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A COMPARATIVE ASSESSMENT OF ZOOTHERAPEUTIC REMEDIES FROM SELECTED AREAS IN ALBANIA, ITALY, SPAIN AND NEPAL

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Zootherapy is the treatment of human ailments with remedies derived from animals and their products. Despite its prevalence in traditional medical practices worldwide, research on this phenomenon has often been neglected in comparison to medicinal plant research. Interviews regarding zootherapeutic traditions were conducted with informants from Albania, Italy, Nepal and Spain. We identified 80 species used in zootherapeutic remedies, representing 4 phyla in the animal kingdom: Annelida, Arthropoda, Chordata, and Mollusca. Remedies were ranked by consensus indices. Our studies show that the selection of medicinal fauna is mediated by human subsistence patterns. Concepts of health and disease differ among our study sites in the Mediterranean and Asia, and these differences also play a substantive role in the selection and use of animal-based remedies.

Key words: *zootherapy, ethnoveterinary, traditional medicine*

La zooterapia es el tratamiento de las dolencias humanas con los remedios obtenidos de animales y sus productos. A pesar de su incidencia en las prácticas médicas tradicionales en todo el mundo, la investigación sobre este fenómeno a menudo ha estado descuidada en comparación con la investigación de las plantas medicinales. Las entrevistas respecto a las prácticas de zooterapia se llevaron a cabo con informantes de Albania, Italia, Nepal y España. Identificamos 80 especies usadas en los remedios de zooterapia, representando 4 phyla en el reino animal: Annelida, Arthropoda, Chordata, y Mollusca. Los remedios fueron clasificados mediante índices de consenso. Hablamos un poco de las semejanzas interculturales y las diferencias en el uso medicinal de las faunas locales.

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Introduction

The treatment of ailments with remedies made from animals and their products is known as zootherapy (Alves and Rosa 2005). Animal-based medicines are generally derived from three sources: the whole or parts of the animal body, metabolic products of the animal (secretions or excrement), and other things created by animals such as nests, cocoons, honey, and eggs (Costa-Neto 2005). Since ancient times, zootherapy has been integral to the traditional pharmacopoeias of many cultures (Alves and Rosa 2006; Costa-Neto 1999; Lev 2003; Mahawar and Jaroli 2007) and has comprised a fundamental element to well-known traditional medical systems, such as Ayurvedic medicine, Traditional Chinese Medicine, and ancient Egyptian medicine. Records of the medicinal use of animals and their by-products date back to the invention of writing (Lev 2003, 2006). Today, animal products make up an important portion of modern pharmaceuticals; approximately 18% of prescription drugs used in the USA have animal origins (WRI 2000). Yet, despite its continued prevalence in traditional medical practices around the globe and importance as a potential source of novel pharmaceutical agents, zootherapy appears in the literature much less than studies of medicinal plant therapies.

Zootherapy is a vital component of traditional medicine (Alves and Rosa 2007a, 2007b, 2007c). This is especially evident in rural communities where access to modern healthcare is limited. Over centuries, the close interactions of rural populations with the environment, often associated with an economic dependence on local natural resources, has fostered the accumulation of a wealth of knowledge in this field. This knowledge of animal-based medicines, much like that of medicinal plants, is usually passed down through the oral traditions typical of many societies.

Loss of this traditional knowledge (TK) in the wake of rampant urbanization in cultures across the globe instills a sense of urgency for ethnobiologists to record and interpret this data before it is lost forever. In an effort to better understand the role of zootherapy in traditional medicine today and to record TK of endangered medicinal practices, we have taken a cross-cultural approach to examine data from our field sites located in four countries. We identify, describe, and compare zootherapeutic remedies used in the traditional pharmacopoeias of rural communities in Albania, Italy, Spain, and Nepal (Figure 1). These four regions were selected specifically for their disparate cultural and geographic domains. We use data from the Mediterranean field sites in Albania, Italy, and Spain to compare zootherapeutic practices in locations that are characterized by different cultures, but similar terrain and fauna. The Nepal data provide zootherapeutic practices from a region with a different culture, environment, and native fauna than that of the Mediterranean sites.

Cross-cultural studies of zootherapeutic practices are uncommon, yet they can offer valuable insight into the dynamic relationship that we share with our environment. In this paper, we aim to address the following questions: How does culture mediate human-environment interactions as they relate to zootherapies? How do subsistence patterns and economic models influence human health and

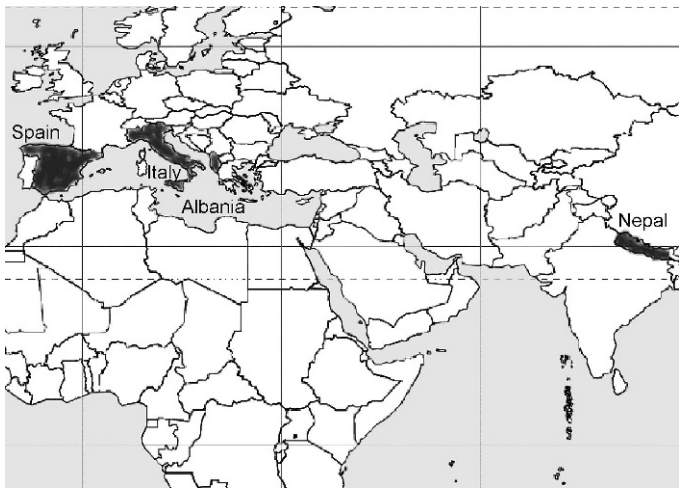

FIGURE 1. Map of the study area: Spain, Italy, Albania and Nepal.

access to medicines? How can we use our understanding of traditional lifeways and ethnomedical systems to promote biodiversity conservation?

Study Area

Albania

Albania has a predominantly mountainous terrain. Although a relatively small country, it has a high level of biodiversity, and 5.8% of the country is protected as national parks and reserves (Hoda and Zotaj 2007). The nation's economy is based on agriculture and forestry. According to the Albanian National Institute of Statistics, 58% of Albanians live in rural areas and approximately 20% of the population live in very poor conditions, 10% on less than US $2 per day (World Bank 2003). Albania is one of the poorest countries in Europe with an estimated Gross National Product of US $930 per capita.

Recent ethnobiological studies have been conducted in two remote villages–Lepushe and Theth–both located in the Shala Valley in the northern Albanian Alps (Pieroni 2008; Pieroni et al. 2005). The terrain in this area is mountainous and is characterized by alpine pastures and beech forests. The average temperature in the summer is 16°C, and winter brings heavy snowfalls and an average temperature of −3°C. Members of these communities survive on an economy of self-sufficiency; households care for a few livestock (usually one or two cows, pigs, and a few sheep) and cultivate staple crops like potatoes and corn along with some additional vegetables. Thus, due to the economic environment and physical isolation from other populations, these communities maintain strong ties with their environment and are actively involved in the collection of plant materials and animal products from both wild and cultivated sources for food and medicine.

Italy

Italy's Basilicata province lies in the south-central region of the country and is dominated by a rugged, mountainous terrain. This 9,992 km^2 region has a

population of about 600,000 people. The local economy is based on small-scale agriculture and agro-pastoral activities, although in the past decade it has shifted toward factory labor for both men and women. One prominent geographical feature of Basilicata is the dormant volcano, Monte Vulture (1,330 m a.s.l.). The Monte Vulture area is home to both autochthonous (native) Italians and ethnic Arbëreshë Albanian communities who have been included in extensive ethnobiological studies (Pieroni et al. 2002; Quave and Pieroni 2005).

In addition to the Vulture area, ethnobiological field studies have been conducted in the Lucanian Dolomite area –an isolated mountainous region near the province capital city of Potenza. The population is autochthonous Italian, with the exception of some eastern European migrants employed as household helpers. The remote location of these communities combined with their close proximity to forests fosters a close relationship between people and their environment. The tradition of collecting wild plants for food and medicine (both for human and animal consumption or use) still thrives, as does the similar use of wild and domestic animals and their products (Pieroni et al. 2004). Some of the domestic animals common to Basilicata include poultry, swine, cattle, goats, and sheep. Those who regularly participate in pastoral labor often use horses or donkeys for transportation while herding the livestock. Thus, the health of their animals is of primary importance, and a rich tradition of ethnoveterinary practices has been documented (Pieroni et al. 2004).

Spain

Castilla-La Mancha lies in the center (C-SE) of Spain, near Madrid. This 79,463 km^2 region has a population of almost 2 million people (Instituto Nacional de Estadística 2009). The flat plains of La Mancha are almost entirely devoid of natural vegetation and are instead occupied by crops, mainly grape vines and cereals like barley, wheat, oat, and rye. Groves of olive and almond trees are common in the warmer climes.

From an ethnobiological point of view, the most interesting areas are the peripheral mountains, where the Mediterranean forests are filled with *Quercus* spp. and *Pinus* spp. in the highest mountains. There, people live in small villages still close to nature and the traditional way of life. The elders living in this region remember old healing practices, now in disuse, but which were an important part of their lives in the past (Verde et al. 2008). A review of the Spanish literature confirms the importance of traditional remedies in the Spanish medical heritage (Blázquez 1989, 1991; Iniesta and Jordán 1991; Sánchez-Mínguez 1995). Zootherapy was commonplace in Spain in the second half of the 20th century, particularly in mountainous areas. In the Pyrenees (Alto Aragón), 48 animal species were used to treat up to 197 different ailments (Palacín-Latorre 1994; Palacín-Rodríguez 1985). In the Cantabrian mountains Orense and Asturias, 12 and 13 animal species respectively, were reported as medicinal resources (Rico-Avelló 1974; Taboada 1948).

Like other Mediterranean countries, Spain has a rich diversity of reptiles and amphibians and many species of birds. Big mammals, however, are rare, and wolves are almost extinct in the region. Some game like deer and wild boar are still common, and foxes are also easy to find, even near villages and towns.

Hunting is an important source of income, and the focus is mostly on small game like partridges, rabbits and hares and big game in some mountainous areas like the Toledo Mountains, Morena Range, and Cuenca Range.

Livestock, particularly sheep and goats used for their milk and meat, are also very important in La Mancha. Some areas are dedicated to breeding bulls for ***corridas*** (bull-fighting). Cattle are frequently found in the mountains. Swine and rabbits are bred for meat, and poultry are raised as a source of meat and eggs. Horses and donkeys were very common in the past, but are now rare in the countryside, although some remain in the mountain villages.

Nepal

Nepal has a distinctive topography that contributes to its rich biological and cultural diversity. Rugged terrain forms specific niches harboring unique assemblages of flora and fauna. Further, because of its location, the country encompasses two zoogeographical regions: the Palearctic in the north and the Oriental in the south. The country, though small, is rich in fauna of both the realms. The narrow middle strip of the country from east to the west is the main region of faunal mixing. Historic and current economic factors have promoted human interaction with biological resources in Nepal resulting in a rich body of traditional knowledge concerning resource utilization, management and conservation (for example Nanhoe and Ouboter 1987; Rajbhandari 2001; Shah and Giri 1992; Shrestha 2003), but Lohani et al. (2008) emphasize a strong need for comprehensive ethnozoological studies.

In this study we document ethnozoological knowledge in Majhi communities from the central mountainous region of Nepal. Majhi communities are usually scattered along the river banks in the Inner Terai and lower mountainous regions. These are river people who constitute about 0.32% of the total population of the country (CBS 2001). The nearby ancient Tharu people depended only upon wild forest products for their livelihood while ancient Majhi were engaged in fishing and farming (Bista 2000). In the wake of modern development efforts, modern Majhi are now engaged in other economic activities such as wage labor and business.

Materials and Methods

Our research methods included participant observation, semi-structured interviews, and focus groups. Although field research was conducted in each of the four study sites by different ethnobiologists, similar interview techniques and data collection methods were employed. Prior informed consent was obtained before conducting interviews, and ethical guidelines adopted by the International Congress of Ethnobiology/International Society of Ethnobiology (ISE 2007) were followed. Interviewees were questioned in their native language about the medicinal uses of the local fauna. Study participants were asked to free-list any known zootherapeutic remedies. Informants were prompted by asking about remedies for different common health problems, such as remedies for respiratory ailments, skin infections, diarrhea, women's health, stomach problems, pain, and wounds. When possible, informants were also interviewed using a focus group

format, and dialogue between the participants was encouraged while the researcher(s) recorded references to zootherapeutic remedies. Details regarding the local names of animals and the use and collection of animal products are presented in Table 1. The consensus index uses how often a certain remedy was cited to provide a relative measure of the knowledge of remedies within each study location.

For Albania, Pieroni conducted field research in the upper Shala Valley in the northern Albanian Alps from 2004 to 2007. Snowball sampling methods (Bernard 2002) were used to recruit 38 study participants, primarily among elderly members of the community who had lived in the area for all or most of their lives. Albanian fauna were identified using the *Libri i kuq i faunës shqiptare [Red Book of Albanian Fauna]* (Misja 2006).

Field research was conducted in the Basilicata Province of southern Italy by Quave and Pieroni from 2000 to 2008. Random sampling techniques were employed to recruit 112 interview subjects. Interviewees were equally stratified by gender and four age groups (21–35, 36–50, 51–70, 71+ years). Italian fauna were identified using the *Checklist of Italian Fauna* (Stoch 2009).

Fajardo, Verde, Rivera, and Obón conducted field research in Castilla-La Mancha Spain from 2000 to 2008. More than 600 study participants were interviewed, 170 of which were knowledgeable of local ethnobiological applications of fauna. Fauna were identified using the *Fauna Iberica* (Ramos 2009).

Field research was conducted in the Inner Terai and Lower Mountainous regions of Nepal by Lohani from 2004 to 2006. A total of 38 informants were interviewed, 17 of whom were 18–29 years old, 10 were 30–49, and 11 were older than 50. Nepali fauna were identified using several taxonomic keys (Grimmet et al. 2003; Shah and Tiwari 2004; Shrestha 1981; Shrestha 2003).

Results

Our research in three countries in the Mediterranean (Albania, Italy, and Spain) and one in Asia (Nepal) gathered information on 80 animal species used in 232 traditional zootherapeutic remedies for either human or animal health (Figure 1). A detailed description of these remedies is provided in Table 1, including popular use, preparation and application, and. a consensus index system.

Animals from 4 phyla (Annelida, Arthropoda, Chordata, and Mollusca) were reported as sources of medicinal remedies, with the majority (62 species, 77.5%) Chordata, followed by Arthropoda (13 species, 16.3%), Mollusca (4 species, 5%) and Annelida (1 species, 1.3%). Of the animal classes, most reported species come from the Mammalia (27 species, 33.8%), followed by the Aves (12 species, 15%) – both in the phylum Chordata. As to orders, the Artiodactyla from the class Mammalia had the most species represented (8 species, 10%), followed by the Carnivora of class Mammalia and order Squamata of class Reptilia, both of which had 7 species (8.8%) represented (Table 2).

Correlation of Remedies to Fauna

A total of 232 zootherapeutic remedies were reported. More remedies were reported from species belonging to certain orders. There were 52 remedies

TABLE 1. Popular uses of animals as zootherapeutic remedies in Albania, Italy, Nepal and Spain.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Phylum: Annelida **Class:** Clitellata **Order:** Hirudinea					
Hirudo medicinalis (Linnaeus, 1758)	European Medical Leech	***sanguijuelas*** [S]	heal contusion	A whole live animal is placed directly over the wound to suck up the blood. (M)	xxx
		a mignattola [I]	amulet against skin disease	A whole live animal is applied to the skin as an amulet against a nondescript skin illness. It is considered a good omen if the animal survives the treatment. (MR)	x
		ushunjz [A]	heal muscular pains	A live animal is applied externally to relieve muscular pains (''they suck the bad blood''). (M)	x
Phylum: Arthropoda **Class:** Arachnida **Order:** Araneae					
unknown	Spider	[A]	haemostatic	A spider web is applied to the laceration. (M)	x
Tegenaria domestica (Clerck, 1757)	House Spider	***arañas*** [S]	vulnerary; heal contusion	A spider web is applied to wounds and bruises. In Campo de Calatrava (Ciudad Real) it is mixed with dried ground red pepper and used as a dressing around the injuries. (M)	xx
Phylum: Arthropoda **Class:** Arachnida **Order:** Scorpiones					
Buthus occitanus (Amoreux, 1789)	Common European Scorpion	***alacrán***, ***aracrán***, ***escorpion***[S]	anti-otitic	One whole scorpion is fried in olive oil. Drops of the filtered oil are instilled into the ear. (M)	xx
				Two or three whole scorpions are fried in olive oil with rue (*Ruta angustifolia* Pers.). Drops of the filtered oil are put in the affected ear(s). (M)	x
			anti-cystitic or against ureter obstruction in mules	Two or three whole scorpions are fried in olive oil with laurel (*Laurus nobilis* L.) leaves. The filtered oil is given to the mule to drink. (MF, EV)	x
			vulnerary for burns	An oleolite is prepared by soaking 5 or 6 whole live animals in a jar of hot olive oil. The oil is left to settle for several days, filtered, and applied to burns. (M)	x
			anti-cystitic	Whole live animals are soaked in a jar of alcohol and left to settle for several days. The filtered alcohol is rubbed onto the lower abdomen. (M)	x

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Euscorpius spp. (Thorell, 1876)	Scorpion	[I/A]	anti-otitic	A whole animal is soaked in olive oil to create an oleolite infusion. This oil is then instilled in the infected or painful ear. (M)	#
Phylum: Arthropoda **Class:** Insecta **Order:** Coleoptera					
Annobium punctatum (De Geer, 1774)	Common Furniture Beetle	***polverini*** [I]	heal diaper-rash or heat rash in infants	Wood powder (saw dust) created by this wood-boring beetle is applied to the rash. (M)	x
			heal infantile seborrheic dermatitis (cradle-cap)	Wood powder (saw dust) created by this wood-boring beetle is rubbed on the infant's scalp. (M)	x
		dru i kalbëtë [I/A]	haemostatic	Wood powder created by the wood-boring beetle is applied. (M)	#
			anti-mastitic	Wood powder created by this wood-boring beetle is applied to the affected breast. (M)	#
Scarabaeidae (several genera)	Scarab Beetles	***escarabajos*** [S]	heal mouth sores or ulcers	An oleolite is prepared by frying 7 or 9 whole live beetles in olive oil. The filtered oil is applied to the sores. (M)	x
Phylum: Arthropoda **Class:** Insecta **Order:** Hemiptera					
Cicadidae (several genera)	Cicada	***chicharras*** [S]	vulnerary for burns	An oleolite is prepared by soaking 5 or 6 live animals in a jar of olive oil. The oil is left to settle for several days, filtered, and applied to burns. (M)	x
Phylum: Arthropoda **Class:** Insecta **Order:** Hymenoptera					
Apis cerana (Fabricius, 1793); *A. dorsata* (Fabricius, 1793); *A. dorsata laboriosa* (Smith, 1871); *A. florea* (Fabricius, 1793)	Asiatic Honey Bee; Giant Honey Bee; Himalayan Honey Bee; Dwarf Honey Bee	***mahuri*** [N]	anti-pharyngitic; anti-rhinitic; anti-gastritic	Honey is eaten. (MF)	x
A. mellifera (Linnaeus, 1758) and other spp.	European Honey Bee	***abejas*** [S]	anti-pharyngitic; anti-rhinitic; anti- laryngitic	Honey (***melë***) is eaten alone or mixed with hot tea. (MF)	xxx
				Honey is mixed with lemon juice (*Citrus limon* (L.) Osbeck) and eaten. (MF)	xxx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
				Honey is added as a sweetener in herbal tea mixtures containing ingredients from some plants such as Spanish sage (*Salvia lavandulifolia* Vahl.) and Italian buckthorn (*Rhamnus alaternus* L.). (MF)	xxx
			heal sore eyes; anti-conjunctivitic	Drops of honey are placed directly in the eyes. (M)	xx
			vulnerary for burns	Honey is topically applied to the burn wound. (M)	xx
		[I]	emollient for chapped nipples	Honey (***miele***) is applied to the nipple between breast-feeding sessions. (M)	x
		[A]	anti-otitic	Bees wax (***dyll***) is liquefied and arranged on the top of a small piece of cloth that is inserted (still warm) into the ear. (M)	x
			heal mouth inflammations	Honey is topically applied to the mucosa. (M)	x
			anti-parotitic (mumps)	Honey is applied externally under the ear. (M)	x
			post-partum reconstituent	Honey is dissolved in hot water and milk and drunk. (MF)	x
Phylum: Arthropoda **Class:** Insecta **Order:** Lepidoptera					
Bombyx mori (Linnaeus, 1758)	Silkworm		anti-wart	A silk ribbon is bound around the wart. (MR)	x
Phylum: Chordata **Class:** Actinopterygii **Order:** Anguilliformes					
Anguilla bengalensis bengalensis (Gray, 1831)	Indian Mottled Eel	***raja bam*** [N]	promote expulsion of placenta	An eel's tail is used to touch the head of a woman during childbirth to facilitate expulsion of the placenta after childbirth and prevent complications. (MR)	xx
Phylum: Chordata **Class:** Actinopterygii **Order:** Clupeiformes					
Sardina pilchardus (Walbaum, 1752)	European Pilchard	***sardinas*** [S]	heal foot blisters and sores	Heads and guts of salty sardines are rubbed on the affected feet. (M)	x
			digestive aid for livestock	A mixture of heads of salted sardines with fodder salt is given to livestock to eat when suffering from indigestion. (MF, EV)	x
Phylum: Chordata **Class:** Actinopterygii **Order:** Cypriniformes					
Schizothorax plagiostomas (Heckel, 1838); *S. richardsonii* (Gray, 1832)	Snowtrout	***sun asala*** [N]; ***buche asala*** [N]	vulnerary for burns	Bile juice and fish oil are applied to burns. (M)	xx
			anti-leucoderma	Milt (seminal fluid) of the fish is smeared on the skin. (M)	xx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Phylum: Chordata **Class:** Actinopterygii **Order:** Synbranchiformes					
Monopterus cuchia (Hamilton, 1822)	Mud Eel	***bam maccha*** [N]	promote expulsion of placenta	An eel's tail is used to touch the head of a woman during childbirth to facilitate expulsion of the placenta after childbirth and prevent complications. (MR)	xx
Phylum: Chordata **Class:** Amphibia **Order:** Anura					
Bufo bufo (Linnaeus, 1758)	Common Toad	***sapo, zampoño*** [S]	taboo	There is a belief that touching the skin of a toad can damage the skin. (MR)	x
Paa liebigii (Günther, 1860)	Spiny-Armed Frog	***man paha*** [N]	reconstituent nutraceutical	Cooked and eaten to treat person with a prolonged illness. (MF)	x
Rana perezi (Seoane, 1885)	Perez's Frog	***rana*** [S]	wound cleansing; disinfectant	The belly of a whole live animal is slit open and applied directly to the wound. (M)	x
Phylum: Chordata **Class:** Amphibia **Order:** Caudata					
Salamandra salamandra (Linnaeus, 1758)	Fire Salamander	***salamandra*** [S]	taboo	There is a belief that touching the skin of the salamander can damage the skin. (MR)	x
Salamandra sp.	Two-Headed Salamander	***a salagreca*** [I]	augury (good omen)	The head is cut off and stored in alcohol. (MR)	x
Phylum: Chordata **Class:** Aves **Order:** Ciconiiformes					
Ardea purpurea (Linnaeus, 1766).	Purple Heron	***garza*** [S]	haemostatic	The chest down feathers are used to stop bleeding in lacerations or wounds. (M)	x
Phylum: Chordata **Class:** Aves **Order:** Columbiformes					
Columba livia (Gmelin, 1789); *C. oenas* (Linnaeus, 1758); *C. palumbus* (Linnaeus, 1758)	Rock Pigeon; Stock Pigeon; Wood Pigeon Pigeon	***paloma; paloma zurita; paloma bravia; paloma torcaz*** [S]	anti-onychocryptosic (ingrown nail); anti-acne	Feces are mixed with bread crumbs and applied. (M)	x
Columbia spp. (Gmelin, 1789)		***u piccionē*** [I]	post-partum healing; reconstituent	Soup made with pigeon meat is prepared (often as a gift) for women recovering from childbirth to eat. It is also eaten as a general reconstituent during illness. (MF)	xx
			galactagogue	Pigeon meat soup is eaten. (MF)	xxx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
		parewa [N]	augury (good omen)	Villagers set the pigeon free to free themselves from untoward happenings, for their peace and general well-being. It is believed that the flying pigeon takes away all kinds of diseases and bad luck. (MR)	x
Phylum: Chordata **Class:** Aves **Order:** Coraciiformes					
Coracias benghalensis (Linnaeus, 1758)	Indian Roller	***theuwa*** [N]	anti-otitic	The cooked flesh is eaten. (MF)	x
Phylum: Chordata **Class:** Aves **Order:** Cuculiformes					
Cuculus canorus (Linnaeus, 1758)	Common Cuckoo	***u cucchē*** [I]	augury (good omen)	Hearing the bird singing is considered a good omen for life. (MR)	x
Phylum: Chordata **Class:** Aves **Order:** Galliformes					
Gallus gallus (Linnaeus, 1758)	Chicken	***galinas*** [S]	vulnerary for burns	Egg white is applied directly to the burn. (M)	x
			anti-onychocryptosic (ingrown nail)	The affected finger or toe is placed in a glass with a raw egg to soak for a few minutes. (M)	xx
			amulet against infantile paralysis	The eggs laid on Good Friday are kept as amulets to protect infants from this disease. (MR)	x
			anti-anemic	Raw eggs (with their shell) are beaten with lemon juice and sugar and left to macerate for a few days to take an aspect of puree (including mold). This puree is eaten by children and adults. (MF)	x
		kukhura [N]	vulnerary for burns	Chicken fat is topically applied to the burn. (M)	xx
			heal broken bones	Small chickens are ground into a paste that is used as a plastering material to set the bone. (M)	xx
			blessing for healing	Faith healers present live hens to the healing diety when treating women and they present a rooster to the deity when healing men. (MR)	xx
		[A]	treat kidney stones	The membrane of the muscular stomach (***mullis pule***) of a hen is removed and dried, then ground and made into a decoction.	x
			poison antidote	A whole egg is eaten raw as an antidote. (MF) This is also used to treat cattle and sheep. (EV)	xxx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
			heal stomachache	Eggs are cooked (boiled) and eaten. (MF)	x
			heal general pains/ analgesic	A ritual ceremony is performed in which a raw egg is put on a piece of raw wool which is adhered to the body with the help of oil. The egg moves on the wool and where the yolk stops, the yolk "takes the pain away" and comes out of the membrane. The whole treatment last at least one hour. (MR)	xx
		a gaddina [I]	anti-abscess; anti-furuncle	Egg yolk is mixed with the yeast from fresh pasta dough and applied. (M)	x
			heal broken or bruised bones	Egg white is beaten well, and then used to coat hemp (*Cannabis sativa* L.) fiber to make a hard cast for setting bones. (M)	+
			heal general sickness	Chicken meat soup is eaten as a reconstituent. (MF)	xx
		[I], [I/A]	heal contusion	The egg albumen (***bardhë vëjtë*** [I/A]) is scrambled and soaked up with either cotton, wheat bran, or a cloth and applied to the bruise with salt. (M)	# [I/A]; xx[I]
			post-partum healing	Chicken meat soup (***mish ta puljë*** [I/A]) is prepared and fed to mothers shortly after childbirth as a reconstituent and post-partum depurative. (MF)	xx [I]; xx[I/A]
		[A], [I]	anti-diarrheic	Eggs are cooked (boiled) (***ufē*** [I])and eaten. (MF)	x [A]; xx[I]
Pavo cristatus (Linnaeus, 1758)	Indian Peafowl	***mayoor*** [N]	magical amulet	Healers use single or multiple feathers arranged in fans in magico-religious healing ceremonies. (MR)	x
Phylum: Chordata **Class:** Aves **Order:** Passeriformes					
Hirundo rustica (Linnaeus, 1758)	Barn Swallow	***golondrina*** [S]	anti-pharyngitic	Two or three swallows are fried and the resulting oil is filtered and kept in a glass jar. The oil is applied externally to the throat. (M)	x
Myophonus caerleus (Scopoli, 1786)	Blue-Whistling Thrush	***kalchaude*** [N]	anti-asthma; anti-gout	Either cooked flesh or blood is eaten. (MF)	xx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Sturnus spp. (Linnaeus, 1758)	Starlings	***saraun*** [N]	anti-otitic; anti-asthma	Cooked flesh is eaten. (MF)	x
Phylum: Chordata **Class:** Mammalia **Order:** Artiodactyla					
Axis axis (Erxleben, 1777)	Chital	***chital***, ***mriga*** [N]	fertility aid	Infertile women eat the blood and bile to become pregnant. (MF)	xx
			evil-eye amulet	An amulet (***buti***) is made of bone and used to protect children from evil-eye. (MR)	xx
			anti-dysenteric	Blood is drunk. (MF)	xx
Bos taurus (Linnaeus, 1758)	Cattle	[I], [A]	vulnerary for burns	Fresh cow feces (***a rumata da vacchē***) are applied to the wound. (M)	x [I]; x[A]
		[A]	vulnerary	Fresh cheese (***diath***) is applied to wounds to promote healing. (M)	xxx
			lip emollient	Milk cream (***masa***) is applied to chapped lips. (M)	x
			anti-parotitic (mumps)	Cow's milk is drunk very hot. (MF)	x
			anti-diarrheic; strengthen the stomach	Fresh cheese (***diath***) is eaten cool or cooked with flour and eaten hot. (MF)	xxx
			heal intestinal pain; poison antidote	Cow's milk is drunk to treat intestinal pains and poisonings (especially in children, and also in animals). (MF, EV)	xx
			heal severe digestive problems in livestock	Rennet (from the calf abomasus) is dried and added into the animal feed. (MF, EV)	x
		vacchē [I]	anti-pertussic	Smelling cow feces in the morning. (M)	x
			heal skin inflammations (for infants)	Fermented milk cream (***u butirrē***) is applied as an emollient. (M)	x
			anti-furuncle	Cooked cream (***panna cottē***) is applied. (M)	x
			treat facial wrinkles; facial emollient	Fresh cow's milk (***u latte freschē***) is used to wash the face. (M)	x
		gai [N]	anti-diarrheic; anti-vomiting	Bile is drunk. (MF)	x
			protective amulet	The gallbladder and bile are used to make charms. (MR)	x
Capra aegagrus hircus (Linnaeus, 1758)	Goat	***caprē*** [I]; ***cabrito*** [S]; ***boka*** [N]	anti-tussive; reconstituent for children	Hot goat milk (***u lattē da caprē***) is drunk with honey. (MF)	x
			anti-asthmatic	Goat fat is heated into a liquid and one spoonful is drunk. (MF)	x

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
			anti-wart	When an animal is killed, a few drops of fresh blood are applied to the wart(s). (M)	xx
			vulnerary for burns	Fat is applied to burns. (M)	xx
Cervus elaphus (Linnaeus, 1758)	Red Deer	***venao***, ***ciervo*** [S]	amulet against heart failure	A deer is killed and its heart removed. Upon drying, a cartilaginous portion of the heart that is shaped like a cross is removed and worn on a necklace as a protective amulet. (MR)	x
			heal snake bites	The sharp tips of deer horns are used to puncture the skin surrounding a snake bite to help expel the venom. (M)	x
Moschus chrysogaster (Hodgson, 1839)	Himalayan Musk Deer	***kasturi mriga*** [N]	protective amulet	Charms are made from the musk and worn by children for their well-being. (MR)	x
Ovis ammon hodgsoni (Linnaeus, 1758)	Tibetan Argali	***bhenda*** [N]	anti-otitic	Drops of urine are instilled in the affected ear. (M)	x
Ovis aries (Linnaeus, 1758)	Domestic Sheep	***pechērē*** [I]; ***cordero*** [S]	anti-diarrheic; galactagogue	Pasta is cooked and some of the cooking water is mixed with dried sheep ricotta (***a ricotta tostē***) to make a sauce for the noodles. This is then mixed with boiled bread and eaten. (MF)	xx
			anti-diarrheic	Ricotta cheese (***gjëz***) is eaten as a light anti-diarrhoeal. (MF)	x
			laxative	Whey (***sir*** [I/A]; ***u sjrē crudē***[I]), the liquid precipitate remaining from the cheese making process, is drunk as a mild laxative. (MF)	xx[I/A]; xx[I]
			reconstituent; preventative for many illnesses	Fresh sheep milk is boiled with salt to produce a dense yogurt-like product (***jardun***) that is eaten. (MF)	xxx
			laxative	Sheep milk (***u lattē da pechērē***) is drunk. (MF)	x
			diaphoretic	A special singlet (***krahol***) and socks made from raw wool are worn only when affected by high fever. (M)	xxx
			anti-wart	When an animal is killed, a few drops of fresh blood are topically applied to the wart(s). (M)	xx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Sus scrofa domestica (Linnaeus, 1758)	Domestic Pig	[I/A]	anti-chilblains	The swine's gall bladder (***fejlli derkut***) is removed and left outside overnight. The next day, it is applied to the affected toes. (M)	#
		maiale [I]	emollient for chapped nipples or udders	Aged dorsal pork fat (***sugna fracidē***) is applied to sore chapped nipples (for breast-feeding women) or to chapped skin in general. (M) It is also applied to the udders of milk producing livestock (especially cattle). (EV)	x
			anti-bronchitic	Layer of aged dorsal pork fat (***sugna fracidē***) is applied to the chest. This is then covered with a warm towel. (M)	x
			laxative	Pork lard (***l'untē***) is prepared in a soup. (MF)	x
			anti-furuncle; vulnerary (for lacerations); anti-abscess; suppurative	A thin layer of aged dorsal pork fat (***sugna fracidē***) is placed on affected area of skin, and then covered with fresh *Rubus ulmifolius* Schott. leaves. (M)	xx
			vulnerary for burn wounds and animal wounds	Pork lard (***lardo di maiale***) is boiled, cooled, and applied to burns. (M) Lard is also rubbed onto livestock wounds and lacerations to coat and protect wounds and promote healing. (EV)	x
		cochino, ***gorrino***, ***guarro***, ***marrano*** [S]	emollient for chapped hands	Pork lard is used as the excipient in many different traditional medical recipes and is the base of many ointments. It is applied to the hands. (M)	xxx
			anti-mastitic for cows	Pork lard is applied to the udders of cows. (M, EV)	x
			anti-depressant	Pork lard is mixed with honey and spread on bread to be eaten by people suffering from depression. (MF)	x
			heal abdominal pains	Pork lard is mixed with chopped celery (*Apium graveolens* L.) and placed on the belly. (M)	xx
			vulnerary	Bile (either alone or mixed with alcohol) is applied to wounds. (M)	

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
		[A]	heal wolf bite in livestock; anti-erysipelas in pigs	Pork lard is heated and applied externally. It is used as veterinary preparation to heal wolf bites (in cattle, sheep, goats), and for treating skin inflammations due to erysipelas (*Erysipelothrix rhusiopathiae*) in pigs. (M, EV)	x
Phylum: Chordata **Class:** Mammalia **Order:** Carnivora					
Canis aureus (Linnaeus, 1758)	Golden Jackal	***syal*** [N]	anti-gout; anti-arthritic	Jackal meat is mixed with millet or locally produced cereal and yeast to produce alcohol, which is trapped through a distillation process. The alcoholic beverage ***syalko raksi*** is very popular and has a high medicinal value. Gout and arthritis are treated by either massaging the affected area with this alcohol or drinking it. (M)	xxx
			bad omen	Hearing the jackal howl is a bad omen for the community. (MR)	xxx
Canis lupus familiaris (Linnaeus, 1758)	Dog	***qeni*** [I/A]	anti-furuncle	Dog saliva (***lëkon qeni***) is applied as an antiseptic and in the treatment of furuncles. (M)	#
		cuanē [I]	vulnerary for burns	Dog feces (***a rumata du cuanē***) are applied. (M)	x
			evil-eye amulet	Leather made from the skin of black dog (***u crigiulē du cuane neurē***) is worn as an amulet against the Evil-eye (***malocchio***). (MR)	x
		[I], [A]	heal dog bite	A hair from the dog that bit you is applied to the bite. (MR)	x [I]; x [A]
		perro [S]	reconstituent for malnourished children	Dog feces are exposed to open air overnight and then boiled. This water is filtered and given to malnourished children to drink. (MF)	x
			anti-rhinitic	Dog feces are prepared in a tea with dry figs (*Ficus carica* L.), ears of corn (*Zea mays* L.), snake skin and honey. (MF)	x
			rabies in dogs	Hair from a rabid dog is fried in olive oil and the oil is used to wash the wound on the same dog. (M, EV)	xx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Meles meles (Linnaeus, 1758)	European Badger	***tajón, tejón, tasón*** [S]	evil-eye amulet	Badger hairs are used with other materials to create a scapular that is worn for protection. (MR)	x
Melursus ursinus (Shaw, 1791)	Sloth Bear	***rukh bhalu*** [N]	anti-hydrocele (scrotal swelling)	Bile is drunk. (M)	xx
			protective amulet	Charms are made from bones. (MR)	xx
Panthera tigris tigris (Linnaeus, 1758)	Bengal Tiger	***bagh*** [N]	protective amulet	Whiskers, pieces of bones, teeth, and claws are made into charms that are worn to ward off evil spirits and frighten the enemy. (MR)	xxx
			magical protection	Bone is burnt in the cow shed to produce smoke. It is believed that the smoke drives away disease causing elements and evil spirits. (MR)	xx
Prionailurus bengalensis (Kerr, 1792)	Leopard Cat	***kalo biralo*** [N]	heal general sickness	Bile is drunk to treat many illnesses. (M)	x
Vulpes vulpes (Linnaeus, 1758)	Red Fox	***zorro, zorra*** [S]	anti-rhinitic; anti-pneumonia	Dried fox liver is administered as an infusion or as a powder added to soups. (MF)	xx
Phylum: Chordata **Class:** Mammalia **Order:** Erinaceomorpha					
Erinaceus europaeus (Linnaeus, 1758)	European Hedgehog	***riccio*** [I]	calm crying babies	Bile of a freshly killed hedgehog (***bile dē riccē***) is fed to babies that won't stop crying. (MF)	x
Phylum: Chordata **Class:** Mammalia **Order:** Perissodactyla					
Equus asinus (Linnaeus, 1758)	Donkey	***asino, ciucciē*** [I]	heal wind illness (skin inflammation)	A braided rope made of hair from a donkey's tail (***lasc***) is used as a ritual object in the magical healing of wind illness (***mal vjnt***). The bundle of hair is dipped into red wine and used to paint the wine onto the area of the skin where inflammations occur. (MR)	x
			reconstituent for children	Donkey milk (***u lattē du ciucciē***) is drunk. (MF)	xxx
		[A]	anti-tussive	Fresh donkey milk is drunk to heal coughs in the elderly. (MF)	xx
		burro, borrico[S]	promote placenta expulsion	A donkey's feces is boiled and the liquid is drunk by women after giving birth. (M)	x
			vulnerary for burns	Old donkey bones are burnt (without becoming completely charred) and ground into a powder that is applied to burns. (M)	x

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Equus caballus (Linnaeus, 1758)	Horse	***gjaku kaljt*** [I/A]	anti-anemic	Fresh horse blood is drunk. (MF)	#
Rhinoceros unicornis (Linnaeus, 1758)	Indian Rhinoceros	***gainda*** [N]	heal sick livestock	Urine is given to ailing livestock to drink. (EV)	xx
Phylum: Chordata **Class:** Mammalia **Order:** Primates					
Homo sapiens sapiens (Linnaeus, 1758)	Human	[I/A]	evil-eye amulet	Human hair is collected to use in an amulet that protects one from Evil-eye (***malocchio***). (MR)	#
		uomo [I]	augury (good omen)	The person's hair is cut (***a ciocca dē capeddi***) on the first Friday in March as a protection against headache. (MR)	x
			heal purulent skin abscess; suppurative	Cerumen (***u cerumē***), ear wax, is applied to purulent skin abscesses caused by being pricked by plant thorns. (M)	x
			heal infantile seborrheic dermatitis (cradle-cap)	Breast milk is expressed and rubbed onto an infant's scalp. Then the hair is brushed to remove the flaky scales. (M)	x
			anti-mastitis	Nursing mothers with mastitis must breast-feed their infants using the "reverse" or "football" position (***lattē alla reversē***). (MR)	xx
			vulnerary	Human sweat that has soaked into the inner rim of a hat is applied to the wound. (M)	x
			haemostatic; disinfectant	Human urine (***u piscē***) is used to rinse fresh bleeding lacerations. (M)	xx
			anti-conjunctivitic	Fresh breast milk (***u lattē da feminē*** or ***lattē dē mama***) is expressed into the infected eyes of babies (also sometimes for adults). Some state the milk must be from a mother who nurses a son. Others say the milk must be from a mother nursing her first born child. Less commonly, fresh milk from a mule or goat is used. (M)	xxx
				The first urine of the day is used to wash the affected eyes. (M)	x
			emollient for chapped nipples	Breast milk is expressed and rubbed onto the nipple. (M)	x

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
		hombre [S]	emollient for chapped hands	Urine is used to wash the hands. (M)	xx
			anti-otitic	Human breast milk is expressed and instilled in the affected ear(s). (M)	xxx
			treat scorpion sting	A few drops of menstrual blood are applied to the scorpion bite area. (M)	x
			anti-wart	A few drops of menstrual blood are applied to the wart(s). (M)	xx
		[A]	treat snake bite	Fresh feces are applied to the snake bite. (M)	x
Macaca assamensis (McClelland, 1840); *M. mulatta* (Zimmermann, 1780)	Assam Macaque; Rhesus Macaque	***bandar*** [N]	nutraceutical for TB patients	The dried liver and gall bladder are eaten by the person suffering from tuberculosis for a few days for nourishment. People also eat the meat for nourishment. (MF)	x
Presbytis entellus (Dufresne, 1797)	Hanuman Langur	***langur*** [N]	nutraceutical for TB patients	Persons suffering from tuberculosis eat the meat (raw or cooked) for nourishment. This meat is preferred to that of *Macaca* spp. (MF)	x
Phylum: Chordata **Class:** Mammalia **Order:** Proboscidea					
Elaphas maximus (Linnaeus, 1758)	Asian Elephant	***hathi*** [N]	anti-gastritic	Bile is drunk. (MF)	x
Phylum: Chordata **Class:** Mammalia **Order:** Rodentia					
Mus musculus (Linnaeus, 1758)	House Mouse	***u sorcē*** [I]	anti-enuresis (bedwetting)	A mouse is cooked or boiled and eaten. (MF)	xx
		ratón [S]	anti-otitic	Several live newborn mice are placed in a jar of olive oil that is left open to air for several months. This oil is then filtered and kept in a glass jar. A few drops of the oil are instilled in the affected ear(s). (M)	x
Hystrix indica (Kerr, 1792) ; *H. brachyura* (Linnaeus, 1758)	Indian Crested Porcupine; Himalayan Porcupine	***dumsi*** [N]	anti-asthma; treat difficulty passing urine	The alimentary canal with its contents is boiled and eaten as a soup. (MF)	x
			anti-abscess	The spines are used as needles to puncture purulent abscesses to allow draining of pus. (M)	x

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Phylum: Chordata **Class:** Osteichthyes **Order:** Cypriniformes					
Tor tor (Hamilton, 1822)	River Carp	***sahar*** [N]	vulnerary for burns	Fish oil and bile are applied to burns. (M)	xx
Phylum: Chordata **Class:** Reptilia **Order:** Squamata					
Elaphe quatuorlineata (Wagler, 1833)	Four-Striped Snake	***a serpē cervonē*** [I]	anti-rheumatic	Snake fat (***a sunzē***) is extracted while the snake is alive and applied as an ointment. (M)	xx
Lacerta lepida (Daudin, 1802)	Ocellated Lizard	***ardacho***, ***jardacho***, ***lagarto*** [S]	anti-contusion; anti-inflammatory in livestock	A live lizard is hung from the ceiling of the stable of the wounded animal (livestock). (MR, EV)	x
			vulnerary; disinfectant	Lizard fat is applied to wounds. (M)	x
			heal inguinal hernia	The blood of the animal is used to rub or scour the groin region (location of the hernia). At the end of this process, the whole dead animal is laid on the groin region for a few minutes. (M)	x
Malpolon monspessulanus (Hermann, 1804)	Montpellier Snake	***culebra***, ***bicha*** [S]	anti-rhinitic	The snake skin is administered in different herbal teas mixed with plants such as arnica (*Chiliadenus glutinosus* Fourr.), dried gigs (*Ficus carica* L.), pennyroyal (*Mentha pulegium* L.), corn cobs (*Zea mays* L.) and marshmallow (*Althaea officinalis* L.). (MF)	xxx
			anti-tussive	The dry snake skin is ground into a powder and mixed with bread crumbs to make a porridge that is eaten. (MF)	xx
			diuretic for kidney stones	The snake skin is taken as an herbal tea mixed with Algerian tea (*Paronychia argentea* Lam.) and elderberry (*Sambucus nigra* L.). The treatment continues until the pain disappears. (MF)	x
			blood depurative; anti-scabies	Snake meat is fried in olive oil and eaten. (MF)	x
			disinfectant for wounds	Snake meat is fried with olive oil. The cooled filtered oil is applied to the wound. (M)	x
			treat colds and sickness in mules	Dry snake skin is ground and mixed with straw that is given as fodder to mules. (MF, EV)	xxx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
*Podarcis hispanic*us (Steindachner, 1870).	Iberian Wall Lizard	***relantija***, ***lagartija*** [S]	anti-pertussic	A live animal is placed inside the hollow stem of the giant reed (*Arundo donax* L.) and the reed is hung on the sick person's neck as a necklace. (MR)	xx
			anti-wart	The whole live animal is rubbed directly on the wart. (M)	x
			anti-conjunctivitic (allergy associated)	A live animal is placed inside the hollow stem of the giant reed (*Arundo donax*) and the reed is hung on the sick person's neck as a necklace. (MR)	xx
Rhinechis scalaris (Schinz, 1822)	Ladder Snake	***culebra***, ***bicha*** [S]	anti-scabies	Snake meat is fried in olive oil and eaten. (MF)	x
			vulnerary; wound disinfectant	Snake meat is fried in olive oil. The cooled filtered oil is applied to the wound. (M)	x
			treat colds and sickness in mules	Dry snake skin is ground and mixed with straw that is given as fodder to mules. (MF, EV)	xxx
			anti-tussive	The dry snake skin is ground into a powder and mixed with bread crumbs to make a porridge that is eaten. (MF)	xx
			anti-rhinitic	The snake skin is administered in different herbal teas mixed with plants as arnica (*Chiliadenus glutinosus*), dried figs (*Ficus carica*), pennyroyal (*Mentha pulegium*), corn cobs (*Zea mays*) and marshmallow (*Althaea officinalis*). (MF)	xxx
Trimeresurus spp.	Asian Pit Vipers	***hareu*** [N]	anti-pharyngitic	A live snake is cooked and its flesh is topically applied to the sore throat. Snake fat is also topically applied to the throat for quick relief. (M)	x
Vipera latastei (Bosca, 1878)	Lataste's Viper	***vibora*** [S]	anti-toothache	A dead viper is placed inside a piece of cloth that is laid on the face over the painful area. After treatment, the viper is dried and stored for future use. (M)	x

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
Phylum: Chordata **Class:** Reptilia **Order:** Testudines					
Emys orbicularis (Linnaeus, 1758)	European Pond Turtle	***galápago, Tortuga*** [S]	anti-rheumatic; anti-inflammatory	A soup is prepared by boiling some turtles with ram head and leg (*Ovis aries*) with rosemary (*Rosmarinus officinalis* L.), Spanish wild marjoram (*Thymus mastichina* L.), spanish lavender (*Lavandula stoechas* L.), and *Teucrium gnaphalodes* L'Hér. (MF)	x
Indotestudo elongata (Blyth, 1854)	Elongated Tortoise	***kacchuwa, thotari*** [N]	amulet	The bone and shell are used to make magico-religious amulets by faith healers. (MR)	xx
			reconstituent; nutraceutical	The meat is eaten as a source of protein. (MF)	xx
			anti-tussive; anti-rhinitic; treatment for respiratory tract infections	The shell is rubbed against a boulder with water to create a thick paste that is administered orally to children as a preventive measure against cough, cold and other respiratory tract infection. (M)	xx
Phylum: Chordata **Class:** Sauropsida **Order:** Testudines					
Mauremys leprosa (Schweigger, 1812).	Mediterranean Pond Turtle	***galápago, tortuga*** [S]	anti-rheumatic; anti-inflammatory	A soup is prepared by boiling some turtles with ram head and leg (*Ovis aries*) with rosemary (*Rosmarinus officinalis*), Spanish wild marjoram (*Thymus mastichina*), Spanish lavender (*Lavandula stoechas*), and *Teucrium gnaphalodes*. (MF)	x
unknown species	Turtle		anti-tussive	Turtle meat is cooked and eaten to treat coughs in the elderly. (MF)	x
Phylum: Chordata **Class:** Teleostomi **Order:** Cypriniformes					
Neolissochilus hexagonolepis (McClelland, 1839)	Copper Mahseer	***katle*** [N]	anti-mastitic	Fish blood is given to a lactating mother to relieve breast pain. (M)	xx
Phylum: Mollusca **Class:** Gastropoda **Order:** Eupulmonata					
Arion hortensis (Férrusac)	Garden Slug	***u vavalicē aranudē, marruculē, lummachē senza guscio*** [I]	anti-wart	The slimy slug mucous is rubbed onto the wart. This procedure must be carried out while the full moon is decreasing. After the treatment, the slug is hung on an elmleaf blackberry (*Rubus ulmifolius* Schott.) thorn. When the slug dries up, the warts will disappear. (MR)	xxx

TABLE 1. Continued.

Scientific Name	English Common Name	Vernacular Name [Country]	Popular Use	Preparation and Application*	C.I.‡
			anti-ulcer (stomach ulcer); anti-gastritic	A live slug is swallowed whole. (MF)	xxx
			vulnerary; anti-dermatitic; anti-inflammatory	Mucous from a live slug is rubbed onto skin. (M)	xx
			anti-callus	Mucous from a live slug is rubbed onto skin. (M)	x
			anti-acne; facial emollient	Mucous from a live slug is rubbed onto skin for facial cleansing. (M)	x
Arion sp.	Black Slug	***chiplekira*** [N]	heal broken bones	A few slugs are mixed with ''***sisnu***'' – the root of stinging nettle (*Urtica dioica* L.) and a whole young chick and ground to make fine paste. The paste is then applied at the site of fracture as plastering material. (M)	xx
Phylum: Mollusca **Class:** Gastropoda **Order:** Pulmonata					
Helix aspersa (O. F. Müller, 1774)	Garden Snail	***caracol, zampoña, caracol sapenco, caracol de la huerta***[S]	anti-wart; anti-callus	Mucous from a live snail is applied. (M)	xx
Limax sp.	Grey Slug	***chiplekira*** [N]	heal broken bones	A few slugs are mixed with ''***sisnu***'' – the root of stinging nettle (*Urtica dioica*) and young chicken and ground to make fine paste. The paste is then applied at the site of fracture as plastering material. (M)	xx

Country abbreviations: A: Albania; I: Italy; I/A: Arberësh (ethnic Albanian) communities in Italy; N: Nepal; S: Spain.
**Type of medical application*: M: medicine; MF: medicinal food; MR: magico-religious; C: Cosmetic; EV: Ethnoveterinary remedy.
‡C.I.: Consensus Index. *The consensus index reflects the spontaneous quotation frequencies for different remedies*: #: disappeared use in the last decades; x: use quoted by less than 10% of the informants; xx: use quoted by more than 10% and less than 40% of the informants; xxx: use quoted by more than 40% of the informants.

TABLE 2. Distribution of fauna and corresponding remedies by country. Numbers in columns for each specific country indicate the number of different species or remedies cited for the respective country. Totals in bold indicate the total number of different species or remedies cited in all countries. If the same species or remedy was cited in more than one country, this is counted only once in the total column. For example, in the order Hirudinea, three countries reported the use of the European Medicinal Leech. Since the number 1 assigned to each country represents the same species, only 1 goes into the total column in bold. However, this species is used in different ways in the different countries, so each remedy will be counted once and the total number of remedies is 3.

			Animal Species (N=80)						Remedies (N=232)					
							Total						Total	
Phylum	Class	Order	Albania No.	Italy No.	Nepal No.	Spain No.	No.	%	Albania No.	Italy No.	Nepal No.	Spain No.	No.	%
Annelida	Clitellata	Hirudinea	1	1		1	**1**	***1.3***	1	1		1	**3**	***1.3***
Arthropoda	Arachnida	Aranae	1			1	**2**	***2.5***	1			2	**3**	***1.3***
		Scorpiones		1		1	**2**	***2.5***		1		5	**6**	***2.6***
	Insecta	Coleoptera		1		1	**2**	***2.5***		4		1	**5**	***2.2***
		Hemiptera				1	**1**	***1.3***				1	**1**	***0.4***
		Hymenoptera		1	4	1	**5**	***6.3***	4	2	3	4	**13**	***5.6***
		Lepidoptera		1			**1**	***1.3***		1			**1**	***0.4***
Chordata	Actinopterygii	Anguilliformes			1		**1**	***1.3***			1		**1**	***0.4***
		Clupeiformes				1	**1**	***1.3***				2	**2**	***0.9***
		Cypriniformes			2		**2**	***2.5***			2		**2**	***0.9***
		Synbranchiformes			1		**1**	***1.3***			1		**1**	***0.4***
	Amphibia	Anura			1	2	**3**	***3.8***			3	3	**6**	***2.6***
		Caudata		1		1	**2**	***2.5***		1		1	**2**	***0.9***
	Aves	Ciconiiformes				1	**1**	***1.3***				1	**1**	***0.4***
		Columbiformes		1	1	3	**4**	***5.0***		3	1	1	**5**	***2.2***
		Coraciiformes			1		**1**	***1.3***			1		**1**	***0.4***
		Cuculiformes		1			**1**	***1.3***		1			**1**	***0.4***
		Galliformes	1	1	2	1	**2**	***2.5***	7	5	4	4	**19**	***8.2***
		Passeriformes			2	1	**3**	***3.8***			4	1	**5**	***2.2***
	Mammalia	Artiodactyla	4	4	5	4	**8**	***10.0***	14	21	9	9	**52**	***22.4***
		Carnivora	1	1	4	3	**7**	***8.8***	1	4	8	6	**18**	***7.8***
		Erinaceomorpha		1			**1**	***1.3***		1			**1**	***0.4***
		Perissodactyla	1	2	1	1	**3**	***3.8***	1	3	1	2	**7**	***3.0***
		Primates	1	1	3	1	**4**	***5.0***	1	12	3	4	**20**	***8.6***
		Proboscidea			1		**1**	***1.3***			1		**1**	***0.4***
		Rodentia		1	2	1	**3**	***3.8***		1	3	1	**5**	***2.2***
	Osteichthyes	Cypriniformes			1		**1**	***1.3***			1		**1**	***0.4***
	Reptilia	Squamata		1	1	5	**7**	***8.8***		1	1	22	**24**	***10.3***
		Testudines			1	1	**2**	***2.5***			6	2	**8**	***3.4***
	Sauropsida	Testudines	1			1	**2**	***2.5***	1			2	**3**	***1.3***
	Teleostomi	Cypriniformes			1		**1**	***1.3***			1		**1**	***0.4***
Mollusca	Gastropoda	Eupulmonata		1	1		**2**	***2.5***		9	1		**10**	***4.3***
		Pulmonata			1	1	**2**	***2.5***			1	2	**3**	***1.3***
TOTAL			**11**	**21**	**37**	**34**	**80**	***100***	**31**	**71**	**56**	**77**	**232**	***100***

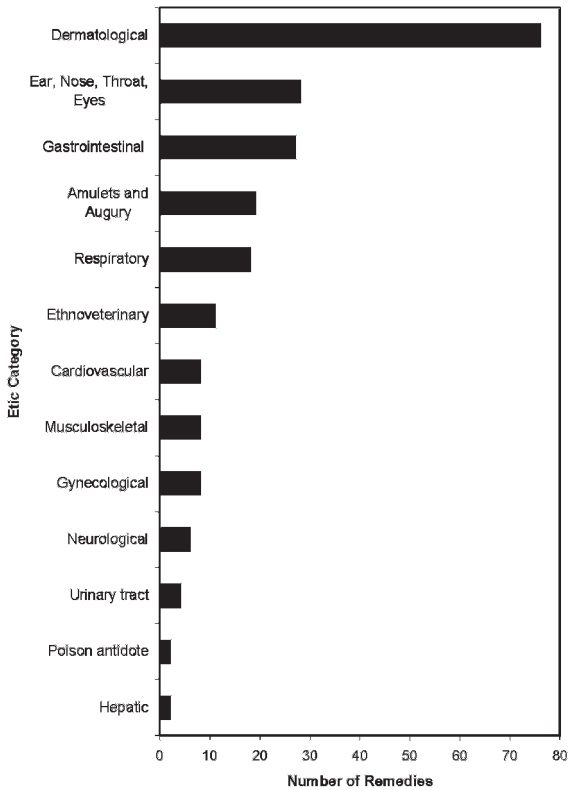

FIGURE 2. Distribution of remedies by etic category. Remedies reported only once are not included: fertility aid, anti-hydrocele, anti-blister, anti-dysenteric, anti-wrinkle, diaphoretic, heal inguinal hernia, treatment for difficulty passing urine, anti-enuresis, anti-erysipelas, anti-chillbains and anti-leucoderma.

(22.4%) reported using animals from the order Artiodactyla. Other important orders included Squamata (24 remedies, 10.3%), Primates (20, 8.6%), Galliformes (19, 8.2%), Carnivora (18, 7.8%), and Hymenoptera (13, 5.6%). The distribution of fauna and remedies is reported by country in Table 2. The greatest number of remedies was reported in Spain, with 77 remedies coming from 34 species. This is closely followed by Italy, where 71 remedies were reported from 21 species. Nepal reported the most species used–37 species used in 56 remedies, and Albania reported 11 species used in 31 remedies.

Etic Categories of Use

Our research found over 50 categories of medicinal remedies, including applications for the treatment of various forms of infection and illness, as well as magical or spiritual protection from illness or misfortune (Figure 2). Vulnerary agents were most numerous (20 remedies), followed closely by protective amulets and blessings (15 remedies). Each study site had a concentration of certain types of remedies. In Spain, the majority of remedies were for vulnerary (9) and anti-rhinitic (6) applications, and ethnoveterinary remedies for the

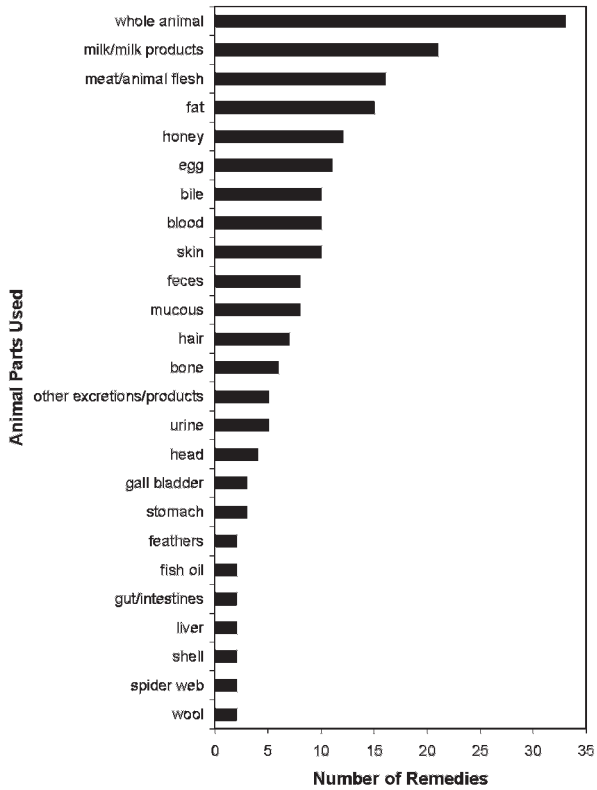

FIGURE 3. Animal parts used in traditional zootherapeutic remedies. Animal parts quoted in only one remedy are not illustrated: bees wax, cerumen, claws, heart, horns, saliva, milt, musk, silk, spines, sweat and teeth.

treatment of sick livestock (7). In Italy, the majority of remedies were for anti-dermatitic (6), vulnerary (5), and emollient (5) applications. In Nepal, most remedies were for protective amulets and blessings (9), followed by vulnerary (5), and reconstituent or nutraceuctical (5) purposes. In Albania, the most commonly reported remedies were for treating animal bites (3)–such as wolf, dog or snake-bites and for nutraceutical or reconstituent purposes (3).

Animal Parts Used in Remedies

There were 36 source categories reported for remedies (Figure 3). The most common sources included the whole animal (33 remedies), milk and milk products (21), meat/animal flesh (16), fat (15), honey (12), and eggs (11). Some of the more unusual remedies come from animal excrements, including feces (10), urine (3), and seminal fluid (1). Figure 4 illustrates the use of some of these different remedies in traditional Spanish medical applications.

Only two species were used as remedies in all four study sites–the domestic chicken (*Gallus gallus*) and domestic goat (*Capra aegagrus hircus*). Other than these two, Nepal shared no common species with the Mediterranean study sites. People in Albania, Italy, and Spain used 7 of the same species for their

FIGURE 4. Zootherapeutic remedies from Spain. (A) Feeding a mule bread and a snake skin to cure general sickness. (B) Applying a spider web to seal a skin laceration and promote healing. (C) Puncturing the skin with a tip of a deer horn to release the poison from a snake bite. (D) Preparing an oleolite by soaking several newborn mice in a jar of olive oil. The oil is instilled in the ears to treat earache.

zootherapeutic pharmacopoeias. These were mainly common livestock such as donkeys, sheep, and swine and the honey bee, medicinal leech, and dog.

Discussion

It is not surprising that the fauna used in traditional zootherapeutic remedies in Nepal differ significantly from those in the Mediterranean study sites (Figure 5).

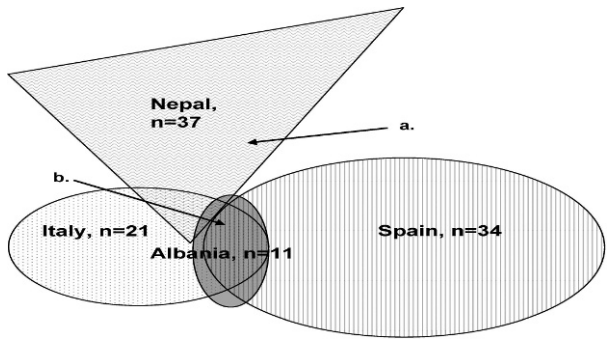

FIGURE 5. Intercultural correlation of fauna reported in zootherapeutic remedies. The fauna reported in Nepal (a) are very different from those in the other countries. Other than *Gallus gallus* (chicken) and *Capra aegagrus hircus* (goat) - reported in all study sites - Nepal shares no other common species with the other study sites. Albania, Italy, and Spain (b) share 7 species as zootherapeutics: sheep, swine, donkeys, honey bees, medicinal leeches, and dogs.

While Albania, Italy, and Spain vary somewhat in their respective wild fauna, their domestic livestock are similar, typical of the agro-pastoral economies of the Mediterranean. The study area in Nepal, on the other hand, is home to a much different wild fauna, and the ethnic populations living in this region demonstrate a strong reliance on wild resources rather than livestock. The native fauna in the Nepali environment includes monkeys, rhinoceroses, tigers, and elephants–none of which are indigenous to the Mediterranean.

It is interesting to note that even when the same or similar species are used in the different study sites, the actual part of the animal and the application often diverge. The only exception we found is that in all study sites honey, from various species of bees, is reported as a popular remedy for colds and sore throat and is typically added to a hot tea and drunk or eaten alone.

To better describe this divergence in preparation and use of similar species, we discuss the example of pigeons. Various species of pigeon are used in three of the study sites, but different parts or products of the pigeon are used depending on the country. In Spain, pigeon feces are used to treat ingrown toenails and acne, whereas in Italy the meat is eaten as a soup for galactagogue, reconstituent, and post-partum healing purposes. On the other hand, in Nepal, a live pigeon is set free as an augury and magical protection against misfortune (Table 1).

The medicinal use of the domestic chicken also differs based on the study site: in Italy it is used to heal broken bones, to treat general sickness, for post-partum healing, as well as to treat abscess and furuncle; in Spain it is used as an amulet, an anti-anemic, and treatment for ingrown toenail; in Albania it is used to treat kidney stones and stomachache, as a poison antidote and analgesic; in Nepal it is used for magical blessings, as a vulnerary, and to heal broken bones. While some applications are similar in more than one country, the animal part used differs. For example, people in both Spain and Nepal use the chicken as a vulnerary, but the egg white is used in Spain while fat is used in Nepal. Only in Italy and Albania, where eating boiled eggs is a diarrhea remedy, do we find a similar preparation and application of chicken.

Besides chickens, other domestic animals commonly used as a source of traditional medicine include cattle, goats, sheep, pigs, dogs, donkeys, and horses. In fact, the largest portion of animal-based remedies reported in this study come from domestic animals, and this is likely due to their role in local subsistence practices and the consequential ease of access and availability of these species to humans. This is particularly evident in the Mediterranean study sites. While the medicinal use of these species was reported in several sites, once again, we note that the actual animal part(s), application, and preparation of the remedies differ between locations.

The use of wild fauna for traditional medicine is, of course, highly dependent on local availability and accessibility to wild resources. We would expect the close proximity of communities to natural resource reservoirs such as forests or water sources to be correlated with a greater use of wild fauna. Communities in the Spanish study site are located near game preserves and hunting is a popular sport. The time spent in the forests perhaps gives this population a greater level of access to wild fauna like snakes, foxes, badgers, and lizards–all of which were reported as popular zootherapeutic remedies. In Nepal, on the other hand, the

emphasis on water creatures–such as fish, eels and turtles, as well as snakes–perhaps relates to the Nepalese economy, which is based in large part on fishing. In Italy and Albania the heavier reliance on domestic, rather than wild fauna is likely associated with the agro-pastoral economy of these study sites.

In addition to looking to other species for medical remedies, certain ethnomedical solutions come from humans themselves. These human-based remedies are not derived from essential organs, but instead from human excrements and secretions, including breast milk, cerumen, sweat, menstrual blood, urine, and feces. Some of these remedies, such as the use of breast milk as an anti-conjunctivitic, may have a biomedical basis to them. For example, breast milk has antibacterial properties that could be useful in treating an eye infection (De Souza, et al. 2002; Stevens et al. 2000). While all of the human-based remedies were reported in the Mediterranean study sites, this does not necessarily exclude the use of such products in Nepal. It is probable that many more zootherapeutic remedies are still practiced (or were used in recent years), but were simply not reported by informants in these particular field studies.

Other studies conducted in countries like Brazil (Alves 2009) and India (Mahawar and Jaroli 2008) have documented the zootherapeutic use of 250 and 109 animal species, respectively. In comparison with these studies, our documentation of 34 medicinal species in Spain, 21 in Italy, 11 in Albania, and 37 in Nepal, reflects a rather small number of species. This may be a consequence of one or more of several possible factors: 1) our study documents the zootherapeutic practices of isolated communities in distinct regions of each country, and the data do not reflect the TK of zootherapy for the entire country; 2) the conversion of wildland habitats (especially forests and wetlands) to accommodate grazing animals and crops has been detrimental to the faunal populations of these regions and also reduces community access to these wild resources; 3) modernization efforts and economic shifts in each study region have contributed to a decline in human daily interaction with the environment and a general abandonment of traditional lifeways; and 4) especially in contrast to NE Brazil (Alves and Rosa, 2006, 2007a, 2007b, 2007c), the biodiversity of our field sites is relatively low, and this is reflected in the diversity of resources used by the communities we studied.

Local Perceptions of Animals as They Relate to Human Health

Local economies doubtlessly play an important role in the relationship between human health and the environment. We have established that communities with an agro-pastoral economy, like that of the Mediterranean study sites, utilize more domestic animals (especially ungulates such as sheep, cattle, swine, donkeys, and goats) in the management of human health, whereas ethnic communities in Nepal that subsist on a fishing economy utilize more animals associated with a riverine or wetland environment for their medical care. These trends underline the implicit link between human subsistence behaviors and the traditional healing praxis. While this general correlation is likely associated with ease of access to certain species, other distinct sociocultural factors, such as religion, should also be taken into consideration.

Like other Nepalese ethnic groups, the Majhi believe in animism. The Majhi worship a family deity called ***Kulkulayan*** and sacrifice animals to appease the

deity. The Majhi also worship a forest goddess called ***Ban Devi***, who protects the forest, an area essential for Majhi survival. This devotion to the forest goddess explains the group's attention to resource conservation. The forest is believed to be governed by the deity and thus is considered sacred. The Mahji believe that life is influenced by the attitude of forest spirits, and many of the zootherapeutic remedies prepared by this group are utilized as protective amulets against bad spirits and as tokens of good fortune. In this sense, religion influences the Majhi perceptions of health and illness and guides the selection of remedies for particular disease states. This health epistemology where a preoccupation with illnesses of magico-spiritual or supernatural origin predominates greatly differs from that of the Mediterranean.

The people in the Mediterranean study sites are Catholic and overall have a more naturalistic perception of health and illness. In other words, the Mediterranean informants believe that many illnesses are caused by exposure to natural elements such as changing temperatures, humidity, rain, wind, and other seasonal weather events. In addition, our informants in Italy and Spain have greater access to allopathic medical care and, as a consequence, also demonstrate a greater understanding of biomedical principles of health and illness. Here, zootherapeutic remedies are selected to treat distinct symptoms of disease–such as the use of animal fat as an emollient for burns and wounds or dairy products in the treatment of intestinal disorders (diarrhea and constipation). In some cases, however, spiritual or magical elements are thought to be the causative factor in disease or misfortune (Quave and Pieroni 2005), and there are some zootherapeutic remedies, such as evil-eye amulets made from dog hide, which are used as a mode of spiritual protection.

Threats to these Medicinal Fauna

Eleven of the species documented in these field studies are included on the IUCN Red List of Threatened Species. Many of these species are threatened as a consequence of human development and the associated loss of natural habitats. In the Mediterranean sites, medicinal reptiles are most at risk–the European pond turtle is listed as lower risk/near threatened (Tortoise & Freshwater Turtle Specialist Group 1996), the four-lined snake is listed as near threatened (Romano and Jelić 2008), and Lataste's viper is listed as vulnerable (Mateo et al. 2008) In addition to the threat from loss of habitat, these two snakes are also subjected to human attack throughout their respective ranges. The European medicinal leech, whose use for phlebotomy has been documented over the centuries, is listed as lower risk/near threatened (World Conservation Monitoring Centre 1996). The major threats to this species are over-collection for medicinal purposes and the loss of their primary habitat from the conversion of grazing marshes to arable land.

In Nepal, four of the medicinal species documented in our study are listed under endangered status: elongated tortoise (Asian Turtle Trade Working Group 2000), Asian elephant (Choudhury et al. 2008), Himalayan musk deer (Wang and Harris 2008), and Bengal tiger (Ahmad et al. 2008). The sloth bear (Garshelis et al. 2008) and Indian rhinoceros (Talukdar et al. 2008) are listed as vulnerable species. The Assam macaque is listed as a near threatened species (Boonratana et al.

2008). Populations of the listed species above are declining due to a combination of habitat loss and poaching/hunting. Moreover, obtaining medicinal products from these species oftentimes requires killing the animal, which also contributes to the population decline.

Loss of habitat is not the only negative environmental factor instigated by people; reduced habitat quality also severely impacts these threatened species. The conversion of land for agriculture leads to the invasion of nonnative plant species and grazing by domestic livestock. Indian rhinoceros populations, in particular, have been affected by such a reduction in habitat quality (Talukdar et al. 2008). Likewise, the Assam macaque is threatened by both a loss of habitat and decline in the quality of habitat as a result of selective logging. They are also trapped for sport, food, medicine, and the pet trade (Boonratana et al. 2008).

Conclusion

We have found that while animal-based remedies constitute an important facet of traditional medicine in each study site, the actual application and preparation of animal products differs noticeably among sites. In addition, the popularity, or consensus of use, is dependent to a large degree on the accessibility or availability of the animals to these communities. Moreover, our studies show that the selection of medicinal fauna is mediated by human subsistence patterns. In other words, people are more likely to utilize medicinal products from animals with which they are in regular contact. This is why the most popular zootherapeutic remedies in the Mediterranean come from domestic animals (especially ungulates), whereas in Nepal, communities rely more heavily on wild fauna. In this sense, economic models play an important role in traditional healthcare practices by influencing the selection of particular medicines.

Concepts of health and disease differ among our study sites in the Mediterranean and Asia, and these differences play a substantive role in the selection and use of animal-based remedies. In Nepal, where a magical or spiritual medical epistemology is predominant, amulets are popularly used to ward off bad spirits and to bring good fortune. Powerful and even feared animals such as the Bengal tiger provide a ''strong'' medicine. The same is true in Spain with the medicinal use of venomous snakes. The difficulty of obtaining products from rare (vulnerable and endangered) species is often associated with the ''potency'' of the particular remedy. The sociocultural value assigned to threatened species that are considered to be ''powerful'' due to their rarity or the peril associated with their collection should be taken into consideration when designing biodiversity conservation measures.

In both the Mediterranean and Asia, populations of wild fauna are in a state of decline due to over-hunting, habitat loss, and reduced habitat quality. Threats posed to endangered and vulnerable wild fauna by poaching, which is also driven by their use in traditional medicine, must be acknowledged and addressed. The resulting loss of biodiversity is detrimental not only to the immediate wildlife affected, but also to local ecosystems and humans in general. Depletion of the variety of natural resources in our environment diminishes the

potential for the discovery of new and much needed drugs. Thus, biodiversity is critical to current and future human health. A thorough understanding of human cognition of animal utility in folk medical systems is necessary for the creation and implementation of appropriate biodiversity conservation measures.

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