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ETHNOBOTANICAL STUDY IN CASMA, PERU: THE IMPORTANT
KNOWLEDGE OF ETHNOBOTANICALS
FROM LOCAL PEOPLE

A Thesis

by

REBECCA L. REYES

Submitted to the Graduate School of the
University of Texas-Pan American
In partial fulfillment of the requirements for the degree of

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ETHNOBOTANICAL STUDY IN CASMA, PERU: THE IMPORTANT
KNOWLEDGE OF ETHNOBOTANICALS

FROM LOCAL PEOPLE

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December 2009

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ABSTRACT

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I began to investigate how local people use medicinal plants in Peru in the summer of 2007. It soon became apparent that many of the citizens of the small coastal town of Casma have an extensive knowledge of how to identify, prepare, and use these plants. During the summer of 2008, I did extensive research on the subject; however, focused more on the local knowledge of medicinal plants. To put my work in context, I researched ethnobotany more generally and became more aware of the worldwide implications, local background traditions and life, and local knowledge that impact the use and utilization of medicinal plants in my study. Local knowledge is only important in a global perspective.

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CHAPTER I

INTRODUCTION

Globally there is a high percentage of the population searching for alternative medicines. Although the reasons may vary, this action has caused round-the-world quests for traditional medicines, including medicinal plants. The study conducted for this thesis consists of ethnographic and ethnobotanical research that explores the availability and use of medicinal plants in a small town called Casma located on the north-central coast of Peru. Both interviews and plant searches contribute to my understanding of the local people's reliance on natural medicines because they are cost effective and readily available, and people trust them. One of the goals of the paper is to present information about medicinal plants growing naturally and the importance of local knowledge in their use. This knowledge consists of cultural traditions as well as social attributes. We can also learn how these indigenous people's faith in the plants and their concerns with Western healthcare. This paper will provide information from the locals about numerous live and preserved plants, this includes a list of growing plants utilized as medicine as well as how these plants are prepared and what ailments they treat. Many studies rely on the local people's information about their use of medicinal plants, and many of their plants have been collected and tested for active healing compounds that eventually become blueprints in making new drug discoveries. However, no plants were chemically tested during this study.

The study is important because it shows the strong connection between common plants growing near the local farmsteads and the local people who use them. It is very important to collect plant use information because plant species are disappearing due to poor land management, and corresponding cultural information is lost as well. The local people's information is vital to finding new plants that may contain active ingredients which can either treat or help reduce the risks of chronic illness. Any information from local informants should be treated with the utmost respect. There are serious issues concerning intellectual property rights because many pharmaceutical companies collect extensive information and harvest large quantities of plants, leaving no compensation for their informants who suffer from poor healthcare. When pharmaceutical companies lack consideration for the people, the over-collection of plants can lead to overharvesting, and the local people may refuse to provide information. With the help of these local people who use medicinal plants, such as locals, *curanderos*, or herbalists, the list of medicinal plants continues to grow; and there is always a demand for information about new natural medicines. Peru contains much biodiversity, making it an ideal place for medicinal plant studies.

Chapter 2 introduces how research is conducted by ethnobotanists and ethnopharmacologists and the importance of this research in making new drug discoveries. Worldwide researchers travel far to find medicinal plants that contain active agents that have the potential to cure chronic diseases. While this goes on, people around the globe are also seeking alternative medicines, including herbal medications, and their actions cause an even higher demand for plant products. Chapter 3 introduces the area of study, Casma, Peru. This town is located on the north-central coast. One of the driest

deserts in the world, this coast has oases formed by the river valleys where lush green plants grow. Expanding this greenery even more, the people rely on irrigation canals that draw water from the river. Medicinal plants grow naturally within the farmland on the outskirts of town. Most of my informants are from these rural areas where they use many plants growing on their lands for daily medication.

Chapter 4 describes the medical systems that are available in the town of Casma. This pluralistic system provides medical help for most of the people; and how it is used reveals the interplay of social, economic and political factors. Chapter 5 discusses the humoral theory that was used to analyze the effects of medicinal plants used in the area today. Two concepts are examined in this chapter. The Andean humoral concept describes the use of hot/cold to determine pathology and ethnophysiology. The Greek-Hippocratic humoral theory, imported as a result of the Spanish conquest, was easily merged into the Andean humoral concept.

Chapter 6 examines the importance of local knowledge. This local knowledge has helped expand the list of helpful plants with active agents. However, primary healthcare providers are also acknowledging the traditional use of medicinal plants and they are trying to incorporate this knowledge into modern healthcare to treat people who cannot afford high-cost healthcare. Chapter 7 focuses on five examples from the many plants encountered during the plant searches and discusses recent research conducted by ethnopharmacologists and biochemists on these species. This chapter also shows that these same plants treat ailments that are recognized by local people who have experience using them and who know about their curative effects.

CHAPTER II

GLOBAL INTEREST IN MEDICINAL PLANTS

Introduction

Health has become an important issue as people worldwide are searching for herbal medicines to obtain vitamins for strengthening their immune systems and to avoid the side effects of synthetic chemicals inside pharmaceutical medicines. In any store we find an assortment of different herbal remedies on the shelves such as St. John's Wort (*Hypericum* spp.) and Aloe Vera (*Aloe* spp.). For many, herbal remedies have become an alternative to modern medicines; and scientists are testing medicinal plants in the hopes of making new drug discoveries. Nevertheless, in the United States there is still debate and distrust about the use of herbal medication.

Along with this increased interest in herbal medicines, there is an increased interest in ethnobotany, ethnomedicine, and ethnopharmacology. Ethnobotany, a branch of ethnobiology, is the study of the relationships between people and plants used as medications, construction material, ritual paraphernalia, clothing, food and in other ways that define the social life of the people. Today ethnobotanists rely on information from people who use plants in their daily lives, including the use of plants as traditional medicines. Ethnomedicine is the study of traditional medicines. People in many cultures pass down the knowledge of medicinal plants as tradition and utilize their knowledge of

plant health care because it is cost effective. Ethnomedical knowledge may come from primary sources - people who know about preparation and the use of plants from information that is passed down to them and also from secondary sources such as classification books. Ethnopharmacology is the study of the active constituents in traditional medicines. This involves research in laboratories to find which compounds are effective in treating which ailments. This is important to modern medicine because these active compounds may result in new pharmaceutical drugs and herbal medications to treat or prevent a variety of illnesses.

With the expansion of interest in these three fields, studies have been made worldwide to find effective plants. Such studies often focus on communities where the economy is depressed and people depend on medicinal plants, not only because it is customary, but also because of the high cost of modern pharmaceutical medicines. The city of Casma, where I conducted fieldwork, is one of these communities. It is a modern town yet many *Casmeños* use a variety of medicinal plants along with some pharmaceutical medicines.

What are Medicinal Plants

In order to discuss medicinal plants further, it is necessary to define some important terms. The World Health Organization defines medicinal plants as a form of traditional medicine composed of indigenous beliefs and practices designed to maintain the health of individuals by treatments, preventions, and diagnoses. Most often the leaves, roots, seeds, or bark contain active constituents. Plants having multiple active constituents that heal more than one ailment are known as higher plants and are most commonly used.

Sixty percent of Western medicines are plant-derived, but most do not consist of pure plant chemicals in isolation. Scientists call these medicines that contain plant substances “botanicals,” especially when the medicine’s activity depends on a plant part or extract. Therefore, the term “botanical,” used in this manner describes herbal medicines. Plant components in herbal medications may endure some modifications, and active plant chemicals may be synthesized to create new types of medicines that are more effective and treat more illnesses. Plant substances in the medicines may be difficult to find because they are used in a chemically unmodified form, but the addition of template molecules design and generate completely new drug substances (Kinghorn 1992 cited in Lewis and Elvin-Lewis 1995:20). The plant substances are so infused with synthetic chemicals that it is difficult to distinguish the organic compound from the plant from the other chemicals.

Global Interest in Herbal Medication

According to the World Health Organization (WHO), 80% of the world’s population relies mostly on traditional health systems, particularly herbal medications. The media is paying closer attention to the benefits of herbal remedies because the global demand for these medications is growing. This sentiment is frequently fueled by a distrust of Western pharmaceuticals, and people are searching for ways to become well while avoiding harmful side effects and high medical costs associated with pharmaceuticals. As knowledge of medicinal plants has expanded in many parts of the world, health providers and their governments have increasingly gained respect for traditional medicine. Medicinal plants and their uses have also come to be regulated.

Guides have been published to educate people about how to identify and prepare natural medicines, thereby making it safer to consume the raw plants.

A study by The Pan American Health Organization and the National Program in Complementary Medicine was conducted to compare traditional remedies with the medicines prescribed by local hospitals and clinics. It revealed that some traditional medicines have a high efficacy for the patient, low side effects, and are more affordable than Western medicine. The growing body of knowledge about herbs that alleviate illnesses has also compelled the United States to further research ethnomedicines. Legislation passed in 1995 acknowledges the role of herbal medicines as a complement to Western medicine (Taylor 1996:924). Naturopathy includes the use of herbal remedies along with the practice of nonsurgical, nonpharmaceutical treatments like manipulation (Taylor 1996:927).

At an international level, physicians are prescribing herbal medications and encouraging their use. National and International government agencies are also acknowledging the effectiveness of herbal medicines, and many are actively involved in promoting new drug discoveries. Plants that reveal anticancer or anti-HIV activity have received special emphasis. The National Cancer Institute (NCI) in the United States and the Central Drug Research Institute (CDRI) in India initiated programs that led to the discovery of taxol and camptothecin from the plants *Taxus buevifolia* and *Camptotheca acuminata* respectively. The plant extracts were first tested in the 1980s when scientists discovered their anti-cancer biological activity. Three common Peruvian plants also have anti-cancer chemical properties: *Uncaria tomentosa* (known in Peru as *uña de gato*), *Lepidium meyenii* (*maca*), and *Croton lecheria* (*sangre de grado*).

Involvement of Government Agencies

Worldwide commercial distribution of herbal medicines has led to the involvement of government agencies in determining which botanical medicines are safe for public use. The Dietary Supplement Health and Education Act (DSHEA) allows manufacturers structure-function claims on the label as long as there is scientific evidence that the supplement is safe. These claims reclassify herbal medicine-type products as dietary supplements in the category between food and over-the-counter drugs (Taylor 1996:925). The Food and Drug Administration (FDA) concentrates on the public safety and announces warnings and regulations on herbal medications. In 1996, the FDA required manufacturers to list the natural herbs in all dietary supplements and herbal medicines.

Fearing dangers to people's health, the United States imposed many regulations and required warnings on herbal medications. For example, the FDA has warned against products that stimulate weight loss and enhanced energy because they contain ephedrine, from the *Ephedra sinica* plant, which can damage the heart and nervous system. After the death of a consumer who overdosed on medication containing ephedrine, federal agencies such as the National Toxicology Program (NTP) and the National Cancer Institute (NCI) became participants in the chemical testing of herbal medications. The NTP tests chemicals or biological mechanisms for agents that may be harmful in short-term or long-term use of herbal medicines that the FDA regulates. The NCI, which focuses on long-term public health risk and cancer risk, also tests herbal medicines for evidence of anti-AIDS and anticancer assets. The U.S. National Council Against Health Fraud (NCAHF) issued a public alert advising the consumers to check labels to discover

which herbal remedies are used in the product and to become aware of warnings about possible side effects in order to avoid health risks and toxicity.

The Forensic Laboratory of the U.S. Fish and Wildlife Service monitors herbal medicines to watch for parts or products of endangered species--such as bile and excretion - although these are rarely found. The agency did discover Chinese products containing mercury and arsenic, and this could have led to chronic mercury sulfide poisoning if a consumer had followed the recommended dosage. Labeling regulations are not yet standardized, and the Office of Alternative Medicine (OAM) argued in *Alternative Medicine: Expanding Medical Horizons* that Congress should assume a more educational and informational role by passing legislation that requires certification of herbal content and potency and their inclusion on labels (Taylor 1996:926). Using such dosage information, the FDA could evaluate herbal medicines globally and assess results of studies in Europe and Asia claiming that herbal remedies provide health benefits. For example, the National Institutes of Health (NIH) reported that *Ginkgo balboa* reduced the risk of heart disease and improved circulation. NIH also found many other plants that were reported to improve liver function and strengthen the immune system. However, such positive results are difficult to verify and replicate without precise data on the herbal medicines involved.

The Pursuit of Higher Plants

The world contains an abundance of plants species that offer ample opportunity to explore for more compounds that alleviate illnesses to be discovered. A major resource in the search for plants is the knowledge local people have about specific plants with active constituents. This greatly narrows the search for higher plants for testing.

Indigenous people have a long relationship with their environment and a dependency on the flora and fauna surrounding them. In fact, almost every culture has its own rich vegetal pharmacopeia (Schultes and Raffauf 1990:9). The shaman, the *curandero*, and other traditional healers are primary sources of information about medicinal plants and their medical properties. The locals are not only knowledgeable about of the medicinal plants in the area, but they are also aware of their toxicity and how to prepare them for use in treating specific ailments. Methods used to prepare and consume plants vary depending on the ailments. Different chemical reactions occur, depending on the method of preparation, therefore a single plant may be used to heal different illnesses. Preparation methods may also serve to reduce toxicity, and this traditional ethnobotanical knowledge about toxic plants is also valuable to the researcher.

Data indicate that ethnomedical information is critical in initial drug discoveries, but it must be paired with scientific testing to confirm the health benefits of herbal remedies. A Belgian study reported that selection of plants for screening based on traditional medicinal data from an herbal healer gave a five times higher percentage of active leads than a random sample (Lewis and Elvin-Lewis 1995:18). With the advancement of this technique to search for active constituents, more effort has also been invested in “biodiversity prospecting” to undertake chemical surveys of many plant species in every ecosystem worldwide. Researchers are said to be using a “modified search” if they rely on knowledge from local healers to select plants for testing. Especially productive areas for a modified search are places with high efficacy. These are areas where there is a strong correspondence between active plant agents and the ailment purportedly cured by the plant. Totally random plant collecting may also be

effective, revealing plants with medicinal uses unknown to local healers. However, according to Nina Etkin, patterns of plant utilization are informed by the understanding that some tangible attributes of a plant indicates its utility (Etkin 1988:27). These attributes can be anything relating to the plant's flower, fruit, resins, smell, color, or psychoactive effects. Not only do healers and local people identify medicinal plants this way but also researchers conducting random samples may locate useful plants by searching for unusual attributes. An example is the milky latex of the *Euphorbia* spp. that is used by the Hausa culture in Nigeria to heal headaches. Plant utilization may be guided by the expectation of certain outcomes that make up a healing process that journeyed from proximate to ultimate effects (Etkin 1988:28). The sign of healing from the effects of a plant is evidence for indigenous people that the plant has curing properties for certain illnesses. The curing properties can be categorized for early treatment medicine or ultimate medicine, depending how serious the illness is.

Examples of the information from traditional healers are numerous. For example, in 1985, "The Task Force of Plants for Fertility" initiated by the WHO Special Program of Research and Training in Human Reproduction, sponsored the collection of selected plants believed by local healers and users to have medical properties relating to human reproduction. With the participation of worldwide centers, 4,000 plant species were collected, 300 were scheduled to be tested, 250 were evaluated for anti-implantation activity, and 50 were selected to study further through chemical isolation studies (Fabricant and Farnsworth 2001:72). Students of Washington University and researchers affiliated with of the Museo de Historia Natural, Lima, studied with four Jívaro tribes (Achuar, Huambisa, Mayna, Shuar), in the tropical forest of northern Peru. They

collected plants from local *curanderos* and others who used traditional medicines for daily medications. A total of 5500 plants was collected and sorted by family, genus; and species, databases of South American medicinal plants were developed; and test screenings were initiated. Shaman Pharmaceuticals in San Francisco, California, sent teams to tropical areas seeking information about medicinal plants from healers and to collect plants for testing. The project succeeded in identifying plants with antidiarrheal properties, including oligomeric proanthocyanidin that is now used in dietary supplements to treat diarrhea. An additional discovery made by this project was the active compound, nordihydroguaiaretic, that lowers cholesterol levels. Random plant collecting has also yielded plants with active ingredients that treat diabetes, dysentery, leukemia, and other types of cancer. In Cameroon, Duncan Thomas collected a plant unfamiliar to the locals, *Ancistrocladus korupensis*, that contains active anti-HIV compounds.

The ultimate goals when collecting higher plants are to isolate compounds for direct use as drugs, to discover bioactive compounds of known structure for semisynthesis, to use active plant agents as pharmaceutical tools, and/or to use the whole plant or part of it as an herbal remedy (Fabricant and Farnsworth 2001:69). It may take only weeks to identify a plant's bioactive constituent, but to determine that a plant is useful enough to develop into a new drug may take up to 10-20 years. For example, an extract taken from a Mexican root, *Heliopsis longipes*, was determined to be an effective analgesic in two weeks. After the initial step of getting permission to collect this root, extracting the active ingredient and testing the extract further took at least two years but the extract now can be found in oral or dental medicines.

Herbal companies, pharmaceutical companies and educators guide the collection of plants for medical information and as samples for screening. Ethnobotanical fieldwork as a means to collect potential pharmaceuticals decreased in the 1950s due to the development of synthetic compounds. Today, ethnobotanists actively conduct fieldwork, making bioassays using modern technology, and testing plants to discover compounds that fight certain diseases. By using local knowledge from people who use plants for daily treatment, there is a possibility of finding plants with active agents. This knowledge also provides a new list of derived plants for testing after they are categorized in the classified family or genus. The collection of a family of plants that have active effects to treat a certain illness are “modified” samples. For example, the families Thymelaeaceae and Celastraceae show cytotoxic activity. The “modified” search is effective in finding derived plants along with ethnomedicine fieldwork. The “modified random” sample searches for the common plant names or plants that are in certain families known to heal many ailments (Lewis and Elvin-Lewis 1995: 17). During screening, many plants mentioned from local knowledge display activity of a certain agent. Looking for plants of these families may lead researchers to more derived plants for those that do not show activity, the search of that family is discontinued. Using local knowledge for collection gives a hint of what plants for which to look. It would be up to the researcher from there to direct the search further by modified or random collection. Some collectors do not bother with plants that are small, take time to find, or are uncommon. Some plants may be harmed by taking a sample such as from the bark or roots, and are therefore not collected.

Critical Problem Related to Medicinal-Plant Prospecting

The increased global interest in herbal remedies combined with the pharmaceutical companies' interest in effectively seeking new prospects for commercially viable drugs has created problems as "prospectors" attempt to meet these demands. Many known medicinal plants are disappearing due to expanding human population and loss of habitat as forests disappear. As forests and their vital plant species are lost, so is the knowledge about their plants that is traditionally held by indigenous people. Furthermore, as indigenous people have become more knowledgeable about the outside world, the issue of fair compensation for information derived from local healers has become an issue.

Increasing global demands for herbal products threaten populations of medicinal plant species with extinction. Tons of dried medicinal plants were harvested in Indonesia, threatening several species with extinction. *Chondrodendron tomentosum* and *Curarea toxicofera*, plants that contain tubocurarine, a chemical used to tighten body muscles, almost became extinct in the tropical forest of South America because of overharvesting and lack of land management. Recently there has been more interest in the conservation of such wild plants. Botanists are also developing cultivated hybrid plants that can be grown in plantations; however, some plants such as the ginseng root take many years to grow. Robert McCaleb, director of the Herb Research Foundation, believes a list should be made of plants on the verge of extinction in order to take action for their survival. The public needs to be informed about the devastation of certain species caused by large demand and overharvesting and about whether specific plants

used as medicine are wild or commercially cultivated. These data may influence the consumers to choose plant products derived from cultivated species.

The destruction of land in the Amazon area of South America may cause the Jívaro tribes to lose their knowledge of medicinal plants that has survived among them for many generations. Acculturation of the Jívaro and loss of the rainforest threaten to eliminate the knowledge they possess before it is possible to scientifically test even a fraction of what they have long used as medicine (Lewis and Elvin-Lewis 1995:21). The Jívaro utilize plants and plant parts that might go unnoticed by non-native people. For example, Jívaro women use *Cyperus articulatus* tops to make crude infusions which they drink as oxytocic agents to aid in parturition or postpartum contractions and to reduce bleeding after childbirth (Lewis and Elvin-Lewis 1995:22). The top of this sedge contains fungal sclerotia, a fungal food-storage area; and the Jívaro women are focusing on the fungus *Balansia cyperi*. It contains alkaloids that function like ergot alkaloids that also have active substances useful for child birth and migraines. The Jívaro women have found and use a fungus that is in the same family as *Claviceps*, an ergot fungus. When this type of knowledge is lost, the result is greater dependency on Western medicine and the loss of their traditional health care this further impacts the search for new medicinal plants.

The Kallawayas of Bolivia provide an example of how modern and traditional medicinal systems can clash, and they also demonstrate the importance of adequate compensation for indigenous people. The Kallawayas of the Bolivian Andes have a long tradition of ethnobotanical knowledge dating at least as early as A.D. 400-800. Armed with the idea that Western medicine was superior, Bolivian doctors arrived in Bolivia to

change many health practices by criticizing traditional methods. The attempt to impose modern medicine was largely unsuccessful because it was centered in cities, costly, and accessible primarily to middle and upper classes (Bastien 1987:88). Only the industrial areas and cities were able to afford the expensive laboratories, clinics, and hospitals that lured most of the educated doctors away from the rural areas. The Kallawaya were living in scattered towns and villages in rough terrain, making them hard to reach and preventing the delivery of much-needed centralized health services. In an attempt to remedy the situation, the Bolivian government required doctors to serve in rural areas for a year. These doctors found themselves working in poorly equipped clinics and attempting to serve patients who could not afford treatment. Even at a reduced rate, the doctor's fee was a week's income. Rural physicians were also discouraged by their patients' lack of knowledge of modern medicine. The Kallawaya had practiced ethnomedicine for many centuries and had established their own traditional healthcare system to treat many illnesses; however, the Bolivian doctors did not realize that modern medicine and traditional medicine can complement each other through an understanding and incorporation of their respective beliefs.

Clearly, the Kallawaya are unable to afford imported medicines. Yet ironically, they have contributed significantly to modern pharmaceutical knowledge. Western companies have received 46 medicinal plants from the Kallawaya, who initially ask for no payment but freely shared their knowledge to help others. The Kallawaya later refused to cooperate with these companies because they were not adequately compensated and they were even viewed disparagingly by representatives of these companies (Bastien 1987:92). When cooperation between the Kallawaya and

pharmaceutical companies ceased, vital information about medicinal plants was lost to the outside world. The Kallawayas have a tremendous knowledge of plants and a capability to utilize medicinal plants that may not be recognized by someone who does not also understand the people who use them. With the loss of this body of knowledge, certain compounds and their ability to reduce the risks of chronic illnesses around the world was lost. A solution is for pharmaceutical companies to recognize the contribution of indigenous people to drug development and to provide royalties, licensing fees, and other forms of compensation to these individuals, to their communities or tribes, and to the host country as appropriate (Lewis and Elvin-Lewis 1995:23). Such compensation would represent a small fraction of the \$100 to \$500 million total cost of taking a new drug all the way through clinical trials and FDA approval. It would, however, go a long way toward resolving the rural health care crisis. Companies have the responsibility to understand that the plants they receive come from people who want to help but who also deserve respect and recognition for their contribution as well as the benefits of proper health care.

The Casma Valley Study Area

The community of Casma on the north Peruvian coast has been modernizing for a long time, but an interest in medicinal plants has been maintained as a cost-effective way to obtain health care. The *Casmeños* keep and value their customs even as their city grows. Across generations they pass their knowledge of folk medicine, including their knowledge of medicinal plants. Because of the expansion of pharmacies and even herbal markets, there is concern whether the folklore behind medicinal plants will be lost in the near future. Only time will tell, but my study shows that medicinal plants are regularly

used as a cost effective way to heal common ailments and that people resort to pharmacies only when a more severe illness occurs.

Casma Province is situated in the coastal zone of north-central Peru. It consists of Casma and thirteen other small towns. The climate of the Casma Valley is subtropical desert, and the Humboldt Current creates a cool fresh breeze along the desert coast. Agriculture relies on irrigation from the Casma and Sechin Rivers that originate in the foothills of the Andean mountains. There are drastic zonation changes between the lush green river valleys and the surrounding desert. Casma has a prehistoric archaeological tradition, and the Spanish arrived in Casma during the 17th century, adding their influence to the indigenous lifeways.

Peruvian Medicinal Plants

Ethnobotanical research in Peru is very rewarding, as the country has one of the highest levels of biodiversity the world (Gonzales and Valerio Jr. 2006:429). Amazonas and the Andes have received much attention in plant studies, but recently there has been more research on the coast. Medicinal plants used in Peru for generations to treat everyday illnesses are now undergoing testing to find active constituents for making new drugs. For example, *uña de gato* has long been known in Peru because of its effectiveness in treating tumors. The anti-inflammatory activity of *uña de gato* as an ethanol extract may function to reduce the inflammation of cancerous tissues, but this needs further study. *Uña de gato* is also used to treat numerous other disorders such as chronic inflammation, arthritis and gastrointestinal dysfunction such as gastritis, ulcers, tumors, and infection (Gonzales and Valerio Jr. 2006:433).

Lepidium meyenii, known locally as *maca*, is used more as a food supplement for nutrition and energy among natives; however, chemical testing has revealed that it displays anti-oxidant properties, increases immune system activities, and may help treat prostatic hyperplasia or prostate cancer. Other plants have the same active constituents as *maca*, therefore *maca* is also important because it may lead to related medicinal plant discoveries. *Croton lechleri*, also known as *sangre de grado* in Peru or Dragon's blood in English, contains sap that interests many medical practitioners because of its possible anti-tumor agents. *Croton lecheri* (Euphorbiaceae) affects various types of cancer. By stimulating the damage of microtubules and apoptosis that are in human cancer cells of the colon and stomach (Gonzales and Valerio Jr.2006:433). *Sangre de grado* also contains the taspine alkaloid, a wound-healing substance.

One of the most commonly used medicinal plant in Peru is the coca plant, *Erythroxylon coca* and *E. novogranatense*. Native to the Andean slopes and Amazonas, leaves of the coca plant are commonly chewed or made into tea. It is used to increase energy and to fight hunger pangs among Andean natives, especially those living and working at high altitudes. Coca has been produced, traded, and used since Pre-Columbian times; however, it has a negative reputation because cocaine derives from this plant. Modern efforts to exterminate the coca plant have been unsuccessful, and it is still widely used in an unrefined form. Casma has a shop where coca leaves are available in bulk for resale to local herbal shops, markets and to local highland villages. As soon as I arrived at a hotel in Cusco, I was given coca tea in order to fight against altitude sicknesses.

Medicinal Plants used as Daily Medication- a case study for Casma, Peru

My pilot study was informal, starting with conversations with my Peruvian coworkers on an archaeological project. Subsequently, I expanded my local contacts by accompanying a coworker on a “plant search” where I collected locally-abundant medicinal plants. I also obtained information from an herbal-medicine vendor at the local market and from an *emolliente*, a sidewalk vendor who specializes in hot herbal tonics. Additional information from secondary sources such as journal articles, books, and references enabled me to put my study in context and to compile more data on the uses of specific medicinal plants. In knowing that the research is going in a positive direction, Dr. Douglas Sharon listened to the construction of this project.

The people of Casma have numerous options for healing their illnesses. The town has many pharmacies and clinics; however, many locals trust medicinal plants more for daily medication. The pharmacist may have only a limited amount and selection of medications to treat their sickness at any given moment because of the low stock of medications. Pharmaceutical medications are also too costly for many *Casmeños*; and, as a result, they have turn to traditional medicine. People gather plants freely on their property within the river valley or they can go to the market where there are two or three stands full of medicinal plants. They can also go to the *emollientes* who make tonics of aloe vera and other medicinal plants for just 50 céntimos (about 16 cents).

I was able to participate in the first stage of medicinal plant use: collecting the plants. A fellow co-worker, who toils in various manual labor jobs, guided me around his family’s land to find medicinal plants in their natural habitat. The land is adjacent to the river and a canal travels through the land surrounded by a large number of cultivated

plants that can serve as medications. The plants are easily found by *Casmeños*, who know what to look for to treat their symptoms, illustrating high collecting efficacy in the area. If plants show signs of healing or reducing symptoms, the plants are culturally accepted as medicinal. The plants used are potent all year long and usually show clear signs of being ripe--for instance bright green leaves and open flowers. *Flor blanca*, used to treat kidney and liver disorders and menstrual pains, is a seasonal plant that flowers in December and January. The best time to collect most medicinal plants is the winter because the climate is moist and warm, but not hot.

Many of the common remedies *Casmeños* search for are to treat the liver, kidneys, arthritis, ulcers, menstrual cycle, prostate problems, stomach problems, and respiratory problems such as bronchitis. Many plants can treat more than one ailment. The informants interviewed had some knowledge of medicinal plants from books and references, but they also learn from an older generation of family members. Printed sources are used to further their knowledge of familiar plants. According to those interviewed and in normal conversation, anyone who has knowledge of medicinal plants is able to prepare medications for illnesses. *Casmenos* believe that because all plants are from nature they do not cause harm as long as they are used in moderation. However, there are plants that may be harmful to pregnant woman, children, and older people such as *manayupa* that has strong effects. Pregnant women are given only teas of manzanilla and anis for stomach problems. Plants are often prepared as a tonic or tea, but occasionally a fruit is eaten or a base leaf is rubbed and applied directly to the affected area. According to the “specialist,” the people focus more on leaves and stems for use in tonics and teas. Plants prepared as medicines are taken in small dosages so that the

correct amount of active plant constituents is consumed by the user. The frequent consumption of teas and tonics can impact an individual as if it were consumed as a food. Medicinal plants consumed during meals are distinguished from regular plants consumed during meals. Thus, plants may be a food, a medicine, a medicinal/healthy food, or a nutritious medicine (Etkin 1988:34). Overall, medicinal plants consumed in small doses for daily dietary reasons were effective in preventing illnesses.

The locals had no concerns about using pharmaceutical medicines and medicinal plants together, and many might recommend this practice thereby documenting the frequent incorporation of Western and modern medicines. My co-worker stated that he took pharmaceutical medications at times, even along with ethnobotanical teas or tonics, but he depended more on medicinal plants. He said that, “If the plants are available, then I will rely on them instead.” This reveals that *Casmeños* maintain their cultural tradition of the use of medicinal plants primarily because their healing properties do not cost anything. Bennet observed similar practices among the Quijos Quichua and the Shuar of Amazonas, one of the Jívaro tribes. The Shuar depended on 245 medicinal plants used mostly to heal gastrointestinal illnesses and skin ailments and occasionally as contraceptives. Bennet (1996:601) also recorded that a Shuar shaman, after carefully combining five plants to make an antipyretic medicine, reached into a small bag and selected the last ingredient--an aspirin.

On late afternoons, an *emolliente* stands at almost every main street corner preparing plant tonics for the minor symptoms of customers. They prepare their tonics on wheeled carts displaying bottles of prepared boiled plant extracts. Different boiled extracts are chosen by the *emolliente* depending on the ailments of the customer. The

tonics are served hot and must be consumed immediately. The tonics are prepared using only plants especially *sabila* (aloe vera) and *la tuna congona*, which is the fruit on top of a prickly pear cactus. “Specialists” run their businesses in the same way as the *emolliente*, but they work from an established concrete building.

I tried to ask the owners of two herbal remedies stands in town about their knowledge of medicinal plants, but both refused interviews. They are sales people and do not seem to have enough knowledge of medicinal plants to answer my questions. It is my understanding that the specialists and vendors obtain their plants from all over the country by ordering them and buying them for their businesses. These vendors are used by people like my co-worker who has access to what is easy to cultivate or collect in the area, but goes to specialists to get the plants when he needs them for certain illnesses that his plants do not relieve.

The *emollientes* or vendors travel to Lima to obtain plants not available in the area, but it takes days to buy a large supply of plants. There are many cultivated and wild medicinal plants growing around Casma and in nearby areas, but imported plants from the highlands and the tropical forest must be acquired in Lima. When I questioned *emollientes*, the specialists, and market vendors about commonly used medicinal plants, they listed most of the same plants. My co-worker, however, knew or named plants not mentioned by other sources. He focuses more on locally available medicinal plants and was able to provide information on 11 different plants. From all these sources, using information from these practitioners as well as published sources, I was able to compile a list of plants that are commonly used in the Casma area along with information about their specific uses (Appendix 1). I have included local names and scientific names

because local plant names may be impacted by the history of the region. Some plant names are maintained within the original indigenous populations, with only slight modifications reflecting the historical development of plant use in the region (Bussmann and Sharon 2006:9). Other plant names have Spanish roots and *mestizo* origins, especially on the coast of Peru which saw much outside contact. Because there was much trade in plants that were native to Amazonas and the Andean highlands, many of the plant names are in Quechua, a native highland language deriving from the time of the Incas.

Conclusions and New Directions for Research

Clearly the topic of ethnomedicine is of worldwide importance in the modern world. Increasingly, Western and non-Western populations are turning to traditional medicine as an alternative to pharmaceuticals and even as a means to ameliorate the side effects of pharmaceuticals. At the same time, pharmaceutical companies continue to prospect for future drugs within indigenous communities. Indigenous populations are also displaced and their culture is disrupted as their habitat is destroyed. Loss of knowledge and practices relating to medicinal plants also occurs as plant species become rare or extinct and the chain of transmitting traditional medical knowledge between generations is broken. Problems arise because of economic development and pressures to adopt Western medical practices. Such efforts to help indigenous populations through the introduction of more modern Western medical practices are often doomed from the outset because developing nations lack adequate infrastructure to deliver this health care, and local populations are typically unable to bear any portion of the cost. A potential solution would be for large pharmaceutical companies to assume some of these costs—

both generally at the national level and specifically as compensation to communities which have been helpful in identifying sources for new drugs. Despite external efforts to promote Western medicine, indigenous populations increasingly address the health care crisis by turning to traditional medicines which they secure from specialized practitioners including *emollientes*, *curanderos* or shamans, and herbal-remedy vendors and which they may supplement through the use of pharmaceuticals. At an even more basic level are citizens of small rural communities who “eliminate the middlemen” by cultivating or collecting medicinal plants and using them to prepare a variety of remedies for themselves and family members. Such people often have considerable knowledge about the preparation and use of medicinal plants which is passed down across generations and freely shared within the community. It is this low-key approach to health care which I believe merits further study, and this will be the focus of my future research.

CHAPTER III

CASMA VALLEY AND METHODOLOGY

Introduction

This chapter describes the environment of the Casma Valley and the town of Casma. It contains descriptions of the scenery because of the immediate changing environment from desert to green river valleys on the Peruvian coast. This chapter explains the result from people utilizing the valleys to exploit the land for agriculture and form towns along the coast. In the rural areas outside of Casma, the plant searches conducted on the lands of my informants displayed the various environments in which medicinal plants were cultivated and/or grow naturally.

The activity in the town of Casma is ongoing. Living above a Pharmacy at Hostal Rebeca right on the PanAmerican Highway, I got a sense of what brings this small busy town alive. In view of the third floor balcony near my room, large commercial buses drive by along with mototaxis that blow their buzzing or beeping horns on the main street of town. Transport trucks carrying various crops, livestock, minerals, and building material rumble by. The traffic never ceases as vehicles flow through town. They honk their horn to notify other drivers and pedestrians of their presence and to have the right-of-way because there are no stoplights. All these vehicles bring the sound of their activities to town. Next door, an electronic repair shop blares the mainstream pop music of Peru from morning to night. Occasional firework explosions can be heard in the distance as

well. Trade, manufacturing and other business occur in town where people from inside and out conduct their businesses. The town does sleep at night; however, the large semis, buses, and transport trucks still roar by. While town is bustling with activity, the outskirts of Casma are awoken slowly to the occasional beep of passing mototaxis or *colectivos* containing many passengers crowded in for a long ride. Branching out from the PanAmerican Highway, broken pavement or dirt roads lead to small farming neighborhoods. The houses display their own small landscapes of domestic plants or small gardens. The neighborhoods are quiet compared to the action at the center of town. Most of my informants lived out in the rural areas northwest and southwest of town. In these areas, the river functions to bring in water to irrigation canals that expand the green valley. The river is quite low and shallow due to this irrigation, and it is common to see women washing clothes at the water's edge. Viewed from on a large hill, the fertile valley displays rich various green fields in a checkerboard pattern of *guayaba*, *palta*, *chivatillo*, cotton, *yuca*, asparagus, *ají*, maize, and *maracuyá*. The edge of this greenery ends suddenly, giving way to desert sands and barren hills devoid of green plants, even cacti.

The coast of Peru is one of the driest deserts in the world. Travel among the river valleys show that many important cities are located on the coast, and that plant growth is more lush than would be expected in desert lands. This chapter describes the environment of the western Peruvian coast. The cold Humboldt Current supplies the area with animal resources; however, it also causes the desert conditions. The rivers that flow west from the Andes allow lush green vegetation to grow. The Casma Valley has been studied by archaeologists who have documented a long timeline of civilization and shown

that vital plant and animal resources for survival were readily available to early people, enabling the area to prosper. Early humans used the Casma River's alluvial soil for agriculture and constructed irrigation canals to supply fields with water. This expanded the green areas with plants and made more plant species available for plants used in daily life. Both native and cultivated plants can grow randomly on land in cultivated fields, in planned but somewhat spread-out gardens, or in pots. In the medicinal plant study, most informants living in the rural areas allowed medicinal plants to grow naturally around their lands. Their knowledge of the proper environment led my informants to find the specific plants needed for medication.

The Environment

The coast of Peru, a narrow desert, stretches to about 2000 km north-south occasionally crossed by lush river valleys. Due to the Humboldt Current that travels north from southern Chile to the farthest north of Peru, the entire coast of Peru experiences a scarcity of rain. This cold-water current brings cold air to the coast; however, once hitting land the air becomes warm. Even though evaporation increases over land, the rains do not occur until the air hits the cooler temperatures of the Andes in the higher altitudes (Pozorski and Pozorski 1987:1). The important contribution of this current is the rich biomass of marine resources. The cold upwelling brings nutrients from the bottom of the ocean that feed a rich ecosystem of marine life. With large quantities of resources such as shellfish, fish, seabirds, and sea mammals, it is no wonder that the coast was able to support the development of civilization from ancient times until today (Pozorski and Pozorski 1987:1). Every few decades the cold water Humboldt Current is

displaced by the Ecuadorian Countercurrent causing the El Niño effect. During El Niño, heavy rains come down on coastal deserts affecting both marine and terrestrial life.

Fog is a frequent occurrence on the coast (Johnson and Platt 1930:9). Due to the low temperature of the Humboldt Current, there is contrast between when the cold air from the Humboldt Current meets the warmer air from the desert coast the result is menacing, but rainless clouds. Usually observed on the winter mornings, these low clouds blanket the coast with dense mist, known as *garua*. Moisture from *garua* may slightly wet the soil, but it has no effect on the land. By afternoon the fog and mist lift, and the sky is clear allowing the warm sun temperatures to dry the ground once again. Only the upper slopes of coastal hills and mountain ranges have enough moisture to support mostly drought-resistant plant and shrub communities that are known as *lomas*.

The coastal region is generally treeless except for *algarrobas* and introduced trees such as Australian eucalyptus and *molle* trees from the highlands (Vivian 1921:13). The amount and scheduling of water supplied by the river impacts the acreage of agriculture, the types of crops cultivated, the location and size of towns, and the number of associated roads (Johnson and Platt 1930:3). Sandy hills and beaches are covered with man-made local trails that lead from outer rural areas to the Pan American Highway. The dependence on rivers has brought dependence on irrigation canals, creating interrelationships or social ties between cultures of the coast and the Andes and the increase of urbanization (Kosok 1965:10-11).

Along the coast of Peru there are 57 rivers. Figure 1 shows the main rivers on the north-central Peruvian coast. The rivers are fed by melting snows and seasonal rains in the Andean Cordillera which flow across the desert, building flood plains and deltas and

furnishing water for irrigation (Johnson and Platt 1930:7). The Casma Valley is located about 350 km north of Lima along the north-central coast of Peru. Two branching river branches, the Sechin to the north and the Casma branch on the south meet just north of the town of Casma to form the Casma River. The Casma Valley is surrounded by steep narrow mountains that become foothills as they approach the coast (Pozorski and Pozorski 1987:2). The drainage basin is 2,775, square kilometers and the Casma River is characterized by a seasonal variation in river flow (Pozorski and Pozorski 1987:2). This is because the Casma River headwaters lie in the rain-scarce Cordillera Negra, resulting in occasional annual water shortages (Kosok 1965: 203). In an area where agriculture is a major economic resource, the flowing of the river is vital for the activity of irrigation canals. In fact, most life in coastal valleys depends on the rivers (Johnson and Platt 1930:3).

I experienced the ecology of coastal Peru first hand when, heading north to Trujillo, my colleague and I needed to get to Chimbote to catch a bus. Our only way there was to take a *colectivo*, a large automobile or truck customized to fit in as many passengers and as much cargo as possible. Because the driver wanted to make sure all spaces were filled, my colleague and I were packed tight in a large Buick with four other people going to Chimbote. Fortunately, sitting in the back seat, I had the cool window on my right side as I stared out into the barren landscape. The mist had already risen up to the tops of the hills and the only plant life visible were the black skeletons of *Tillandsia straminea*. These plants live off the moisture from the mists and apparently have no root system. There is hardly any *lomas* in the Casma Valley, but the soil does produce a little green coloring within the crevices on the hills where condensation collects. However, the

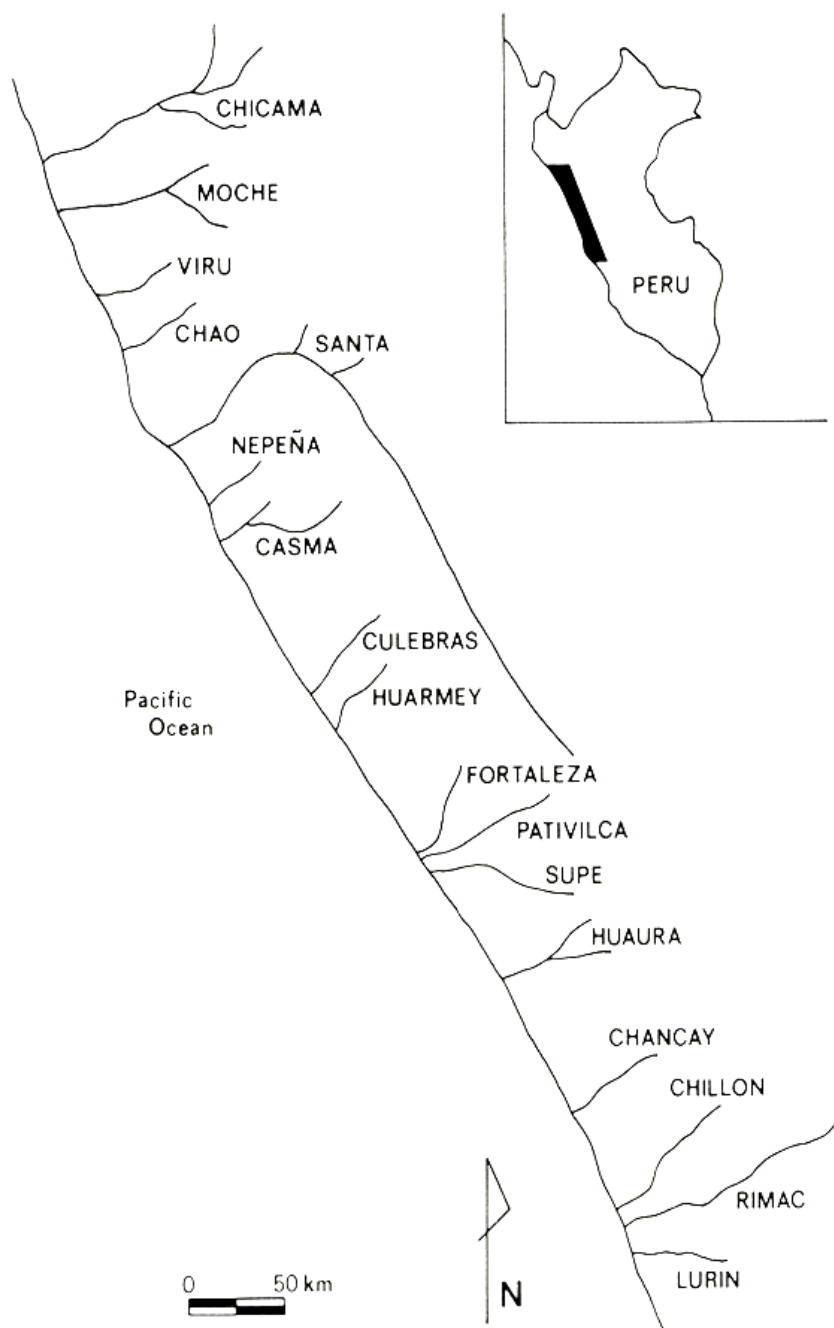


Fig. 1. River valleys along the north and central coast of Peru.

greenish appearance can be due to green shales as well. In desert areas, the colors intensify with yellow, tan/brown desert framed against a bright blue sky during the day. The Andean foothills also consist of steep desolated slopes that reflect many shades of gray, brown, purple and red. The trip north was quiet along with the landscape, but once I saw green vegetation, I knew a river was nearby.

On the bus ride between Casma and the desert land is interrupted every 16-48 kilometers by green valley zones that reveal the presence of a river, irrigation, alluvial fans or deltas. Fields are obvious with their different shades of green, and natural wild plants look like gardens. The active Casma River floodplain is lined by the greenery of trees and shrubs such as tall grasses, *algarroba*, *Salix* sp., *Tessaria integrifolia*, and *Mimosa nothacacia* just to name a few. The shallow rivers create floodplains with fertile soil and provide water for irrigation. The impact of agriculture is obvious in the visible threads of irrigation canals that can more than double the area of vegetation supported by the river alone (Fig.2). Irrigation canals travel as far as the water can be carried allowing fields of various crops to expand. Houses are visible, and there are small roads. The greenery from river valleys provides living scenery after passing through kilometers of barren desert sands and hills. Plant searches conducted during the research also increased my awareness of the drastic zonation change between the desert and river valleys as desert sand gave way to lush vegetation and vice versa (Fig. 3)



Figure 2. Various crops sustained by irrigation canals. Reyes.



Figure 3. A drastic division from the lush green environment to desert. Reyes.

Urban Setting

Full of light greens and dark greens, the valley comes to life, giving signs that soon a small town will appear. The river valley provide a setting for thriving towns in the midst of fertile fields. There fields grow crops on alluvial soil of river deltas where irrigation ditches form a network dependent on river flow. The rivers that run along the coast long have been used to support irrigation canals, and around these canals grew the large settlements that relied on the area for farming. Population is increased with the increase of irrigated lands that also support various activities such as manufacturing, trade distribution centers, and markets. In the town of Casma, the sight of low, flat-roofed buildings against the background of large desolate hills is quite striking.

The earliest Casma Valley inhabitants hunted and gathered within the valley and along the coast about 8000 years ago. By learning to farm the floodplain, the ancient people of the Casma Valley practiced agriculture for the first time about 4500 years ago. The introduction of intensive agriculture based on irrigation canals within the river basins is well documented by 4000 BC, and this made possible the construction of large settlements such as Sechin during the Initial Period dating to about 2000-1000 B.C. Today archaeologists and tourists arrive in Casma to view the ancient sites of Sechin Alto, Cerro Sechin, Pampa de Llamas-Moxeke, Manchan, Chanquillo, and Las Haldas.

During the 17th century the Spanish arrived in Casma, adding their influence to the indigenous ways. After the destruction of the first Casma city, known as Casma Alta, Don Fernando de Castro arrived in 1751 and established the town of Maria Magdalena de Casma in commemoration of the saint (Paredes 1996:6). Simon Bolivar created the district of Casma which became part of the province of Santa in January 2, 1857, upon

approval of the President, Ramon Castilla. In 1909 Casma was elevated the status of “city” by President Augusto B. Leguía. The earthquake in 1970 changed Casma completely. The city was rebuilt; and the citizens constructed new and bigger avenues, a grid work of city streets, neighborhoods or urbanizations, local public places, and gardens and parks (Paredes 1996:10). Now Casma Province is situated in a coastal zone of the Ancash region known as Chavin. It is divided into four political districts: Casma, Yaután, Buenavista, and Comadante Noel. According to the Taseo online database (2009), within these districts, a population of 21,000 inhabitants reside in small towns and the surrounding countryside.

The climate temperature is unusually sunny compared to the rest of the coast, hence the town’s name: Ciudad Del Sol Eterno (City of Eternal Sun). The major industries of the valley are agriculture and fishing. Based on the irrigation agriculture, many cultivated crops are produced, including cotton, corn, beans, peanuts, pepper, manioc (*Manihot esculenta*), lima beans (*Phaseolus lunatus*), squash (*Cucurbita* spp.), tomato, asperagus, bananas, melons, grapes, oranges, pacay, circuelas, cherimoya (*Annona cherimolia*), avocados, mangos, and potatoes (Paredes 1996:13). Local markets, light manufacturing, and small-scale ocean shipping operate in the Casma Valley, providing more occupations. Construction businesses thrive in town by selling sturdy building material such as brick, lumber, ceramic tiles, and cement. The people of Casma used also plants for house construction materials such as the *qincha* canes that are set into the ground and woven in place or woven into mats for walls and ceilings. Thick bamboo poles are used as construction material to frame houses. These two products can be purchased in town.

Most businesses face the streets that are part of the Panamerican Highway because it runs through the center of town. This highway runs along the coast of Peru from Ecuador in the north to Chile in the south. Smaller roads branch off this highway to provide routes to and from the Andean highland regions. This highway system for coastal travel easy and allows people from all over the coast and highlands to maintain social and economic ties to both regions.

Casma, with much business activity, is a node that links many coastal towns of Peru with highland regions. For the long trips, there are agencies for number of bus lines in town. Shorter trips between towns are usually made in *colectivos* which can be found at designated departure points from which they depart once the vehicle is full of travelers. The most common vehicle used to travel around town is the mototaxi, a three-wheeled motorcycle with a back seat that fits three passengers. Many mototaxis cruise the streets to see if anyone needs a ride somewhere. Driver, passengers, and vehicle itself are covered in a tarp-like covering that displays number of there mototaxi as well as personalized decoration. It is easy to catch a mototaxi at the center of town because there are so many, and to travel across town usually costs a passenger around 35 cents.

The center of Casma is quite active during the day. Furniture stores display their wares alongside food stores, salons, bakeries, internet places, public phones, and the many restaurants this town contains. The shops located side by side reveal their many items, with displays that spread out onto the sidewalk. People walk among them, purchasing items and then heading to restaurants. After dinner time the town seems quiet except for the loud music and the trucks and buses passing by.

School marching bands perform in parades at the Plaza de Armas at the center of town where most of the public events take place. A large market near the Plaza de Armas provides most all the necessities for everyday life. This main marketplace consists of an outdoor restaurant situated near the butcher's area. Where there are fresh meats that have already been prepared as well as live animals that will be prepared or purchased. Fresh fruits and vegetables are sold by the kilogram. Other areas contain school supplies, party supplies, home-repair products, casual clothing, and shoes. Herbal vendors also have their establishments there, providing herbal medications. Second, more casual marketplace, is located on the south side of town, but is most active on Sunday mornings. The outside of town is quiet and peaceful.

Most coastal people have *mestizo* origins and speak Spanish; however, many visitors in town are from the nearby Andean highlands where Quechua is regularly spoken. Highland people arrive in Casma to shop and conduct business. They wear traditional highland clothing, making them distinct from those who live in town. The women wear multicolored skirts and blouse and shawls and tall white straw hats with a wide brim. Men, too, wear hats of white straw that are not so tall. Most of the local population of the nearby countryside are farmers who live at a different pace compared to those in town. They have been the focus of my study as they revealed their knowledge about the collection and use of medicinal plants and their trust in these remedies.

Research Methods

This project first began with a pilot medicinal plant study in the summer of 2007 that involved few interviews with townspeople who had much knowledge of the use of medicinal plants. Before research began in 2008, I had to be approved by the university's

Institutional Review Board (IRB). This board is to protect human subjects in research and must view over my application for research and approve my consent forms that I give to my informants before every interview. They view over my interview questions to see if there will be no complications during interviews (Appendix B). Receiving research ethics education was also required and I had to receive a certificate from the Collaborative Institutional Training Initiative (CITI) Program after completing the Human Subjects Research course.

Once my forms, application, questions, and certificate were approved by the University of Texas Pan-American IRB, I was able to continue on with my study. The main focus of the study in 2007 was to understand the common illnesses in the area, to record the most common plants used as medicine, and to discover whether they were either bought in the market or harvested from the land nearby. Many people of Casma have a basic knowledge of medicinal plants, but the my more specialized information obtained from a “plant search” guided by a local, from vendors at the market, from a medicinal plant “specialist,” and from an *emolliente*. Most of the plants mentioned were readily available in Peru. These informants were able to provide much of the information presented here, but there was no time to interview a *curandero* or an herbalist at that time.

The project was continued during the summer of 2008 with a few changes from the previous fieldwork. There was more focus on local people who used medicinal plants as daily medication. There were also interviews with *curanderos* and herbalists to better understand the system of healthcare around the area. During both summers a total of 24 interviews were conducted. During the documentation of interviews, my informants

were given pseudonyms. Four interviews were from healers and herbalists. One interview was from an *emolliente* and one “specialist.” There were 18 interviews from local people, and 14 of these interviews included plant searches conducted before or after the actual interview. The duration of interviews varied depending on whether or not they included plant searches. The plant searches were necessary and a main part of this project because they allowed the users to define the native plants used as daily medication and they gave me knowledge of the characteristics of these plants and the environment where they grow. With an idea of what informants with knowledge of what plant they are looking for, took me on a journey through different environments: along the river, across dry sandy areas, into shaded areas with moist soil, and along fields with commercial crops. The methodology was simple. A local driver was hired to take me to visit local people living outside the town of Casma. These locals, mostly women, work in the farmland (*chakra*) and care for their children. The informants were first given a brief explanation of what the project was about and how the interviews would be conducted. Once agreeing to participate and to be voice recorded, they were asked to answer a few questions about their use of medicinal plants and healthcare. They would often agree to give a tour of their land and show me which plants they use for medicines. Most had no gardens nearby where they grew the plants, and only the plants used commonly grew near the home. Therefore we walked a long distances to find some plants. Numerous pictures of each plant were taken for classification/taxonomy purposes. A Canon Powershot camera was used to take both general plant photos and close-up views of distinct plant characteristics to help ensure correct species identifications for the thesis.

Some of the informants were recommended by our driver and others were recommended by local townspeople who know me. The local people who were interviewed were those who use medicinal plants and have knowledge of them. Interviews conducted near town within walking distance were shorter because they did not include plant searches due to lack of open land. However, these informants provided valuable information and showed me plants prepared with alcohol in plastic bottles with alcohol. These plants were collected their garden or potted plants. The interviews without plant searches ranged from 15 to 30 minutes.

In comparing interviews with and without plant searches, it is necessary for me to define the term, "garden." Living close to town requires women to grow their own domestic "gardens", which can be a little patch of land where a variety of plants grow near each other or, more typically can be pots in which medicinal plants are grown. Sometimes both cultivation methods were used to cultivate medicinal plants near the home, with some, as aloe vera, growing from the natural ground such and other plants growing in pots. Most of the plants can adapt well to cultivated land, and it is not unusual to find plants from different environments growing a few meters apart. However, this was occasionally displayed in interviews that included plant searches as well. The reason for this was the distance between home and farmland. For a few interviews, I had to go to visit an informant's cropland to find additional medicinal plants after seeing the cultivated medicinal plant at home. Sometimes the farmland it may be miles away from the actual home located in a small urban neighborhood, and we would have to drive there to find natural garden of medicinal plants.

Most of the plant searches were conducted southwest of a town called Carizal, and most informants who took me on plants searches had their home situated near the cropland. The interviews that included plant searches ranged from around 45 minutes to two hours. The walking distance ranged from a 1/4 mile to a mile radius from the home.

Conclusion

Knowledge of the environment has been a vital survival skill since the beginning of civilization in the Casma Valley. The Humboldt Current not only provides the Peruvian coast with essential resources for survival, it also causes the region to be a dry desert. This dry land, however, has many rivers and fertile alluvial soil to support vegetation. The rivers provide water for irrigation that has been ongoing for thousands of years and has allowed the population to grow and expand into towns along the coast. The town of Casma displays its modernity today. Many shops contain imported name-brand products, pharmacies prosper, internet places allow everyone to enjoy technology and communication as a pastime, and new restaurants are continuously established.

Both within their gardens and especially outside of town, my informants displayed their knowledge of medicinal plants and the local environment. Their focus on plants exhibits a deep trust in them because the plants are their natural medicine. The people in town have pharmacies and clinics nearby, revealing that Casma is also a town of modern medicine. However, based on my understanding of the cultural social ties that local people still have towards traditional medicines, it seems unlikely that modern medicine will ever be the only source of healthcare in the area.

CHAPTER IV

MEDICAL SYSTEMS IN CASMA, PERU

Introduction

Recently many nations, especially developing countries, have considered traditional medicine as economically important and sought after worldwide. According to the WHO Regional Office for the Americas, a high percentage of Latin American countries are still using traditional medicine even after Western medicines have been introduced. Complementary Alternative Medicine is also becoming increasingly popular, worldwide, and today, these practices are gaining more respect by national governments such as the National Program in Complementary Medicine and the Pan American Health Organization. With gaining respect from national governments, various traditional medical practices continue as options in countries such as Peru. Camino described northern Peru as the Central Andean Health Axis because traditional medicinal practices are still such an important component of health in everyday life (Revene, Bussman and Sharon 2008:15). These practices predominate among local and rural people in modernizing towns, but these same people will also chose biomedicines and such treatment from Western medicine practitioners for severe illnesses. Many choices of medical systems are available in Casma to suit the varied needs of the people.

How to approach medical systems can be difficult to understand; however, it is helpful to view medical systems as pluralistic arrangements in which modern medicine, usually dominant, is associated with the other operating medical systems in a society. A medical system is defined as “patterned, interrelated body of values and deliberate practices, governed by a single paradigm of the meaning, identification, prevention, and treatment of disease combining technologies, knowledge, practitioners, institutions, and ideologies” (Bushnell 1993 cited in Sowell 2001:3). Medical pluralism is often evident in regions where there were multicultural encounters or colonializing events. Taking into account these experiences of cultural change allows a clearer view of the resultant hierarchical patterns that are evident and based on factors such as racial, ethnic, class, gender and religious divisions within large societies. Medical systems may be transformed to suit the needs of people in various classes of society. “Pluralistic” medical systems are distinguished from “plural” national medical systems that have an obvious dominant medical system. For example, biomedicines are usually dominant in societies with national medical systems while pluralistic societies have overlapping medical systems.

This chapter attempts to explain why medical pluralism occurred in Andean history. In the sixteenth century, during Spanish colonialization, the intermixing of Spanish and traditional cultural beliefs and practices caused confrontations about the effectiveness of traditional medicine vs. scientific Western medicine. Although scientific Western medicine became “officially” dominant, indigenous cultural and social beliefs were still supported by a larger population. These beliefs included a belief in traditional

medicine that continued due to its cost effectiveness and because it was socially appropriate to most people who reflected their cultural backgrounds.

In describing the theoretical context of medical pluralism in the Andean region, Crandon-Malamud (2003) generated a new approach for anthropological researchers by viewing pluralistic societies' medicine as a reflection of their political, social, and economic powers. This approach reveals the effects of class, culture, and ethnicity in the society. Where there are so many divisions in a society, Western and traditional medicines contribute to each other and overlap to suit the needs of the people in each division. In Western medicine, there is little or no personal association between practitioner and patient. Western medicines and treatments are also more expensive and practitioners and facilities may be difficult to reach due to poor or costly transportation.

This contrasts with traditional medicines which, even today, reflect the close cultural and social associations between patient and practitioner, especially within the family and between traditional healers and their patients. At the end of the chapter, there is a list and explanation of the various medical systems in Casma, Peru. With so many systems, varied healthcare options are available to the people of the town. The list begins with the most local level system, the family level. It proceeds on through traditional healers and herbalists, market vendors, *emollientes* and "specialists," pharmacies, clinics, doctors, and the hospital. The establishment and maintenance of such a complex medical system reveals the people of Casma's concern with the availability of healthcare to everyone.

History of Andean Medical Pluralism

Medical systems and medical knowledge do not happen spontaneously. In the case of many Latin American countries during Spanish colonialization, Catholic healing practices blended with indigenous beliefs and some African ideologies and practices, forming what Sowell (2001:xv) calls a “colonial medical spectrum” that was dominated by Hispanic medicine. Scientific medicine became the “official medicine” while other medical beliefs were generally defined as “traditional,” “primitive” or “backwards.”

Medical pluralism is not a new concept for regions where there was a diffusion of cultural and social medical systems. During the Great Transformation in the nineteenth century, where rationalism and liberalism became predominant with social and political influence in Latin America, medical pluralism replaced the “colonial medical spectrum.” Pluralistic medicine allows patients to seek specific aspects of these medical systems depending on their associated social and cultural beliefs about their specific illnesses. Once the Spanish arrived, many additions to the native medical systems were inevitable and this resulted in the merging of the Iberian and Greek Hippocratic Humoral medical systems with traditional medical systems in developing nations. Also during the development of republics and nations, there was a growth of economic dependence in culture, modern medicine and technology (Pedersen and Baruffati 1985:6). The growth of modern medicine occurred in both urban and remote areas of the region. Nevertheless, once Western medicine emerged, there was actually an increased use of medicinal plants and herbs.

By the 20th century, Western medicine practitioners and industries believed that modern medicine had been incorporated into all systems in order to suit the needs of the

people. However, the purpose of the modern medical industries was to expand health services, to replace traditional medicine, and to gain medical control. These industries attempted to create a market and distribution system for manufactured drugs and other high cost medicines; unfortunately, their influence was not widespread because they could not suit the needs of the local people. There was constant conflict between traditional medicinal ideologies and scientific medicine, but traditional medicine continued to be supported by a large population with associated social patterns that enabled various systems to operate for everyone in society.

Traditional Medicine Cultures (TMC) acknowledge the socially-defined concepts, behavior, and values of their original culture which may become modified or renovated during diagnosis and treatment of illnesses and based on etiology. Pedersen and Bauffati (1985:6) believe healing practices from the Andean region are examples of Traditional Medicine Cultures. In Andean areas, the original medical traditions developed, greatly influenced by ecological diversity, and remained important even in the context of dominant cultural horizons with very advanced political and religious systems (Pedersen and Baruffati 1985:6). Within TMC's social network ties allow local people to obtain knowledge and advice about medicines such as medicinal plants from other traditional health providers. Such cultural medical systems in general consist of medical knowledge, practices, skilled personnel, apparatus, and *materia medica* (Young 1976 cited in Pedersen and Baruffati 1985:5). People grow an abundance of plants on their land and share them among family, friends and neighbors for self-treatment. Many of the practices of TMCs expanded throughout western South America, and today the

consistency in concepts and terms used in the defining of diseases in distant regions reflects the original source cultures.

Theoretical Perspectives on Medical Pluralism in the Andean Realm

The theoretical context of medical pluralism in the Andean region has gone through many shifts from the 1960s to the present. The main conclusion explains that the systems are established by social, cultural, economic, political and global events. According to Miles and Leatherman, in the 1980s medical anthropology began a reformulation of earlier perspectives that broadened the contexts of research and restructured key theoretical concepts such as adaption (Leatherman 2003:7). Crandon-Malamud (2003) set the stage for new approaches critical to medical anthropology.

Instead of viewing medical systems in a geographical and cultural setting, Crandon-Malamud focused on the political economy of health. Inspired by her book, *From the Fat of the Souls*, theoretical concepts are now focusing on medicine as a reflection of cultural identity and the social and political powers that affect behavior, collective experiences, local ecologies, cultural meanings, class, and ethnic groups (Crandon-Malamud 2003, Baer 2003:44, Greenway 2003:93). Baer relates medical pluralism to similar constructs such as class relations and political, social, and economic factors along with conflict, resistance and exploitation (Baer 2003:43).

Although medical pluralism is defined more as the mutual incorporation of modern and traditional medicine, it is also created by competition between Western and traditional medicine. The resultant interrelationship among different medical systems broadens the decision making-model for anthropologists studying the medical choices people make and the different medical systems that run parallel with each other. Janes

(1999:1803) defines the basic principle of medical pluralism as the interaction of indigenous and cosmopolitan biomedicine in local settings, and this principle holds strong in much of the theoretical literature that has been published about medical pluralism globally. Janes' anthropological explanation for this emphasizes two factors. First, in order for a patient to cope with illness, medical systems must confirm diagnosis and treatment that are compatible with local belief systems. Second, indigenous medical resources comprise a much larger 'metamedical' framework, including various medical systems within a society, within which ethnicity, nationalism, rapid social change, and social conflict both resonate with and are expressed through patterns of illness behavior (Janes 1999:1804).

Medical pluralism exemplifies the importance of multiple options for healthcare to local people because transculturation and maintenance of cultural identity can result in conflict with modern medicine when there are no other options for medical systems. Bastien (1987:86) stated that modern medicine has certain elements that articulate with traditional medicine; and, conversely, traditional medicine can contribute to modern medicine by utilizing aspects of Andean culture, economics, and social organization. The capability of "dual use" of medical systems is common around the Andean region. Nevertheless, medical pluralism in the modern world is typically characterized as a pattern in which biomedicine exerts dominance over alternative medical systems (Baer 2003:45). This has been argued as not true, although modern medicine is viewed to have curative efficacy.

According to Janes (1999:1807), medical efficacy within different medical systems is a complex issue that needs to be addressed more carefully. With respect to

biomedicines, medical efficacy is described in narrow medical terms such as pathology; however efficacy has been questioned because biomedicines may not be especially valued in terms of population health. Efficacy is measured by the improvement of the quality of life of a patient. Viewing illness behavior in a medical pluralistic context shows how traditional medicine may be used along with biomedicines to treat chronic diseases because biomedicines may not be effective without the aid of traditional treatment. This shows how the measurement of efficacy becomes complex and difficult to determine within a medical pluralistic context.

Health transitions, on the other hand, as defined by Caldwell, reflect the demographic and socioeconomic changes as well as the epidemiological transitions that accompany development (Caldwell et al. 1990 cited in Janes 1999:1806). The social and cultural consequences of development drive shifts in population and mortality (Janes 1999:1806). Health transitions disrupt the cultural, social, and behavioral factors that maintain effective healthcare; and they also establish a vast new market for both alternative medicines that are readily available and expensive medicines that may be ineffective and/or not easy to come by. Health transitions will continually to provide opportunities for the promotion of biomedicines, however, the existence of divisions in societies based on their varied economic, social and political aspects, has insured continued use of traditional, alternative medicines.

Approaches of Traditional Medical Systems Today

Types of traditional healing used reflect cultural and social values. These values are part of long-term continuing knowledge of healing passed down from generation to generation. This tradition may include religious ideas, symbolic items, incantations,

rituals, and ethnobotanicals. According to Izugbara et al (2005) and Pedersen and Baruffati (1985) there are six main reasons why local people utilize medicinal plants: the locals view medicinal plants as more effective than pharmaceuticals, plants are natural, people using them feel independent, they are affordable and readily available, they are culturally appropriate, and they are appropriate for certain illnesses. Religion also plays a part because some believe that God created nature and humans to exist and live within natural laws. In this scenario humans are able to discover the secrets of nature as created by God, including plants that combat illness (Sowell 2001:89).

According to McKee, in social discourse, the family is viewed as the social group a person relies on first (McKee 2003:133). The family works together to find cures for illnesses before going out of this social circle, and collective medicinal plant knowledge results from the social bond within the family. At the family level, medicinal plants are considered by the health provider, usually the mother, as the first choice of treating the sickness. Medicinal plant knowledge is complex and varies among different regions because it is a variable component process based on local practices and social relations (Crandon 1983:1286). Thus, each family passes down remedies orally that may be different from remedies for the same ailment from a family passed down within a different region. If the treatment is not effective enough and depending on what type of sickness ails the patient, another type of medical system may be considered by a family member.

Some illnesses can be considered more as social illnesses that are caused by forces beyond human control. Considered by local people as the most severe of any other illnesses, many may find ways to prevent these supernatural illnesses from occurring to

themselves and their family. A lot of these illnesses have environmental, supernatural and ecological aspects that require a knowledgeable healer to treat affected patients. Such knowledgeable healers include *curanderos*, shamans, and *yatiri*. As intermediaries between the natural and supernatural worlds, these healers claim to have supernatural authority and social power in curing. In such healing, the healer performs symbolic rituals that involve incantations, songs, and dance. These types of illnesses, as described by Crandon-Malamud (2003), are embedded in social processes and ethnic identity and may exemplify “culture-bound syndromes” (Baer 2003:49). While the belief of these supernatural illnesses continues, the knowledge and use of traditional healing persists as well. The cultural belief that a particular therapy is essential for effective treatment is root of healing. Healing occurs because the sick person believes in the efficacy of the treatment and –often to a lesser extent- because the treatment is effective (Sowell 2001:5). This effectiveness can be the basis of either the cultural belief system or the “placebo effect”. Faith that healers can manipulate the laws of nature or the supernatural to defeat a natural or supernatural defect in the body is crucial for a successful cure.

Traditional healing is what also McKee identifies as, enculturation: the inter-generational transmission of cultural beliefs that foster internal interpretations based on opinions and feelings (McKee 2003:132). McKee connects enculturation to ethnomedical procedures in a cognitive theory. She believes that children’s experiences of cleansings developed their knowledge as an adult about what kind of illness is present and what causes it. The child’s experience acquires a meaning to him or her and instills expectations from the treatment of healing. In this case, the child acquires cultural representations that will become part of his or her belief in illness and treatment. This

observation explains that, not only is information passed down orally, but the childhood experiences of being treated by various traditional methods are also remembered, especially when a treatment proves effective. Within traditional medical systems most people who believe that they or a relative are ill will go to a folk healer before seeking treatment from a medical physician. The cultural representations and interpretations embedded in these cultural models are shared by their intersubjective group; children prepare for their social life in their communities (McKee 2003: 132). In this manner, they access medicinal plants, indigenous medicine and local knowledge before going to health clinics (Browner 1985).

The traditional healthcare systems described above exist along with growing numbers of pharmacies and other modern medicinal options. Nevertheless, the last medical systems that people rely on are modern doctors and clinics. These medical systems may be too expensive and difficult to get to because of poor transportation. Peru opened clinics to help local people who avoid expensive healthcare. Many such clinics were established to bring in modern healthcare initiatives, and they were affordable to the poor. In Peru, the *Comite Locales de Administración de Salud* (CLAS) system was adopted in the 1990s. These clinics function nationwide, but not under a central administration. They are easily accessible to the community, but the people still turn to medical plants and their many folk healers. However, it has been successful in sectors of Peruvian societies where there is a mix income because of its cultural sensitivity and providing basic health needs to the poor. There are many other such healthcare-reform strategies conducted by Latin American governments are still ongoing.

A major reason for local reliance on traditional medicines is distrust due to misunderstandings in defining diseases, illnesses and treatments between patients and doctors. According to Bastien (1987:67), who did ethnographic research on the Bolivian healers of the Kallawaya in the 1970s and 1980s, many doctors and nurses do not understand how Andeans perceive symptoms, disease, and treatments. Bastien explains that the Andeans share and pass down such ethnophysiological ideas as part of their heritage. As practitioners of this social medicine, *curanderos* and other traditional healers speak the same language and share the same culture as their patients. It is also likely that the patient is familiar with the herbs, remedies and rituals performed. This type of medicine binds personal affiliation and works as a local network in contrast to the regional or cosmopolitan network that characterizes the modern medical system. Local systems also persist because of their perceived efficacy and expertise (Miles and Leatherman 2003:10). Acquiring knowledge as a social healer is a slow process involving of casual experience, medicinal and healing knowledge, and the spiritual aspects in the process of healing. Even though the patient may be familiar with the healer's treatments, the healer has more detailed knowledge and practice than the patient.

To improve health in local areas, many modern health practitioners attempt to incorporate modern medicines with traditional medicines. Glass-Coffin reiterated an interesting point contributed by Crandon-Malamud, who once stated that there is a dialectical relationship between social and medical processes in societies where medical pluralism is practiced (Glass-Coffin 2003:234). Glass-Coffin believes that the specific medical systems used place the patient and practitioner relationship in a political and

economic context. Sharing the same cultural context allows patients and practitioners to share similarities, thereby transferring trust to the practitioner.

According to Greenway (2003:93), in order to understand how illness and healing are expressed and to define the conceptions of identity in complex and shifting social landscapes, there needs to be a full exploration of how bodies, suffering, and treatments are integrated into other aspects of cultural reality. As stated by Frank Young, there needs to be a mutual understanding of both types of medicines and not just the addition of information to each in order to make changes (Young 1968 cited in Bastien 1987:78). This is supported by Levi-Strauss in *The Savage Mind*, when he states that items of information fit into structural-cognitive systems with underlying assumptions and premises and that there is a basic logic to cultural and symbolic systems (Levi-Strauss 1966 cited in Bastien 1987:78). The conversion of information is only possible when there is an understanding of the cognitive thought patterns within the system of traditional medicine. An analysis of the integration of traditional and modern medicines reveals an understanding of cultural aspects along with the implementation of a cost effective way for people to choose different types of healthcare: traditional, modern or both (Miles and Leatherman 2003). However, concerns about the clinics suggest that this integration leads to the idea that traditional medicine is a static system. However, it is very complex and dynamic, involving many medical techniques; and its patients and practitioners do not focus on one medical system. The term “interrelationships” should be used in the model of medical pluralism because, according to Madge (1998), both types of medicines function alongside each other; and the use of modern medicines does not change the local cultural ideology. Today, both rural and urban areas participate in a

mosaic of medical systems that suit the different needs of different classes. With the various choices of medical systems, people freely choose their type of provider from the varied choices of medical systems available, and they are not under any policies that force a choice. People can turn to traditional healthcare when modern healthcare is ineffective and vice versa, but there is still a division based on from social, political, and economic relations to deal with when choosing systems with biomedicines.

Brief Overview of Casma Medical Systems

Since most of my informants were originally from other areas in the Andean region, many cultural ideas migrated with them into the Casma area. Glass-Coffin (2003:235), who has published much research on folk healers on the coast of Peru, described two factors that are critical to the existence of traditional folk healing on the coast. First, immigration to coastal cities caused a shift from an economy that was previously based on family-based subsistence farming to a wage-labor economy that focused on one individual rather than the entire household as the income producer. Second, low economic production caused competition between industries and service sectors that in turn resulted in overexplored resources and poverty. In Casma, agricultural work is economically valuable; and this occupation was frequently cited by many of my informants.

Modernizing today, the town of Casma is known to be a migration town where many people from different regions of Peru can to stay and conduct business temporarily. This town displays various cultural behaviors and, of special relevance for this research, many different types of healthcare systems. Some of these various health systems in Casma were simply observed during the medicinal plant research, but they deserve

mention in this thesis. Viewing the system as a whole helps explain and give context to reasons why traditional medicine exists in a modernizing community. The study also describes how these traditional health systems integrate during modernization.

Because my research focused on medicinal plants, most of my observations were centered on the local level. However, brief narratives from local people informed me of their concerns about certain modern medicine influences, and these concerns helped me become aware of various systems of healthcare available around town. When I use the term “local level”, I am describing the healthcare practices of the family, folk healers, market vendors, and *emollients*. These four fit within the definition of traditional medicine developed by the World Health Organization which focused on traditional practitioners and local knowledge. The term “traditional medicine” encompasses a set of medical techniques that have large ties with cultural beliefs. Modern medicine lies at the opposite end of the continuum, and there are many levels in between. These levels are described below starting the level of traditional medicines and ending with modern medicine. During my research, I was able to study these specific systems, however, the systems listed below should not be seen as separate or static because there is much overlapping. Dividing them into groups can be difficult because more than one system can be consulted by patients for their illness. I list them to show that there are many health systems, not to show that they are used separately. Patients do not follow this order all the time and may, in fact, go in reverse from the order of list as I will explain below. The following sections give a brief description of what was observed during the research, revealing the existence of medical pluralism inside and outside of Casma. Table 1 provides an overview of medical providers available in Casma and their

operational characteristics. It shows differences in medicinal plant use between traditional medicine and biomedicines, whether the plants used are collected or purchased, differences in the nature of compensation, and differences in the dependence on medicine based on nature of ailments.

Family-Level

This domain of healthcare is the primary focus of the research. Most of the interviews that were conducted involved local women who had more than one child and described their occupation as homemaker and farm laborer. They care for farmlands and tend to domesticated animals while being the prime nurturers of the family. They were helpful in providing information on the most common medicinal plants growing around their land. I examined the uses and preparations of medicinal plants as well as where plants can be found near local households and elsewhere on people's lands. Much family-level healthcare relies on medicinal plants for common illnesses without going to another medical practitioner. Medicinal plants are readily available for daily use by local people and are less costly.

After a brief interview, each individual gave a tour of their land to point out the plants they use as medicine. Because farmlands can be large, the informants usually pointed out plants that grew within a half mile radius of their home. The informants provided a brief description of how each plant is prepared, the ailments the plant treats, and their reasons for using the raw plants as medicine. Many informants trust these plants to work effectively because they are natural, and because they trust the plant knowledge passed down by relatives from generation to generation, documenting the long-term use of these plants to treat illnesses. Some informants see this knowledge as

more common sense, resulting in the simplest and most common response to the question of why use native medicinal plants: “If it worked before, it will work again.”

Most of my informants moved to the Casma Valley from the highlands at a young age but they are old enough to remember old natural remedies. Many of the plants mentioned and cultivated in the coastal area were from the highland regions. With such a large number of plants used as medicines, it would be difficult to describe each one and report where each is commonly found because anyone can buy plants in the market, including species that are harvested from distant Andean and jungle regions. Many of the local rural people knew about plants that grow on their lands whereas people who live and work in town knew mostly about plants sold in markets or promoted on national flyers such as the suddenly-popular *noni* which is now widely marketed as herbal medication. My project focuses on five common plants used as medicines that are readily found on local people’s land. This research is both to point out the native use of medicinal plants based on knowledge passed down from generation to generation and to demonstrate how important this information is to future medicine researchers who explore the plant world for new healing agents.

The traditional use of medicinal plants in coastal Peru is an essential part of people’s lives. Many responses from informants described how the plants came from the earth that all life is connecting to naturally. The term “natural” can best be understood by how the informants describe it. It was defined variously as “pure,” “clean,” and “something that can do no harm in moderation.” Herbal medicine is different from pharmaceuticals because pharmaceuticals are man-made; and, instead of curing, the component chemicals relieve the pain or irritation whereas folk healing and medicinal

Table 1: The Present-Day Medical Providers in Casma

Providers 1	Medicinal Plants		Herbal Medications 2	Pharmaceutical 3	Compensation 4		Curative	Prevent	Nature of Ailments 5		
	Obtainment	Purchase			No Char.	Donat.			Set Fee	Common	Mild
Family level*	X	X	X	X	X	X	X	X	X	X	X
<i>Cuaranderos/Herbalists</i>	X	X	X	X	X	X	X	X	X	X	X
<i>Emolliente</i>		X	X	X	X	X	X	X	X	X	X
Market Vendors		X	X	X	X	X	X	X	X	X	X
Pharmacy											
Local doctors/clinics											
Hospital											

Sources: Informant interviews and observations around Casma.

- 1 The providers are ordered from the local traditional level (top) to providers that require modern medicines (bottom).
- 2 Those who sell or use herbal medications for treatment.
- 3 Allowed by all systems as part of treatment. When used for self-treatment in family level, it is for mild to severe ailments.
- 4 Payment asked by providers for treatment.
No Char. = No charge.

Donat. = Donations accepted as payment, but no payment is required for treatment. The decision to give a donation is made by the patient.

Set Fee = A set amount of payment is required, depending on the extent of service by providers.

- 5 Local level treatments used for common to mild sicknesses. Consideration of modern medicines occurs when illnesses are mild or severe.

Common = colds, headaches, coughs, gastrointestinal complications, etc.

Mild = fevers, inflammations, pain, etc.

Severe = unknown diseases or illnesses, severe diseases, pregnancies, severe pain, *susto*, *mal aire* etc.

* Family-level healthcare uses medicinal plants for common illnesses before considering other options for healthcare. They can move along through each level in the system voluntarily until there is a solution for healing a family member.

plants do the curing. As a result of being man-made, there are chemical additions to pharmaceuticals performed in labs. In contrast, people see plants grow with just soil, sun, and water and naturally proceed through life stages in the manner that everything develops in nature.

During some interviews and tours around the lands, I began to notice that the children of my informants would follow us with such curiosity and that the young adults would express some knowledge of these plants and relate their experiences using them. During one interview, an informant's daughter around the age of 20 pointed out many more plants saying, "remember mom, remember what this plant was for?" as she happily gave the answer herself. Some of these plants were not medicinal in the strictest natural sense. Rather, some could also be used in supernatural folk healing by the mother if she had knowledge of treatments such as sweepings or *limpias*. Many families rely on the mother to provide treatment for both types of illnesses, but if they cannot treat the illness, the mother or a few times the father will seek help.

Traditional Healers and Herbalists

Each healthcare system has basic forms of healing of the described above where sicknesses are self-treated or treated with help from family members. However, individuals will also seek healers outside the family who provide diagnosis and treatment. When being asked about medicinal plants, my informants would often mention plants that are used in treating supernatural folk illnesses such as *susto* or *mal aire*. Dealing with these ailments require a healer with much knowledge and experience in how to apply and perform treatment. There are many *curanderos* around town, and mothers will usually take their children to *curanderos* before or after visiting a modern medical

practitioner. These traditional healers are major providers for local people because the patient shares common knowledge with the healer including familiar technologies and herb uses. They play an important role in healthcare around Casma even as pharmacies, clinics, and herbal medicine stores expand around town. In this context we can see how the people construct their own compatibility with respect to healthcare and also how this compatibility structure can shift along with changing medical systems.

Found both inside and outside of town, the healers and herbalists require a fee or accept donations. Both men and women may acquire the knowledge of healing from an older relative, and for them folk healing becomes a second occupation. Folk healing uses many props-from natural plants to religious objects-because the practitioners do not secularize the process of healing. Religion and healing are socially infused, and many spiritual objects are used in rituals so the healer can interact with supernatural forces to promote healing. This type of holistic healing is usually performed at the healer's home in a special room that has *mesas* (healing altars) laid out for treatment.

An herbalist, on the other hand, may collect plants from the land, but often goes to the market vendors to buy dry plants imported from all around the country. They usually boil plants into a tea and add other substances such as honey and sugar. Both types of healers use curative and preventive medicines. An herbalist may give advice to the patient about how to avoid further illnesses and may provide preventative medicines that the patient can prepare at home.

Market Vendors

Casma's commercial herb vendors are located in the center of a large market place in town. Side by side the vendors set up their establishments with dried herbs

transported from the larger towns such as Lima and Cajamarca, herbal tonics produced within Peru, and international herbal medications. Each vendor displays about 40-50 species of dried plants. Most plants sold in Casma come from the highlands (*sierra*) and the jungle (*selva*). There are many packets (*paquetes*) and bundles (*bultos*) of dried herbs from Peru that serve the specific purpose of healing a certain ailment. These prepackaged units can be used either as curative or preventative medicines.

Market vendors are important health providers because, not only do they provide medicines, but they are also frequently asked for help by patients when they are in need of proper medicines. Vendors have knowledge of the products they sell and are trusted by their customers. The patient will explain to the vendor their symptoms and ask for a cure. Vendors also provide medicinal herbs to herbalists and folk healers to treat “magical” or psychosomatic ailments such as *susto* (fright), *mal aire* (evil air), *envidia* (envy), and *daño* (damage). They sell these medicines and provide various objects used to perform folk healing treatments such as sulfur blocks, rusted metals and magnets, small good luck charms, *ekeko* statues, and perfumes.

Market vendors continue using their knowledge of medicines in their own household as well. One vendor explained to me that she cultivates medicinal plants at her home and that her land is covered with plants used as daily medication. Their knowledge of the products, especially medicinal plants, is shared among their family members. Two informants worked along with their daughters who also usually help when the mother is working at home. Mother and daughter explained that they grow medicinal plants at their homes that are within a two hour’s drive from town.

Emollientes and “Specialists”

During the summer of 2007, a classmate who traveled with me fell ill; and a local co-worker immediately suggested we visit a nearby *emolliente* for consultation. Not knowing what he meant, we followed along because, for my friend was searching for any alternative treatment for his illness since pharmaceutical medication had not proven as effective as expected. As we walked to a busy street corner, it was not hard to find this *emolliente* because there was a crowd of people surrounding the cart for treatment. We watched him prepare his tonics, taking no more than ten minutes to serve each customer. He asked my classmate what ailed him and began to whip up the remedy using various watered-down plant extracts. My classmate who was given a hot tonic to drink down immediately, then handed back the glass, paid the *emolliente* and walked with me back to the *hostal* where we were staying.

This was the first time I was introduced to the *emolliente*; and, based on the sight of the large crowd of people I saw then and again during my study in 2008, I knew the *emolliente* must be considered as a health provider. If it were not for my co-worker and my sick friend, I would never have known about this health provider. There are not many literary sources that mention the *emollientes* as health providers, but they are well known among the local people who highly recommend them. Because so little is known about this type of health provider, their treatments could easily be seen as ineffective by people who had never before met an *emolliente*.

When we were walking to the *emolliente*, our co-worker mentioned that sometimes people go to the pharmacy and buy an aspirin to take along with the tonic to relieve stomach problems. The *emolliente* allows this but is careful not to use powerful

plant extracts that may contain similar chemicals as the pharmaceutical drug or cause a reaction to it. An *emolliente* concocts many different tonics using extracts of many plants. He or she will usually start by preparing a raw aloe vera plant by extracting the slimy substance from inside the leaf. This substance is placed in a glass and stirred rapidly to liquefy the mixture. Depending on what the ailment is, the *emolliente* adds many other plant extracts. Encountered frequently in coastal towns such as Casma, Trujillo and Chimbote, *emollientes* have formed a localized system of healthcare for curative and preventative medicines; and they usually require a small fee.

The term “specialist” refers to practitioners who have their own clinic where they run their business the same way as the *emolliente*. One informant self identified as a “specialist,” and I decided to keep this term to make the distinction between this health provider and the *emolliente* because *emollientes* run their businesses on small carts that displays the tools and plant extracts needed for healing. *Emollientes* move among various locations around town and can be found on most main street corners by late evening. The specialists have a concrete building where customers enter to get their treatment and where they can make appointments. The customers have much faith in the *emollientes* and specialists because they prepare the tonics directly and they know much about the plants with where work.

The Pharmacy

Around the main part of Casma, there are a cluster of pharmacies containing many types of modern medicine and over-the-counter drugs. These pharmaceutical drugs exhibit labels from a variety of companies revealing the widespread distribution of modern medicines. Residents arrive there to ask the clerk what medicines they would

suggest for a certain illness. Some store owners also provide and perform injections if needed. In this case, pharmacies can be seen as reliable modern-day health providers, but they cannot be identified as a replacement for the practice of traditional medicine.

Instead, to make healing more effective, pharmaceutical drugs may become one part of the treatment in all medical systems. Because of the naturalness of traditional treatments, there are concerns about overdoses when biomedicines are taken. For example, the *emolliente* may ask customers if they have taken any pharmaceutical medicines before mixing their tonic. Even *curanderos* may add a certain pharmaceutical drug as treatment during the healing process thereby making it an essential part of holistic treatment.

Pharmacies do not pose much of a threat of overdose to people because the sellers usually only allow a certain amount of medication to a customer depending on the severity of the illness. The customer can get advice about a helpful drug and then buy it in only a matter of minutes; therefore, this healthcare seems positive. However, some informants worry about the side effects these drugs may cause, especially on the liver. Many informants would take pharmaceutical drugs to be cured along with medicinal plants to ameliorate the side effects. People often go only as far as the pharmacy in using modern medicine because at this level they are still self-treated. Then, if the drug does not work, they may go back to seek more helpful plants or advice from another healer. For others, pharmacies are costly; and patients consider pharmaceuticals only when they contract an illness that cannot be cured within the family by medicinal plants or by traditional healers.

Recently, a few commercial herbal medication clinics have opened in Casma. Although no interviews were conducted in this medical system, it needs to be mentioned

for future reference. The herbal medications sold are not similar to the ones sold by the market vendors, rather, they are new company products that are distributed as medications.

In Casma, pharmaceuticals are relatively popular, but are usually taken along with alternative traditional treatments for mild illnesses. It was quite difficult to find a position for this medical provider in the table. I put it between traditional medicines and modern medicines because of its role as a mediator in the health care system. Those who do take pharmaceuticals usually consume them with traditional medicines such as medicinal plants or during folk healing to make curing more effective.

Clinics, Doctors, and Hospital

Inside the town of Casma, there are many clinics and one hospital that perform treatments using Western medicine. A few clinics in Casma are staffed by practitioners from other countries who help treat residents. Although I did not do any detailed research on these clinics or the hospital, I mention them because they are health providers and during interviews there was a very brief mention of them. The topic came up in these interviews mainly as part of explanations about why each informant uses medicinal plants and distrusts modern medicine. Some informants were able to describe negative personal experiences with clinics as well. Other informants relayed information from neighbors and friends about the ineffectiveness of these clinics. They mostly disagreed with the methods used by the practitioners in the clinics, and the hospital and its personnel were viewed the same way. Another reason why local people do not choose modern medicine is the high cost of medical care and the difficulty of obtaining transportation to access

these services. Nevertheless, when uncertain or severe illnesses occur, many people do consider going to a clinic or hospital for diagnoses and curing.

Many informants indicated that there is not a strong incorporation of both modern and traditional medicine, but I did not collect much information about this. There needs to be further study of the clinics and hospital in order to analyze how the incorporation of both medicines and modernization affects the medial systems in the area. To go even further with this idea, more information needs to be collected about the local viewpoints of practitioners around Casma and their cultural relationships with each other. Understanding the respective medical practices of different cultures can forge a social bond between modern and traditional medicine. Until that happens, the local peoples' many concerns with biomedicine and practitioner sensitivity have resulted in a revitalization of traditional medicines, especially the use of medicinal plants.

Conclusion

It takes many centuries for a complex pluralistic society, including a pluralistic medical system, to be established. The study of medicinal plants exposed the related political, economic, cultural, and social infrastructures of the associated society. Informants not only document the continued use of natural medicines but also give understanding of the larger socio-political economic behavior around the area. Crandon-Malamud's definition of medical pluralism has provided the larger picture of how medical systems fit groups of people divided by class, ethnicity, politics, economics, and gender. Many definitions of medical pluralism suit the pluralistic society in the town of Casma, and my brief descriptions of the components of this medical system allow an understanding of how and why people in the area choose their specific methods of

healthcare. The descriptions also expose cultural and social relationships among the community members and how these relationships have a great impact on people's choices of healthcare systems. As modernization continues in town, new types of biomedicines more associated practitioners may be introduced; however, if immense social divisions continue among the people, traditional medicines will also persist as a major healthcare system. The long-term knowledge and experience associated with homeopathic and popular traditional medicines enable them to persist, usually in the household. Such domestic medicines, as popular medicines, represent an immediate response to healing, and the associated *material medical* has grown to a large pharmacopoeia that treats illnesses and occasionally associates with scientific medicine.

It cannot be emphasized enough that in Casma, medical systems cannot be studied without using an integrated approach. What needs to be noticed is the fact that new biomedicines have become a structural and cultural part of the traditional medicine that is still used more often. Traditional medicine systems are clearly not going to disappear because the economic factors and conflicted social positions that support them are unlikely to disappear. Throughout the country of Peru, traditional medicinal plants have become more public as they appear in markets and are transformed into herbal medication. The use of these medicinal plants shows how the people culturally associate their plants to ailments in ways that reflect the incorporation of both Spanish colonial influences and Andean humoral concepts into their ethnophysiology.

CHAPTER V

ANDEAN BODY CONCEPTS AND HIPPOCRATIC HUMORS

Introduction

The previous chapter presented a variety of medical systems in Casma. This revealed that the continuation of traditional medicines is based on strong cultural and social ties between the people and their traditional medicine. This chapter takes the medicinal plant study in another direction. Looking even deeper into the local knowledge of medicinal plants revealed broader cultural concepts seen in many Latin American countries. An example of this is the “humoral pathology” which determines bodily temperature equilibrium. Also known as Hot-Cold syndrome, it marks the qualities of certain foods and medicinal plants as a reflection of their temperature and environment. The qualities, usually hot or cold, of a medicinal plant are used in “binary opposition” to the illness. This classification can be seen in the labeling of Casma foods and medicinal plants that are reported to have these qualities. In Chimbote, north of Peru, for example diarrhea has both hot and cold qualities so a person must avoid drinking cold beverages, eating cold foods, and bathing in cold water even when the summer is hot. Such beliefs showed that the people are careful about what they eat, consuming only foods that are sensible with respect to the hot/cold dichotomy. Wet/dry qualities can also be part of the humoral system, but this distinction was not observed in the Casma area.

The Spanish constructed their main settlements along the coast of Peru, incorporating much of the local population and forcing acculturation throughout their period of influence. Many cultivated plants were brought from Europe during Spanish colonial times, and this introduction of plants contributed an important pharmacopeia. It is common to see cultivated European plants used to heal Andean diseases. One example is the common use of *ruda* (*Ruta graveolens*) to treat *mal aire*. It is likely that Spanish influence impacted indigenous Andean medicine in other ways, and the Spanish may have introduced the humoral concept which merged with aspects of indigenous Andean religion. In pre-Columbian times, religion and healing were closely connected, and Bastien states that the Andean natives had already humoral concept based mostly on nature and the motions of body fluids. He states that their concepts were so similar to the Greek humoral concept, it was easily incorporated into traditional Andean medicine (Bastien 1987, 1989). Spanish medicine at the time of the Spanish conquest was based on classical Greek and Roman practices. The informal and formal contacts between the Spanish and the native people of Latin America formed Hispanic American culture (Foster 1953:201). Customs relating to folklore, music, everyday living, and particularly medicines were modified in both cultures.

This chapter introduces two concepts of the humoral medicine practiced in Peru. Many of the people in the Casma area express their feelings about natural plant medicines in terms of being one with the earth. They also use plants that display hot/ cold qualities and observed humoral concepts when conversing about the pathologies treated with plants. This use of humoral concepts, commonly seen today, was also observed in Peru in the past:

The common people, both along the coast and in the sierra, maintain the old classification of foods and medicines as *hot* or *warm*, and *cool* or *cold*, this classification being the reason they recommend, for each illness, foods and remedies of a state opposite to that of the illness: if it is a fever *warm* medicines and foods will be absolutely prohibited, and if it is pneumonia, this prohibition will apply to cold foods and remedies (Valdizán and Maldonado 1922:I: 102 cited in Foster 1994:xv).

The incorporation of both the Spanish humoral and Andean concepts was possible due to various similarities; however, there are some differences.

Revealing Concepts of Ethnophysiology in the Study

The medicinal plant research not only resulted in a list of local plants commonly used as medication; it also revealed a backdrop of ethnophysiology. In a modernizing town like Casma this background can be weakly expressed and easily overlooked but fortunately, a few informants revealed their trust in medicinal plants as natural medicine. Most informants state that plants, like humans, are from nature and link to the earth as a whole. Certain plants are put on earth with healing as the major purpose; and humans, animals, and plants all have cycles of life to death. Such intense answers revealed the mutual respect between people and their environment even though *Casmeños* do not seem to have rituals dealing with symbolic items given to the earth.

Medicinal plant descriptions display a hint of humoral body concepts. During the study of indigenous medicinal plants and folk practices, informants' concepts connected some plants with the humoral classification based on their large knowledge of folk beliefs about the nature of health, causes of illness, and curing techniques, a body of knowledge that is made up of Andean concepts and Spanish ideas about folk healing. A main concept is the idea that traditional medicines and foods are characterized by hot and cold qualities. Medicinal plants are usually seen as having cold qualities to oppose hot

illnesses. Hot illnesses are mentioned often when describing the ailments a plant treats. The most common concerns among the informants are infections or inflammations of the kidneys and liver and the presence of too much heat in the stomach. This heat causes diarrhea and gastrointestinal problems. It is considered serious if too much heat travels throughout the body because it may cause damage to organs. Peruvian potatoes, of which there are various indigenous types, are considered to be cold and are used to heal headaches, diarrhea, warts, rheumatism, erysipelas, and the liver. Conversely during a plant search I was introduced to a plant called *hierba luisa* (*Cymbopogon citrates*) which is known to warm up the body when an individual has a cold.

Greek Humoral Theory

During the sixth century B.C., Ionian philosophers announced that the world consists of four elements: fire, water, earth, and air and this concept was applied to human physiology. The philosophers believed that four humoral fluids flowed within the body in a balance: blood, phlegm, yellow bile, and black bile. Each was believed to be marked with certain qualities: blood-hot and moist; phlegm-cold and moist; yellow bile-hot and dry; black bile-cold; and dry that all must be in balance to insure good health (Bastien 1987:45). This ideology was popularly practiced and passed down by practitioners. After it was adopted by Hippocrates around 460 B.C., many of these practices and doctrines were published in books that were reprinted several times. This humoral classification was first modified by the Greek culture in the Old World and later adopted by the Spanish. The Spanish had arrived in the New World with this concept; and, according to Bastien, it was incorporated into Andean medicine because it was similar to the indigenous Andean humoral concept.

Under this humoral system, treatment was characterized by being warm, cold, dry, and/or moist. This medical practice viewed everything from individuals, foods, illnesses, and medicines as having their own complexion. The heart, liver, and brain were the most important organs and typified these complexions. Selection of medicine plants was governed by the principle of binary oppositions. Although having an excess of heat and moisture characterized a normal body, the balance within the body could vary depending on the individual. By understanding the complexion of the patient and the patient's illness, treatment could be based on bringing balance to the body through diets, purging, vomiting, bleeding, cupping, and/or internal medicines (Foster 1953:203).

The Mountain/Human Metaphor

Bastien's fieldwork on ayllu Kaata reveal the symbolism of the vertical land mass of the mountain (*ayllu*) to the human body. The Kallawayá communities he studied are located throughout Bautista Saavedra province in the Bolivian highlands. The Kallawayás look to the land and water in order to understand their physiology (Bastien 1987:67). The wholeness of the environment is reflected in their body concepts as a system that has deep social and cultural significance. They are settled among the three zones of the ayllu: high, central, and low ecological zones. In the area of ayllu Kaata, three major communities work together to provide produce and exchange the proper nutrients needed for each community. Niñokorin is the lowest ecological zone and produces corn, wheat, barley, peas and beans. Kaata, the central zone, produces *oca* (*Oxalis crassicaulis* Zucc.) and potatoes. In highest zone community, Apacheta, people herd llamas, alpacas, and sheep. The Kallawayá perceive the mountain as the locus of a cyclical system where humans, plants, and animals follow the continuous pattern of life

and death and undergo the transformation through death to life. After death, the body is returned to the head place (*uma pacha*) at the top of the mountain. The body is viewed holistically by the Kallawaya as moving by centripetal and centrifugal forces. These forces circulate the fluids that comprise emotions, thought, nutrients, and lubricants throughout the body. These body concepts of the Kallawaya are not universal within the Andes, but they exhibit certain structural similarities to ethnophysiology concepts in other Andean regions (Bastien 1985:596).

The Kallawaya body concepts find similar qualities between the Andeans and their environment, especially the mountains. They characterize the three ecological zones of ayllu Kaata, centrally located in the province, as a human body. The land mass levels relate to the parts of the body. The high zone is the head (*uma*), eyes (*nawi*), and mouth (*wayra*); the central zone represents the stomach (*sixa*) and the heart (*sonco*); and the low zone forms the legs (*chaquis*) and toenails (*sillus*) (Bastien 1987:68; 1989:45). All these three zones are connected by rivers, underground streams, and tunnels that link the zones together. “Sickness” occurs when there is a breakdown of the body that is analogous to a disruption such as a landslide on land. To restore the total health of a patient, a diviner must feed the mountain through rituals at the ayllu shrines.

The Intermixing of Concepts

Indigenous Andean people respect the environment and perceive themselves as closely related to the environment, and they allowed the incorporation of Spanish folk healing practices. This exchange of folk medicine beliefs and practices between the Spanish colonists and the indigenous people helps us to understand the origins of some of the folk medicines in Peru. Today, half of the herbs that were introduced and cultivated

by Spanish authorities 500 years ago are still used in Spanish America. The geographers and natural historians arrived to discover and classify new flora and fauna. The indigenous pharmacopeia was recorded along with the associated notions of hot, cold, wet, and dry. The Spanish were interested in indigenous pharmacopeia, and the Spanish incorporated it into their humoral classification. According to George Foster (1953:204), the increased reliance on traditional medical beliefs and practices resulted from the lack of doctors, priests and other educated individuals who were usually called upon to help the sick. Local people began using guides to produce home-made medicines, and these guides incorporated Spanish beliefs and curing practices which became knowledge passed down from mother to daughter.

Formal medical training in Peru was based on Western medical concepts of Hippocrates, Galen, Avicena, and other authorities of Classic and Arabic periods. These Hippocratic treatments expanded the growing pharmacopeia in Latin America for treatment. However, the lack of trained medical doctors and the widespread belief on native cultural curing by the natives and *mestizos* resulted in a blending of Spanish medical practices and folk practices of indigenous people. According to Foster, the result is a well-developed and flourishing body of folk beliefs about the nature of health, causes of illness, and curing techniques that combines native American, Spanish folk, and classical medical elements (Foster 1953:203). Folk medicines overlapped with Western formal medicines, but in the New World, the folk medicines seem to have prevailed intact.

Foster believes that Spanish-American folk medicines are homogenetic from Mexico to Chile (Foster 1953:204). The approaches to health and sickness, causes of

disease, folk illnesses with the same names, and the same treatments can be seen in distant places in Latin America. Within these approaches, ideas of hot and cold qualities prevail while wet and dry distinctions have faded or disappeared. A middle or “temperate” quality is sought, and treatments require adherence to the “principles of opposites.” For example, a cold illness requires a hot remedy and vice versa.

A majority of medicinal herbs that prevailed in many regions are classified as “hot.” Old World “hot” plants that the Spanish brought from their native land and cultivated include garlic which was used for numerous ailments, balm gentle (*toronjil*), aloe vera (*sábila*), rue (*ruda*), rosemary (*romero*), oregano, pennyroyal (*poleo*), sweet marjoram (*mejorana*), mallow (*malva*), dill (*eneldo*), lavender (*alhucema*), and artemisa (*altamisa*) (Foster 1953:207). Among the cold plants are plantain (*llantén*), sorrel (*acedera*), and verbena (Foster 1953:207). All these plants are still used today. This shows the deep impact of Spanish medicines in the New World and how the humoral concept was easily adopted by the indigenous cultures and it became more significant in the New World than in Spain. Throughout the New World, Peru and Chile were most impacted by Spanish folk medicine. Foster does not believe that or there are not enough data to reveal if American folk medicine influenced Spain. However, the potato, prickly pear cactus, and other New World plants were widely sought after in Europe.

In Peru *Susto*, witchcraft and other emotional experiences are believed to cause sickness. In response the shaman and *curanderos* use curing techniques such as herbal remedies, emetics, enemas, sucking, massage, calling upon spirits, and the like (Foster 1953:203). Traditional healers in Casma also practice Andean rituals such as guinea pig (*cuy*) and cocoa readings to reveal the patient’s ill health, fortune, and treatment. The

Andean illness, *mal aire* is common and treated with special care because it deals with forces beyond the obvious. *Mal aire* (bad air) is also most frequently mentioned in Peru. Some forms of *aire* must certainly be pre-Conquest in origin, but other aspects of modern belief appear to stem from the Hippocratic concept of hot and cold (Foster 1953:209).

Classifying Pathology

In the Bolivian Andean region, medical pathology has been categorized as “hot” or “cold” or consisting of cordial diseases. Hot diseases consist of fevers, liver and kidney inflammations, plague, and toothaches. Liver complications can be caused by many conditions such as excess alcohol consumption and consuming many fatty, greasy foods. These conditions do not allow the liver to excrete enough bile for digestion. This lack of bile can result in piercing pains that signal irritability and possible bile duct build-up of fats that can stop circulation. According to Bastien, an herbalist prescribes cold herbs such as *berro* (watercress) and *khanapaco* (dandelion) to relieve liver distress (Bastien 1987: 48). Another hot disease is kidney infections. Kidneys work as filters to produce urine, and the blockage of urine causes the kidneys to be inflamed. Cold herbs such as *berro* (watercress), *cola de caballo* (horsetail), and *llantén* are used for treatment.

Cold sicknesses are believed to be caused by cold climate, cold wind, or the consumption of cold foods or drinks. The illnesses are classified as cold are colic, coughs, bronchitis, colds, pneumonia, tuberculosis, and rheumatism (Bastien 1987:49). Cold wind is also believed to cause *mal de aire*. Hot herbs are used for treatment, especially herbs that cause perspiration such as coca and *eucalipto* (eucalyptus). Many people take precautions to avoid cold air or winds due to the risk of being ill. Once cold air hits the body, it becomes rigid; and muscles aches can make the body’s joints and

bones feel as if they are frozen (rheumatism). The temperature plays an important role in health. Frequently changing temperatures can cause sickness. A warm body can be disrupted by a cold wind, and an Andean herbalist then prescribes warm herbs such as *ruda* (rue) or *amor seco* (*Bidens pilosa* L.) to lower blood pressure. Cold wind chills can trigger rheumatoid arthritis among the elderly. The inflammation in the joints becomes a hot sickness that is treated with cold herbs. According to Bastien, many herbalists also use herbs with alkaloids for noninflamed rheumatism (Bastien 1987: 51).

Among Andean groups, urinary diseases are considered to be cold sickness. Burning urination and inability to urinate are usually treated with *llantén*, *cola de caballo* (horsetail), and *khanapaco* (dandelion). Most common of all cold sickness is colic which links to the gastro-intestinal tract. There are many kinds of colic, and Bastien identifies three main series of colic: *Cólico biliar* is due to calcium deposits in bile ducts, *Cólico miserere* is associated with appendicitis or obstruction within the intestines, and *Cólico ventoso* is the accumulation of gas in the stomach and intestines. Influenza (*la gripe*) is another common cold illness that can become severe due to the post-symptoms such as weakness and pneumonia.

Cordial sicknesses are temporary and neither hot nor cold. Examples include temporary headaches and eye sores. Eye irritations or sores are usually diagnosed as conjunctivitis caused by dust, dirt, or smoke in the eyes. Such temporary illnesses are mostly treated by simple medications in the form of plants or pharmaceuticals. Overall, people will also consume healthy fruits and vegetables so that their illness does not become a long-lasting chronic sickness.

Kallawaya herbalists classify sicknesses and medicinal plants more according to empirical effects of hot/cold, and wet/dry, rather than based on their correspondence to symbolism and consistency of the conceptual system (Bastien 1989:49). Hot sicknesses correlate with high fevers and inflamed muscles. Cold sicknesses are linked to debility, immobility, and respiratory complications. Wet sicknesses are diarrhea and hemorrhaging. Dry sicknesses are associated with symptoms of thirst. Hot herbs are usually stimulants, irritants, and rubefacients while cold herbs are refrigerants, calmatives and febrifuges. Wet herbs are emenagogues and lactagogues. Dry herbs, areglutinous plants, are used for setting bones or drying wounds. These classifications follow the qualities of symptoms and the effects of plants.

Similarities and Differences of Both Concepts

The Andean humoral system and the Greek humoral system focus on health as an analogy of nature. The Greek humoral concept reveals that philosophy and science are the explanations of the functioning of the universe and suggests that the body had similar components to this universe. The various body fluids, emotions, personality types, seasons, and sicknesses were categorized by the four humoral elements (Bastien 1987:45). The Greeks believed that the body fluids were at a balance with environmental and social factors (Bastien 1989:47).

Andeans also perceived a relationship among geology, climate, and human physiology with the environment. Unlike the Greeks, Andeans viewed the similarities between body and universe in terms of a cycle formation instead of balance. They focused on the hydraulic system that is based on the cycle of fluids, semifluids, and secondary fluids that are to intermix and be constant. The stopping of this intermixing of

fluids, blood circulation, or eliminating of waste products causes disease (Bastien 1987:46). The aspects of hot/cold, dry/wet impact the fluidity of the cycle. The Kallawaya understand that the body fluids are related to the *ayllu*. Also unlike the Greeks, they believed the body fluids move in centripetal and centrifugal motion within the body and the *ayllu*. The closeness to systems of nature and the analogical thinking about the universe corresponds within the Greek and Andean culture, however there are also differences that lead me to conclude that these two humoral concepts were in fact different.

Greek medicine was based on a conceptual system that was more philosophical, consisting of verbal symbols that were classified and consistent. The great tradition of Greek medicine was consequently a learned, literate, and elite discourse (Bastien 1989:47). The Kallawaya medical practices are passed down through oral traditional and ritual. The rituals, with symbolic meanings, connect the people and their *ayllu* because ritual is a means of expressing in polysemic objects known and unknown relationships among the body, society, and environment (Bastien 1989:48). This folk tradition imbues the knowledge of the body with a symbolic understanding of their physiology. The cultural, ecological, and social structures of the *ayllu* reflect the body structure. The body is then simultaneously symbolic and analogical. Under this scenario diagnosis and treatment may involve divinations, rituals, and symbols.

Greeks understood nature as cyclic, steady, and balanced whereas Andean view nature as cyclic, processual, and oscillating (Bastien 1989:48). The concept of hot/cold wet/dry is compressed in time and place according to the Andeans. Seasons and temperatures in the Andes fluctuate and are asymmetrical. Even on land, temperatures

differ based on elevation. In a single day, a person can travel through different climates of humid, dry, cold, and hot places in an oscillatory pattern. Greek health was based on the balance of the four humors of hot, cold, wet, and dry; and an imbalance caused sicknesses. For the Kallawayas, the swinging back and forth of fluids and semi fluids (water, air, blood, and food) that are distilled into secondary fluids (mucus, bile, sweat, urine, gas, milk and semen) and semifluids (feces and fat), all need to be regular or the accumulated excess of fluids in the body will become toxic (Bastien 1989:48).

According to Bastien, the similar use of the concepts of hot/cold and dry/wet classification in both cultures could have facilitated incorporation or caused modifications to Andean medicine. There was an existing Andean humoral system that enriched the Western traditions of Galen's and Hippocrates traditions as a result of the Spanish conquest. Conversely the Andean religious traditions incorporated Greek-European humoral ideas into telluric-metaphorical symbolism of the Andeans. The Kallawayas correlated the wholeness of their bodies with the structure of the *ayllu*. However, the Andeans emphasize the relationship of their bodies to their environment (Bastien 1989:49). Health, crops, knowledge and the *ayllu* must mirror each other to maintain holistic health.

Conclusion

The humoral concept is considered by many people to impact pathology and treatment. A few informants explained ailments and medicinal plants in terms of hot and cold qualities, and there are examples on the application of this concept to foods in informal conversations as well. For example, some people were shocked I ordered a cold

Sprite in cold weather. I was warned that I was going to get sick. Obviously, many believe in the hot-cold pathology even today.

Looking deeper to the concept opened arguments that allow an understanding of how people's pathology and health in the present reflect the history of their culture. This also reveals their long cultural knowledge of plants as medicine. The chapter reveals the two concepts that influenced this knowledge: the Greek-Hippocratican humoral concept and the Andean body concepts.

Although the Greek humoral concept was not especially significant in Spain, it became common very early in medical pathology among people of different classes in Latin America. The adoption of this concept has been recorded in writings of European arrivals. In allowing this humoral concept, medicinal plants had qualities opposite of the ailments. Such examples of binary oppositions were hot/cold and wet/dry. Foods, herbs, drinks, and medicines were then categorized on hot/cold and wet/dry in order to define good health as a warm moist body with a balance of blood, phlegm, yellow bile, and black bile. The excess of one element causes an imbalance within the body, and this imbalance manifested as illness.

Bastien explains Andean body concept as symbolic and reflective of the relationship between the Andeans and their environment. The primary body fluids (air, blood, and fat) are similar to the four humors within the body, and they must circulate regularly and flow in a centripetal and centrifugal motion. An excess of fluids due to slowing or stopping of motion causes illness, and the type of illness determines if it is hot/cold or wet/dry.

The Greek and Andean concepts are similar, yet however different; and this reflects the sharing of ideologies. The major similarity between the Kallawayan ethnophysiology and the Greek humoral theory begins with the analogies from nature, however their views of nature and health also reflect the pathology differences of imbalance vs. cyclic. Although there have been many changes through time, the physiology concept and treatment of pathology is still viewed as a way to keep people healthy. This concept clarifies reasons behind the utilization of some plants and cautions us to be careful how we view knowledge of medicinal plants.

CHAPTER VI

THE IMPORTANCE OF LOCAL KNOWLEDGE

Introduction

Various medical systems may be employed to suit the needs of the people in a society. Within the family-level healthcare system, the use of medicinal plants is first considered by the main caregiver, the mother or grandmother. Their knowledge, passed down from generation to generation, has been vital throughout their family history in keeping the family healthy. Their knowledge is not usually written, but, instead, embedded in their minds so that they know what plant treats coughs, what plant is hot or cold, or what plant is used for *mal aire*. Their knowledge of plants is important to their traditions, and it also enables them to provide healthcare that is affordable.

Today's search for alternative medicines has driven researchers to focus on the knowledge of local people. The knowledge of medicinal plants has gained immense attention from primary healthcare programs. There is still much controversy about how information is obtained from local people; however, there is no doubt that local knowledge about the use of medicinal plants has been important globally as a means of finding plants that may help cure chronic diseases or treat common diseases for which pharmaceuticals are too powerful. As a result of my study, I became curious about the uses of medicinal plants and their continued effectiveness when transformed into commercial herbal medications or synthesized into pharmaceutical medicines. The daily

use of raw plants I observed drove me to seek to understand why such plants continue to be used as medicine and to collect a list of plants still used today as daily medicine. My focus is on the family level because these caregivers have the most experience with using raw plants as medicine and with knowledge passed down from generation to generation. This use of specific plants across generations also suggests that the plant has active constituents for healing and it is reliable.

Knowledge and Authority

How do we portray knowledge? According to Wayland (2001:173), there are many types of knowledge within a culture; however, only certain bodies of knowledge are given privileges. An example she uses is the privileging of scientific knowledge over local knowledge, especially in healthcare. The use and application of such valued knowledge is controlled by the experts who express status and authority. This power of knowledge and those who control knowledge is determined by factors such as race, class, and gender.

In the politics of knowledge, medicinal plants are generally viewed worldwide as a nonbiomedical healing system; however, recently there has been increasing of interest in the curative power of medicinal plants. This increased attention comes not only from local-level health providers but also from biomedical health care professionals, pharmaceutical companies, and NGO's, and the different perspectives of each group variously define a politicized nature of the knowledge (Wayland 2003:483). The experiences of public health physicians working in Rio Branco, Brazil revealed the importance of gaining medicinal plant knowledge for treating the poor. They valued their scientific knowledge, but, as they identified with the local people, they also came to

appreciate local knowledge. Many of these physicians acknowledged the healing potential of plants, but mostly accepted the efficacy of plants where this had been scientifically proven. They considered local information is important in making a list of plants; however, they did not believe that the reported curing effects are truly “real.” They believed the results were caused by the placebo effect and that only by testing the plants can it be proven that the plants do work. This perspective reflects the attitude that one body of knowledge is superior, especially if it relates to scientific domains. The local vs. scientific plant knowledge relates to the different relationships of power in which physicians find themselves in each context (Wayland 2003:844).

Among the different types of knowledge from each domain such as aesthetic, spiritual, experiential, scientific and local, there are systems that are valued more than others. The experts possessing valued knowledge have authority, but authority may be challenged by individuals depending on the context. Individuals within each context try to maintain, defend, or assert their authority. As health care providers, scientists and scholars recognized local knowledge, but this local knowledge challenges the dominant scientific knowledge. Nevertheless, local populations are gaining more attention and are being viewed by scientists globally as valuable sources of information. In fact, biomedical HCPs first realized the potential of some drugs, such as quinine and digitalis, when they observed local populations using phytotherapy (Wayland 2003:845).

Today local knowledge of medicinal plants is exploited for pharmaceutical drug development. Although this may seem to put traditional medical knowledge on an equal footing with scientific medical knowledge, it does not. This issue has caused much controversy with respect to plant collecting and sharing plant knowledge. When

ethnopharmacologists want to analyze local plants and validate them as potentially significant for curing diseases in the future, collecting the plants for testing is a problem because of issues of bioprospecting and intellectual property rights. Scientists and especially pharmaceutical companies must devise a means to compensate populations or healers for their plant knowledge (Wayland 2003:845). Furthermore, while there are numerous plant species with potential healing properties, the problems of deforestation and biopiracy have threatened botanical diversity. Acculturation and genocide of populations can dilute or eliminate knowledge about medicinal plants. A main concern is that foreign researchers and companies are plundering botanical material and knowledge in their quest to develop products to market without leaving any compensation or respecting intellectual property rights (Wayland 2003:851).

Incorporating Local Knowledge into Primary Healthcare

A very important reason why local people choose to use medicinal plants is because it is cost effective. Recently, public health providers are acknowledging that the use of medicinal plants is effective for this main reason. Wayland has written several articles about medicinal plant knowledge and has come to one main conclusion. Not only does the use of medicinal plants keep social and cultural traits alive, but it is an alternative medical system that helps people who cannot afford modern biomedicines. Public health providers in the Amazon have learned to appreciate the local plant knowledge.

During rapid urbanization or modernization, associated public health systems in the developing world may be underequipped, underfunded, and understaffed. People in the low-income population suffer most because they are not able to afford high-cost

healthcare. Family-level phytotherapy, the use of plants or plants extracts for medicinal treatment, is a way to cope with these disadvantages. The caregivers freely grow their plants in gardens and share them with neighbors, friends, and relatives. They use medicinal plants because they grew up with them and have seen and experienced their effects. This public circulation of medicinal plant knowledge and material supports and perpetuates the regular use of phytotherapy among low-income households (Wayland 2003:488). There is, however, another deeper reason for medicinal plant use from a sociopolitical perspective. This perspective reflects a difference approach to pharmaceuticals vs. medicinal plants. Medicinal plants are usually linked to the traditional and natural state, while pharmaceuticals are associated with the state of modernization and urbanization (Wayland 2004:2410).

According to Wayland (2001:182), the incorporation of medicinal plant knowledge into primary healthcare programs has the potential to improve health among low-income populations and to provide alternatives to costly clinic-based care. She believes that by combining the knowledge of primary health providers with the local women's ethnobotanical knowledge the two groups can work together to assemble a large inventory of the local species of medicinal plants and their uses. These plants can then be researched further to find certain plants that contain active pharmaceutical constituents. One downside is that there is a danger that the incorporation of medicinal plants into primary healthcare policies can affect women's authority in the household.

Today's research on alternative medicines worldwide has led to the search for local knowledge, especially about medicinal plants. Much of this knowledge then becomes important to primary health care projects as well as the local person sharing

knowledge. Contemporary development strategies, including primary healthcare programs, have begun to increasingly emphasize grassroots approaches, sustainability, empowerment, and participation (Wayland 2001:171). Policy makers look for new ways to relieve famine, poverty, and sickness in developing countries and this has led to the incorporation of new development strategies and local knowledge. It was once believed that indigenous knowledge was backwards and ineffective in a modern world, but recently researchers have incorporated local knowledge into developments especially in primary healthcare.

Researchers have long realized that local cultures hold useful information about medicinal plants that can treat various diseases (Wayland 2001:172). Identifying species and testing for active agents within the plants have a role when conducting research. The social aspects of medicinal plant knowledge and use are viewed as less of a concern but also play a role in ethnobotanical research in PHC projects. Today, the medical plant research is typically conducted by researchers in the fields of botany, biology, anthropology, and pharmacology.

Health care providers for the poor are aware of this local knowledge and use it occasionally to treat patients. However, physicians downplay the importance because they view the people with this knowledge as uneducated, superstitious, and gullible (Wayland 2003:490). Consequently, the frequent use of home remedies of natural plants to treat health problems occurs mostly in family health. Women, as caregivers in the family, have the knowledge and materials to make these remedies and avoid talking to physicians. They prefer their home remedies because they are more effective, and may

be better than pharmaceuticals. Side effects can be avoided by consuming plants and the plants may be more potent.

Gendered Knowledge

Feminist's theories have revealed that, within the gendered nature of knowledge and authority, there are different ways of knowing and thinking between men and women (Wayland 2001:174). Both men and women accumulate knowledge on different topics and develop expertise in different areas as they continue using their bodies of knowledge. The cultural construct of gender roles within a culture usually links women with the knowledge specialized in agriculture, resource management, and healing. These bodies of knowledge are different from those of men. Through experiences and by accumulating knowledge, women are able to diagnose and treat many different illnesses with their accessible resources, including medicinal plants. This can be seen in many low-income households in areas where there is no free health care. In these households, the mother is seen as the primary healer and a source of authority in the household. Much of the medicinal plants knowledge used has been learned and it becomes part of a long tradition. Most women grow up watching their mothers, grandmothers, and aunts make remedies as the primary medicine.

However, within a society, certain bodies of knowledge are focused on more than others, and feminists believed that the public domain of "male" knowledge is more privileged than "female" knowledge (Wayland 2001). Class and race also cross with gender and influence the status of the different types of knowledge. The devaluation of women's knowledge has encouraged a reliance on the knowledge of experts rather than on women themselves. In public health systems, women's health care knowledge is

devalued compared to that of biomedical doctors. Their knowledge and experience are ignored by doctors and they may be viewed as incompetent as caregivers.

Plant Searching with Informants

Many of my informants are women who stay at home and work on their lands. They also assume the role as the main source of healthcare in the family household. In my case studies, women are the informal household healers because they are the first person family members go to when they are ill, and they are frequently treating illnesses. My focus in this project was on their use of medicinal plants and how they prepare them. During the interviews, I began to learn more about the people as well as the medicinal plants. The pilot research I conducted in 2007 showed me the importance of obtaining local knowledge, and I began to wonder how important this knowledge could be in global primary health care. This led me to focus my research on the local level. Since most of my informants who had knowledge of medicinal plants were women, the nature of this knowledge also closely connects to authority and gender.

As the second part of numerous interviews, the informant gave a tour of their land and pointed out plants that they use as medicine. The duration of this part of the interview varied as well as the distance traveled. The first plant search interview was with a woman, Juanita, who was able to give me a tour on her land near her house. The informant is 56 years old and from Huaraz in the *sierra*, near the Cordillera Blanca. She had moved to Casma when she was 18 years old and speaks both Quechua and Spanish. She works in the *chakra* as well as selling animals in the market. The home is along a dirt road outside town and distant from the owner's agriculture land. Juanita's husband followed along to help find plants. The part of the land with medicinal plants is not for

agriculture, but is left slightly unkempt to let the plants grow naturally; and it is inhabited by large turkeys and peacocks. Since they have this plot of land right beside their household all the plants are easily accessible. While on the plant search, I would usually take more than one picture of each plant and be ready for the next plant.

We began near a harvested field behind the house where we found *hierba de gallinazo* (*Chenopodium album*). This plant is used to treat *susto*, a folk illness that is common around the area. To heal a person with *susto*, sprigs of the plants are swept over the body of the patient, usually a child. Growing together with *hierba de gallinazo*, we immediately found *altamisa* (*Ambrosia peruviana*) and *paico* (*Chenopodium ambrosioides*). *Altamisa* is used to treat *mal aire*, another common folk illness. This plant can be boiled, and, once the water is warm, it is added to the bath. The leaves are also used for sweeping. The entire plant of *paico* can be boiled and as a tea, treats stomach problems and eliminates intestinal parasites. *Altamisa* and *paico* herbs were more in the shaded area. Walking away from that area we found *pájaro bobo* (*Tessaria integrifolia*). The leaves are boiled into a tea to treat kidneys and liver infections.

We entered another part of the land that was large and full of trees that bear fruit. The trees and a few plants were cultivated there a long time ago, but they are now left to grow naturally. Once in a while we would encounter a group of large turkeys. To the left and right in this plot of land many plants were being pointed out fast; and, though trying to keep up I would take more than one picture of each plant. We walked deeper into the wooded area. We found *llantén* (*Plantago major*) and *alacrán* (*Heliotropium* sp.) as soon as we walked into the wooded area. *Llantén* is used to treat infection, especially of the kidneys. It is another plant that is boiled in a tea. *Alacrán* flowers are boiled in a tea to

reduce the risk of and treat prostate cancer. *Hierba mora* (*Solanum americanum*) was found near these plants. This plant is also used for *susto* by drinking it as a tea but can be boiled in a tea to treat inflammation and infections.

As we went looking for more plants, Juanita explained how she first learned about these plants. She had watched and experienced curing from the elders in the *sierra*. She said that the curers in the *sierra* cure only with plants, not with medicines. Juanita told her husband to go find certain plants and gave him the names of the plants for which he should look. Her husband walked around nearby, looking for plants as well, and he called us when he found a plant. She asked us what other plants we had encountered during other interviews, and we told her about different ones she had not mentioned or about which may not know. We all began to share our information and then we proceeded to look for more plants. The area was wooded now and there is a lot of shade, but some sun shone in.

One plant Juanita and her husband searched for was *hierba de la meastranza* (*Lantana scabiosiflora*). While we searched we found *matagusano* and *higo* (*Ficus carica*) (fig). *Matagusano* (*Flaveria bidentis*) stems, leaves and flowers can be boiled and consumed as a tea to treat coughs and bronchitis. The fresh flowers are also rubbed on the face to treat rashes or discolorations. *Higo* leaves are boiled in a tea to treat the liver. *Hierba santa* (*Cestrum auriculatum*) was found in a more shaded area. Its thin broad leaves and stem can be made into creamy foam, *espuma*, and applied to achy joints, especially when someone has the flu or a bad cold because it warms the body. The foamier the cream is, the more effective it will be. On the arms, one is only supposed to apply the medication from elbows to hands. On the legs, one can only apply it from the

knees to feet. Her husband showed us how *espuma* was made as he rolled the leaves pressed between his hands, moving his hands in a circular motion (Fig. 4). A person can also bathe with the peels of the stems of *hierba santa* to treat body aches.



Figure 4. Juanita's husband mashes up leaf of *hierba santa*. Reyes.

There were a few *palta* (*Persea americana*) (avocado) trees on Juanita's and her husband's land that were also used for medicine. The leaves can be boiled in a tea to heal stomach aches and ulcers. Nearby there was a plant called *chupasangre* (*Oenothera rosea*) that treats open wounds and bruises from wounds when rubbed fresh on the body. *Hierba de la meastranza* was found in a shaded area near more *hierba santa*. This plant is boiled into a tea and used to relieve menstrual pains in women. We also stopped by the small trees called *chivatillo* (*Cajanus cajan*). By eating the legume of this plant, a person

can reduce the risk of diabetes or treats diabetes. It is also reduces cholesterol. At the edge of the wooded area, *granadilla* (passion fruit) grows along with *muña* (*Minthostachys mollis*). The peel of *granadilla* (*Passiflora ligularis*) is boiled into a tea to treat diarrhea. *Muña* is boiled into a tea to treat stomach aches, colic and intestinal worms.

Another interview that I will describe is a little different because of the longer walking distance and because the household is surrounded by the farmland. Farther down the same road where Juanita's house is and further from town, our driver took us into an area that was dominated by larger fields and had even fewer houses. Driving down a road walled in by tall trees and plants, we stopped at the long driveway onto Maria's land. She opened her gate to let us drive to her house and where we discussed plants with her and her husband. The informant, Maria, is 78 years old and lives with her husband, daughters and grandchildren. They work in the *chakra* where they grow oranges, *mandarina* (*citrus reticulata*), sugar cane, and *maracuyá* (*Passiflora edulis*). Maria and her husband were raised in Casma and have lived there all their lives.

After the first part of the interview, we looked near the house and found *paico*, *turre* (*Spilanthes leiocarpa*), *aravisca* (*Leuceaena leuceocephala*), and *membrillejo* (*Cordia lutea*). The yellow flowers of *membrillejo* are boiled and used to treat kidney infections. The root of *turre* can be mashed and applied on the body where there are rashes and body pains. The seeds within the legume of *aravisca* are boiled and the liquid is also applied to rashes, wounds, and sores. Maria's husband also helped by pointing out a few plants, and he and his wife discussed what they were used for and how they were

prepared. From where we were standing, I could not even see the road where we entered at all.

After they had shown us all the medicinal plants they found near the household, Maria decided to take my colleague and me around her land to find more plants. Her teen granddaughter also followed along to accompany us (Fig. 5). As we walked, she told about a memory of her family working on the farmland. She said that someone with a stomach ache or tooth ache would not be able to work efficiently. They would get a leaf of a plant for stomach or tooth ache or their mother would gather plants and boil them into tea. Fortunately, there were always plants around to relieve their ailments, and they could feel better and work better in no time. Our route was a long walk along a trail that travels along an irrigation canal with fast moving water. We encountered *guayaba* (*Psidium guajay*) first, and Maria explained that the leaves can be boiled into a tea to treat liver ailments and cancer. We walked past an orchards of *mandarina* on our left and *maracuyá* on our right. Growing naturally in unkempt areas are many *matagusano* plants, the most I had seen in one area. The treatment and preparation Maria described for this plant were the same as in Juanita's description above. Another plant growing nearby is *amor seco* (*Bidens pilosa*). The whole plant can be boiled and consumed to treat the liver and prostate cancer.

Once we got to the orange orchards, Maria showed us *guanabana* (*Annona muricata*) and *achiote* (*Bixa orellana*). *Guanabana* is known commonly as a remedy to treat cancer, and most believed that the leaves need to be boiled into a tea. I had heard much about *achiote* but I did not expect to see it so we stopped for a while. Beneath the *achiote* tree was a pile of the dark brown spiny capsules. On the tree, more capsules

could be found, but they were still in their light green immature state. The capsules fall off during the dispersion of their seeds which turn a bright red color when they ripen within the capsule. The seeds are the focus when it comes to healing, and their bright red color reveals their potency. They are boiled into tea to treat urinary and kidney infections. Maria pointed out that oranges, *naranjas*, are consumed to heal many stomach problems. As we walked along, along the edge rushing water from small irrigation canals, she pointed out *clavito cimmaron* (*Ludwigia* spp.). Usually the flowers are made into tea and treat diarrhea. Moving on from there we had to cross the canal and go through a gate.

The next area had a beautiful flower garden and various crops. We were a fair distance from the house. Around this area we found *enojo* (*Foeniculum vulgare*) (Fig. 6), *ajenjo* (*Artemisa absinthium*), *hierba buena* (*Mentha spicata*) and *hierba luisa* (*Cymbopogon citrates*). The entire *enojo* plant is boiled as a tea to treat colic. An aggregated group of *ajenjo* was found nearby, and this plant is also boiled into a tea to treat gastrointestinal problems and stomach ache. During many of the plant searches, *ajenjo* was commonly found near another aggregated group, *hierba buena* (mint). *Hierba buena* is a common herb, and in this case it was used by Maria to treat stomach and intestinal worms. The leaves can be boiled or washed and consumed fresh. *Hierba luisa* has the scent of a citrus fruit and the long leaves are boiled as a tea to treat kidney infections.

On our way back to the house, Maria pointed out *altamisa* and *madre maíz* (*Physalis* spp.). *Madre maíz* is an interesting plant that is commonly known as a weed, but its use in healing is also commonly known. The tightly sealed flower bud contains a

clear liquid. For pink eye in children or eye irritations in adults, the buds are pulled off the plant and squeezed to squirt this liquid into the infected eye of the individual. This plant has attractive flowers, and, worldwide, plants of this genus produce a fruit that of considerable economic value production, but the liquid-filled bud is the main focus in this area.

These examples are only two of the interviews conducted during the summer of 2008. The plants were easily found by the individuals and most were cultivated or encouraged to grow. It was very common to prepare the plants in tea or tonic form. The second most common method of use was simple application. Many of the informants obtained their knowledge through personal experience and from their elder relatives. At this level of healthcare, women were the main healthcare providers and they had clear authority in this knowledge. These cumulative experiences and learned knowledge were critical to my research on the topic of medicinal plants.



Figure 5. The granddaughter leads the way to a large garden. Reyes.



Figure 6. Maria shows *enojo*, *Foeniculum vulgare* Mill., Reyes.

Conclusion

When conducting research on medicinal plants by talking directly to those who use them frequently, it is clear that medicinal plants, in this study, comprise a gendered body of local knowledge within a global perspective. The authority of scientific vs. local knowledge remains unequal in a local area; however, from a global perspective many of health, pharmaceutical and government organizations value local knowledge. Their research leads to a list of plants tested by ethnopharmacologists in order to find active components that may someday help treat chronic diseases. These groups search and collect plants based on local knowledge, but still view traditional medicine as less important because it comes from local people. The acknowledgment of the effectiveness of medicinal plants by healthcare providers for the poor shows that they have understood

the use of medicinal plants as affordable medicine. However, they overlook the trust, traditional beliefs and valuable knowledge that are also given. Healthcare professionals only really believe that a plant has specific curative effects once this has been scientifically proven. They overlook the long tradition of use as the plant information has been passed down from generation to generation. A large percentage of the plant information has been corroborated by tests showing that the plants named do have active agents and they do treat the ailments in the manner described by local people.

CHAPTER VII

PLANT RESEARCH BY USING PLANT KNOWLEDGE

Introduction

The physiography of Peru is reflected in its environment which supports the resources used for food, medicine, energy, crafts, dye, fiber, art, ritual, and symbolic human activities (De la Cruz 2007:284). Andean *sierra* and coastal regions have a higher diversity of plants than was assumed even though the diversity of plants is not as high as in the Amazon regions. Medicinal plant knowledge, however, is higher in the Andean region. Local medicinal plant knowledge is defined as a “social product” that is part of the specific cultural system (Antweiler 1998 cited in Vandebroek et. al. 2004:838). This knowledge is distributed differently among people, and those with more history and experience have generally been equipped with more knowledge of herbal healing. Medicinal plant knowledge is a long tradition in the Andean regions of Peru that still continues today. Many of the local communities in Andean regions continue using traditional medicines connected to plant biodiversity, and knowledge of multiple use species is common. However, as time goes by, traditional knowledge of plants used as medicine is maintained by relatively few people. Due to globalization and modernization, ethno-cultural erosion is increasing, and this encourages researchers to aim to identify not just medicinal plants but also the traditional medicinal knowledge relating to their use as medicine (Bussman, Sharon, and Lopez 2007).

Today, many studies are initiated to obtain medicinal plant information from those who have knowledge about preparing natural medicines. The information can be useful in understanding how people utilize plants, even species that have not been tested scientifically. Without the aid of such modern technology, people with traditional knowledge can show that their plants are indeed helpful in healing many ailments. This chapter describes five plants in order to demonstrate how the traditional approach to healing with medicinal plants works and illustrates the contribution that information about traditional plant use can make to scientific research. The plants chosen meet the following criteria 1) They are commonly used among local people and few healers 2) The plant may be native and has a long history of use as part of the society; and 3) The plant can be prepared by a local family member or healer with traditional knowledge of plants. The plants described show a high probability of effective curing, and they reveal how traditional knowledge can narrow down possibilities for further research leading to commercial medicines. The next step, analyses of the active ingredients and pharmacological properties remains the role of laboratories; and the use and tradition of medicinal plants cannot substitute for scientific validation of the constituents (Bastien 1987:53). The selected plants described in detail are *matagusano* (*Flaveria bidentis* (L.) Kuntz), *hierba santa* (*Cestrum auriculatum* L. Heritier), *párajo bobo* (*Tessaria integrifolia* Ruiz & Pav), *paico* (*Chenopodium ambrosioides* (L.)), and *guanábana* (*Annona muricata* L.).

Matagusano

Matagusano (*Flaveria bidentis*) is a robust annual herb from 90 to 100 cm tall (Fig. 7 and 8). This plant is well established in coastal areas and possibly native in South

America. From the Asteraceae family, the *Flaveria* genus has been commonly used through history as a yellow textile dye (Zhang et al. 2007). Another distinctive feature is the presence of flavonoid sulphates (quercetin and isorhamnetin) found in this natural dye, placing the *Flaveria* species in the flavonol-dye category (Zhang et al. 2007:1578). Current evidence shows that *Flaveria* plant compounds have been extracted from fabrics associated with five north coast Peruvian cultures dating to the Late Intermediate Period (ca. 1050-1200 AD) (Zhang et al. 2007). The plant materials extracted, flavonoids and glycosides, revealed that late prehispanic people used the plant to obtain yellow dyes.



Figure 7. *Matagusano* found along a trail. Reyes.



Figure 8. The yellow flowers of *Flaveria bidentis*. Reyes

Matagusano plant has commonly been sought after by traditional healers who use it as an antiseptic, antiparasitic, and cough suppressant. Commonly used as a medicinal plant, this plant is used mostly to treat children with bronchitis and parasite infections. The common name, *matagusano*, attests to its antiparasitic properties. Recent studies conducted to provide information on the healing properties of *matagusano* have been successful in their discovery of its active compounds. Many samples of “*matagusano*” were collected in Supe Pueblo, Peru; and researchers extracted tannins, flavonoids, leucoantocianidinas, steroids, and triterponoids (Pastor de Abram et al. 2006). The tannin astringents are potent antibacterial and antiparasitic combatants. The isolated compounds, 1-methyl-3-(methylthio)-benzene from the leaves and 3-methylbenzyl mercaptan from the flowers showed nematicidal activity by first reducing mobility and

then killing nematodes. A recent study has shown that the chloroform extracted from *F. bidentis* also has strong antibacterial effects (Bardón et al. 230:2007).

F. bidentis has received recent attention because of the active flavonoids which affects a variety of enzymes, have antioxidant properties, and exhibit inhibitory effects on platelets and leukocytes that play a role in coagulation, and blood-clotting processes (Guglielmonea et al. 184: 2002). *F. bidentis* is the only plant species known that synthesizes sulphation Qc quercetin derivatives. The highly sulfate-rich flavonoids within the leaves of the plant are quercetin derivatives, quercetin 3-acetyl-7,30,40-trisulphate (ATS) and quercetin 3,7,30,40-tetrasulphate (QTS). The derivatives, once isolated, were investigated further and revealed to have possible anticoagulate activity. They work by inhibiting the thrombin protein which causes blood clots and thrombosis (Guglielmonea et al. 184: 2002). Further study revealed that QTS can also inhibit the agonist-induced human platelet aggregation that activates thrombin generation. The generation of thrombin can cause complications such as heart attacks, strokes, and cardiovascular disease (Guglielmonea et al. 495: 2005).

Hierba Santa

Hierba santa (*Cestrum auriculatum*) is a large branching shrub that can grow up to a few meters high (Fig. 9). Native to Ecuador and Peru, *C. auriculatum* has a long history of use for medical treatment. From the time of pre-Inca cultures as well as during the time of the Incas, this plant was used to treat post-surgical symptoms. It was usually applied or taken orally to serve as an antiseptic, to treat fevers, and to serve as a sedative (Farfán 199: 2008). Recent recorded uses for this plant in folk healing include warding off evil and bad luck. The leaves are also commonly applied to specific areas of the body

to treat skin infections, allergies, headaches, and hemorrhoids and to disinfect wounds. It may be taken orally to treat fevers, bronchitis, colic, high blood pressure, and diabetes (Rojas et al. 2003; Kawano et al. 2009).



Figure 9. The broad thin leaves of *Cestrum auriculatum*. Reyes.

Hierba santa has been collected and analyzed because of its apparent use in treating infections and inflammatory effects. An ethanol extract was examined to discover new antimicrobial compounds that can be active against human pathogenic microorganisms (Rojas et al. 2003), and *Cestrum auriculatum* displayed significant antimicrobial activity. This study also revealed that much active ingredients were concentrated mostly in the leaf. Another recent study sought to identify compounds with anti-inflammatory and analgesic components from *Cestrum auriculatum* and *Cestrum*

hediundinum. Both these two species of plants are known by local people as “*hierba santa*.” Although these plants display anti-inflammatory and analgesic activities, they do not have the same active components. The study of these two species identified a numerous active components including cestrumin A and B, cestrusides A and B (Kawano et al. 147:2009). The new discovery of compounds cestrumine A and cestrusides A and B showed high analgesic activity.

Pájaro bobo

Tessaria integrifolia Ruiz & Pav. from the Asteraceae family is a shrub or small tree that grows up to 3 to 4 meters high (Fig. 10). Used commonly in tea as anti-inflammatory medicine, the leaves of *Tessaria integrifolia* have been analyzed to discover the main agents responsible for its apparent anti-inflammatory properties. These agents play a role in the activation of chemotaxis and monocyte cells that respond to inflammatory reactions. The complex functions of monocyte cells have made compounds derived from this plant potentially useful against acute and chronic inflammatory diseases. During the cells' motion towards a response to inflammation, any slight obstacle can stimulate a “respiratory burst” where oxygen is rapidly metabolizing and causing tissue damage. The caffeoylquinic acid derivatives within the plant, especially 3,5-di-*O*-caffeoylquinic and 4,5-di-*O*-caffeoylquinic, inhibited monocyte migration, chemotaxis, and oxygen metabolism (Peluso et al. 640:1995). These two and other caffeoylquinic derivatives have also been found to inhibit lipid peroxidation in liver mast cells, the release of histamine from mast cells, HIV replication, DNA polymerase activity, leukotriene B4 synthesis in human leukocytes, and platelet aggregation.

Although not mentioned by informants during interviews many people also treat allergies with this plant, and “*pájaro bobo*” is considered to have anti-allergy and anti-asthmatic activity as well as antioxidant constituents. Many other constituents have already been found in leaves and flowers, including squalene, β -amyrin acetate, β -selinene bishienyl derivatives, lignan, sesquiterpenes, flavones, and steroids (Ono et al. 2000, *Azahuanche* 7:2007). While examining the anti-allergy compounds, five new eudesmane derivatives (integrifoside A-D, integrifonol A) were discovered along with a caffeoyl derivative acid that all inhibit the release of histamine from the enzyme hyaluronidase, thereby treating illnesses such as asthma and pollenosis.

A search for natural antioxidant constituents has led to the examination of *Tessaria integrifolia* because it is safer to consume than synthesized antioxidants. Antioxidants are needed to fight against lipid peroxidation that activates oils and fats in foods. The damage by unsaturated fatty acids to cell membranes, enzymes, and DNA can cause cancer, inflammation, and atherosclerosis. Twenty-three compounds were extracted that show strong activity and five of these compounds may be new (Ono 2000 et al.).



Figure 10. *Tessaria integrifolia* grows all over the river valley. Reyes.

Paico

Chenopodium ambrosioides, of the Chenopodiaceae family, is an annual or perennial herb native to tropical areas of Central and South America and the West Indies (Fig. 11 and 12). *Paico* stands erect at about 1 meter high or less and has a strong aroma of camphor (Bastien 1987:140). The plant is found in disturbed soils along roads, irrigation canals, and houses. *Chenopodium ambrosioides* is a popular medicinal plant within numerous Latin American countries. *Paico* is commonly employed as a local medicinal plant to treat intestinal parasites such as roundworms, dwarf tapeworms, and hookworms as well as stomach complications in Peru, Columbia, and Ecuador.

First used to flavor foods, the Mayans added its leaves to corn, black beans, mushrooms, fish, and shellfish (Coile and Artaud 2002:3). Also known as Mexican tea, it has become a popular ingredient in herbal remedies, and the root is consumed to treat toothaches. In Venezuela *paico* is used to treat burns and stomach problems. The plant is employed in Argentina for ulcers, diarrhea, pneumonia, and bronchitis (Gadano 2002:11). As a medicinal plant, *Chenopodium ambrosioides* has been known to heal a variety of ailments in different cultures throughout history, especially because of its vermifuge properties. The usage of this “weed” to treat intestinal parasites has been recorded as the Aztec’s *epazotl*, in the Florentine Codex of Sahagún in the sixteenth century.

According to Bastien (1987:140), Kallawaya herbalists of Bolivia employ had various types of treatment using *paico*. For intestinal worms, 20 g of the plant is boiled with water and consumed before breakfast. Inserting a *paico* twig as a suppository is another means for treating worms in the rectum. This *paico* tea is also used prepared to treat gastritis. A child with indigestion is treated by the application of crushed *paico* leaves mixed with cooking oil to the stomach and back. The common use of *paico* as an anthelmintic drug by local people has attracted attention to this plant. However, testing has revealed that it does not cure a human of intestinal parasites, but it will prevent parasites from becoming numerous (Kliks 1981, Coile and Artaud 2002, Jardim et al. 2008). In this case, it would still be helpful; and it is usually administered repeatedly to the patient as therapeutic.



Figure 11. *Paico* flowers and fruits in spike inflorescence. Reyes.



Figure 12. *Chenopodium ambrosioides*. Reyes.

The search for natural antifungal agents has been active because of the various side effects of synthetic drugs. *Chenopodium ambrosioides* has shown very effective activity against pathogenic fungi that cause dermatomycoses such as ringworm fungi. Along with ringworm fungi, many other dermatophytes cause severe skin infections due to the invasion of tissue. Such infections cause symptoms like inflammation and loss of hair in infected area. Treatment involves applying the plant to affected areas. When applied as oil *C. ambrosioides* almost completely inhibited the growth of tested dermatophytes *Trichophyton mentagrophytes*, *Epidermophyton floccosum*, *Microsporum ferugineum*, *M. fulvum*, *Trichophyton equinum*, *T. souclanense*, *T. terrestre*, *T. verrucosum*, *T. violaceum*, *T. rubrum*, and *Microsporum audouinii* (Kishore et al. 1996). The screening displayed that this plant exhibits inhibition at over 50 percent and completely deleted *T. mentagrophytes* and *Microsporum audouinii* dermatophytes. The study also revealed that chenopodium oil is fungicidal by nature and six main components are responsible for this activity (Kishore et al. 1996). Another study identified additional components responsible for antifungal activity. These components were identified by their activity against the tested postharvest fungi and not human pathological fungi; however, the tests did document the main components that display antifungal activity. The components which specifically inhibit mycelial growth are ascaridole, carvacol, and p-cymene while other antifungal components involved are α -Terpinene, Piperitone, *p*-Cimen-8-ol, α -Terpineol, Piperitol acetate, Benzyl alcohol, *p*-Cresol, *p*-Mentha-1,3,8-triene, and Carvyl acetate (Jardim et al. 2008).

Because *Chenopodium ambrosioides* has been found to treat such a variety of diseases, a few studies were developed in order to see if *C. ambrosioides* exhibits anti-

tumoral properties. This is part of new research focused towards making cancer chemoprevention drug discoveries. Studies involved analyzing the impact of hydroalcoholic extract of *C.ambrosioides* on the development of ascetic and solid ehrlich tumors. When chenopodium extract was administered in small doses by means of intraperitoneal injection the development of ascetic and solid ehrlich tumors was significantly inhibited (Nascimento et al.2006). The study also revealed that the compounds possibly responsible for the anti-tumoral activity were flavonoids and terpenoids that work as antioxidants.

An interesting and important study of chenopodium oil has involved the search for active ingredients that can treat leishmaniasis. This major tropical disease is caused by infection with the protozoan parasite, *Lieshmania sp.* This disease, one of the most common, is known to infect two million people in Brazil, and the numbers continue to rise. Leishmaniasis is especially devastating because it is a physically disfiguring cutaneous disease. Even though there have been many strategies to control the vector and reservoir hosts, this disease is still a serious problem. Vaccines are not yet available, and while antimonials (pentamidine, amphotericin B (AmB) and paromomycin) and other pharmaceuticals are expensive, limited in quantity, toxic and ineffective. New efforts to discover alternative traditional medicines to treat leishmaniasis has brought attention to *C. ambrosioides*. There was also hope that, because *Chenopodium abrosioides* has been found to be active against some parasites, it might also be effective against protozoans such as *Typanosoma cruzi*, the cause of Chagas disease, and *Plasmodium falciparum*, which causes malaria.

Three ways of administering the oil in the study have used to study the effectiveness of *C. ambrosioides* against leishmaniasis: application, oral dosage, and injection. Application is the most common traditional treatment method among local people in Brazil. Unfortunately, when *C. ambrosioides* was administered by all the three modes, there was no decrease in lesion sizes (Monzote et al. 2007). Lesions are deep sores in the skin caused by the parasites that are inserted by a feeding sand fly. However, oral and injection treatments did decrease the parasite burden or loads, and the parasite did not successfully develop resistance to the oil (Monzote et al. 2007:153). Injections of the oil were most effective because this treatment, which targeted the injection directly, prevented lesions from forming. However, it also resulted in toxic effects. Nevertheless, the study was promising because it advanced research on the resistance of *Lieshmania amazonensis* to such treatments. The search for a cure for this disease has been a difficult struggle, and studies do show evidence that chenopodium oil has antileishmanial effects. One further study analyzed a hydroalcoholic crude extract (HCE) of chenopodium and found that the progress of the promastigotes of *Lieshmania amazonensis* was reduced by oral treatments using this compound (Partrício 2008).

The leaves of the plant contain flavonoids, saponins, and terpinenes that were believed to have analgesic and anti-inflammatory effects. In one study, the oral dose of 700 mg of methanolic extract inhibited oedema, the accumulation of fluid underneath the skin (Ibironke and Ajiboye 2007). There was also an acute reduction on the formation of granuloma tissue. The extract significantly inhibited acute and chronic nociceptive (pain) phases, suggesting the involvement of both neurogenic and inflammatory mechanisms (Ibironke and Ajiboye 2007:114).

Treatments using oil of chenopodium has been a concern due to its toxicity, and its repeated use is a greater concern. The plant's toxicity has resulted in irritation to the mucous membrane of the intestines, kidney and liver. Other side effects include headaches, gastroenteritis, impaired vision, face flushing, vertigo, incoordination and paresthesia (Gadano 11:2002). The Chenopodium oil consists of about 90 percent ascaridole, unsaturated terpene peroxide, and is believed to cause acute dermatitis, an allergic reaction when oil is placed on the skin. Tests on the aqueous plant extract usually consumed was revealed to have cytotoxic activity that can cause genetic and cellular damage (Gadano 2002).

Despite its side effects, *C. ambrosioides* shows considerable promise. The cytotoxic effect and systematic effect of injected *C. ambrosioides* on Ehrlich tumor cells by intraperitoneal injections was responsible on the inhibition of solid and ascetic tumors (Nascimento et al. 2006:2652). The leaves were found to contain kaempferol and organic acids while the fruits yielded glycosides of kaempferol, isorhamnetin, quercetin, and 4'-O-demethylarbutin (Jain et al. 1990 cited in Daniel 2006:71). These glycosides are now being studied because of their activity to possibly prevent various cancers, respiratory disease, improve heart health, relieve diabetes complications and have antioxidants. A recent study that discovered the antileishmania activities of this plant also revealed that there is no tissue damage due to its toxicity (Partrício 2008:317). This plant must be consumed in a limited dose, and it takes very knowledgeable people to prepare and administer such natural medication. On the Peruvian north coast, the oil from the seeds is consumed orally only once a month to treat parasites (Bussman and Sharon 220: 2007). The leaves, flowers and seeds were first utilized for medicinal

purposes in a 1-30 g dosage, but in the nineteenth century there was a shift of focus to the oil of chenopodium. Subsequently, oil within the leaves and seeds as well as alcoholic extracts of the plant have increased in popularity to the extent that chenopodium was recognized in the official United States Pharmacopoeia from 1820 to 1947 (Kliks 1981:880). Further research needs to be conducted on this plant and its toxicity before it is considered for approval by the Food and Drug Administration (FDA) and for use by qualified health practitioners.

Guanábana

Annona muricata L. from the family Annonaceae is an evergreen tree that grows up to 4 to 7 meters high (Fig. 13 and 14). The prickly fruits can be egg or heart-shaped. *Guanábana* is native to northern South America and the West Indies. Although it is also considered to be native to Central America, archaeological evidence of seeds and vessel representations document *guanábana* as an important fruit in ancient Ecuador and the north and north-central Peruvian coast. An early evidence of the presence of *guanábana* were vessel representations found in Ecuador dating to the Valdiva culture around 4500-2900 B.C. (Bonavia et al 2004: 516). Although the time of the introduction of *A. muricata* in Peru is unknown, an idea of trade and/or political networks between the Peruvian north coast and the highland and tropical forest areas of northern Peru and southern Ecuador is possible (Pozorski and Pozorski 1997:244). Many pre-Columbian archaeological sites share evidence of the utilization of this species. A few seeds and a vessel representation were found in the Peruvian north coast Virú Valley and Jequetepeque Valley dating around the late Early Horizon, Middle Horizon (ca 700 B.C.) and Early Intermediate Period (ca. 200 B.C). However, there is clear evidence that *A.*

muricata had been popularly utilized by the Chimú culture in the Late Intermediate Period sometime after AD1000 (Pozorski and Pozorski 1997:235). The pottery vessels depicted the tropical fruit of *Guanábana* and numerous seeds were found in the north and the Casma Valley on the north-central coast that follow with Chimú conquest. The archaeological sites in the Casma Valley that have Chimú evidence dated to the Late Horizon (AD 1470-1532) and early Colonial times (Pozorski and Pozorski 1997:241). This culture established their empire in the north coast valleys and spread out southward bringing their popular food plant.

A. muricata is cultivated worldwide, and there are a variety of ailments that this plant is known to treat. Healers in many Latin American countries believe this plant to have sedative, analgesic, antiphlogistic (reduces inflammation and fevers), antispasmodic, antipyretic (reduces fevers), astringent, diuretic and anthelmintic properties. Other common treatments that rely on *guanábana* are for skin infections and skin diseases; asthma, coughs and fevers; inflammation of internal organs especially the gall bladder; as well as arthritis; nervousness; diarrhea; malaria; stomach ulcers; indigestion, ringworm, high blood pressure, and to induce lactation (Ross 1999:134). Clinical trials have shown that *A. muricata* is active against amoebic effects, bacteria, fungi, leishmania, parasites, tumors, and viruses. It also displays antihepaotoxic, cardiac depressant, cytotoxic, hypertensive, hypotensive, lipid peroxidation inhibition, muscle relaxant, spasmogenic, and vasodilator activity as well as anti-depressant properties (Ross 1999:136-138). In Peru, informants say that a tea made by boiling fresh leaves and bark from the smaller branches can treat prostate cancer and can also cure inflammation of the kidneys.



Figure 13. *Annona muricata*. Reyes.



Figure 14. *Guanabana* fruit, a major historical food plant. Reyes.

Conclusion

It would be difficult to describe every plant, its traditional uses, and related and its pharmaceutical research analyses because so many scientific examinations have revealed so much potential for these medicinal plants. These effective agents gain attention from scientists because they are able to treat what local people say the plants treat and more. The five plants described above also help illustrate the importance of documenting traditional aspects of herbal curing based on information given by local people. Many of these plants have a long history of use and across large geographic regions, and the complex practice of herbal healing is based on long-term experience and in-depth knowledge. People who use these plants learn the names, effective plant part, and location, and treatment associated with each medicinal plant species. They recognize seasonality of the plant and its potency, and this enables them to focus on harvesting seasonal plants if necessary.

In my case studies, most of the informants depended on fresh plants and recognized the different areas where a plant can be picked. Only a few would collect and dry plants to have them on hand for use with other plants to make the medicines more effective. Careful preparation is necessary because some plants may have therapeutic effects only on specific symptoms. The vast local knowledge of medicinal plants and their effective use attests to the effectiveness of the traditional pharmacopeia. As a result, many plants globally have been collected to be scientifically investigated. These scientific investigations are confirming the presence of active compounds and resultant therapeutic effects. The plants most commonly used as traditional medicine hold the most promise for further study to find active compounds.

CHAPTER VIII

CONCLUSION

Local knowledge has become important to researchers who are trying to increase the inventory of derived plant pharmacopeia and the chances of making major discoveries of plants that may cure chronic diseases. In gaining this knowledge, researchers often interact with the people who use them as daily medication based on knowledge that is part of their culture and social upbringing. My thesis is presenting plant research that also encompasses the cultural background of my informants and their social status in their society. The local people trust in their traditions that have been practiced, experienced and seen to be effective since they were children. Within this scenario, the cross-cultural transfer of plants between Spanish and indigenous people throughout history after Spanish colonialism has also been important. The plant research revealed the bigger picture of how traditional medicines continued to impact the social, cultural, economic and political development of local people within a modernizing and urban city surrounded by desert. These traditional medicines continued to be options for people who searched for trustworthy, familiar, and affordable healthcare. The associated local knowledge is more valuable than once assumed, and today researchers hurry to obtain information before deforestation eliminates the botanical diversity, or before the knowledge of local people is lost, and before they refuse to share information with self-serving companies.

The family has been the most important locus for acquiring and transmitting medicinal plant knowledge followed by the experienced traditional healers who operate out of the family circle. Although the Casma area has high anthropogenic activity, active modernization and ample primary health care, this Andean region displayed a high degree of continuity of medicinal plant knowledge compared to areas in the Amazon regions that are more isolated. Due to physical accessibility and spatial homogeneity of groups of healers and families, plant knowledge and plant inventories have increased (Vandebroek et al. 2004:842). As modernization continues and some cultural aspects become diluted and may fade, natural medicines still prevail in certain circumstances. Some medicinal plants that represent the cultural aspects of Andean pharmacopeia such as the plants above display examples of the doctrine of signatures, humoral concepts, and hot and cold classification. Most of the plants named by informants are used based on the hot and cold classification. Hot herbs may have continued in use because of their effectiveness against the common folk illness of *mal aire*.

It does not appear frequently, but the doctrine of signatures plays a small role in a few medicinal plants named by informants during research. The doctrine of signatures is a theory that a hint or cue as to what the plant can heal is revealed by its natural form or signature. For example the *imilla imilla* (*Alonsoa* sp.) flowers in the Bolivian Andes resemble the uterine region and are therefore employed to treat gynecological disorders (Bastien 1987:53). Uses of many recorded global medicinal plants are also associated with the shape of the leaf. Other signatures such as scent, taste, color, and latex substance in the stems are considered as well. As mentioned above, *Chenopodium ambrosioides* is a strongly scented plant known to be an effective vermifuge, and it is

called wormseed for this known reason. The scent from this plant is unappealing to insects, fungi, and parasites that may damage the plant. The habitat of this plant also is easily accessible to people because it grows near homes. Another example is a plant that produces milky latex within the stem. The latex of the plant *hierba lechera* (*Chamaesyce hyssopifolia* (L.)) is directly applied into the eyes to treat cataracts or blurred vision. This is the most common use described for *hierba lechera* today; however, an informant mentioned that it could be used to induce lactation after childbirth. The signature of this plant, the milky latex, has signified its potential value in stimulating human milk production.

Hot and cold classifications are more obvious than the doctrine of signatures, but not everyone classifies herbs as hot or cold. This distinction seems to be fading among local people, herbalists, and *cuaranderos* who often classify plants only by the ailments they treat. However, there are aspects of this traditional knowledge that come up when informants describe plant use. *Matagusano* (*Flaveria bidentis*) has been described as a native plant in the area of study and it has been used for a long time to treat coughs, cold, and bronchitis. *Flaveria bidentis* is an example of a hot plant used to treat cold illnesses. *Cestrum auriculatum* was described as a hot plant was by one informant who explained that the treatment involved the application of crushed leaves on “frozen” achy joints.

It would be difficult to describe every plant entering in my study and its pharmaceutical research so the five plant examples described in Chapter 7 are used to illustrate the traditional aspects of herbal curing based on information given by local people who learn the names, product, and location of each medicinal plant species. They recognize the potency and season of plant availability which enables them to focus on

harvesting if necessary. Most of the informants depend on fresh plants and recognize the different areas where a plant can be picked. Only a few will collect and dry plants that rely on the addition of other plants during preparation to be more effective. The complexity of herbal healing is based on long experience and local knowledge. Careful preparation is critical because some parts of some plants may have therapeutic effects only on specific symptoms. Many of the plants used show a long history of use and are also used in other distant regions. It is safe to say that the local knowledge of and experience with medicinal plants attest to the effectiveness of this pharmacopeia, and many of these plants have been collected to be scientifically investigated and found to contain active compounds with therapeutic effects. The plants most commonly used in traditional medicine are usually the most valid species for further study.

REFERENCES

- Azahuanche, Fredy Pérez., Fernando Rodríguez Avalos, and Abundio Sagástegui Alva
2007 Estudio fitoquímico preliminar de *Tessaria integrifolia* R. et P. Ciencia Y Salud
1(1):6-8.
- Baer, Hans A.
2003 Contributions to a Critical Analysis of Medical Pluralism: An Examination of
the Work of Libbet Crandon-Malamud. *Medical Plualism in the Andes*.
Routledge Publishing, London. 42-60.
- Bardón, Alicia., Susana Borkosky, María I. Ybarra, Susana Montanaro, and Elena
Cartagena
2007 Bioactive plants from Argentina and Bolivia. Fitoterapia 78:227-231.
- Bastien, Joseph W.
1985 Qollahuaya-Andean Body Concepts: A Topoographical-Hydraulic Model of
Physiology. American Anthropologist 87(3):595-611.
- 1987 Healers of the Andes: Kallawaya Herbalists and their Medicinal Plants.
University of Utah Press, Salt Lake City.
- 1989 Differences Between Kallawaya-Andean and Greek-European Humoral Theory.
Social Science and Medicine28(1):45-51.
- Bennet, Bradley C.
1992 Plants and People of the Amazonian Rainforest. BioScience 42(8):599-607.
- Bonavia, Duccio Carlos M. Ochoa, Óscar Tovar S., and Rodolfo Cerrón Palomino
2004 Archaeological Evidence of Cherimoya (*Annona cherimolia* Mill.) and
Guanabana (*Annona muricata* L.) in Ancient Peru. Economic Botany 58(4):509-
522.
- Browner, C.H
1989 Women, household and health in Latin America. Social Science and Medicine
28(5):461-473.
- Bussmann, Rainer W. and Douglas Sharon
2006 Traditional Medicinal Plant use in Northern Peru: Tracking Two Thousand Year
of Healing Culture. Journal of Ethnobiology and Ethnomedicine 2:47.

- Bussmann, Rainer W. and Douglas Sharon
2007 *Plants of the Four Winds: The Magic and Medicinal Flora of Peru*. Graficart, Trujillo, Peru.
- Bussmann, R.W, D. Sharon and A. Lopez
2007 Blending Traditional and Western Medicine: Medicinal plant Use Among Patients at Clinica Anticona in El Porvenir, Peru. *Ethnobotany Research & Applications* 5:185-199.
- Coile, Nancy C. and Carlos R. Artaud
1997 *Chenopodium ambrosioides* L., (Chenopodiaceae) Mexican-tea, Wanted Weed? *Botany Circular* 1-6.
- Crandon, Libbet
1983 Grass Roots, Herbs, Promotors and Preventions: A Re-evaluation of Comtemporary International Health Care Planning. The Bolivian Case. *Social Science & Medicine*17(17):1281-1289.
- Crandon, Libbet
2003 Changing Times and Changing Symptoms: The Effects of Modernzation on *Mestizo* Medicine in Rural Bolivia (The Case of Two *Mestizo* Sisters). *Medical Plualism in the Andes*. Routledge Publishing, London. 27-41.
- Daniel, M.
2006 *Medicinal Plants: Chemistry and Properties*. Science Publishers, New Hampshire.
- De-la-Cruz, Horacio, Graciela Vilcapoma, and Percy A. Zevallos
2007 Ethnobotanical Study of Medicinal Plants Used by the Andean People of Canta, Lima, Peru. *Journal of Ethnopharmacology* 111:284-294.
- Etkin, Nina L.
1988 Ethnopharmacology: Biobehavioral Approaches in the Anthropological Study of Indigenous Medicines. *Annual Review of Anthropology* 17:23-42.
- Fabricant, Daniel S. and Norman R. Farnsworth
2001The Value of Plants Used in Traditional Medicine for Drug Discovery. *Environmental Health Perspectives* 109:69-75.
- Farfán, Rodlfo Díaz,
2008 Los Primeros Neurocirujanos De América: Pre y Postoperatorio en las Trepanaciones Incas. *Revista Argentina De Neurocirugia*. 22(4):197-201.

Foster, George M.

1953 Relationships Between Spanish and Spanish-American Folk Medicine. The Journal of American Folklore 66(261):201-217.

1994 Hippocrates' Latin American Legacy: Humoral Medicine in the New World. Gordon and Breach Science Publishers, United States.

Gadano, A., A. Gurni, P. López, G. Ferraro, and M. Carballo

2002 In Vitro Genotoxic Evaluation of the Medicinal Plant *Chenopodium ambrosioides* L. Journal of Ethnopharmacology 81:11-16.

Glass-Coffin, Bonnie

2003 Anthropology and Shamanism: Bottom-line Considerations in Image and Practice. *Medical Pluarlism in the Andes*. Routledge Publishing, London. 234-249.

Gonzales, Gustavo F. and Luis G. Valerio, Jr.

2006 Medicinal Plants from Peru: A Review of Plants as Potential Agents Against Cancer. Anti-Cancer Agents in Medicinal Chemistry 6:429-444.

Greenway, Christine

2003 Healing Soul Loss: The Negotiation of Identity in Peru. *Medical Pluarlism in the Andes*. Routledge Publishing, London. 92-106.

Guglielmone, Hugo A., Alicia M. Agnese, Susana C. Núñez Montoya, and José L. Cabrera

2002 Anticoagulant Effect and Action Mechanism of Sulphated Flavonoids from *Flaveria bidentis*. Thrombosis Research 105:183-188.

2005 Inhibitory Effects of Sulphated Flavonoids Isolated from *Flaveria bidentis* on Platelet Aggregation. Thrombosis Research 115:495-502.

Ibironke, G.F. and K.I Ajiboye

2007 Studies on the Anti-Inflammatory and Analgesic Properties of *Chenopodium ambrosioides* Leaf extract in Rats. International Journal of Pharmacology 3(1):111-115.

Izugbara, C. Otutubikey, I. Wilson Etukudoh and A. Sampson Brown

2005 Transethnic Itineraries for Ethnomedical Therapies in Nigeria: Igbo Women Seeking Ibibio Cures. Health & Place 11(1):1-14.

Janes, Craig R.

1999 The Health Transition, Global Modernity and the Crisis of Traditional Medicine: The Tibetan Case. Social Science & Medicine 48:1803-1820.

- Jardim, Carolina Marangon., Gulab Jham, Onkar Dhingra, and Marcelo Moreira Freire
2008 Composition and Antifungal Activity of the Essential Oil of the Brazilian
Chenopodium ambrosioides L. Journal of Chemical Ecology 34 (9):1213-1218.
- Johnson, George R. and Raye R. Platt
1930 Peru From the Air. The American Geographical Society, New York.
- Kawano, M., M. Otsuka, K. Umeyama, M. Yamazaki, T. Shiota, M. Satake, and E.
Okuyama
2009 Anti-inflammatory and Analgesic Components from “hierba santa,” a
Traditional Medicine in Peru. Journal of Natural Medicines 63(2):147-158.
- Kishore, N., J. P. N. Chansouriat and N. K. Dubey
1996 Antidermatophytic Action of the Essential Oil of *Chenopodium ambrosioides*
and An Ointment Prepared from It. Phytotherapy Research 10:453-455.
- Kliks, Michael M.
1985 Studies on the Traditional Herbal Anthelmintic *Chenopodium ambrosioides* L.:
Ethnopharmacological Evaluation and clinical Field Trials. Social Science and
Medicine 21(8):879- 886.
- Kosok, Paul
1965 Life, Land, and Water in Ancient Peru. Long Island University Press, New York.
- Lewis, Walter H. and Memory P. Elvin-Lewis
1995 Medicinal Plants as Sources of New Therapeutics. Annals of the Missouri
Botanical Garden 82(1):16-24.
- Madge, Clare
1998 Therapeutic landscapes of the Jola, The Gambia, West Africa. Health & Place
4(4):293-311.
- McKee, Lauris A.
2003 Ethnomedicine and Enculturation in the Andes of Ecuador. *Medical Pluarlism in
the Andes*. Routledge Publishing, London. 131-147.
- Miles, Ann and Thomas Leatherman
2003 Perspectives on Medical Anthropology in the Andes. *Medical Pluarlism in the
Andes*. Routledge Publishing, London. 3-15.
- Monzote, Lianet , Ana M. Montalvo , Ramón Scull, Migdalia Miranda, Juan Abreu
2007 Activity, Toxicity and Analysis of Resistance of Essential Oil from
Chenopodium ambrosioides after Intraperitoneal, Oral and Intralesional
Administration in BALB/c Mice Infected with *Leishmania amazonensis*: A
Preliminary Study. Biomedicine & Pharmacotherapy 61:148-153.

Nascimento, Flávia R.F., Gustavo V.B. Cruz, Paulo V. S. Pereira, Márcia C.G. Maciel, Lucilene A. Silva, Ana Paula S. Azevedo, Elizabeth S.B. Barroqueiro, and Rosane N.M. Guerra

2006 Ascitic and Solid Ehrlich Tumor Inhibition by *Chenopodium ambrosioides* L. Treatment. Life Sciences 78:2650-2653.

Ono, Masateru, C. Masuoka, Y. Odake, S. Ikegashira, Y. Ito, and T. Nohar

2000 Antioxidative Constituents from *Tessaria integrifolia*. Food Science and Technology Research 6(2):106-114.

2000 Eudesmane Derivatives from *Tessaria integrifolia*. Phytochemistry 53:479-484.

Paredes, Abelino Zapata.

1996 Casma en la Historia. Alcalde de la Municipalidad Provincial de Casma, Casma.

Pastor de Abram, Ana. Bertha Ruth, and Zelada Mariluz

2006 Estudio fitoquímico de *Flaveria bidentis* (L.) Kuntze (Asteraceae). Revista de la Sociedad Química del Perú 72(1):3-11.

Partrício F.J., G. C. Costa, P. Pereira, W. C. Aragão-Filho, S. M. Sousa, J.B. Frazão, W. S. Pereira, M. Maciel, L. Silva, F. Amaral, J. Rebêlo, R. Guerra, M. Ribeiro, and F. Nascimento

2008 Efficacy of the Intralesional Treatment with *Chenopodium ambrosioides* in the Murine Infection by *Leishmania amazonensis*. Journal of Ethnopharmacology 115:313-319.

Pedersen, Duncan and Veronica Barufatti

1985 Health and Traditional Medicine Cultures in Latin America and the Caribbean. Social Science & Medicine 21(1):5-12.

Peluso, Gianfranco, Vincenzo De Feo, Francesco De Simone, Elio Bresciano, and Maria Vuotto

1995 Studies on the Inhibitory Effects of Caffeoylquinic Acids on Monocyte Migration and Superoxide Ion Production. Journal of Natural Products 58(5):639-646.

Pozorski, Shelia and Thomas Pozorski

1987 Early Settlement and Subsistence in the Casma Valley, Peru. University of Iowa Press, Iowa City.

1997 Cherimoya and Guanabana in the Archaeological Record of Peru. Journal of Ethnobiology 17(2):235-248.

- Revene, Zachary., Rainer W. Bussman and Douglas Sharon
2008 From Sierra to Coast: Tracing the Supply of Medicinal Plants in Northern Peru-
A Plant Collector's Tale. Ethnobotany Research & Applications 6:15-22.
- Rojas, Rosario, Beatriz Bustamante, José Bauer, Irma Fernández, J. Albán, and O. Locka
2003 Antimicrobial Activity of Selected Peruvian Medicinal Plants. Journal of
Ethnopharmacology 88:199-204.
- Ross, Ivan A.
2003 Medicinal Plants of the World: Chemical Constituents, Traditional and Modern
Uses, Volume 1. Humana Press, Totowa, New Jersey.
- Schultes, Richard E. and Robert F. Raffauf
1990 The Healing Forest: Medicinal and Toxic Plants of the Northwest Amazonia.
Dioscorides Press, Portland.
- Sowell, David
2001 The Tale of Healer Miguel Perdomo Neira: Medicine, Ideologies, and Power in
the Nineteenth-Century Andes. Scholarly Resources Inc., Wilmington.
- Taylor, David
1996 Herbal Medicines at a Crossroads. Herbal Health Perspectives 104(9):924-928.
- Vandebroek, I., P. Van Damme, L. Van Puyvelde, S. Arrazola, and N. De Kimpe
2004 A Comparison of Traditional Healers' Medicinal Plant Knowledge in the
Bolivian Andes and Amazon. Social Science and Medicine 59:837-849.

APPENDIX A

APPENDIX A

LIST OF MEDICINAL PLANTS COMMONLY USED IN CASMA, PERU

Local Name	Scientific Name	Family	Information
Achiote	<i>Bixa orellana L.</i>	Bixaceae	<p>This plant is cultivated by land owners. Only a few trees were found.</p> <p>The seeds and the leaves are used for medicinal purposes. The seeds can be eaten or boiled into a tea. The leaves are only consumed in a tea.</p> <p>The common ailments are for kidney infections, urinary infections, prostate, and bronchitis.</p>
Alacrán	<i>Heliotropium sp.</i>	Boraginaceae	<p>This is found growing in aggregated groups along with other tall weeds.</p> <p>The flower and leaves can be boiled into a tea and consumed reduce the risks of and treat prostate problems.</p>
Altamisa	<i>Ambrosia peruviana Willd.</i>	Asteraceae	<p>This plant can be found all over the lands, mostly in shaded places but also found along roadsides.</p> <p>The leaves and stems are boiled in tea and can be mixed with other plants. This plant treats nerves, bronchitis, colds which is when it is made into a tea.</p> <p>For <i>susto</i> and <i>mal aire</i>, the plant is added in a warm bath.</p>

Amor Seco	<i>Bidens pilosa</i> L.	Asteraceae	<p>This plant grows all around the lands usually surrounded by shrubs.</p> <p>The leaves, stems, and flowers are boiled into tea and can be mixed with plants of choice.</p> <p>This plant treats inflammation, kidneys, liver, and prostate.</p>
Anjeco	<i>Artemisia absinthium</i> L.	Asteraceae	<p>This plant grows in aggregated groups and planted by land owners. Most of the time, it was found growing with <i>Mentha spicata</i>, “<i>Hierba Buena</i>”</p> <p>The leaves and stems are boiled into a tea and can be mixed with other plants.</p> <p>This plant is mostly used for stomach aches, gastrointestinal problems, colic, and dysentery.</p> <p>It is also used for folk healing such as <i>susto</i> and witchcraft.</p>
Arabisca	<i>Leuceaena leucecephala</i> (Lam.) De Wit.	Mimosaceae	<p>This tree is cultivated mostly for ornamental purposes. Many trees can be found around the town of Casma. It is used as an antiseptic.</p> <p>The leaves, flowers and seeds are boiled. The boiled liquid contents are then used to wash wounds, rashes, and sores.</p> <p>The seeds are boiled into a tea and help treat the kidneys.</p>
Berros	<i>Nasturtium officinale</i> R. Br.	Brassicaceae	<p>This plant is found along rivers, usually surrounded by large boulders that provide</p>

			<p>shelter.</p> <p>The leaves are put in salads or eaten to reduce or regulate blood pressure.</p>
Buenas Tardes	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	<p>This plant was cultivated by landowners along with other medicinal or ornamental plants.</p> <p>The flower of this species is known to open at noon.</p> <p>The root is added to tea and can be mixed with other plants.</p> <p>The tea is consumed to treat kidney aches and infections.</p>
Camote	<i>Ipomoea batatas</i> (L.) Lam.	Convolvulaceae	<p>This plant is cultivated near other food plants.</p> <p>The whole plant can be boiled into a tea, not mixed with other plants.</p> <p>Drinking this tea allows a woman to lactate after childbirth.</p>
Caña de Azucar	<i>Saccharum officinarum</i> L.	Poaceae	<p>This is a cultivated plant cultivated by land owners.</p> <p>Drinking the juice within the stems serve to treat the kidneys and prostate.</p>
Cardo Santo	<i>Argemone mexicana</i> L.	Papaveraceae	<p>Found growing naturally on the sides of small irrigation canals or in crop fields.</p> <p>Treats cough and anemia.</p> <p>The whole plant is boiled into a tea and can be mixed with other plants. Once the tea is yellow in color, it is ready for consumption.</p>
Cerraja	<i>Sonchus oleraceus</i> L.	Asteraceae	<p>This plant is cultivated by owners for medicinal purposes.</p> <p>The entire plant can be</p>

			<p>used usually in a tea.</p> <p>This treats anger, blood pressure and nerves.</p>
Chicoria	<i>Picrosia longifolia</i> D. Don	Asteraceae	<p>This plant grows along the irrigation canals and can be found with “Madre Maize” <i>Physalis</i> sp.</p> <p>The whole plant is boiled into a tea and can be mixed with other plants of choice.</p> <p>This can be a very potent plant and the amount of the plant used must be measure carefully.</p> <p>This plant helps purify the blood, treat the liver and gall bladder, and hepatitis.</p>
Chivatillo	<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	<p>This plant can be found growing as a crop outside of Casma.</p> <p>The legume fruit is prepared and cooked in foods. The fruit can also be eaten plain.</p> <p>This treats diabetes and high cholesterol. Around the area, it is commonly eaten to obtain protein and other vitamins.</p>
Chupa sangre	<i>Oenothera multicaulis</i> Ruiz & Pavon	Onagraceae	<p>This is cultivated by land owners and commonly used throughout the Andean valleys.</p> <p>The leaves and shoot are crushed and rubbed against the body where there is bruising, sores, and fractures.</p>
Clavito cimmaron	<i>Ludwigia</i> sp.	Onagraceae	<p>This is a cultivated by the land owners and usually found right along the water small irrigation canals.</p> <p>The bright yellow flower is boiled into a tea to</p>

			treat diarrhea.
Cola de Caballo	<i>Equisetum bogotense</i> Kunth	Equisetaceae	This plant grows naturally along irrigation canals where there is a large amount of water. The whole plant is boiled into a tea along with other plants that can treat kidney infections and kidney stones.
Enojo	<i>Foeniculum vulgare</i> Mill.	Apiaceae	This was planted by land owners and usually in shaded areas. The entire plant and seeds are used for medicinal purposes. The whole plant is boiled into a tea to treat colic. Women after childbirth, drink this tea to treat diarrhea and stomach aches.
Eucalipto	<i>Eucalyptus globules</i> Labill.	Myrtaceae	This tree is cultivated by the owners of the lands. The leaves are grinded in the hands and the grinded leaf will emit a smell that can clear sinuses and congestion. The leaves can also be boiled along with other plants that have a potent smell. The steam is to be inhaled by the person. The leaf can also be boiled into a tea. This treats bronchitis, colds, cough, flu, congestion, and asthma.
Flor de Arena	<i>Tiquilia paronychioides</i> (Phil.) A.T. Richardson	Boraginaceae	This plant is close to the ground because of its decumbent stem system. It grows in dry sandy areas, keeping a distance of other plants. The taproot is boiled into a tea to treat kidney infections and kidney

			aches. This plant has to be in its mature state.
Geranio	<i>Pelargonium roseum</i> Willd.	Geraniaceae	<p>This is cultivated plant used more for ornamental purposes but does have medicinal qualities.</p> <p>The flowers and leaves are boiled into a tea and consumed.</p> <p>This treats uterus inflammations and infections in the throat.</p>
Granadilla	<i>Passiflora ligularis</i> A. Juss.	Passifloraceae	<p>This plant is cultivated by landowners.</p> <p>The leaves, stems and fruit are used for medicinal uses.</p> <p>The fruit can be boiled as a tea along with other plants to treat the kidneys and liver. The peel is also boiled in a tea to treat diarrhea.</p>
Guanábana	<i>Annona muricata</i> L.	Annonaceae	<p>This is a large tree usually found with other large trees and known to grow natively around the lands.</p> <p>The skin of the branches and leaves are boiled into a tea.</p> <p>This tree is commonly known to heal all types of cancer but to other informants, it was known to treat prostate cancer.</p>
Guayaba	<i>Psidium guajav</i> L.	Myrtaceae	<p>This tree is cultivated by land owners</p> <p>The leaves and stems serve a medicinal purpose. As a tea, it is used to treat the liver and cancer.</p>
Hierba Buena	<i>Mentha spicata</i> L.	Lamiaceae	<p>This plant is cultivated by land owners and can be found growing along with <i>Artemisis absinthium</i>.</p>

			<p>It looks very similar and can be confused with <i>Mentha x piperita</i>.</p> <p>The entire plant can be boiled into a tea and many plants can be mixed with this plant.</p> <p>The common ailments for this plant to treat are colic, gastrointestinal problems, stomach aches, nerves, and parasitic worms.</p>
Hierba de Gallinazo	<i>Chenopodium album</i> L.	Chenopodiaceae	<p>This plant is cultivated and grows naturally around the lands.</p> <p>The entire plant can be boiled into a tea and consumed to heal colds. The liquid can also be rubbed on body to get rid of spots on the body.</p>
Hierba de la Meastranza	<i>Lantana scabiosiflora</i> Kunth	Verbenaceae	<p>This plant can be found with <i>Cestrum auriculatum</i> along shaded areas.</p> <p>The entire plant is made into a tea along with other plants.</p> <p>This plant is used commonly for menstrual pain.</p>
Hierba Lechera	<i>Chamaesyce hyssopifolia</i> L.		<p>This plant grows naturally around the lands.</p> <p>The stem is made up of milky latex used as eye drops to treat cataracts.</p> <p>Consumed orally in a tea, induces lactation after childbirth.</p>
Hierba Luisa	<i>Cymbopogon citrates</i> Stapf.	Poaceae	<p>This plant is cultivated by the owners along with other medicinal and ornamental plants.</p> <p>The leaves and stems are usually boiled in tea and treats colds, cough, and</p>

			<p>flu.</p> <p>It is known for its citrus smell and this scent helps identify the plant.</p>
Hierba Mora	<i>Solanum americanum</i> Mill.	Solanaceae	<p>This plant can be found along the edges of irrigation canals.</p> <p>The leaves, stems, flowers and fruit are used for medicinal purposes.</p> <p>The fruit can treat colds, flu, congestion, inflammation, and cold sores.</p> <p>The whole plant is used for <i>susto</i>.</p>
Hierba Santa	<i>Cestrum auriculatum</i> L. Hér.	Solanaceae	<p>The plant can be found with <i>Lantana scabiosiflora</i>, in shaded areas.</p> <p>The leaves are used for muscle aches and bruises on only the arms and legs, not the torso. It is also used for joint pain.</p> <p>The leaves are grinded together in the hands until it forms a foamy cream lather. The more foam there is, the more potent it will be. The cream is applied where the joint aches are.</p>
Higo	<i>Ficus carica</i> L.	Moraceae	<p>This tree grows along with other large trees. It grows naturally and cultivated in the lands.</p> <p>The leaves and stems are boiled into a tea.</p> <p>The common ailment for this to treat is diabetes.</p>
Higuerilla blanco	<i>Ricinus communis</i> L.	Euphorbiaceae	<p>This plant can be found around the lands and on the side of the roads.</p> <p>The leaves are rubbed or placed on the lower back in order to treat kidneys</p>

			<p>that cause back pain. This can work for wounds as well.</p> <p>The leaves can be warmed and placed on the stomach for stomach aches and constipation</p>
Huacatay	<i>Tagetes</i> sp.	Asteraceae	<p>This is a cultivated plant often found with ornamental and other medicinal growing.</p> <p>The flower is known to be cooked in foods.</p> <p>The entire plant is boiled into a tea to treat colds and bronchitis.</p>
Lima	<i>Citrus limetta</i> Risso	Rutaceae	<p>This tree can grow naturally around the land or cultivated.</p> <p>Boiling the flowers along with other plants in a tea can help with nerves and anxiety.</p> <p>Eating the fruit reduces and regulates blood pressure and heart. The juice is helpful with stomach pain, heartburn, and gastritis</p>
Llantén	<i>Plantago major</i> L.	Plantaginaceae	<p>This plant can be found under shaded areas alongside irrigation canals.</p> <p>The leaves and seeds are boiled into a tea.</p> <p>It is used to treat the liver and kidneys. It also is known to treat coughs and colds.</p>
Madre Maize	<i>Physalis</i> sp.	Solanaceae	<p>Found growing naturally along the edges of small irrigation canals and in crop fields.</p> <p>Known commonly as a weed to local people.</p> <p>The sepals are tightly closed and bladder-like.</p>

			<p>The clear liquid accumulates until the sepals open. This bud is the main focus for medicinal use in the area.</p> <p>The immature flower bud is squeezed to allow the liquid to be squirted in the eye.</p> <p>For children, this plant treats pink eye and for adults and children, it treats eye irritations.</p>
Maracuya	<i>Passiflora edulis</i> Sims.	Passifloraceae	<p>This plant is cultivated and marketed as a crop. Many fields of this fruit are growing outside the town of Casma.</p> <p>This very sour fruit is consumed orally to treat high blood pressure mostly but can also regulate the heart similar to the <i>limas</i>.</p>
Matagusano	<i>Flaveria bidentis</i> (L.) Kuntz.	Asteraceae	<p>This plant grows natively all over the lands</p> <p>It is known to be a weed among many as fields of this plant can cover unkempt land.</p> <p>The yellow flowers, stems and leaves are boiled into a tea and can be mixed with other plants of choice.</p> <p>This plant is known to treat coughs, colic, and bronchitis.</p>
Membrillejo	<i>Cordia lutea</i> Lam.	Boraginaceae	<p>Found growing naturally along the roads and usually with other small trees such as <i>Tessaria integrifolia</i>.</p> <p>The bright yellow flowers are the main focus as medicine.</p> <p>The flowers boiled into a tea and can be mixed</p>

			<p>with other plants.</p> <p>Helps treat hepatitis, liver, kidney stones and kidney infections.</p>
Menta	<i>Mentha x piperita</i> L.	Lamiaceae	<p>This plant is cultivated by land owners and can be found growing along with <i>Artemisis absinthium</i>.</p> <p>It looks very similar and can be confused with <i>Mentha spicata</i>.</p> <p>The entire plant can be boiled into a tea and many plants can be mixed with this plant.</p> <p>The common ailments for this plant to treat are colic, gastrointestinal problems, stomach aches, nerves, and parasitic worms.</p>
Molle	<i>Schinus molle</i> L.	Anacardiaceae	<p>This is a native tree in the Andean region and cultivated by land owners in the area.</p> <p>The common ailment is toothache which is treated by chewing the leaves and flowers.</p> <p>For wounds, colds, arthritis, bronchitis, body aches, the leaves and stem are kept in alcohol. The contents are rubbed on the body where aches are at and the chest.</p>
Muña	<i>Minthostachys mollis</i> Grieseb.	Lamiaceae	<p>This is a cultivated plant, native in the Andean region.</p> <p>The whole plant can be boiled in a tea or cooked in food.</p> <p>It treats stomach aches, colic, intestinal worms, dysentery, controls</p>

			nerves and stress, and regulates the heart.
Naranja	<i>Citrus sinensis</i> Osbeck	Rutaceae	<p>This is a cultivated tree grown in orchard-like or a few trees together.</p> <p>The leaves, flowers, and stems serve a medicinal purpose.</p> <p>For nerves and anxiety, the flowers can be boiled into a tea.</p> <p>The fruit juice is said to treat stomach aches.</p>
Paico	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	<p>This plant is known to grow as a weed and can be found along irrigation canals and along roads.</p> <p>The leaves, stems, and flowers are boiled into a tea and can be mixed with plants of choice.</p> <p>This plant treats gastrointestinal problem, usually stomach aches and is known to treat intestinal parasites.</p>
Pájaro Bobo	<i>Tessaria integrifolia</i> Ruiz. & Pav	Asteraceae	<p>This is found all over the lands and on the sides of the road.</p> <p>The leaves and flowers serve a medicinal purpose.</p> <p>They are boiled into a tea and can be mixed with other medicinal plants depending on what ails the person. It treats the inflammations, kidneys, liver.</p>
Palta Fuerte	<i>Persea americana</i> Mill.	Lauraceae	<p>This tree is grown as a crop and can be grown for ornamental purposes. Around the area of study five different species of palta were grown. Only one species serves medicinal purposes. In one land alone, all five were palta trees were</p>

			<p>growing side by side, planted by the owner.</p> <p>The leaves and flowers are used for medicinal purposes. They are usually boiled into a tea and consumed.</p> <p>The common ailments are stomach aches and ulcers.</p>
Plátano	<i>Musa paradisiacal</i> L.	Musaceae	<p>This is a cultivated plant, usually for its fruit and ornamental purpose than medicinal purpose.</p> <p>The liquid in the trunk is applied on wounds. It is also put in tea to treat diabetes</p> <p>The flowers are also used as medicine, usually boiled into a tea.</p> <p>Common ailments are diabetes, asthma, and heal wounds.</p>
Ruda	<i>Ruta graveolens</i> L.	Rutaceae	<p>This is planted by the owners along with other medicinal and ornament plant.</p> <p>There are many ailments that this plant treats but mostly for folk healing such as <i>mal aire</i> and <i>susto</i>.</p> <p>Other ailments that were commonly mentioned were abortion, cold, flu, coughs, and nerves.</p> <p>The plant is usually boiled as a tea with many other plants that associate with the same ailment. Only for abortions is the rue singularly boiled and consumed.</p>
Sávila	<i>Aloe vera</i> (L.) Burm. f., <i>Aloe barbadensis</i>	Aloeaceae	<p>This is an universal medicinal plant and the remedies of this plant focus on the substance</p>

			<p>inside the leaf.</p> <p>This plant is cultivated around the land where it can fully grow and mature.</p> <p>There are many medicinal uses for this plant but it is also a good luck plant that hangs above the door of homes and businesses with a red ribbon tied to it.</p> <p>The main uses are skin relief, vaginal irritations, wounds, gastrointestinal problems, eye irritations, and ulcers.</p> <p>The leaf contains an iodine gel. The secretion is applied on the body or consumed orally by mixing and adding it, in liquid form, in tea depending on what ails the person.</p>
Sombrerito	<i>Hydrocotyle blobiflora</i> Ruiz. & Pav.	Apiaceae	<p>This plant grows in aquatic areas, usually at the bottom edge of irrigation canals.</p> <p>The leaves and flowers serve a medicinal purpose.</p> <p>They are boiled into a tea to treat kidney infections and liver.</p>
Suelda con Suelda	<i>Ligaria</i> sp.	Loranthaceae	<p>This parasitic vine-like plant is found growing on a small <i>Schinus molle</i> tree near a river.</p> <p>The leaves can be grinded and is applied to wounds, usually fractures.</p> <p>The leaves are also used for <i>susto</i>.</p>
Tamarindo	<i>Tamarindus indica</i> L.	Caesalpinaceae	<p>This tree can be found growing along with other trees either ornamental or</p>

			<p>natural growing.</p> <p>The fruit of this tree is boiled into tea or eaten.</p> <p>The fruit works as a laxative and treat gastrointestinal problems</p>
Turre	<i>Spilanthes leiocarpa</i> DC.	Asteraceae	<p>This decumbent growing plant usually grows in an aggregated group in dry sandy soil.</p> <p>For infections and pains on the body the leaves, stems, and flowers are grinded and applied to the area.</p> <p>For skin irritations and rashes, the inside white part of the root is mashed and applied to the effected area.</p>
Una de Gato (coastal)	<i>Mimosa nothacacia</i> Barneby	Mimosaceae	<p>This plant was commonly found along the rivers. Often, they can found in groups.</p> <p>The bark served a medicinal purpose when boiled as a tea to treat cancer, kidneys, liver, inflammation, and hepatitis.</p>
Yuca	<i>Manihot esclenta</i> Crantz	Euphorbiaceae	<p>This plant is grown as a crop outside the town of Casma.</p> <p>The tuber serves as medicinal purposes by being boiled in a tea for vaginal infections or rubbed on the body for allergies.</p>

PLANT FAMILY LIST

Family :	No. of Species:
Asteraceae	9
Boraginaceae	3
Euphorbiaceae	3
Lamiaceae	3
Rutaceae	3
Solanaceae	3
Apiaceae	2
Chenopodiaceae	2
Mimosaceae	2
Myrtaceae	2
Onagraceae	2
Passifloraceae	2
Poaceae	2
Aloeaceae	1
Anacardiaceae	1
Annonaceae	1
Bixaceae	1
Brassicaceae	1
Caesalpinaceae	1
Convolvulaceae	1
Equisetaceae	1

Fabaceae	1
Geraniaceae	1
Lauraceae	1
Loranthaceae	1
Moraceae	1
Musaceae	1
Nyctaginaceae	1
Papaveraceae	1
Plantaginaceae	1
Verbenaceae	1

Total: 31

Total: 56

APPENDIX B

APPENDIX B

MEDICINAL PLANT RESEARCH INTERVIEW QUESTIONS

The Informant

Name:

Occupation 1:

Occupation 2:

Age:

Children: Male: Female:

Religion:

Sex:

Place of Birth:

Marital Status:

Languages:

Ethnic Group:

Education:

Date:

The town in which you conducted the interview:

In what kind of location did the interview take place?

1. What medicinal plants are use take for certain illnesses? Coughs, colds, etc...
2. How these plants usually prepared?
3. How many times do you treat with medicinal plants in a week or month?
4. Where do you get the plants? (garden, vendors, *emoilliente*?)
5. How do you know about the medicinal plants?
6. Are there any other types of medications aside from medicinal plants that you take for your illnesses? Herbal medicines, pharmaceuticals?
7. Due you change your preparing method for a child, elder, or pregnant woman?

BIOGRAPHICAL SKETCH

Rebecca L. Reyes was born in Grelton, Ohio on June 9, 1982, the daughter of Jesus Reyes and Susana Losoya Reyes. She graduated from Patrick Henry High School in 2001. She moved to Texas in 2002 to attend the University of Texas Pan-American, Edinburg, Texas, and received a degree of Bachelor of Arts in Anthropology with the honor of magna cum laude in May 2007. She continued on for her masters at the University of Texas Pan-American in the masters of Arts Interdisciplinary Studies with the concentration on Anthropology. She will be receiving her degree in December 2009. She is currently the President of Lambda Alpha Anthropology Honor Society and a member of Phi Kappa Phi.

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