Cutaneous Leishmaniasis in Subtropical Ecuador: Popular Perceptions, Knowledge, and Treatment[1]

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Popular perceptions and knowledge about cutaneous leishmaniasis and its treatment were studied in an endemic area of subtropical Northwest Ecuador. Although most of the adults surveyed were familiar with the disease, the vector, and traditional treatments, many showed a lack of knowledge about transmission of the disease, ulcer healing, and conventional treatment.

Gender was found to have a significant impact on disease risk, perceptions, and treatment knowledge. Males experienced a risk of contracting cutaneous leishmaniasis that was almost triple that of women. Men were also more likely to perceive that the disease seriously diminished the victim's capacity to work. Women, on the other hand, were more prone to perceive that cutaneous leishmaniasis was a serious disease that significantly decreased self-esteem.

Although 80% of the subjects knew at least one method of treating the disease, women tended to know more methods than men. Most of 150 different therapies reported involved the use of indigenous plants, chemicals, acids, antibiotics, heat treatments, or petroleum by-products. Some of these treatments could have clinical value. However, only 7% of the subjects knew about pentavalent antimonials. Almost 70% of the subjects with a past or present infection history were treated solely by traditional methods; only 12% received a full course of Glucantime®, while 7.5% got an incomplete course. The findings indicate that it will be important to consider the identified gaps in knowledge and gender perceptions regarding the disease and its treatment when planning future control programs.

Cutaneous leishmaniasis is endemic in subtropical and tropical Ecuador (*1–3*), including Northwest Pichincha Province (*4–6*). Although it is considered a major public health threat in Ecuador and many other Latin American countries, little is known about either the disease or the treatment-related perceptions and knowledge of at-risk populations. It is recognized that having such information is crucial for the planning and execution of effective cutaneous leishmaniasis control programs (*7, 8*).

In addition, gender (*9–11*), age, occupation, and other socioeconomic factors (*7, 10, 12*) are reported to affect disease risk as well as disease-related and treatment-related perceptions, knowledge, and behavior. Thus, it is also important to consider the impact of these factors in planning control programs.

Many cultures have developed an extensive inventory of folk medicines, usually plant-based, to treat parasitic infections (*13–16*). Some of these have been

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found to contain natural antiprotozoal compounds (*13*). However, little is known about the traditional indigenous plant and other methods used to treat cutaneous leishmaniasis. Such information could be invaluable in the development of new therapeutic alternatives to the conventional antimonial drugs, which are often associated with unwanted side effects (*3*).

The first aim of the current study was to investigate the disease-related and treatment-related perceptions and knowledge of the population. We were especially interested in what subjects knew about cutaneous leishmaniasis—including vector identification, disease transmission, treatment alternatives, and perceptions related to the possible medical, economic, and psychosocial consequences of the disease. The second aim was to study the influence of gender, age, clinical history, and other factors on disease-related and treatment-related perceptions and knowledge. The final aim was to inventory the specific methods used to treat cutaneous leishmaniasis in the area studied.

MATERIALS AND METHODS

Study Site

Twenty-six small agricultural villages located in a remote endemic area of Northwest Pichincha Province were visited over a 16-month period in 1989–1991 as part of a joint USAID and Ecuadorian Ministry of Public Health leishmaniasis service and control project. The study was approved as part of a larger project by the Ethics Committee at the School of Medical Sciences of the Central University of Ecuador.

The study area is located on the western slope of the Andes Mountains approximately 125 miles from the capital city of Quito. The subtropical rain forest in which the communities are situated has an elevation ranging from 500 to 1 800 meters above sea level. The mean annual temperature is 27 °C. The major rainy season lasts from December until April, during which time most of the secondary roads and trails are impassible except by pack animal or foot.

Subject Selection

The selection of specific community sites in the endemic area was based on official health ministry data regarding population size and estimated disease prevalence (*6*). The subject selection protocol precalculated the number of individuals in three clinical history groups at each site. The three groups consisted of never-infected individuals (Group 1), those with prior disease (Group 2), and those with current infection (Group 3).

Potential subjects from each of the three groups were randomly selected after initial medical screening interviews verified their clinical history status. They were then recruited for study participation. Informed verbal consent rather than written consent was obtained from the subjects due to the population's high illiteracy rate and the subjects' distrust of signing official documents they could not read. All persons in the communities surveyed (n = 3 985) received the same level of free medical care during their visits, regardless of whether they participated in the research portion of the study. None of the subjects selected for the study refused to participate.

Data were collected on a total of 466 subjects with respect to sociodemographic characteristics, clinical history, and disease-related and treatment-related perceptions and knowledge. However, during the surveys we found it common for parents and relatives of younger subjects to interrupt them, answer the questions for them, or otherwise influence their responses. Thus, in order to minimize

response bias, it was decided to use only the data from subjects at least 18 years of age (n = 208) for the statistical analyses of responses regarding disease-related and treatment-related perceptions and knowledge. Nevertheless, the data from the entire sample of 466 subjects were used to obtain information about the actual treatments received by those subjects with a positive cutaneous leishmaniasis clinical history (n = 219). The survey data were collected by questionnaire, clinical history, physical examination, and laboratory analysis.

Subject Interviews

Subjects were questioned by trained interviewers using a data collection instrument that contained both closed and open-ended questions. Specific information was elicited regarding the respondent's age, sex, marital status, occupation, family size, land ownership, residence and migration patterns, and other sociodemographic matters. Additional questions probed the subject's knowledge of cutaneous leishmaniasis, its characteristics, its vector, and conventional and traditional treatment alternatives. The subjects were also asked about their perceptions regarding the health, economic, and psychosocial consequences associated with cutaneous leishmaniasis.

Clinical History and Physical Examination

A detailed clinical history, including treatment history, was obtained for all subjects. A comprehensive physical examination included detailed examination of the skin and mucous membranes, concentrating specifically on detection of past or present cutaneous leishmaniasis infection.

Laboratory Diagnosis of Leishmaniasis Infection

The leishmanin skin test, in conjunction with the physical examination, was used to detect previous cutaneous leishmaniasis (*17*). Several different techniques were used to confirm the presence of *Leishmania* amastigotes in patients with suspicious lesions. These methods included examination of aspirates and direct smears taken from lesions (*3, 18*). Promastigotes were detected using aspirate cultures, which were seeded into a tube of modified Evans' diphasic medium (*19*).

Two direct smears were also obtained from each ulcer. Using a surgical blade, dermal scrapings were obtained from the ulcer borders, and the tissue was placed on a glass slide and fixed with methanol. One of the samples was stained with Giemsa to permit direct observation of the *Leishmania* organism under an oil immersion microscope at 1 000x power (*20*). The other sample was processed by direct immunofluorescent monoclonal stain (*21*).

Statistical Analyses

The data were analyzed using the Statgraphics 5.1 (*22*) and Epi-Info 5.0 (*23*) statistical packages. In addition to descriptive statistics, analysis of variance (ANOVA), 2 × 2 and 2 × 3 contingency table analyses with X^2 (Yates' correction), and Fisher's exact test were utilized depending upon the relationship of analytical interest.

RESULTS

The mean age of the 208 adults surveyed was 35.8 years, with a standard deviation of ± 14.2 and a range of 18–74. Males constituted 53.4% of the mostly (97%) mestizo sample. Most subjects had been born elsewhere, in other rural communities situated in the Ecuadorian An-

des (35.8%) or Pacific coastal plain (29.8%), although 67% reported that they had resided in their present community for more than 10 years (Figure 1). All but 25% were legally married or living in consensual unions.

Most of the men (61.7%) worked in agricultural occupations, principally in activities related to subsistence farming that included the raising of cassava, plantains and bananas, maize, tropical fruits, and some farm animals. Women, especially those with children, tended to spend most of their time working in the house or nearby garden/livestock area. Although most subjects (58.8%) owned their homes and the land they cultivated, the level of technical sophistication was not high; 73% farmed with only machetes, hoes, and other hand-held implements. Only 13.1% had access to gasoline or electric power tools (e.g., chain-saws and tractors).

Thirteen percent of the subjects were diagnosed as having a current leishmania infection while 37% showed evidence of past disease. *Leishmania guayanensis, L. panamensis,* and *L. brazilensis* amastigotes and promastigotes were detected respectively in 63%, 33%, and 4% of the lesions from subjects with active disease; several subjects were infected with more than one leishmania species. There were 18 adult males and 8 adult females with current cutaneous leishmaniasis infections. These data indicate that adult males were at significantly higher risk for cutaneous leishmaniasis than their female counterparts ($X^2 = 4.33$, $p = 0.037$; odds ratio = 2.83, 95% confidence interval = 1.05–7.81).

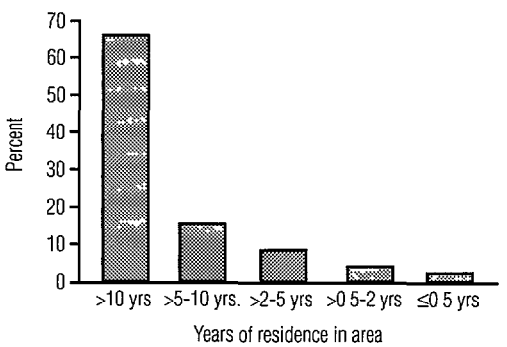

Figure 1. Distribution of survey subjects by years of residence in their local communities.

Most subjects were familiar with the disease, either from personal experience or through contact with affected family members or neighbors. However, 17% of the uninfected subjects indicated they were unfamiliar with the disease, as compared to only 1% of those with current or past infection ($X^2 = 13.8$, $p = 0.0002$). In general, the subjects who lacked familiarity with cutaneous leishmaniasis tended to be recent immigrants from nonendemic communities who had lived in the area less than 6 months.

The most widespread name for cutaneous leishmaniasis was *sarna brava* (angry sore), although *charra brava* (angry ulcer), *la Colombiana* (the Colombian), and *marca de Santo Domingo* (mark of Santo Domingo) were also common. The two latter names refer to a common belief that cutaneous leishmaniasis ulcers and scars are characteristic markers of people from endemic areas of coastal southern Colombia and the Ecuadorian town of Santo Domingo.

All but 2.3% of the subjects said that they were familiar with *manta blanca* (white blanket), the common name for the sandfly vector, *Lutzomya sp.* Despite familiarity with the vector, however, less than 10% of the subjects knew it was responsible for cutaneous leishmaniasis transmission. One-fifth of the subjects with a history of prior or current cutaneous leishmaniasis claimed they had never had any contact with the vector.

The subjects' disease perceptions showed a degree of uniformity that was independent of their clinical histories. As Table 1 indicates, 91% of the subjects who

Table 1. Perceptions about cutaneous leishmaniasis by survey subjects with prior infection, current infection, and no prior or current infection.*

Disease perception	Group 1		Group 2		Group 3		Total		X^2	p value
	No.	(%)	No.	(%)	No.	(%)	No.	(%)		
Disease severity:										
Severe disease vs.	70	(76.9)	53	(71.6)	22	(84.6)	145	(75.9)	2.05	>0.05
Moderate disease vs.	13	(14.3)	13	(17.6)	3	(11.5)	29	(15.2)		
Mild disease	8	(8.8)	8	(10.8)	1	(3.8)	17	(8.9)		
Disease effect on capacity to perform work:										
Has negative effect vs.	64	(70.3)	51	(68.9)	16	(61.5)	131	(68.6)	0.72	>0.05
Has no effect	27	(29.7)	23	(31.1)	10	(38.5)	60	(31.4)		
Disease effect on self-esteem:										
Has negative effect vs.	76	(83.5)	62	(82.7)	20	(76.9)	158	(82.3)	0.62	>0.05
Has no effect	15	(16.5)	13	(17.3)	6	(23.1)	34	(17.7)		
Disease treatment:										
Requires treatment vs.	84	(91.3)	67	(89.3)	25	(96.2)	176	(91.2)	1.12	>0.05
Doesn't require treatment	8	(8.7)	8	(10.7)	1	(3.8)	17	(8.8)		

* Group 1 = never-infected subjects (n = 105, 50.5%); Group 2 = subjects with prior infection (n = 77, 37%); Group 3 = subjects with current infection (n = 26, 12.5%).

knew about cutaneous leishmaniasis reported that they considered it a disease with moderate to severe health consequences. Almost 70% believed the disease had a negative impact on the capacity of the affected individual to perform his or her normal work duties. Also, 82.3% stated that the presence of a cutaneous leishmaniasis ulcer or scar on a person's face or body significantly diminished that person's self-esteem. Regarding their perceptions about curing the disease, over 90% reported that the ulcers could not be cured without some type of intervening treatment.

Although age was not associated with disease perceptions, several noteworthy gender differences were observed (Table 2). Specifically, women were somewhat less likely than men to report that cutaneous leishmaniasis had a negative impact on work capacity. On the other hand, despite having only one-third the risk, women were more prone than men to believe that the disease was a serious medical condition. Women were also more likely to indicate that the presence of a cutaneous leishmaniasis ulcer or scar diminished self-esteem.

Eighty percent of the adults surveyed were able to name at least one treatment option for the disease. Clinical history was not associated with this ability. Women named more treatment methods than men (1.6 ± 1.2 vs. 1.2 ± 1.1; $p < 0.05$). Over 150 specific treatments were reported, which were subsequently classified into seven categories (Figure 2). Most were based on traditional methods that involved applying topical preparations or objects to the ulcer site(s).

One-third of the therapies utilized indigenous herbs, trees, or other plants (Table 3), many containing acids, resins, saponins, solanines, or other alkaloids as principal active components (*35*). A diverse variety of nonbotanical treatments were also reported. Chemicals (see Table 4) were among the most frequently mentioned, especially homemade rum or *trago*, wood alcohol, iodine, menthol, methiolate, and sulfur. Use of topical, oral, or injectable antibiotics accounted for 17% of the specific methods reported. Use of

Table 2. Associations between gender and perceptions about cutaneous leishmaniasis.

Disease perception	Women* No.	Women* (%)	Men† No.	Men† (%)	Total No.	Total (%)	X^2	p value
Disease severity:								
Severe disease vs.	75	(85.2)	70	(68.0)	145	(75.9)	8.27	0.015
Moderate disease vs.	7	(8.0)	22	(21.4)	29	(15.2)		
Mild disease	6	(6.8)	11	(10.6)	17	(8.9)		
Disease effect on capacity to perform work:								
Has negative effect vs.	63	(61.2)	68	(77.3)	131	(68.6)	4.99	0.025
Has no effect	40	(38.8)	20	(22.7)	60	(31.4)		
Disease effect on self-esteem:								
Has negative effect vs.	80	(89.9)	78	(75.7)	158	(82.3)	5.63	0.017
Has no effect	9	(10.1)	25	(24.3)	34	(17.7)		
Disease treatment:								
Requires treatment vs.	77	(86.5)	99	(95.2)	176	(91.2)	3.48	>0.05
Doesn't require treatment	12	(13.5)	5	(4.8)	17	(8.8)		

*n = 97.
†n = 111.

acids was also popular, especially sulfuric acid from car and radio batteries. A tenth of the treatments involved applying some type of heat source (especially hot water or heated metal objects) to the ulcer site. Other methods called for putting undiluted gasoline, kerosene, or creosote in the open ulcers. Conventional antimonial drugs such as Glucantime® (Specia Labs, France) or Reprodral® (Wintrop Labs, U.K.) were not well known.

Treatment history data were available from 88.6% of those 219 subjects in the larger (466) sample who had either current or past infection. As Table 5 shows,

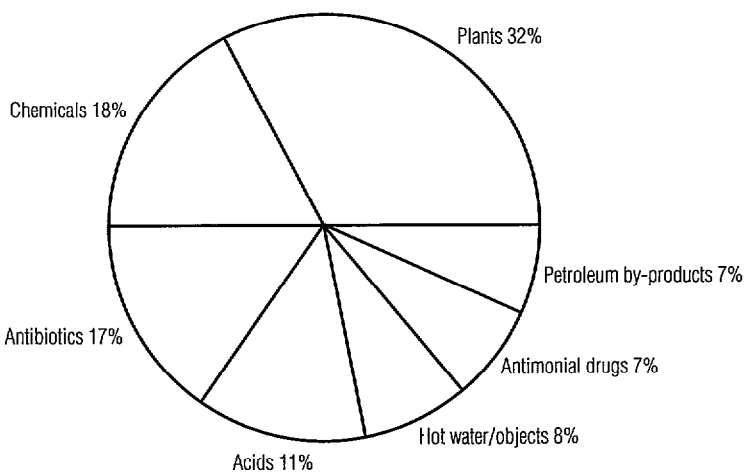

Figure 2. Percentages of subjects reporting treatment for cutaneous leishmaniasis, by the general type of treatment reported.

ABOVE: The foot of a 65-year-old man who treated his cutaneous leishmaniasis ulcer with sulfuric acid obtained from car batteries. The darker-colored lump at the base of the ulcer (toward the toes) is necrotic bone whose condition was induced by the acid. BELOW: A cutaneous leishmaniasis ulcer on the ankle of an 8-year-old girl whose parents treated her disease by applying a hot metal object to the ulcer.

Table 3. Partial inventory of common plants identified by survey subjects as being used for the treatment of cutaneous leishmaniasis.

Common name in Spanish or Quechua	Scientific name	Part of plant utilized
Ajo	*Allium sativum*	Cloves
Achiote	*Bixa orellana*	Leaves
Berbena/verbena	*Verbena microphylla*	Leaves
Cebolla paitena	*Allium cepa*	Leaves, stalk
Calaguala	*Polypodium calaguala*	Sap
Escobilla	*Sida rhombifolia*	Leaves
Guayaba	*Psidium guajava*	Juice, pulp
La compaña	Not classified	Flower
Limón	*Citrus aurantifolia*	Juice
Llantén	*Plantago major*	Leaves
Mandarina	*Citrus reticulata*	Juice
Manzanilla	*Matricaria chamonilla*	Flower
Matapalo	*Ficus dendrocida*	Sap
Matico	*Piper angustifolium*	Leaves
Monte piojo	Not classified	Leaves
Naranja	*Citrus aurantium; C. sinesis*	Juice
Plátano	*Musa paradisiaca*	Peel, sap, fruit
Paico	*Chenopodium ambrosioides*	Leaves
Pera del monte	Not classified	Leaves
Piñón	*Pinus sp.*	Sap
Ruda	*Ruta graveolens*	Leaves
Sangorache	*Amaranthus caudatus*	Leaves
Santa Juana	Not classified	Leaves
Tatiana	Not classified	Leaves
Tauri	*Lupinus tauris*	Leaves
Tigre bravo	Not classified	Leaves
Yerba mora (mortino)	*Solanum nigra*	Fruit, leaves
Zarzaparilla	*Smilax sp.*	Leaves

the majority (68%) had been treated with traditional methods. Only 12% had received a full course of Glucantime® therapy, while 7.5% more had received an incomplete course. A number of subjects (8.5%) had received both Glucantime® and folk treatments; less than 12% of the infected subjects had received no treatment of either kind. In addition, 6 subjects who had suffered from tropical ulcers mistakenly diagnosed as cutaneous leishmaniasis reported that they had received treatment for the latter disease involving Glucantime® or folk methods.

Although it has been suggested that males may receive preferential treatment for some tropical diseases (*9, 10*), we were unable to identify any gender differences with respect to the type of treatment received (i.e., Glucantime® vs. traditional therapy). Overall, we found males no more likely than their female counterparts to receive a complete course of Glucantime® treatment.

DISCUSSION AND CONCLUSIONS

The prevalence of cutaneous leishmaniasis infection found in this study was similar to that previously reported in this endemic zone of Northwest Pichincha Province (*6*). Two-thirds of the subjects were long-time (over 10-year) residents of the area, which probably accounts for

Table 4. Inventory of nonplant chemicals and other items identified by survey subjects as being used for the treatment of cutaneous leishmaniasis.

Acids:

- Acetic acid
- Boric acid
- Citric acid
- Sulfuric acid (from commercial car and radio batteries)
- Unspecified acids

Antibiotics:

- Penicillin class drugs
- Sulfa drugs
- Topical antibiotic ointments

Antimonial drugs:

- Glucantime®
- Reprodral®

Chemicals (see also acids and petroleum by-products):

- Alcohol (rubbing alcohol)
- Alum
- Ashes (tobacco ash, wood ash)
- Battery lead (powder)
- Calcium carbonate
- Chlorine bleach
- Copper sulfate
- Creams, pomades, ointments (homemade, store-bought)
- Ether
- Ferrous sulfate liquid
- Formalin
- Gunpowder
- Hydrogen peroxide
- Iodine
- Liquor (rum, *trago*)
- Menthol
- Mercury
- Methiolate
- Nail polish
- Piedra azul
- Potassium permangenate
- Powdered animal bones
- Powdered seashells
- Rubbing alcohol
- Soap powder
- Soaps
- Sodium chloride
- Sulfur
- Talc
- Vaseline

Heat treatments:

- Hot animal bones
- Hot eating utensils
- Hot fats (tallow, lard, snake fat)
- Hot honey, hot molasses
- Hot pocket knives
- Hot metal objects, various
- Hot radio batteries
- Hot water/hot water compresses
- Hot wood
- Lighted matches

Petroleum by-products:

- Creosote
- Gasoline
- Kerosene

Table 5. Treatments reported by 194 of the 219 subjects with current or prior cutaneous leishmaniasis infections (n = 194).

Treatment	No.	(%)
Traditional methods only	132	(68.0)
No treatment used	23	(11.9)
Complete course of Glucantime®	14	(7.2)
Traditional methods + complete course of Glucantime®	10	(5.2)
Incomplete course of Glucantime®	8	(4.1)
Traditional methods + incomplete course of Glucantime®	7	(3.6)
Total	194	(100.0)

widespread familiarity with the disease, vector, and traditional treatment options. There was also a general consensus of opinion with respect to the perceived health, economic, and psychosocial consequences of the disease.

However, there was considerable unfamiliarity regarding disease transmission and misunderstanding about ulcer healing. In addition, very few subjects knew about antimonial drugs, and almost a fifth incorrectly identified antibiotics as providing appropriate treat-

ment for cutaneous leishmaniasis. Our experience indicates that, as in many parts of Latin America, self-treatment with antibiotics is common in rural Ecuador, these drugs commonly being considered effective against all infections. This practice of inappropriate antibiotic use may delay the search for effective treatment in the case of cutaneous leishmaniasis and can increase personal exposure to the risk of serious drug allergies.

Furthermore, of the subjects who received Glucantime®, 39% did not receive the complete course of treatment necessary to prevent disease relapse (*3*). This apparent lack of familiarity with conventional treatment and correct drug dosage appears to be the result of poor access to medical care and Glucantime® distribution problems that are common in this part of the country. Improvements in the Glucantime® distribution system, better access to health care, and community education about cutaneous leishmaniasis and its treatment could improve the situation. The indicated problem areas should be addressed by future leishmaniasis control programs.

The gender differences identified in this study with regard to disease risk, personal perceptions, and treatment knowledge were intriguing and could contribute to effective planning of cutaneous leishmaniasis control programs in the area. It appears that the excess risk observed for adult males is most likely associated with gender differences related to occupational exposure (i.e., agricultural work in the rain forest) rather than with sex differences per se, since no elevated risk was detected for males 6 months to 17 years old in the same population (unpublished data).

Differences in cutaneous leishmaniasis disease risk related to gender have also been reported in other Latin American populations (*24–27*). Besides occupational exposure, the social activities of adult men could increase their risk, since they are more likely than women to be outdoors during times of maximum vector activity. Within this context, it seems noteworthy that gender disease risk differences related to occupational exposure and social activities have previously been reported for many tropical infections (*9, 10*) including cutaneous leishmaniasis (*12, 24, 25*).

The current study also found several gender distinctions in personal perceptions of cutaneous leishmaniasis. (Authors of previously published works had apparently not explored such distinctions.) For instance, men were more likely than women to perceive the disease as having a negative economic effect associated with diminished work capacity. We considered whether this perceptual distinction could be due to males having more severe clinical disease, since male-female differences in symptom severity have been reported for other tropical diseases (*10*). However, further exploration of the data revealed that the two sexes did not differ with respect to the number of ulcers, ulcer size, or ulcer duration. Neither were men less likely than women to have received conventional Glucantime® treatment. One possible explanation for the observed phenomenon may be that men are less able to cope with the disease symptoms. It is also conceivable that the presence of open lesions may affect the work activities of men disproportionately, since they tend to perform intense physical activity outdoors in a hot and humid subtropical environment rather than in or near the home. The nature of their outdoor work may also subject them to increased risk of physical trauma to the ulcer site or to secondary bacterial and fungal infections.

Adult females, on the other hand, were more inclined than adult males to perceive cutaneous leishmaniasis as a serious medical condition. The reason for this

gender difference could be related to the perceived psychosocial impact of the disease. Independent of their own clinical histories, women were more likely to report that cutaneous leishmaniasis ulcers and scars decreased the self-esteem of the affected individual. Poor self-esteem has been linked with a myriad negative psychological, social, and economic consequences.

Furthermore, in Ecuadorian mestizo society, females who have ulcers or scars that are deep or extensive, especially on the face or other prominent areas of the body, are generally perceived to be less attractive than those who lack them. Although physical appearance is considered less important in males, a female's marriage prospects and her ability to keep a mate may be reduced by the social stigma associated with cutaneous leishmaniasis scars or ulcers. Thus, the disease may be perceived by women as having potential long-term negative consequences for social relationships and perhaps upon socioeconomic status and mobility. Similar types of repercussions for women have been reported for other tropical diseases (*10*).

In many cultures (*9, 10, 29*), including indigenous groups in the Ecuadorian Andes (*30*), women play a major medical decision-making role within the family. Our experience working with various mestizo groups in lowland Ecuador points to a similar gender role. Although we did not investigate directly whether the women were in charge of family treatment in the current study, the evidence suggests that they were—especially since they reported a larger and more diverse repertoire of treatment options than men, even though fewer had actually experienced the disease. Within this context, it has been reported that Ecuadorian women may be reluctant to seek medical care outside the home due to the perceived loss of control over family medical decision-making that this entails (*30*). Thus, it is important for health workers to take into account the special role and concerns of women when designing leishmaniasis control programs.

The number of different treatments specified by subjects in the present study was extensive. Many of these treatments were similar to those used by a primarily black group on the Ecuadorian coast (*31*) and by a predominantly black population in Colombia (*28*). Reported methods employed in common include use of materials from the plant species *Ficus sp., Piper sp., Musa sp., Philodendron sp.,* and *Bixa orellana* as well as topical application of heated objects, hot water, petroleum byproducts (i.e., creosote, gasoline, kerosene), and various other chemicals (i.e., alcohol, copper sulfate, iodine, potassium permanganate, tobacco ash, and sulfuric acid obtained from batteries). Wijeyarante (*12*) also reported that battery acid, tar, and "toxic" herbs were popular folk treatments for cutaneous leishmaniasis but did not specify the cultures in which they were used.

The spontaneous healing of cutaneous leishmaniasis lesions and nodules is common (*3*). However, like the members of a nearby Colombian population (*10*), most of our Ecuadorian subjects had the perception that treatment was a prerequisite for cure. This perception was reinforced by the behavior of infected subjects, since all but 12% had received treatment.

The evidence also suggests that subjects followed a general decision-making strategy with respect to treatment. The small lesions characteristic of early disease are often interpreted as reactions to insect bites or bacterial/fungal infections. Thus, the affected sites are usually treated first with medicated soaps, rum, rubbing alcohol, antibacterial and fungal creams, hydrogen peroxide, iodine, or methiolate. Although these may be the logical treatment choice for insect bites and some tropical sores, and although they may re-

duce the risk of secondary bacterial and fungal infections, they do not appear to promote ulcer healing.

If these methods fail to produce a "cure" after what is perceived as an appropriate amount of time, then cutaneous leishmaniasis becomes more suspect and stronger methods are tried. These usually involve various plant preparations, hot water compresses, some types of chemicals, or injectable antibiotics. The "strongest" treatments are usually saved for ulcers that last longer than 6 months or for multiple lesions. These latter treatments include direct application to the ulcer site of white-hot objects or chemicals such as chlorine, lead, mercury, petroleum by-products, or battery acids.

Although they may seem drastic, some of these folk methods could have therapeutic value. For example, it has been reported that *Leishmania* amastigotes appear thermosensitive and that the application of local heat to achieve a skin temperature of 40–41 °C (*3*) or the use of ultrasound or metal probes to induce higher temperatures are effective in speeding ulcer healing times (*32, 33*). In fact, Navin and associates (*34*) have reported that heat treatment was as effective as Glucantime®. In addition, many indigenous plants used to treat diverse parasitic infections in other cultures contain chemical compounds with antiprotozoal activity such as alkaloids, terpenoids, and other natural products (*13*). Many of the species specified in the current study contain similar compounds (*35*). The potential clinical utility of these and other ethnotherapies should be investigated in future studies.

Despite these possible therapeutic benefits, unwanted side effects are also common. For example, methods involving strong acids, caustic agents, and hot metal objects may result in permanent scars that are more severe than those caused by the ulcer itself. In extreme cases, such treatments can cause extensive tissue necrosis, increased risk of secondary infection, and delayed ulcer healing (see photos). Furthermore, applying toxic agents such as gasoline, kerosene, creosote, formalin, mercury, lead, or chlorine bleach to open lesions may promote carcinogenesis in susceptible individuals and cause birth defects in pregnant women. Education programs should discourage these practices.

In conclusion, most subjects in this endemic area of Northwest Ecuador were familiar with cutaneous leishmaniasis, its sandfly vector, and a variety of traditional therapies. The disease was recognized by local inhabitants as a distinct clinical entity even though the initial appearance of the lesion was sometimes confused with reactions to insect bites or bacterial/fungal infections and treated accordingly.

Despite this general familiarity, there were significant knowledge gaps and misconceptions concerning disease transmission and treatment. These problems, as well as gender differences relating to disease risk and also to disease-related and treatment-related perceptions and knowledge, need to be considered when planning cutaneous leishmaniasis control programs. In addition, the potential clinical utility of some of the traditional therapies, especially those involving plants, should be investigated in future studies.

REFERENCES

1. Hashiguchi Y, Gómez EA. A review of leishmaniasis in Ecuador. *Bull Pan Am Health Organ* 1991;25(1):64–76.
2. Grimaldi G Jr, Tesh RB, McMahon-Pratt D. A review of the geographic distribution of leishmaniasis in the New World. *Am J Trop Med Hyg* 1987;41(6):687–725.
3. World Health Organization. *Control of the leishmaniases*. Geneva: WHO; 1990. (Technical report series, 793).
4. Armijos RX, Chico ME, Cruz ME, et al. Human cutaneous leishmaniasis in Ec-

uador: identification of parasites by electrophoresis. *Am J Trop Med Hyg* 1990; 45(5):424–428.

5. Hermida C, León L, Aguilar M, et al. *Características clínicas, epidemiológicas y sociales de la leishmaniasis cutánea en dos poblaciones andinas*. Quito: CONUEP; 1985.
6. Ministerio de Salud Pública. La leishmaniasis en el Ecuador. *Bol Epidem* 1985 (March);7:13.
7. Andreano R, Helminiak T. Economics, health, and tropical diseases: a review. In: Herrin AN, Rosenfield PL, eds. *Economics, health, and tropical diseases*. Manila: University of the Phillipines; 1988:19–72.
8. Herrin AN. Perceptions of disease impacts: What can they tell us? In: Herrin AN, Rosenfield PL, eds. *Economics, health, and tropical diseases*. Manila: University of the Phillipines; 1988:225–232.
9. Rathgeber EM, Vlassoff C. *Gender and tropical diseases: a new research focus*. Geneva: Special Programme for Research and Training in Tropical Diseases (TDR/UNDP/WHO), Social and Economic Research; 1992. [Unpublished manuscript].
10. Vlassoff C, Bonilla E. *Gender differences in the determinants and consequences of tropical diseases: What do we know?* Geneva: Special Programme for Research and Training in Tropical Diseases (TDR/UNDP/WHO), Social and Economic Research; 1992. [Unpublished manuscript].
11. Bundy DAP. Gender dependent pattern of infection and disease. *Parasitol Today* 1988;4:186–189.
12. Wijeyarante PM. Socioeconomic considerations in the control of leishmaniasis. In: Herrin AN, Rosenfield PL, eds. *Economics, health, and tropical diseases*. Manila: University of the Phillipines; 1988:383–391.
13. Phillipson JD, Wright CW. Medicinal plants in tropical medicine: 1. medicinal plants against protozoal diseases. *Trans R Soc Trop Med Hyg* 1991;85:18–21.
14. Foster GM. An introduction to ethnomedicine. In: *Traditional medicine and health care coverage*. Geneva: WHO; 1983:17–24.
15. Hughes CC. Medical care: ethnomedicine. In: Logan MH, Hunt EE, eds. *Health and the human condition*. North Scituate, Massachusetts: Duxbury Press; 1978: 149–158.
16. Logan MH. Digestive disorders and plant medicinals in highland Guatemala. In: Logan MH, Hunt EE, eds. *Health and the human condition*. North Scituate, Massachusetts: Duxbury Press; 1978:180–188.
17. Wyler DJ, Marsden PD. Leishmaniasis. In: Warren KS, Mahmoud AAF, eds. *Tropical and geographical medicine*. New York: McGraw-Hill; 1984:270–280.
18. Navin TR, Arana FE, de Mérida AM, et al. Cutaneous leishmaniasis in Guatemala: comparison of diagnostic methods. *Am J Trop Med Hyg* 1990;42(1):36–42.
19. Hendricks L, Wright N. Diagnosis of cutaneous leishmaniasis by *in vitro* cultivation of saline aspirates in Schneider's drysophila medium. *Am J Trop Med Hyg* 1979; 20:962–964.
20. Weigle KA, de Dávalos M, Heredia P, et al. Diagnosis of cutaneous and mucocutaneous leishmaniasis in Colombia: a comparison of seven methods. *Am J Trop Med Hyg* 1987;36(3):489–496.
21. Grogl M, Milhous WK, Martin RK, et al. Kits for the diagnosis of cutaneous leishmaniasis in field laboratories. *Proc Soc Armed Forces Med Lab Sci* 1989;18:22.
22. Statistical Graphics Corp. *Statgraphics 5.1*. Rockville, Maryland: Statistical Graphics Corporation; 1988.
23. Dean AG, Dean JA, Burton AH, et al. *Epi info, version 5: a word processing database and statistics program for epidemiology on microcomputers*. Stone Mountain, Georgia: USD, Inc; 1990.
24. Dourado MI, Noronha CV, Alcantara N, et al. Epidemiologia da leishmaniose tegumentar americana e suas relações com a lavoura e o grimpo, em localidade do Estado da Bahia (Brasil). *Rev Saúde Pub* 1989; 23(1):2–8.
25. Le Pont F, Mouchet J, Desjeux P, et al. Epidémiologie de la leishmaniose tégumentaire en Bolivia: 2. modalités de la transmission. *Ann Soc Belg Med Trop* 1989;69(4):307–312.
26. Torres JM, Le Pont F, Mouchet J, et al. Epidémiologie de la lesihmaniose tégumentaire en Bolivia: 1. description des zones d'étude et fréquence de la maladie. *Ann Soc Belg Med Trop* 1989;69(4):297–306.
27. Dedet JP, Pradinaud R, Gay F. Epidemiological aspects of human cutaneous leishmaniasis in French Guiana. *Trans R Soc Trop Med Hyg* 1989;83(5):616–620.
28. Vásquez ML, Kroeger A, Lipowsky R, et al. Conceptos populares sobre la leish-

maniasis cutánea en Colombia y su aplicabilidad en programas de control. *Bol Of Sanit Panam* 1991;110(5):402–415.
29. Hibbard JH, Pope B. Gender roles, illness orientation, and use of medical services. *Soc Sci Med* 1983;17(3):129–137.
30. Finerman R. Who benefits from healthcare decisions? Family medicine in an Andean Indian community. In: *What we know about health transition: the cultural, social and behavioral determinants of health.* 1980: 657–668. (Health transition series; vol 2, no 2).
31. Kroeger A, Marcheno M, Ruiz W, Estrella E. *Malaria y leishmaniasis cutanea en Ecuador.* Quito: Museo Nacional de Medicina del Ministerio de Salud, Facultad de Ciencias Médicas de la Universidad Central de Ecuador; 1993.
32. Aram H, Leibovici V. Ultrasound-induced hyperthermia in the treatment of cutaneous leishmaniasis. *Cutis* 1987;40(4): 350–353.
33. Neva FA, Peterson EA, Corsey R, et al. Observations on local heat treatment for cutaneous leishmaniasis. *Am J Trop Med Hyg* 1984;33(5):800–804.
34. Navin TR, Arana FE, de Mérida AM, et al. Placebo-controlled clinical trial of meglumine antimonate (Glucantime®) vs. localized controlled heat in the treatment of cutaneous leishmaniasis in Guatemala. *Am J Trop Med Hyg* 1990;42(1):43–50.
35. Samaniego E, Escaleras T. Farmacología y medicina tropical. In: Samaniego E, Escaleras T, eds. *Fundamentos de farmacología médicas.* 3rd ed. Quito: Editorial Universitaria; 1987:1037–1067.

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World Plague Situation

Media reports of human plague outbreaks in Zaire, together with official 1993 reports of 267 plague cases and 70 deaths in that country, have recently underlined the actual and potential problems posed by this disease in Africa, Asia, and the Americas.

From 1978 to 1992, 21 countries notified the World Health Organization of a worldwide total of 14 856 plague cases and 1 451 deaths. In 1992, the last full year for which figures are available, nine countries reported a total of 1 768 cases and 198 deaths. Those nine countries were Zaire (390 cases, 140 deaths), Madagascar (198 cases, 26 deaths), Viet Nam (437 cases, 13 deaths), China (35 cases, 6 deaths), Mongolia (12 cases, 4 deaths), Myanmar (528 cases, 3 deaths), Peru (120 cases, 4 deaths), Brazil (25 cases, no deaths), and the United States of America (13 cases, 2 deaths).

In general, experts believe that world statistics on plague are incomplete because of inadequate surveillance and reporting. Only bacteriologically and serologically confirmed cases are reported in most countries.

Source: World Health Organization. *Plague still a killer in many countries, warns WHO.* Geneva: WHO; 1994. (Press release WHO/18, 2 March 1994).