual systems, but sometimes also crucial biological and sociological facts and interrelationships overlooked by Western science. This untapped source of systematic information could be of great potential value to ERD because, as one author has convincingly argued, in some cases folk practice or conceptualization of a problem may prove comparable or superior to that of established science. In others, the two perspectives may diverge but may both embody important insights which can be synthesized. In either case, it is desirable to transcend the conventional science/indigenous, active/passive dichotomy to allow greater indigenous participation in determining development goals and means [after Howes 1980:342]. Formal ethnosemantic analysis has an obvious role to play in this discovery process.

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Another area which has received surprisingly little attention is the many parallels between human and animal ethnomedical systems. The vast literature on human traditional medicine (see, eg., Harrison and Cosminsky 1976) rarely mentions any link between the two. Yet the ethnoveterinary literature contains repeated hints that they are not always highly differentiated. Indeed, as Schwabe and Kuojok (1981) and Schwabe (1978) observe, knowledge derived from folk veterinary experience may be analogy inform human ethnomedical concepts and practice. Moreover, *Homo sapiens* and their domestic animals share many ills; and livestock often serve as hosts, reservoirs, vectors and agents of human disease (*cf.* Schwabe 1969). As these authors point out, the links both folk and scientific, direct and indirect—between human and animal medicine suggest the possibility of mounting coordinated programs of health care. This is a particularly attractive development and extension potential for remote, nomadic, poor, or otherwise ill-serviced regions.

Finally, I suggest that it is time at least to begin substantively integrating and theoretically synthesizing ERD findings to date. An overview of the literature reveals many commonalities—and even some startling identities—in folk veterinary beliefs and practices cross-culturally. Unfortunately, there is not space in this review to launch a discussion of these congruencies and their probable causes. Clearly, though, both the similarities and differences in ethnoveterinary systems worldwide need to be catalogued, systematically compared with their correlates in human ethnomedicine and Western veterinary science, and explained.

In arriving at larger explanatory models of ethnoveterinary phenomena, the relatively more advanced field of medical anthropology holds forth some pertinent analytic frameworks. As noted above, folk medical theory and practice for animals is both emically and etically related to that for humans. Consequently, general research topics and approaches in medical anthropology and ERD frequently overlap. (For a survey of medical anthropology concerns see, eg., Colson and Selby 1974, Foster and Gallatin Anderson 1978, McElroy and Townsend 1979.) Again, there is neither the space, nor perhaps the need, to detail these touchpoints here. Suffice it to reiterate that "veterinary anthropology" can profit from much of the analytic groundwork already laid in its sister field of medical anthropology.

Likewise for programs of veterinary extension vis-a-vis social science models of cultural change and development, theories of innovation and modernization, the FSR&E literature [farming systems research and extension], and communications theory. As ERD begins to compile and integrate its holistic knowledge of folk veterinary medicine in a production-systems context and to apply itself to hands-on extension, perspectives derived from these cognate areas of research can do much to insure that its insights into the real-world complexity of ethnoveterinary systems are appropriately and effectively utilized. These analytic and synthetic tasks now facing ERD offer an even newer direction for this "new direction in ethnobiology."

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NOTES

¹Although it avoids the academically hienous mixing of Latin and Greek roots, "ethnozootechnics" is perahps a too-narrow term. It could be taken to imply the study of folk veterinary knowledge and technique to the exclusion of larger considerations (ideological, socio-organizations, economic, etc.) which also influence the management of animal health. "Veterinary anthropology," while linguistically inelegant, obviates this problem. As "the study of 'man' from a veterinary viewpoint," it focuses attention upon the importance of animal health and productivity for *human* well-being rather than as decontextualized ends in and of themselves. Moreover, it precisely captures the core of inquiry at the forefront of contemporary ERD (see text). And, it forms a nice analogy to "medical anthropology," since ERD in many ways parallels for animals this domain of study among human populations. Also, the term is innately appealing to anthropologists like myself who work in this area. Still, a slightly less disciplinary-specific label might be more indicative of the field in its broadest definition and antecedent forms—and hence, too, more politic. So despite its Latin-Greek mix, here I employ the overarching "ethnoveterinary" [McCorkle 1982a] to reference the field as a whole.

²This is most likely where the agroeconomic base or, better still, the animal production system itself forms one of the foci of research. To give but a few yet representative ethnographic examples, in an extensive study of Saami ethnoecology, Anderson (1978) details both past and present systems of reindeer management, their sociostructural correlates and physiographic setting, and touches upon *Rangifer* nutrition and health. Evans-Pritchards' (1937, 1969) classic investigations among the Nuer document many health-related aspects of their cattle husbandry, although unfortunately he mentions little of Nuer veterinary medicine *per se*. And works like those by Flores-Ochoa (1979) and West (1981) on alpaca herders in Peru, Bernus (1981) and Nicolaisen (1963) on the Twareg, Okaiyeto (1980) and Stenning (1959) on the Fulani, Dyson-Hudson and McCabe (1985) on the Turkana, and many others offer occasional observations on the types and occurrence of animal diseases, health-related management practices, contact points between folk and modern veterinary science, and so forth.

A patchwork of ethnoveterinary information is also tucked away in the fieldnotes and "heads" of ethnological and archaeological researchers. This is illustrated in personal communications from: Lynn Hirschkind, for a variety of animal domesticates in Ecuador; Frank Hole, on reproductive, ethnoetiological, ethnodiagnostic, and other aspects of sheep and goat husbandry among the Lur of the Zagros mountains of Iran; Joel Knipers, for folk theories of equine health in eastern Indonesia; and David Lonergan, on the veterinary beliefs and practices of shepherds in central Sardinia.

³Snippets of ethnoveterinary lore may appear in works that touch upon witchcraft, ritual, and religion as these relate to health and healing (e.g., Buxton 1973 and Richards 1927, cited in Schwabe and Kuojok 1981; *Jalby 1974) or in addenda to discussions of human ethnomedical systems (e.g., the appendix to Hockings 1980).

⁴For example, researchers in a variety of disciplines have sought to reconstruct elements of veterinary knowledge and technique among ancient peoples (e.g., Bodson 1984, Roquet 1984, Schwabe *et al.* 1982, Schwabe 1978, 1984). Also, recent archaeozoological work provides some insights into disease patterns (e.g., Wheeler 1984) and stresses (e.g., Pollard and Drew 1975) among early animal domesticates.

⁵Such studies may allude to folk beliefs or, more typically, disease-related husbandry practices, e.g.: in veterinary medicine, Fazil and Hofmann 1981; Higgins 1983; Reed *et al.* 1974; Schillhorn van Veen 1981, 1984; Schneider 1977; Sollod 1981; and in range science, Glazier 1982.

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⁶The extensive historiography of Western veterinary medicine and its practitioners documents much of the discipline's folk underpinnings (e.g., Smithcors 1957, and many others). And specialized works on a given animal domesticate (e.g., Law 1980) sometimes mention ethnoveterinary techniques and theories applied to that species.

⁷An exhaustive review was the initial ideal, but this was thwarted by a number of factors. For one, the limited number of researchers whom I have been able to identify as working specifically in ERD is flung 'round the world—most notably in the U.S., Europe, and Africa. Moreover, we appear to have been only partially aware of one anothers' work, especially when we step outside our primary geographic area(s) of research. There as yet exists no formal network, or even an informal community, of ERD-ers. Nor is there any recognized group of journals in which ethnoveterinary information regularly appears. Indeed, a good deal of the ERD literature exists only in "fugitive" form: in unpublished mimeo or xerox, in recondite newsletters and journals, in USAID and other project technical reports, in theses and dissertations from third- as well as first- and second-world countries—and of course, all in a variety of languages.

Sifting through the literature that is available presents yet another basic problem. Because, as noted earlier, there is no one label for the field, from titles alone it is often impossible to distinguish between works with and without an ethnoveterinary orientation. Of course, titles which contrapose "veterinary" with "anthropology," "ethno," "traditional," "indigenous," "popular," or "folk" pose no problem. But more amorphous appellations like "Epidemiology of Animal Disease X in Place X" or "Herding Among the X People" may or may not have an "ethno" and a veterinary component, respectively. Each such work must be carefully examined for its perspective and content.

⁸Among the earliest and most sustained of such efforts are those of French researchers investigating the folk veterinary medicine, both past and present, of France [e.g., Societe d'Ethnozootechnie 1984]. Brisebarre (1985b) has compiled a thorough-going annotated bibliography of 57 works dealing in part or in whole with this topic. It is not feasible to reproduce all these listings in the space available here. In any case, many offer only piecemeal ethnoveterinay observations; and only a few of the remainder were available for firsthand examination. Nevertheless, based on their titles and annotations, a number of these publications are clearly relevant to sections of the discussion. In such instances, these studies are cited with an asterisk. Finally, Brisebarre [1985a] has also produced a companion, but unannotated, bibliography listing 63 theses in veterinary medicine produced in France between 1970 and 1984 which deal with pastoral research in Africa.

⁹"Ethnosemantics" is employed here in a simple, non-technical sense. I do not mean to reference the formal linguistic discipline known variously as ethnosemantics, ethnoscience, or componential analysis. See concluding remarks.

¹⁰For contemporary Nilotic cattle-culture peoples, Schwabe |1984:140) remarks that "the practices of animal husbandry, religion and healing are thoroughly mixed." Maliki (1981:54) notes that "there is a thin line between" pharmaceutical and magical veterinary treatments among WoDaaBe. McCorkle (1982a:7) writes that Quechua villagers make little or no distinction between natural and supernatural ills and cures.

¹¹For concrete examples of ideology-based impacts upon other management activities like culling, slaughter, marketing, restocking, pasturing, breeding, docking, and predator control, see McCorkle 1983a, b.

¹²Detailed descriptions and symbolic analyses of livestock "fertility rites" are fairly abundant in the anthropological literature. However, insofar as these accounts fail to link such rites to any larger issues in animal health and husbandry, I do not reference them here.

LITERATURE CITED

ANDERSON, MYRDENE. 1978. Saami Ethnoecology: Resource Management in Norwegian Lapland. Unpubl. Ph.D. Dissert. (Anthrop.), Yale Univ.

AREVALO T., FRÁNCISCO and HER-NANDO BAZALAR R. In progress a. Ensayo de la eficacia contra Fasciola hepatica de la shepita y alcachofa en ovinos alto andinos naturalmente infectados. Paper to be presented at V Congreso sobre Agricultura Andina, March 1986, Puno, Peru.

______. In progress b. Ensayo sobre la eficacia de la pepa de zapallo contra nematodos gastrointestinales y pulmonares en ovinos alto andinos naturalmente infectados. IVITA, Huancayo, Peru.

- BA, ABOU SIDI. 1982. L'Art Veterinaire des Pasteurs Saheliens. Environnement Africain, Serie Etudes et Recherches 73-82:1-90.
 - _____. 1984. L'Art Veterinarie en Milieu Traditionnel Africain. Agence de Cooperation Culturelle et Technique, Paris.
- BAIRACLI-LEVY, JULLIETTE DE. 1984 (1952). The Complete Herbal Handbook for Farm and Stable. Faber and Faber, London.
- BAZALAR R., HERNANCO and FRAN-CISCO AREVALO T. In progress. Ensayo de la eficacia del *Utashayli* contra *Melophagus ovinus* en ovinos alto andinos naturalmente infestados. Paper to be presented to LAPA, November 1985, Huancayo, Peru.
- BERNUSE, EDMOND. 1981. Touaregs Nigeriens: Unite Culturelle et Diversite Regionale d'un Peuple Pastuer. Memoire ORSTEM No. 94. Editions de l'Office de Recherches Scientifiques et Techniques Outre Mer, Paris.
- BODSON, L. 1984. La medecine veterinaire dans l'antiquite greco-romaine: problemes, composantes, orientations. Ethnozootechnie 34:3-12.
- BRISEBARRE, ANNE-MARIE. 1978. La medecine veterinaire traditionelle du

berger de transhumance en Cevennes. Le Courrier de la Nature 5:4-12.

. 1984a. A propos de l'usage therapeutique des boquets suspendus dans les bergeries Cevenoles. Bulletin d'Ethnomedecine 32(4):129-163.

- . 1984b. Le recours a Saint Fleuret, guerisseur des bestiaux, a Estaing (Aveyron). Ethnozootechnie 34:59-85.
- . 1985a. Elevage et medecine veterinaire dans les pays d'Afrique et Madagascar. Production Pastorale et Societe 16:109-112.
- . 1985b. Le medecine veterinaire populaire en France: apercu bibliographique. Production Pastorale et Societe 16:101-108.
- BROKENSHA, DAVID, D. M. WARREN, and OSWALD WERNER. 1980. Indigenous Knowledge Systems and Development. Univ. Press of America, Lanham, Maryland, New York, London.
- BUSTINZA CH., VICTOR, et al. 1985. Piel de Alpaca. IIDSA, Puno, Peru.
- BUXTON, J. 1973. Religion and Healing in Mandari. Oxford Univ. Press, Oxford.
- CABROL, A. 1984. Lexique pastoral du Languedoc oriental. Folklore 38:30-72.
- CHAVUNDUKA, D. M. 1976. Plants regarded by Africans as being of medicinal value to animals. Rhodesian Veterinary Journal 7(1):6-12.
- DE ST. CROIX, F. W. 1972. The Fulani of Northern Nigeria. Gregg International Publ., Westmead, England.
- DUNLOP, DAVID W. 1975. Alternatives to "modern" health delivery systems in Africa: Public policy issues of traditional health systems. Soc. Sci. and Med. 9:581-586.

- DYSON-HUDSON, RADA and J. TER-RENCE MCCABE. 1985. South Turkana Nomadism: Coping with an Unpredictably Varying Environment. HRAFlex Books FL17-001, Ethnography Series. Human Relations Area Files, Inc., New Haven, Connecticut.
- EVANS-PRICHARD, E. E. 1937. Economic life of Nuer: Cattle. Sudan Notes and Records 20:209-245.
 - ______. 1969 (1940). The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic People. Oxford Univ. Press, New York and London.
- FAZIL, M. A. and R. R. HOFMANN. 1981. Haltung und Krankheiten des Kamels. Tierarztl. Prax. 9:389-402.
- FERNANDEZ, MARIA E. 1985. Participatory Action Research and the Farming Systems Approach with Highland Peasants. Unpubl. M. A. thesis, [Rur. Soc. Dev.] Reading Univ.
- FLORES-OCHOA, JORGE A. 1978. Classification et denomination des camelides sud-americans. Annales Economies Societes Civilisations 5-6:1006-1016.
- _____. 1979 (1968). Pastoralists of the Andes. ISHI, Philadelphia.
- FOSTER, GEORGE and BARBARA GALLATIN ANDERSON. 1978. Medical Anthropology. John Wiley & Sons, New York.
- GLAZIER, DANA. 1982. Herding Dynamics Study: Profile of a WoDaaBe Herding Unit of the North Dakoro Region, Niger. Niger Ministry of Rural Development/USAID, Tahoua.
- GOURLET, S. 1979. Les Plantes en Medecine Veterinaire Populaire. These de Doctorat (Vet. Sci.), Toulouse.
- GRANDIN, BARBARA. 1985. Towards a Maasai ethno-veterinary. Unpubl. Doc., ILCA, Nairobi.
- HALPIN, BRENDAN. 1981. Vets-barefoot and otherwise. Overseas Devel-

opment Institute Agricultural Administrative Unit Pastoral Network Paper 11c, London.

- HARRISON, IRA E. and SHEILA COS-MINSKY. 1976. Traditional Medicine: Implications for Ethnomedicine, Ethnopharmacology, Maternal Health, and Public Health—An Annotated Bibliography of Africa, Latin America, and the Carribean. Garland Publ., Inc., New York and London.
- HIGGINS, A. J. 1983. Observations on the diseases of the Arabian camel (*Camelus dromedarius*) and their control: A review. Veterinary bulletin 53(12):1089-1100.
- HOCKINGS, PAUL. 1980. Sex and Disease in a Mountain Community. Vikas Publ. House, New Delhi.
- HOWES, MICHAEL. 1980. The uses of indigenous technical knowledge in development. Pp. 335-351 in Indigenous Knowledge Systems and Development. (David Brokensha, D. M. Warren, and Oswald Werner, eds.). Univ. Press of America, Lanham, MD, New York, London.
- IBRAHIM, M. A. 1984. Veterinary traditional practices in Nigeria. Paper presented at the ILCA/NAPRI Symposium on Livestock Production in the Subhumid Zone of Nigeria, Kaduna.
 - , N. NWUDE, Y. O. ALIU, and R. A. OGUNSUSI. 1983. Traditional concepts of animal disease and treatment among Fulani herdsmen in Kaduna state of Nigeria. Overseas Development Institute Agricultural Administration Unit Pastoral Development Network Paper 16c, London.
 - , N. NWUDE, R. A. OGUNSUSI, and Y. O. ALIU. 1984. Screening of West African plants for anthelmintic activity. ILCA Bulletin 17:19-23.
- IMPERATO, PASCAL J. 1974. Nomads of the West African Sahel and the

delivery of health services to them. Soc. Sci. and Med. 8:443-457.

- JALBY, R. 1974. Sorcellerie et Medecine Populaire en Languedoc. Ed. de l'Aygues, Nyons.
- KIMBALL, LINDA AMY. Forthcoming. Brunei Malay ethno-veterinary practice. Borneo Research Bulletin.
- LAW, ROBIN. 1980. The Horse in West African History: The Role of the Horse in the Societies of Pre-colonial West Africa. Oxford Univ. Press, Oxford.
- LAWRENCE, J. A., C. M. FOGGIN, and R. A. I. NORVAL. 1980. The effects of war on the control of diseases of livestock in Rhodesia (Zimbabwe). Veterinary Record 107: 82-85.
- LOUTAN, L. 1984. Veterinary auxiliaries Pp. 763-781 *in* Pastoral Development in Central Niger: Report of the Niger Range and Livestock Project [Jeremy Swift, ed.], Niger Ministry of Rural Development/USAID, Niamey.
- MAILIKI, ANGELO B. 1981. Ngaynaaka: Herding According to the WoDaaBe. Niger Range and Livestock Project, Rapport Preliminaire/Discussion Paper No. 2. USAID/Niger Ministry of Rural Development, Tahoua.
- McCORKLE, CONSTANCE M. 1982a. Management of Animal Health and Disease in an Indigenous Andean Community. SR-CRSP Publ. No. 4, Dept. Rur. Soc., Univ. Missouri, Columbia.
 - _____. 1982b. Organizational Dialectics of Animal Management. SR-CRSP Publ. No. 5, Dept. Rur. Soc., Univ. Missouri, Columbia.
 - . 1983a. The Technoenvironmental Dialectics of Herding in Andean Agropastoralism. SR-CRSP Publ. No. 7, Dept. Rur. Soc., Univ. Missouri, Columbia.
 - ______. 1983b. Meat and Potatoes: Animal Management and the Agropastoral Dialectic in an Indigenous Andean Community,

with Implications for Development. Unpubl. Ph.D. Dissert. (Anthrop.) Stanford Univ.

- McELROY, ANN and PATRICIA K. TOWNSEND. 1979. Medical Anthropology: An Ecological Perspective. Duxbury Press, N. Sciuate, MA.
- MENESES T., NORMA. In progress. Vocabulario Pecuario Quechua de la Comunidad de Quishuara. B.A. thesis (Ling.), Univ. San Marcos, Lima.
- MOURIER-BALLON, M. 1983. Essai d'Ethnobotanique en Bas-Dauphine. These de Doctorat de 3eme Cycle, Univ. Lyon II.
- METAILIE, G. 1984. Apercu des principes de la medecine veterinaire traditionnelle en Chine. Ethnozootechnie 34:43-50.
- NICOLAISEN, JOHANNES. 1963. Ecology and Culture of the Pastoral Tuareg, with Special Reference to the Tuareg of Ahaggar and Air. National Museum of Copenhagen Ethnographical Series No. 9, Copenhagen.
- NOIRTIN, C. 1975. Vocabulaire patois en pathologie bovine. These de Doctorat (Vet.) Ecole Nationale Veterinaire, Alfort.
- NWUDE, N. and M. A. IBRAHIM. 1980. Plants used in traditional veterinary medical practice in Nigeria. J. Vet. Pharmacol. Therap. 3:261-273.
- OHTA, I. 1984. Symptoms are classified into diagnostic categories: Turkana's view of livestock diseases. African Study Monographs, Supplementary Issue 3:71-93.
- OKAIYETO, P. O. 1980. A Descriptive Study of the Major Economic Activities of the Settled Pastoral Fulani in Three Zaria Villages of Kaduna State. Unpubl. M.S. thesis, Ahmadu Bello Univ.
- POLLARD, GORDON C. and ISABELLA M. DREW. 1975. Llama herding and settlement in prehistoric northerm Chile: Application of an analysis for

determining domestication. Amer. Antiquity 40(3):296-305.

- REED, J.B.H., D.L. DOXEY, A.B. FORBES, R.S. FINLAY, I. W. GEERING, S.D. SMITH, and J. D. WRIGHT. 1974. Productive performance of cattle in Botswana. Trop. Anim. Hlth. and Prod. 6:1-21.
- RICHARDS, M.C. 1927. Medical treatment by Bor witchdoctors. Sudan Notes and Records 10:241-242.
- ROQUET, GERARD. 1984. De l'iconographie du velage a l'identification d'un signe hieroglyphique egyptien [IIIe millenaire]: les membranes du foetus. Societe d'Ethnozoologie et d'Ethnobotanique Bulletin de Liaison 15:3-20.
- SANDFORD, DICK. 1981. Pastoralists as animal health workers: The range development project in Ethiopia. Overseas Development Institute Agricultural Administration Unit Pastoral Network Paper 12c, London.
- SANDFORD, STEPHEN. 1983. Management of Pastoral Development in the Third World. John Wiley and Sons, Chichester, New York, Brisbane, Toronto, Singapore.
- SCHILLHORN VAN VEEN, T. W. 1981. Livestock systems and animal health. Farming Systems Research Group Working Paper No. 3, Michigan State Univ.
- . 1984. Observations on animal health, especially on approaches to identify and overcome constraints in the subhumid zone of West Africa. Pp. 303-316 *in* Livestock Development in Subsaharan Africa: Constraints, Projects, Policy (James R. Simpson and Phylo Evangelou, eds.), Westview Press, Boulder.
- SCHNEIDER, H. 1977. Analyse der Tiergesundheitssituation in Sudwest Africa (Namibia). Unpubl. thesis (Vet. Med.), Univ. Giessen, West Germany.
- SCHWABE, CALVIN W. 1969. Veterinary Medicine and Human Health. The

Williams & Wilkins Co., Baltimore. ______. 1978. Cattle, Priests, and Progress in Medicine. Univ. Min-

nesota, Minneapolis.

______. 1980. Animal disease control, part II. Newer methods, with possibility for their application in the Sudan. Sudan J. Veter. Sci. and Animal Husbandry 21(2):55-56.

_____. 1984. A unique surgical operation on the horns of African bulls in ancient and modern times. Agricul. Hist. 58(2):138-156.

and ISAAC MAKUET KUOJOK. 1981. Practices and beliefs of the traditional Dinka healer in relation to provision of modern medical and veterinary services for the southern Sudan. Human Organization 40(3):231-238.

- ______, J. ADAMS and C. T. HODGE. 1982. Egyptian beliefs about magical and physiological properties of the bull's spine suggest a rational anatomical origin and meaning for the *ankh*. Anthropol. Linguistics, Winter:445-479.
- SHANKLIN, EUGENIA. 1985a. Donegal's Changing Traditions: An Ethnographic Study. Gordon & Breach Science Publishers, New York.

______. 1985b. Sustenance and symbol: Anthropological studies of domesticated animals. Annu. Rev. Anthr. 14:375-403.

- SMITHCORS, J. F. 1957. Evolution of the Veterinary Art: A Narrative Account to 1850. Veterinary Medicine Publishing Co., Kansas City, Missouri.
- SOCIETE D'ETHNOZOOTECHNIE. 1984. La Medecine Veterinaire Populaire. Special Issue, Ethnozootechnie, No. 34. Paris.
- SOLLOD, ALBERT E. 1981. Patterns of disease in Sylvopastoral Herds of Central Niger: An Epidemiological Study of Herd Health in the Niger range and Livestock Project Zone.

Niger Ministry of Rural Development/USAID, Niamey.

. 1983. The influence of trypanosomiasis on the animal disease taxonomies of the Fulbe. Paper presented to the 26th Annual Meeting of the African Studies Assoc., Boston.

and JAMES KNIGHT. 1983. Veterinary anthropology: A herd health study in central Niger. Pp. 482-486 *in* Proceedings of the Third International Symposium on Veterinary Epidemiology and Economics, Veterinary Medicine Publ. Co., Edwardsville, Kansas.

- , KATHERINE WOLF-GANG, and JAMES KNIGHT. 1984. Veterinary anthropology: Interdisciplinary methods in pastoral systems research. Pp. 285-302 in Livestock Development in Subsaharan Africa: Constraints, Prospects, Policy [James R. Simpson and Phylo Evangelou, eds.], Westview Press, Boulder.
- STENNING, D. G. 1959. Savannah Nomads: A Study of the Wodaabe

Pastoral Fulani of Western Bornu Province, Northern Region, Nigeria. Oxford Univ. Press, London.

- WEST, TERRY L. 1981. Alpaca Production in Puno, Peru. SR-CRSP Publ. No. 3, Dept. Rur. Soc., Univ. Missouri, Columbia.
- WHEELER, JANE C. 1984. On the origin and early development of camelid pastoralism in the Andes. Pp. 395-410 in Animals and Archaeology: Early Herders and Their Flocks (Juliet Clutton-Brock and Caroline Grigson, eds.), BAR International Series 202.
- WOLFGANG, KATHERINE. 1983. An Ethnoveterinary Study of Cattle Health Care by the Fulbe Herders of South Central Upper Volta. Unpubl. thesis, Hampshire College/Tufts Univ., Amherst, Massachusetts.

and ALBERT SOLLOD. 1986. Traditional Veterinary Medical Practice by Twareg Herders in Central Niger. Integrated Livestock Production Project, Tahoua, Niger and Tufts Univ. School of Veterinary Medicine, North Grafton, Massachusetts.