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Veterinary Anthropology in the Small Ruminant CRSP/Peru

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The primary research mandate of the Small Ruminant CRSP (SR-CRSP) is to design and test appropriate and affordable technology to enhance the productivity of resource-poor stockowners' herds of sheep, goats, llama, and alpaca in developing countries (DCs). Correctly contextualized in a social science of agricultural development (DeWalt this volume) and carefully targeted to reach its intended beneficiaries (DeWalt and DeWalt, Jamtgaard this volume), research to increase food and income from livestock products holds forth one of the greatest promises for increased human well-being throughout the developing world. Two-thirds of the globe's domesticated ruminants are found (WILRTC 1978:25) in DCs, where even "the poorest of the poor" in rural areas often keep at least a few small ruminants.

To fulfill this promise, however, improvements in animal health are critical, for without them rarely can any other improvements in livestock productivity be realized. Especially in DCs, where animal diseases abound and where herds are more susceptible because of climatic and nutritional stress, stockraising "most of all . . . requires a mastery of disease risks through good husbandry and adequate veterinary protection" (Moris 1981:79).

The SR-CRSP has been a leader in pioneering an exciting new field of study to address this need: ethnoveterinary R&D, or "veterinary anthropology" (McCorkle 1986). As a named and recognized branch of research, veterinary anthropology is barely a decade old.[1] In broad topical and disciplinary terms, the field spans ethnomedicine, ethnosemantics, and international agricultural development, drawing upon the skills of sociocultural (especially ecological and economic) anthropologists, linguists, and veterinary scientists (epidemiologists, immunologists, microbiologists, parasitologists, pathologists, pharmacologists, physiologists), plus specialists in still other fields such as animal husbandry, range science, water management, and agricultural economics.

Veterinary anthropology can be briefly defined as the systematic investigation and practical application of folk veterinary knowledge, theory, and practice within a holistic but comparative and production system–specific framework. In this context, it forms one component in mixed farming systems research. Its goal is to increase livestock production and productivity through improved management of animal health, as informed by an interdisciplinary understanding of folk veterinary medicine and related husbandry techniques. Key elements of this approach include the following:

1. An explicit recognition that the complexity of exogenous (i.e., external to etiological agents and their hosts) and endogenous variables impinging upon animal health lies beyond the ken of any one social or technical science
2. An emphasis upon in-depth, firsthand field research among stockowners under real-world husbandry conditions in order to achieve a meaningful, holistic comprehension of the complex structures in which animals and their owners are embedded
3. The use of anthropological fieldwork methods, combined with the laboratory expertise and technical skills of veterinarians and animal scientists
4. Perhaps above all else, equal attention to emic and etic, i.e., the folk and scientific, in the description and analysis of animal health problems and solutions
5. Finally, a firm commitment to making research results useful for hands-on livestock development and extension, coupled with a constant awareness that the ultimate goal is increased *human* rather than *animal* well-being

Topics typically addressed from these perspectives include veterinary ethnosemantics and ethnotaxonomy; ethnoveterinary pharmacology, manipulative techniques (e.g., bonesetting, obstetric, cosmetic, and vaccination skills), and magicoreligious operations; and appropriate methods and personnel for local veterinary extension. The overarching subject of veterinary anthropology is folk management of animal health in the context of the pastoral or farming system as a whole, and its relation to larger ecological, socioeconomic, cultural, political, historical, and other realities.

It is not possible to address all these issues here. (For full detail, see McCorkle 1986). Instead, the aim is to illustrate some of the approaches, applications, and broader implications of this new area of international agricultural R&D, drawing upon SR-CRSP activities in highland Peru between 1980 and 1987.

EMIC AND ETIC, ANTHROPOLOGICAL AND BIOLOGICAL

One of the most basic tasks of veterinary anthropology is the investigation of folk knowledge systems and the associated semantic and taxonomic systems that guide and encode animal management practices. An appreciation of the shape, scope, and accuracy of a people's etiological, anatomical, physiological, diagnostic, therapeutic, and epidemiological information about livestock ills is essential. Without this, developers cannot even begin to evaluate what, how, or if native veterinary practices should be altered, nor can they communicate their evaluations and relevant development strategies in a way that is comprehensible, culturally inoffensive, and congruent with indigenous cognitive and social systems pertaining to animal husbandry.

The first part of the veterinary anthropologist's task is to translate folk ways of conceptualizing, describing, and combating animal ills into Western scientific terms.[2] Predictably, this is not easy. Medical science, whether human or animal, classes diseases and stipulates treatments and prophylaxes according to the etiological information afforded by sophisticated laboratory analysis. In contrast, at least pending practical necropsy, ethnoveterinary distinctions and therapies typically rely on the recognition of morbid signs, more rarely on epidemiological observation, sometimes on sorcery, or on any combination of these.

Below, a combined ethnographic and veterinary-medical analysis of one major category of livestock disease recognized by the Quechuas of highland Peru is presented. Folk and scientific understandings are systematically compared along the following parameters: clinical signs and diagnosis; etiology; treatment; and prevention and control (for parallel analyses of nine other disease designations, see McCorkle 1982, 1983a, 1988). These data derive from the author's SR-CRSP fieldwork in 1980 in the peasant community of Usi, Department of Cuzco.

Next, an example is given of the successful application of veterinary anthropology to combat another type of livestock disease. This example stems from ongoing work in ethnopharmacotherapy in the peasant community of Aramachay, Department of Junin, by SR-CRSP social scientists and collaborating veterinary scientists from IVITA (Instituto Veterinario de Investigaciones Tropicales y de Altura, of the Universidad Nacional Mayor de San Marcos). The SR-CRSP has been conducting intensive interdisciplinary crop/livestock research and technology testing in Aramachay since March 1983, under the direction of the University of Missouri Sociology Project. Finally, both specific and general implications of these two cases for livestock development programs in Peru and other DCs are discussed, along with the overarching importance of integrating social, biological, and folk science in any development initiative.

Q'icha in Usi

Quechua stockowners in Peru invariably report *q'icha* as one of the most destructive diseases plaguing their herds of sheep, llama, alpaca, and cattle. The translation of q'icha is simply diarrhea.

Clinical signs and diagnosis. Q'icha is both named and diagnosed by its most obvious clinical sign. Usiños uniformly apply this diagnosis across all species to any case of diarrhea. At the same time, they remark a number of additional signs, many of which are merely the general indications of parasitism: weakness; fatigue; listlessness; loss of appetite; and, in one informant's words, overall "stupefaction." Villagers also cite other indications that can accompany the diarrhea: e.g., fever; blood in the urine and feces; foaming at the mouth; blind staggers; and, in sheep, yellowing and dropping of the wool. In fact, some of these symptoms are unrelated to the diarrheas. Many others that *are* related go unmentioned, such as bloating or swelling of various parts of the anatomy; differing consistencies and colorings of the feces; anemia, as evidenced by paleness of eye, nose, and mouth membranes; and more (cf. Ensminger 1970; Fulcrand Terrisse 1978).

Etiology. Scientifically, the jumble of symptoms that Usiños gloss as q'icha corresponds to at least seven distinct ailments spanning endoparasitic, bacterial, viral, and toxemic etiologies. Folk ideas as to the causes of q'icha are much more colorful, however.

One of the most dramatic explanations is that malevolent foreigners have polluted community water supplies and grazing grounds with diarrhea-inducing substances broadcast from airplanes! More commonly, however, villagers adduce a variety of supernatural causes for this and other livestock ills, such causes as the anger of a mountain spirit (*apu*) or of the *Pachamama* (earth mother) at a stockowner's failure to pay these deities proper respect and ceremony; a punishment from God for wrongdoing; a neighbor's vindictive sorcery; and, in certain cases, a herd's desire to follow its deceased master into death. Another frequently cited cause of diarrhea is a fascinating panoply of twisting, gusting, sacred, and evil winds (*wayra*). Curiously, from informants' recitation of clinical signs, these wind-induced ailments sometimes appear to gloss plant poisoning from a native loco weed (*Astragalus* spp.; Quechua *husq'a*, Spanish *garbancillo*).

Supernatural diagnoses may be made singly or in combination or sequence with other, more naturalistic etiologies. An example of the latter is some stockowners' apt attribution of q'icha to internal parasites. However, this etiology is often cited only upon observation of massive worm infestation at slaughter. For example, initial ethnodiagnoses of general or supernaturally induced q'icha may be revised to *qallutaka* (lit., slug) when

practical necropsy reveals a fluky liver crawling with the *p'alta kuru* or flat worms of hepatic distomatosis.

Folk theories as to how these and other worms enter livestock vary. One posits that animals ingest them during early morning grazing when pastures are still moist with dew. The tiny worms or worm eggs are said to be encased in the dew droplets. Another theory holds that the dewy grass itself infects the herds. Also, a few villagers link q'icha to the muddy, muck-filled corrals of the wet season; all stockowners agree that the disease is most troublesome at this time of year. Others add that sometimes q'icha results from livestock's eating too much fresh, young grass. Although Usiños are unable systematically to correlate these more naturalistic ethnoetiologies and their associated management practices with specific types of q'icha, comparison with findings in Western veterinary science indicates that they are essentially empirically correct for some diarrheal ills.

Of course, damp conditions generally favor the spread and growth of a number of diarrhea-inducing agents and/or their hosts, as, for example, the stomach and gut worms of verminous gastroenteritis, or various bacteria. For example, when sufficient moisture is present, the larvae of the common stomach worm crawl up grass blades, coming to rest with evaporation and moving onward and upward with additional moisture. Once they pass the 1-inch mark, below which some 98% of most infective larvae are found, they are more likely to be consumed by livestock. (Along with erosion control and forage sustainability, this is one of the principal reasons for avoiding overgrazing.) Similarly, the hardy grass mites that host the larvae of other intestinal worms migrate upward during the cool dimness of early dawn; but as the sun emerges and the day grows warmer, they retreat into the protective soil (after Ensminger 1970).

Also, humid pastures and heavy rains favor the snails that host the embryos and cercariae of the liver fluke, which promotes the constant diarrhea of hepatic distomatosis. Wet, filthy corrals certainly provide the ideal environment for a variety of bacteria that produce diarrheas in both ovines (e.g., *Escherichia coli* and *Clostridia perfringens*; see Ensminger 1970:457) and camelids (e.g., *Clostridia welchi*; see Flores Ochoa 1979), as well as for the microscopic protozoa of coccidiosis, which cause the bloody diarrhea commonly known in English as "red dysentery." However, like many infectious agents, the coccidia oocysts are readily destroyed by direct sunlight and complete drying (Schillhorn van Veen 1986).

Finally, diarrhea may sometimes accompany enterotoxemia or "overeating disease" (Alexander 1982). This is a toxic condition that can arise from abruptly placing animals on rich, high-carbohydrate diets—as when, at the end of the long, lean dry season, starving stock gorge themselves on the fresh, young pasturage of the early rainy season.

Treatment. Treatments for q'icha differ as much as do ethnoetiologies. When sacred or evil winds are diagnosed, cures vary according to the type of wind involved and largely rely on magical techniques. In the case of sorcery, stockowners may hire the dehexing services of a shaman, although these specialists are becoming rare and their services increasingly dear. For other supernatural causes, stockowners may perform appropriate propitiatory rites. However, the most popular cures are more naturalistic and consist of drenching (the force-feeding of liquids) with any of a host of herbal infusions and decoctions mixed with other ingredients such as lemon juice, human urine, salt, and oil. An adjunct therapy is to rub such preparations onto the sick animal's body, especially in the area of the liver. An alternative cure is to feed it handfuls of salt.

The practical value of some of these treatments is obviously debatable. Supernatural cures do not afford animals even the psychosomatic benefits they can produce in humans, although such cures do comfort the worried stockowner. And heavy salt feedings may only worsen certain conditions. However, Usiños express considerable satisfaction with their herbal remedies, avowing that these often work. If nothing else, force-feeding liquids may combat diarrheal dehydration. It is also likely that at least some of the herbs employed have anthelmintic, or deworming (Choquehuanca 1986) and constipative properties.[3] Furthermore, as Elisabetsky (1986) notes for human ethnomedicine, recent scientific findings on skin permeability are at least suggestive for additional research on topical applications of folk veterinary medicaments.

Usiños know that commercial drugs to combat q'icha and other livestock ills are readily available in nearby towns, but they hardly ever purchase such preparations, for good reasons. Modern veterinary medicines are usually too expensive for the peasant pocketbook. A related complaint centers on travel expenses and the time involved in obtaining and administering commercial drugs. Moreover, particularly for sheep, the drugs are not cost-effective; better simply to slaughter the animals. Finally, informants report that on the few occasions they attempted store-bought cures (usually for the much more valuable and beloved camelids), their money was thoroughly wasted. They say the medicines worked only for a week or two, or not at all; that they cured some animals but not others; or even that they hastened the creatures' death!

In part, such failures are due to Usiños' imperfect understanding as to which drugs to purchase. Additionally, villagers are often uncertain about the proper posology of alien medicaments. Applied too sparingly or irregularly, no drug is effective. Conversely, excessive doses of powerful modern drugs can further sicken or even kill the scrawny, malnourished animals that comprise many Indians' herds. Ethnic domination mechanisms also figure in commercial treatments' failure. *Misti* (mestizo) store owners habituany foist

off their oldest, shoddiest, or most slow-moving merchandise on Indian clients. In consequence, the few pharmaceuticals villagers do purchase are sometimes long past their effective shelf-life, or are even contraindicated.

Prevention and control. Prophylaxes logically follow from etiologies. In the supernatural realm, for example, prevention consists of keeping animals away from windy areas, avoiding wrongdoing and quarrels with covillagers, and performing ceremonies properly—particularly the annual reproductive and protective rites (*t'inka*) for herds. These rites are festive affairs that feature dramatic events such as the forced inebriation of llama; "marriages" of herd-animal couples; burnt offerings to the earth mother; libations cast to the various "winds"; propitiation of powerful mountain, aquatic, and lightning spirits; and more (cf. *Allpanchis Phuturinga* 1971; Aranguren Paz 1975; Flores Ochoa 1977; Mayorga et al. 1976; McCorkle 1983a, 1983b; Nachtigall 1975; Tschopik 1951; Valderrama and Escalante 1976).

In the natural realm, given "dew-ridden grass" etiologies of q'icha, Usiños do not graze stock in the early morning before the dew has risen. Dirty-corral explanations lead some people to rotate corrals during the rainy season, but only one villager reported any systematic effort to clean and disinfect corrals.

While there is some merit in keeping animals away from windy areas (e.g., to minimize cold stress and, perhaps, exposure to certain aerially transmitted ailments[3]), this has little direct impact on the risk of acquiring a diarrheal disease. Neither do pastoral rituals, although they may serve various "library" and instructional functions, encoding and transmitting valuable pastoral information in their symbology, incantations, and ceremonial paraphernalia and enactments (Flores Ochoa 1977). On the other hand, avoidance of damp, filthy surroundings is an apt preventive measure for a number of parasitic and other ills that induce diarrhea in Usi's livestock. Aside from the few measures just listed, though, Usiños do little to prevent or control q'icha and the many other diseases afflicting their herds.

Indeed, village stockowners follow almost none of the tenets of preventive medicine set forth by veterinary science, such as the prompt isolation or slaughter of animals with transmissible diseases; general sanitation in all management operations, (e.g., docking, shearing, castrating, ear-branding, and birthing); periodic cleaning and disinfecting of animal quarters, and the provision of clean, dry bedding; regular mineral feeding; dipping, dosing, spraying, dusting, and vaccinating against both parasitic and nonparasitic ills; eradication of toxic flora; subdividing herds by different age/sex/species susceptibility to contagion; or avoiding overgrazing and regularly rotating pastures. Expectedly, Usiños' inaction in many of these regards is linked to constraints on capital, labor, and land. In others, however,

lacuna in folk veterinary knowledge are implicated, particularly in etiological and epidemiological information.

In sum, comparative analyses such as that of q'icha in Usi provide important insights into ethnoveterinary systems. Specifically, they help pinpoint within indigenous knowledge and management systems where animal health could potentially be improved. Veterinary anthropology also suggests *how* improvements can be brought about, as the following case-study materials illustrate.

Utashayli in Aramachay

In the central sierra of Peru, the community of Aramachay identified ovine manges, produced by a variety of biting and burrowing ectoparasites, as one of their primary herd health concerns. Like Usiños, Aramachay stockowners are well aware of the existence of commercial veterinary pharmaceuticals to combat this problem. Indeed, until the late 1970s, villagers regularly employed commercial sheep dips and other modern methods of ectoparasitic control. But, with Peru's rampant inflation and crumbling economy, by the 1980s these remedies had become too expensive for all but a few families (after Fernández 1986).

Community members met with SR-CRSP personnel to discuss this problem. During the meeting, a village shepherd recalled a traditional home remedy for ectoparasites of horses, burros, and cattle. An all-but-forgotten therapy, it consisted of rubbing the leaf of a local wild tobacco, named *utashayli*, into the afflicted animal's hide. Villagers wondered whether this topical treatment could be modified to serve as a dip for sheep. With the assistance of SR-CRSP social scientists and veterinarians, they organized several initial trials to test this idea. As per the long-standing use of nicotine-based parasiticides in both folk and modern veterinary medicine worldwide, the trials were successful. Indeed, stockowners felt the utashayli dip was even more effective than the commercial preparations they had previously used (Fernández 1986).

SR-CRSP veterinarians therefore embarked upon laboratory research to establish the minimum effective frequency and concentration of the dip (Bazalar and Arévalo 1985), ultimately finding that a solution of 500 g of ground utashayli in 6.25 l of water applied once a year renders a treatment that is 97% effective on one of the major ectoparasites (*Melophagus ovinus*, or sheep ticks) as of the twenty-second day after dipping (Bazalar and Arévalo 1986). Additionally, the project is testing the tobacco compound in combination and comparison with *tarwi* water. Tarwi (*Lupinus mutabilis*) is a bitter, alkaloid-laden but high-protein legume that is edible only after prolonged steeping. The resulting infusion has long been used in the southern sierra as an effective folk remedy for ectoparasites of alpaca

(Bustinza 1985). Project veterinarians in both southern and central Peru are analyzing still other plant materials in the ethnopharmacopoeia (artichoke leaves, squash seeds, various herbs) that are employed to combat ovine endoparasitism (Arévalo and Bazalar 1986; Bazalar and Arévalo 1986; Choquehuanca 1986). SR-CRSP economists are evaluating the cost-benefit ratios of all these treatments relative to one another and to commercial remedies, taking into consideration all relevant factors: price of materials and travel or other expenses involved in obtaining them; labor, water, and fuel resources required to prepare the treatments; and spin-off benefits for human well-being, such as increased cultivation and consumption of such high-quality foods as tarwi . At the same time, SR-CRSP sociologists in Aramachay are investigating how to organize the cultivation and/or controlled harvesting of these plant resources to ensure an adequate and equitable supply. They are also helping the community to establish social, economic, and juridical mechanisms for preparing the medicament, financing and maintaining dipping structures, and universally enforcing the treatment. In this endeavor, extant lines of authority, community decisionmaking processes, and common-interest associations are respected and put to use as basic sociostructural building blocks in collaborating with community members to disseminate new veterinary information and develop improved husbandry practices that fit comfortably into existing ideological, socioeconomic, and production systems.

VETERINARY ANTHROPOLOGY AND DEVELOPMENT

In accord with findings in veterinary anthropology from other parts of the globe (e.g., Schwabe and Kuojok 1981; Sollod and Knight 1983; Sollod et al. 1984; Wolfgang 1983; Wolfgang and Sollod 1986), the case of q'icha in Usi suggests that stockowners such as those discussed here could improve herd health and productivity solely by incorporating additional veterinary information into the indigenous knowledge system. For example, Usiños' premortem ethnodiagnoses of q'icha are often confused. Villagers generally fail to recognize prodromes and syndromes that would permit them to distinguish one diarrheal ailment from another, and to treat and prevent it accordingly. The same is true for other diseases as well. For example, stockowners sometimes cite tapeworms as the cause of the wracking cough that is variously symptomatic of verminous bronchitis (infestation by lungworms) or the viral infections of pulmonary adenomatosis and pneumonia.

There is an important caveat here, however. For some livestock ills, Quechuan diagnostic and therapeutic skills rival those of Western veterinary medicine. Predictably, these are diseases that have patent manifestations, such

as mange; or contagious keratoconjunctivitis (pink eye). In the latter, for instance, Usiños reportedly achieve 100% cure rates, even though folk diagnosis and therapy are partially cast in supernatural terms.

Nevertheless, for q'icha and many other diseases, these Andean stockowners could certainly benefit from increased diagnostic information, if only to distinguish endoparasitism from plant poisoning. Indeed, better understanding of the developmental symptomology of any ailment allows for earlier and more positive diagnosis. Simple and inexpensive education into the prodromes and syndromes of the economically most destructive diseases plaguing their herds permits stockowners everywhere to take more prompt and appropriate management action, whether it be quarantine, treatment, or slaughter.

In the same vein, Usiño etiologies are significantly incomplete. Villagers themselves confess they often have no idea of the causes of their animals' ailments. Lacking modern laboratory tools and techniques and access to the in-depth veterinary information these provide, Usiños, like many DC stockowners, are understandably ignorant of the microscopic life cycles of certain endoparasites, the existence of hosts and vectoring agents, and even simple excremental cycles. For example, villagers in both Usi and Aramachay were unaware of the role of the intermediate snail host with which their pastures are visibly infested and which leads to the constant diarrhea of hepatic distomatosis.

Like stockowners everywhere (McCorkle 1986), the Andean groups described here do control considerable empirical veterinary knowledge. At the same time, as nearly all researchers of ethnoveterinary epistemology have observed, many folk diagnoses, explanations, and curative or preventive steps are "incorrect in major or minor parts" (Schwabe and Kuojok 1981:237). While they are not the whole problem, such gaps in ethnoveterinary knowledge in part explain Usiños' inaction in prevention and control. Without insulting existing etiologies, both supernatural and natural, development personnel can readily explain that there are still other sources of disease that must also be guarded against[5] (except, perhaps, when expatriate developers are confronted with "malevolent foreigner" explanations).

Admittedly, limited-resource stockowners typically lack the capital, labor, or technology to devote to intensive systems of animal husbandry (McCorkle 1983b; Vineze 1980). They may therefore be unable systematically to destroy the agents, hosts, and vectors of disease. However, with increased etiological and epidemiological information, they can still take advantage of at least some basic, low- or no-cost controls: not herding where agents, hosts, and vectors of disease abound or where, at certain times of the day or year, they are most active, for example, or instituting or reinforcing household- or community-level pasture rotation systems; not constantly quartering animals in their own excrement; exercising simple hygienic habits

in management operations; recognizing and thus avoiding contaminated water; creating herd subdivisions; and so forth.

For both prevention/control and treatment, the case of utashayli in Aramachay illustrates the very real benefits of teaming social and biological, folk and scientific know-how to tackle specific development goals. There, SR-CRSP efforts in ethnopharmacotherapy emphasize compounds and applications that are based upon cheap or even free materials available locally, and that are readily comprehended and easily prepared within the community. Equal attention is given to community social systems for managing veterinary health programs. This integrated approach obviates the negative reciprocity and human indignities of dealings with oppressive, superordinate ethnic groups. It also frees stockowners from dependency upon expensive external inputs over whose quality, price, and supply they have no control.

Indeed, spasmodic breakdowns in supply of modern technological inputs to rural populations are commonplace in developing countries. Breakdowns may be due to civil strife, simple infrastructural inadequacies, political and financial machinations within government agencies, or an unstable economy. As Lawrence et al. (1980) have dramatically documented for another part of the globe, asystematic extension of Western veterinary technology can ultimately result in more acute animal health problems than if it had not been adopted in the first place. The well-being of human groups who depend upon livestock for a crucial part of their subsistence is accordingly imperiled.

SOCIAL, BIOLOGICAL, AND FOLK SCIENCE

In the findings and hypotheses of veterinary anthropology to date, some consensus on development and extension strategies is emerging: to wit, that educational, managerial, marketing, and other such interventions are often more appropriate, economical, and effective than is modern drug therapy as applied in mass vaccination and treatment schemes or other costly top-down, "tech-fix" programs such as wholesale eradication of disease-bearing pests. Not surprisingly, findings also indicate that interventions grounded in indigenous practice and/or evaluated and coordinated by local stockowners or native veterinary practitioners are likely to be more successful.

A larger lesson is that ethnological investigations coupled with biomedical research can return indigenous knowledge "improved through scientific analysis, to the people that most contributed to it and most desperately need it" (Elizabetsky 1986:125). In the process, knowledge that might otherwise be lost is rescued, and low-cost medicines can be developed that are free of the sales, delivery, distribution, consumption, and misinformation problems attached to modern commercial pharmaceuticals in DCs.

At an even broader level, these lessons are equally applicable to other arenas of international agricultural development. Veterinary anthropology is only one, fresh example of an overarching approach to development that melds anthropological, biological/technical, and folk or "people's" science (Chambers 1986; Richards 1985) in order to understand and successfully build upon indigenous knowledge systems in designing and implementing sensitive, cost-effective, bottom-up interventions. Moreover, in this process the bearers of such knowledge ideally take an active role as coresearchers and developers.

This approach provides two critical kinds of development intelligence: first, as for q'icha in Usi, it can identify where the indigenous knowledge base could most benefit from increased information; second, as with utashayli in Aramachay, it taps this same system, its human bearers, and their social institutions to generate solutions that are culturally acceptable, technically comprehensible, ecologically sound, and sociostructurally, economically, and even politically feasible—i.e., "appropriate" in every sense.

No one science can accomplish this on its own. It is therefore imperative that social and biological/technical scientists join forces in the R&D process. It is equally imperative that this process begin with existing folk science and, throughout, involve the people whose livelihood will be affected. In sum, whether in veterinary health, livestock or crop production generally, or any other arena, "bringing people in" is critical to true development.

NOTES

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1. This exogamous marriage of seemingly strange bedfellows is a direct outgrowth of the conscious melding of social and biological sciences on integrated, interdisciplinary livestock development projects such as the SR-CRSP (Bloud n.d.) or the Niger Range and Livestock Project, or NRLP (Swift 1984), which focus upon immediate production problems of DC smallholders.

The SR-CRSP and the NRLP began work in veterinary anthropology contemporaneously (ca. 1980) but in ignorance of each other's efforts. Interestingly, on the SR-CRSP, social scientists spearheaded the move into this area, while veterinary scientists led the way on the NRLP. Clearly, the topic is of equal disciplinary interest to social and biomedical scientists; they have independently sought each other out to tackle this unorthodox branch of research.

2. This comparative or "translation" exercise should not be taken to imply any ethnocentrism. The issue is *not* how closely folk knowledge and practice parallel Western veterinary medicine, or whether indigenous beliefs and practices are "right" or "wrong" in any absolute sense. Rather, it is the extent to which they promote productive animal management given the resources (ecological, technological, socioorganizational, informational, etc.) actually or potentially and realistically available to stockowners. For further discussion of this point, see McCorkle 1983a and 1986, the chapter conclusion, and more broadly, Brokensha et al. 1980.

3. Interestingly, these same concoctions are used for human diarrhea. Unfortunately, at the time of fieldwork in 1980, SR-CRSP did not yet have the facilities and personnel to analyze the plants in question.

4. There is some controversy in the veterinary literature over the role of aerosol transmission (the classic route for respiratory ailments) in diarrheal diseases. While certain diarrhea-inducing viruses and bacteria can be spread in this fashion, most researchers feel that contagion is more closely related to direct contact, as in crowded and poorly ventilated quarters, than to airborne routes (Don Benden personal communication). In fact, the strong winds on open ranges that Quechua stockowners are referring to when they speak of wayra would likely offer some protection from contagion by diluting rather than enhancing aerosol transmission of diarrheal agents.

5. Fernández (1986) includes an instructive account of action anthropology to disseminate veterinary information in a peasant community of highland Peru. Significantly, the case she independently encountered also involved ignorance of the life cycle of the liver fluke and its snail host.

REFERENCES

Alexander, A. F. 1982. Personal communication from Alexander (then professor and head of the Department of Pathology, College of Veterinary Medicine and Biomedical Sciences at Colorado State University) to McCorkle in Denver, CO.

Allpanchis Phaturinga. 1971. Ritos agrícolas y ganaderos del sur-andino. Cusco: Revista del Instituto de Pastoral Andina Vol. 3.

Aranguren Paz, Angélica. 1975. Las creencias y ritos mágicos religiosos de los pastores Puneños. *Allpanchis* 8:103–132.

Arévalo T., Francisco, and Hernando Bazalar R. 1986. Ensayo de la eficacia contra *Fasciola hepática* de la shepita y alcachofa en ovinos alto andinos naturalmente infectados. Paper presented to the 5th Congreso sobre Agricultura Andina, Puno, Peru.

Bazalar R., Hernando, and Francisco Arévalo T. 1985. Ensayo de la eficacia del *Utashayli* contra *Melophagus ovinus* en ovinos alto andinos naturalmente infestados. Paper presented to LAPA, Huancayo, Peru.

———. 1986. Uso de hierbas en el control de parásitos externos e internos a nivel de comunidades campesinas de la sierra central del Perú. Informe Técnico. Huancayo: Convenio UNMSM. IVITA/SR-CRSP.

Blond, R. D. (ed.). n.d. Partners in Research: A Five Year Report of the Small Ruminant Collaborative Research Support Program. Davis, CA: SR-CRSP ME, University of California–Davis.

Brokensha, David, D. M. Warren, and Oswald Werner (eds.). 1980. *Indigenous Knowledge Systems and Development*. Lanham, MD: University Press of America.

Eustinza Ch., Victor, et al. 1985. Piel de alpaca. Puno: Instituto de Investigaciones para el Desarrollo del Altiplano.

Chambers, Robert. 1986. *Rural Development: Putting the Last First*. London, Lagos, New York: Longman.

Choquehuanca, Zenon. 1986. Personal communication from Choquehuanca (SR-CRSP veterinarian) to McCorkle during joint fieldwork in Quishuara, Peru.

Elisabetsky, Elaine. 1986. New Directions in Ethnopharmacology. *Journal of Ethnobiology* 6(1):121–128.

Ensminger, M. E. 1970. *Sheep and Wool Science* (4th ed.). Danville, IL: Interstate Printers & Publishers.

Fernández, María E. 1986. Participatory-Action-Research and the Farming Systems Approach with Highland Peasants. SR-CRSP Technical Report No. 72. Columbia: Department of Rural Sociology, University of Missouri.

Flores Ochoa, Jorge A. 1977. Enqa, enqaychu, illa y khuya rumi. In *Pastores de puna: Uywamichiq punarunakuna*. Jorge A. Flores Ochoa, ed., pp. 211–237. Lima: Instituto de Estudios Peruanos.

———. 1979. *Pastoralists of the Andes: The Alpaca Herders of Paratía*. Philadelphia: Institute for the Study of Human Issues.

Fulerand Terrisse, Bernardo. 1978. Enfermedades de ovinos y su tratamiento. Cusco and Ayaviri: Centro de Estudios Rurales Andinos 'Bartolomé de las Casas' and Instituto de Educación Rural 'Waqrani.'

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.

Mayorga, Sylvia, Félix Palacios, and Ramiro Samaniego. 1976. El rito aymara del "despacho." *Allpanchis* 9:225–241.

McCorkle, Constance M. 1982. Management of Animal Health and Disease in an Indigenous Andean Community. SR-CRSP Technical Report No. 5. Columbia: Department of Rural Sociology, University of Missouri.

———. 1983a. Meat and Potatoes: Animal Management and the Agro-pastoral Dialectic in an Indigenous Andean Community, with Implications for Development. Ph.D. dissertation, anthropology, Stanford University.

———. 1983b. The Technoenvironmental Dialectics of Herding in Andean Agropastoralism. SR-CRSP Technical Report No. 30. Columbia: Department of Rural Sociology, University of Missouri.

———. 1986. An Introduction to Ethnoveterinary Research and Development. *Journal of Ethnobiology* 6(1):129–149.

———. 1988. Manejo de la sanidad de rumiantes menores en una comunidad indígena andina. Lima: Comisión de Coordinación de Tecnología Andina.

Moris, Jon. 1981. Managing Induced Rural Development. Bloomington: International Development Institute of Indiana University.

Nachtigall, Horst. 1975. Ofrendas de llamas en la vida ceremonial de los pastores. *Allpanchis* 3:133–140.

Richards, Paul. 1985. *Indigenous Agricultural Revolution: Ecology and Food Production in West Africa*. Boulder: Westview Press.

Schillhorn van Veen, T. W. 1986. Some Considerations in the Approach to Measure and Prevent Animal Health Problems in Traditionally Raised Livestock. Paper presented to the workshop on Les Methodes de la Recherche sur les Systémes d'Elevage en Afrique Intertropicale, Dakar.

Schwabe, Calvin W., and Isaac Mahuet 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.

Sollod, Albert E., and James A. Knight. 1983. Veterinary Anthropology: A Herd Health Study in Central Niger. In *Proceedings of the Third International Symposium on Veterinary Epidemiology and Economics*, pp. 482–486. Edwardsville, KS: Veterinary Medicine Publishing.

Sollod, Albert E., Katherine Wolfgang, and James A. Knight. 1984. Veterinary Anthropology: Interdisciplinary Methods in Pastoral Systems Research. In *Livestock Development in Subsaharan Africa: Constraints, Prospects, Policy*. James R. Simpson and Phylo Evangelou, eds., pp. 285–302. Boulder: Westview Press.

Swift, Jeremy (ed.). 1984. Pastoral Development in Central Niger: Report of the Niger Range and Livestock Project. Niamey, Niger: USAID.

Tschopik, Harry Jr. 1951. The Aymara of Chucuito, Peru. Part I: Magic. The American Museum of Natural History Anthropological Papers No. 44, Part 2.

Valderrama, R., and Carmen Escalante. 1976. Pacha Tinka o la Tinka a la madre tierra en el Apurimac. *Allpanchis* 9:177–191.

Vineze, Lajos. 1980. Peasant Animal Husbandry: A Dialectical Model of Techno-environmental Integration in Agro-pastoral Societies. *Ethnology* 20(4):387–403.

WILRTC (Winrock International Livestock Research and Training Center). 1978. The Role of Ruminants in Support of Man. Morrilton, AR: WILRTC.

Wolfgang, Katherine. 1983. An Ethnoveterinary Study of Cattle Health Care by the Fulbe Herders of South Central Upper Volta. Unpublished thesis, Hampshire College/Tufts University.

Wolfgang, Katherine, and Albert Sollod. 1986. Traditional Veterinary Medical Practice by Twareg Herders in Central Niger. Tahoua, Niger and North Grafton, MA: Integrated Livestock Production Project, and Tufts University School of Veterinary Medicine.