

## Chapter 2

# Fieldwork Methodology

### Introduction

This doctoral dissertation describes a traditional ethnopharmacological project with three aspects: anthropology, botany and chemistry. Each of these aspects utilized different methods for gathering data, yet these methods continuously overlapped throughout the project. Interviews conducted in the early stages of fieldwork determined the depth of knowledge of a particular healer regarding Thai Traditional Medicine and medicinal plants. During the later stages, when selected medicinal plants were screened in the laboratory, a healer who had become a key research participant would be interviewed again to ask about the specific therapeutic characteristics of that particular plant. While these interviews were about different topics, the method of asking questions to obtain information is the same.

The ethnographic data for this study was gathered during semi-structured interviews using an interview questionnaire, and both direct and participant observation [1]. Direct observation allowed me to witness healing sessions without being a part of them, but I was able to participate in the preparation of the remedies and was sometimes treated by the traditional healers I interviewed (participant observation). In the preliminary stages of my research, the interviews focused on selecting traditional healers with knowledge about plants used for the brain and for memory. For this purpose, I used a directed questionnaire seeking information about the healer's background, including information on where they learned about Thai Traditional Medicine and herbal remedies. Specific information on plants was not discussed on the first visit and instead that interview time was used to establish rapport with the healer.

In some cases, it took many interviews to determine if a healer actually had a deep knowledge of medicinal plants, or if they were gifted in another method of healing, like massage, and had only a surface knowledge of plants. One observed cultural characteristic of many healers is the desire to provide an answer, regardless of whether it is correct. In many situations, the healers told me very general or

incorrect information, because to say “I don’t know” is perceived as a “loss of face” or shows a lack of knowledge in Thai culture. So any answer, even if it is incorrect “saves face” or shows personal knowledge. A number of times the healers said that they would give me information about plants in the following interview. I found the healers who were straightforward about their level of knowledge actually did have information on medicinal plants for memory. In the end, there were some healers who I visited only once as they did not have a deep knowledge of medicinal plants, others about 10 times and still others over 30 times. These frequently visited healers became my primary research participants.

## **Selection of Traditional Healers for Interviews**

### ***Types of Healers in Thai Traditional Medicine***

Research participants were primarily healers of Thai Traditional Medicine. Thai people call these healers *maws*, and there are usually one or two traditional healers or *maws* in each village. Healers with expertise in medicinal plants were considered specialists and were used as research participants [1]. In this document, I will refer to these specialist research participants as traditional healers. Many of the interviewed healers, especially the men, were previously Buddhist monks and learned about traditional medicine from older monks at the temple. Others learned about it as the knowledge passed through generations of family members. Some received their training from both the temple and their family. Many of the research participants had formal education in Thai Traditional Medicine. Currently, the Ministry of Public Health licenses many traditional healers, as the profession is becoming more regulated.

There are a number of different specializations for traditional healers in northern Thailand. These range from healers who use physical therapy like massage (*kai bam bad*) to spiritual healers (*pii tii kam bam bad*), to those who advise on food choices (*ahan bam bad*) and healers that specialize in using medicinal plants (*samunprai bam bad*). There can be overlap in these types of traditional Thai healers, so some healers are both spiritual healers and use medicinal plants. In addition to traditional healers, there are midwives in Thailand who specialize in pregnancy, childbirth and caring for the mother after the child is born using medicinal plants, prescribed foods and ceremony. The midwife will also ensure the new mother follow the special taboos and postpartum practices. There are specific medical afflictions if the mother does not follow these prescribed regulations in Thai Traditional Medicine.

### ***Selection of Participating Healers***

I met many of my research participants through an introduction by Dr. Panee Sirisard (Ajan Panee), PhD in the Department of Pharmaceutical Sciences at the Faculty of Pharmacy of Chiang Mai University. She is an expert on *Lanna* Traditional Medicine and was my local mentor during my time in Chiang Mai. Without her



**Fig. 2.1** First visit to a traditional Thai healer with Ajan Panee (photograph by author)

introduction, many of the healers who agreed to work with me would not have allowed me to interview them at all. The “introduction” is a significant cultural practice in Thailand. Many doors were opened for me because of an introduction, or because of the request of someone in a respected position. By accommodating this request, the person was practicing *kreeng jai*, which is the sense of obligation and politeness found in Thai society [2].

Ajan Panee took me to meet some of my key research participants during my first trip to Thailand in the summer of 2006 (Fig. 2.1). When I returned to Thailand to begin my fieldwork in earnest, she again helped me make contact with these healers. She also gave me a list of local healers she had worked with in the past, and selected some of them for me to contact.

### ***Description of the Interviewed Traditional Thai Healers***

The healers identified in this dissertation were interviewed at least once, and their traditional knowledge is contained in this document. In the cases where the healer was interviewed only once, it was apparent after the first interview they did not have the mastery of medicinal plants needed for my research. These healers are not included in this list. A healer was interviewed more than once if they had a good understanding of Thai Traditional Medicine or how cognitive impairment and dementia are explained in that context. These healers are described to offer a perspective on the types of training for traditional healers, their differences and similarities in training and practices (Table 2.1). The names of the interviewed traditional healers are coded to respect their confidentiality.

**Table 2.1** Chart of interviewed traditional healers with information on their training and personal characteristics

| Name         | Age | Sex    | Ethnicity             | Practices                                                                                  | Training                                  | Additional information                                                                      |
|--------------|-----|--------|-----------------------|--------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------|
| Mor A        | 42  | Male   | Khon muang            | Herbal medicine<br>Spiritual healer<br><i>Hae</i> <sup>a</sup>                             | Grandmother<br><i>Pali</i> manuscripts    |                                                                                             |
| <u>Mor B</u> | 66  | Male   | Khon muang<br>Chinese | Herbal medicine<br>Thai massage                                                            | Family<br>Thai Ministry of Health         | He is a ninth generation healer and operates his own factory                                |
| <u>Mor C</u> | 50  | Female | Central Thai          | Thai massage<br>Herbal medicine                                                            | Grandmother<br>Thai Ministry of Health    | Teaches Thai massage at her healing center                                                  |
| Mor D        | 55  | Male   | Khon muang            | Thai massage<br>Herbal medicine                                                            | Thai Ministry of Health                   | Director of healing center in Chiang Mai                                                    |
| Mor E        | 73  | Male   | Khon muang            | Thai massage<br>“hot foot” massage <sup>b</sup><br>Herbal medicine                         | Temple                                    | Healer for over 50 years                                                                    |
| <u>Mor F</u> | 60  | Male   | Khon muang            | Herbal medicine<br>Spiritual healer                                                        | Family                                    | Healer for 45 years                                                                         |
| Mor G        | 51  | Male   | Khon muang            | Massage<br>Herbal Medicine                                                                 | Temple<br>Learned from<br><i>Thai Yai</i> | Teaches massage<br>Healer for 27 years                                                      |
| <u>Mor H</u> | 51  | Male   | Khon muang            | Herbal Medicine                                                                            | Thai Ministry of Health<br>Grandmother    | Teacher at Thai Massage School<br>Shivagakomarpaj (The Old Medicine Hospital) in Chiang Mai |
| Mor I        | 75  | Male   | Khon muang            | Herbal medicine<br>Tells horoscopes                                                        | Grandfather                               | Healer for 40 years                                                                         |
| <u>Mor J</u> | 60  | Male   | Khon muang            | Herbal medicine<br>Spiritual healer<br>Thai massage<br><i>Tak sen</i> massage <sup>c</sup> | Temple<br>Grandfathers (both sides)       | Healer for 30 years                                                                         |

(continued)

**Table 2.1** (continued)

| Name  | Age      | Sex  | Ethnicity  | Practices                                                                             | Training                | Additional information                 |
|-------|----------|------|------------|---------------------------------------------------------------------------------------|-------------------------|----------------------------------------|
| Mor K | 49       | Male | Khon muang | Herbal Medicine<br>Spiritual healer<br>Bone setter<br>“Hot foot” massage <sup>b</sup> | Father<br>Grandfather   | Healer for 25 years                    |
| Mor L | 63       | Male | Khon muang | Herbal Medicine                                                                       | Unknown                 | Runs an herbal medicine factory        |
| Mor M | 58       | Male | Khon muang | Herbal Medicine                                                                       | Grandfather             | Healer for 20 years                    |
| Mor N | 65       | Male | Khon muang | Herbal Medicine<br>Scraping <sup>d</sup>                                              | Grandparents            | Healer for 35 years                    |
| Mor O | Deceased | Male | Unknown    | Herbal Medicine                                                                       | Unknown                 | Monk at a temple outside of Chiang Mai |
| Mor P | 74       | Male | Khon muang | Herbal medicine<br>Fortune teller                                                     | Temple<br>Other healers | Healer for 26 years                    |

Key participant healers are underlined

<sup>a</sup>*Hae* is a practice where a tiger tooth or elephant husk is used to apply herbs to the patients skin

<sup>b</sup>Hot foot massage is where the healer dips his foot in alcohol, quickly sets it on fire, extinguishes it with water and places it on the body of the patient

<sup>c</sup>*Tak sen* massage uses an block of wood and a cylindrical piece of wood, which causes a vibration to the *sen* lines in the body

<sup>d</sup>“Scraping” is where the skin is scraped with a rock to help the disease come out

Five healers became my key research participants. These healers had both the willingness to share with me, and the depth of knowledge I needed for my research. Some of the other healers were interviewed up to five times. I visited the five healers who were my key research participants numerous times, some over 30 visits.

## Methods for Data Gathering

### *Interview Protocol*

This study focuses on plants used for memory impairment that could lead to general dementia, Mild Cognitive Impairment (MCI) and Alzheimer’s disease (AD). It was impossible to identify the type of dementia the plant remedies discussed by the healer were meant to treat; specifying Alzheimer’s Disease or even Mild Cognitive Impairment as the primarily affliction would be inaccurate. Therefore, questions

focused on plants to improve memory in general, plants for the elderly who had memory problems, and tonics for the brain. As the disease categories relating to age-related cognitive decline were identified and clarified within the paradigm of Thai Traditional Medicine, there were more questions relating to the specific formulas used to treat these diseases. Some doctors knew about Alzheimer's disease, but not about other type of dementias, and one healer offered a formula specifically for Alzheimer's disease. As this study was a directed ethnopharmacological study, no discussion about other disease categories took place unless there was some relevance to the brain or memory. Healers were asked about herbal remedies for the aforementioned categories and then free-listed the plants used to treat them [1]. Many discussed ancient multi-plant formulas, which were written in *Pali*, the language of the Lanna Kingdom and Buddhism. These formulas were inscribed on palm leaves with a sharp instrument and rubbed with soot for the letters to appear. The healers translated these formulas into Northern Thai, and botanists at the Queen Sirikit Botanic Garden or the healers themselves identified the plants contained in them.

Interviews with the healers began with a general explanation of my research and the presentation of my Graduate Center Institutional Review Board (IRB) approval letter written in the Thai language. To secure free prior informed consent, a signature was required, but the first healer I interviewed alerted me that obtaining a signature in this situation was culturally inappropriate. He refused to sign my IRB form and repeatedly stated he would sign it the next time I visited him. He believed that his signature meant I had ownership over his traditional knowledge. He would not sign my IRB letter asking permission to interview him for fear he was signing over all of his knowledge. Instead of a signature, I obtained approval from The Graduate Center Office of the President for Research and Sponsored Programs Institutional Review Board that required only verbal permission after each healer read the IRB letter describing my project. I audiotaped the healer giving permission for the interview in Thai to document their prior informed consent.

The interviews were directed by a semi-structured questionnaire approved by the IRB of The Graduate Center at The City University of New York (IRB number: 08-05-1563; PI: Lisa Offringa). The questionnaire contained a number of different types of questions ranging from closed and directed questions, to those that were very open-ended [1]. As I conducted more interviews, the questionnaire was adjusted to account for my understanding of cultural differences in the Thai culture and language. Certain questions were asked during the first interview, but others were held until subsequent interviews as rapport was established with the healers. Questions about plants and formulas for memory disorders were asked after more general questions about Thai Traditional Medicine and theory on memory loss as described by Thai Traditional Medicine.

During the botanically focused portion of this project, the type of interviews I conducted varied. Initially, I used the questionnaire and only deviated from the questions when the healer offered more information on a specific question. As my work with particular healers continued for many years, the interviews with them became more unstructured. During collecting trips, plants were discussed in field interviews and there were discussions about these plants at the market, or in the healer's home or factory since some of the plants were obtained directly from the healers.

The interviews were audio recorded after the healers freely gave their permission. After I identified my key research participants, the interviews became more informal and I did not record the entire interview. Towards the end of my work, the visits to healer's homes became more like social visits to friends with food and laughter (and sometimes a taste of their homebrewed strawberry wine or *yaa dong*, which is whiskey steeped with herbs). The casual nature of these visits allowed me the opportunity to be present and observe when other villagers would come by for medical or spiritual advising. All interviews used a research assistant to translate from Central and Northern Thai, which was the language of choice for the healers, to English.

With my five key research participants, I asked questions as needed (unstructured interviews) without using a directed questionnaire. Many times, as the healers became more familiar with my project, they understood the information I needed and would just talk about the topics of my work. In addition, I would conduct interviews on the specific plants to understand the use of the plant in Thai Traditional Medicine to get a better perspective on how the use could translate into western medical concepts. Collecting trips in the forest were perfect for conducting field interviews and asking questions about specific plants. As one of the healers became more familiar with me, he would invite his friends, who are also traditional Thai healers, along on our field trips. These circumstances allowed me to have group interviews, and elicit discourse and debate about plant uses and folk names (group interviews).

Trips to the field were made with the healers to collect plants for my project in addition to plants they needed for their practice. When the trip focused primarily on my project, I was able to conduct field interviews. During other field trips, I was able to observe the healers collecting plants for use in their practice (participant observation) (Fig. 2.2).

All the plants in the memory formulas received from the traditional healers were investigated in online databases (NAPRALERT, PubMed, SciFinder Scholar, etc.) to determine if they had already been tested for antioxidant activity, total phenolic content and other activity before bringing them to the laboratory to be studied. If the plant was previously tested, it was removed from the list for in vitro screening. I presented the remaining single species names (in Thai) to the healers who provided the formulas in the form of a checklist for them to rank the single plants in the order they would select them to test in the laboratory for memory enhancement activity. The checklists made by the healers were compared, and 11 plants were chosen for in vitro screening.

## ***Interview Questionnaire and Development***

An ethnography is best conducted with a good survey technique and an effective questionnaire [3]. The questionnaire used to interview the healers was designed to facilitate semi-structured interviews where the research participant would be asked an open-ended question to allow them to speak for any length of time about



**Fig. 2.2** Fieldwork group interview in *Papae Village, Lamphun Province, Thailand* (photographer: Jiratthitikaan Tumakaew)

whatever they felt pertained to the question [1]. Sometimes these questions would elicit simple, one-word answers, other times they would lead to long stories, which encouraged additional questions. For example, some healers would just state where they were born when asked, while others would talk about where they were born, where their parents were from and what it was like growing up there.

The questionnaire was originally designed utilizing questions from ethnobotanical methods guides [1, 4]. I also spoke with other students who conducted similar work, and took the advice of my committee members. As the interview process progressed, the questionnaire was edited as some questions were confusing to the healers. I developed questions during the interviews to address information that was freely offered by some healers and not by others.

The same questions were asked at the start of each interview, but the discussion would often diverge after a certain level of knowledge was revealed. The questionnaire began with demographic questions about the healer and their practice. The second part of the questionnaire often divided the healers into one of two categories: those who did not know about treating memory loss that can lead to dementia and those that did. These questions addressed the symptoms of cognitive impairment, dementia and Alzheimer's disease, especially memory loss. If the healer was familiar with any of these disease categories or symptoms, then additional questions would be asked to clarify their knowledge and determine if they would be interviewed again about plants they used. If they did not know about memory loss and elderly dementia, then I would use the interview time to learn about Thai Traditional Medicine in general. This approach allowed me to gather necessary information, and at the same time, not cut off the interview and dishearten the healer because they did not possess certain knowledge.

All the healers I interviewed were asked about plant resources and collecting, and about plant management and conservation. These questions would relate specifically to this project if I continued to visit that healer and ask them questions about plants used for memory. If the healer was interviewed only once, these questions would provide me information on the condition of medicinal plants in northern Thailand, and plant resources in general.

Questions about particular plants to treat memory, cognitive impairment and even dementia were asked during the second interview and beyond. Some rapport was established with the healer before asking about plant formulas to treat memory issues since this information is sometimes considered a guarded secret. One healer provided his formula in its entirety after working with me for over 2 years. Other formulas that related to memory, for example, to improve blood circulation, or to treat a culturally specific condition that afflicts only women who did not follow the prescribed diet after childbirth, were given more freely.

Questionnaires were to address each formula and the single plants they contained. I asked about the history of the formula and which plants were the most important in the formula. Before the laboratory portion of my work began, a list of plants from the formulas was developed to determine which ten plants to test in the chemical bioassays. Two plants were added to the list of single plants that were tested as it was specifically suggested by more than one healer. One of the plants could not be identified, so it is not reported in the results.

The International Review Board (IRB) approved the original interview questions used during this project. Each year these questions were reassessed when I applied for continued IRB approval.

## ***Plant Identification and Voucher Collection***

The medicinal plant samples were collected from the forest, the home gardens of the healers, obtained directly from the healers or purchased at the local herbal market. During the interviews, information on each plant including the folk name, part used, preparation, where the plant could be obtained (forest, garden, market) and any special information on collecting the plant was recorded. I also collected “plant use” information on the activity of each plant as defined by Thai Traditional Medicine. This information helped to bridge the different perspectives between the eastern medical paradigm and the western view of dementia.

For plants collected in the forest and in the healer’s home gardens, standard botanical collecting techniques were employed [1, 4]. Wittaya Pongamornkul, a botanist at the Queen Sirikit Botanic Garden (QSBG), curated the voucher specimen and deposited them in the herbarium of the QSBG. My research permits stipulated that no plant material was to be removed from the Kingdom of Thailand. Therefore, the voucher specimen were photographed and digitized as a record of this work. These files are kept at the Institute of Economic Botany at The New York Botanical Garden (NYBG). A complete list of voucher specimen and collected

plant samples are not included in this dissertation as to keep confidential the complete list of species in the multi-plant formulas.

The *Lanna* Kingdom encompassed more than just the current borders of Thailand, and during historical times, includes parts of Laos, China and Myanmar (Burma) therefore some plants listed in the ancient manuscripts are not found in Thailand [5]. Since this is a contemporary study of Thai Traditional Medicine, the plant material currently used by the healers in their formulas was considered valid for this project. One healer has a factory where he produces his own herbal remedies. Some of the documented plants were obtained directly from him. If he did not have a plant, it was purchased at *Lanna Herbs* in Chiang Mai city, a market commonly used by many healers (Fig. 2.3). These plants were identified using standard Thai medicinal manuals and field guides for the area [6–11] and, when available, compared to



**Fig. 2.3** Outside and inside of *Lanna Herbs* store at *Kad Luang* Market, Chiang Mai, Thailand (Photographer: Dr. Jillian De Gezelle)

herbarium specimen [12]. These names were double checked by presenting the healer with a photograph of the known plant species to confirm the botanical name [13]. This reference collection of “market vouchers” was photographed for documentation. The photographs will remain at the Institute of Economic Botany at The New York Botanical Garden to contribute to the documentation of medicinal plant knowledge in northern Thailand. All scientific names were referenced against the Tropicos website of the Missouri Botanical Garden for accuracy (Tropicos <http://www.tropicos.org/>).

## **Ethics of Ethnobotanical Research**

### ***The Protection of Biological Resources and Traditional Knowledge***

According to the World Health Organization, 80 % of people in certain Asian and African countries use traditional medicine as their primary source of healthcare [14]. These traditional knowledge systems are often mined for information about plants with the potential to treat disease, which can be the beginning of a process where a potential new medicine is found in nature, patented and sold. The worldwide use of herbal medicines, many from these traditional medical systems, is in the billions of U.S. dollars [15]. In Western Europe sales from herbal medicine reached five billion dollars for 2003–2004, in China it reached 14 billion dollars in 2005, and in Brazil sales in 2007 were 160 million dollars [14].

For some specific medical issues, only a few specialists or traditional herbalists hold information on treatments using medicinal plants, therefore this information is regarded with a high level of sensitivity. These plants can be endemic to the area where they grow, have a specific part that is used and there may be a high demand for them with a potentially low supply [16]. In order to develop marketable herbal products from plant material, more developed countries with fewer natural resources may extract raw biological materials from the less developed countries with considerable biodiversity and traditional plant knowledge. Developing countries have begun to valorize their natural resources, their knowledge for using these resources and the necessity to preserve them [15].

To help regulate the exchange of biological resources, agreements like The Convention on Biological Diversity (CBD, <http://www.cbd.int/convention/text>) and the Nagoya Protocol on Access to Genetic Resources (<http://www.cbd.int/abs/text/default.shtml>) were developed. These documents aim to be comprehensive and accessible, so they are of use to local populations who often are the suppliers of both the biological resources and the knowledge of their use. The Convention on Biological Diversity was adopted in Rio de Janeiro, Brazil in 1992. It is a treaty designed to manage the conservation of biological diversity including genes, species and ecosystems, to promote sustainable use of biological resources, and to direct the “fair and equitable use of benefits” that arise out of the use of these

biological resources. It states that the countries, who are the suppliers of biological resources, have “the sovereign right to exploit their own resources according to their environmental policy,” and manage and control access to their resources with the least damage to the environment [17]. Each state that is party to the CBD must agree to cooperate with each other through international organizations (Article 5), and seek mediation if there is a dispute (Article 27). The Convention for Biological Diversity was ratified in 1993 by many countries, but not the United States [17]. The Nagoya Protocol, as an amendment to The Convention for Biological Diversity, was adopted October 29, 2010 and put into force 90 days later. This document addresses access to genetic resources, but also the traditional knowledge associated with those resources. To obtain access to resources and information, prior informed consent must be obtained on levels from securing permits at a national level to acquiring permission from local people. There must be clear information and regulations to follow on obtaining prior informed consent as it relates to biological resources and traditional knowledge (Article 6). The countries or states providing these resources are encouraged to use their benefits for the further conservation of their biocultural diversity [18].

### ***Protection of Biocultural Diversity in Thailand***

In 1999, Thailand’s legislature passed the “Act on Protection and Promotion of Traditional Thai Medical Intelligence, H.E. 2452” which was signed into law by the current Prime Minister. This law defines Thai Traditional Medicine and proposes the creation of a committee to protect traditional medicine, and manage access to traditional knowledge and biological resources in herbal medicine. It also proposes a process to register traditional knowledge for its protection, and regulates the use and removal of medicinal herbs to guarantee their conservation [19].

In this document Thai Traditional Medicine is defined as “the medicinal procedures concerned with examination, diagnosis, therapy, treatment or prevention of, or promotion and rehabilitation of the health of humans or animals, obstetrics, traditional Thai massage, and also includes the production of traditional Thai drugs and the invention of medical devices on the basis knowledge or text that has been passed on from generation to generation” [20]. This definition includes recipes and formulas, and any formal documentation like stone inscriptions, manuscripts written on palm leaf, Thai traditional books, and even statues depicting *ruesi dud ton*, or traditional Thai stretching techniques. Five national traditional Thai books are recognized by the “Act on Protection and Promotion of Traditional Thai Medical Intelligence, H.E. 2452”: the *That Pra Narai Inscription* (Palm Leaf) with 81 recipes, the *Inscription Pharmacopoeia of Wat Orasaram* with 203 recipes, the *Medicine Aid Treatise of Rama V*, Vol. 1 with 713 recipes, the *Medicine Aid Treatise of Rama V*, Vol. 2 with 1,066 recipes and the *Inscription Pharmacopoeia of Wat Po* with 2,022 recipes [21]. Along with these formal documents, both general and healer’s individual recipes on Thai traditional plant knowledge are also protected [19].

## ***Dissertation Project Ethics***

Permission was obtained from the National Research Council of Thailand (NRCT) to conduct this research project for the duration of the study period beginning October 2009 through February 2011 (Registration number 124/52). Provisional permission was received in April 2009 to begin the “social sciences” portion of this research in the form of a 6-month Short-Term Training Agreement (No. Biotec 5402/364/2552) through Thailand’s National Centre for Genetic Engineering and Biotechnology (Biotec).

Fieldwork was conducted in collaboration with the Queen Sirikit Botanic Garden (QSBG) with permission from the director, Dr. Konganda Chayamarity. Laboratory research was performed in collaboration with Chiang Mai University Faculty of Pharmacy for the in vitro studies. The research permits obtained from the NRCT for this project had the following stipulations:

1. Research will be conducted under the supervision of Dr. Jintanaporn Wattanathorn of Khon Kaen University and Dr. Konganda Chayamarity the director of the Botanical Garden Organization.
2. Dried samples will be stored in the herbarium of the Botanical Garden Organization.
3. No samples will be taken to be analyzed abroad in the United States.
4. All expenditures which are borne during the survey and analysis in Thailand will be paid by the researcher.

Two extensions were requested and secured from the National Research Council of Thailand (NRCT) for this project. The first was a 6-month extension from March 2011 until August 2011 (Registration number 5/54), then again for 3 months from September 2011 until December 2011 (Registration number 80/2554). Progress reports were submitted to the NRCT every 6 months during this research period to include a final report of the research results.

After completion of the research at Chiang Mai University, Dr. Wisinee Chanmahasathien and two other students were trained on some of the in vitro bioassays. This type of reciprocation is suggested by Gary Martin [4]: “extraction, screening and more sophisticated techniques should be carried out in the local laboratories and with local expertise whenever possible to stimulate capacity building.”

All fieldwork conducted and data collected for this project followed the Guidelines of Professional Ethics as put forth by the Society for Economic Botany [22], the International Society for Ethnobiology [23], the Convention on Biological Diversity and Nagoya Protocol and national law of the Kingdom of Thailand with respect to traditional knowledge. The International Society for Ethnobiology (ISE) has a very comprehensive Code of Ethics, which is upheld by its members [23]. It is comprised of different sections to address its purpose, suggested principles and practical guidelines. Obtaining prior informed consent requires the researcher to fully communicate his or her research and potential risks to each research participant. It must be in the language of the research participant, and consider cultural

context and potential latent misunderstandings. Free Prior Informed Consent was obtained and full disclosure of potential misuse of the research data was explained to all of the healers who participated in this study, as per the Code of Ethics set forth by the International Society of Ethnobiology [23].

The Society for Economic Botany (SEB) also has prescribed guidelines which are outlined under four headings calling for responsibility to the public, those individuals or cultures studied, host government and institutions, and to the profession [22]. The SEB guidelines for professional ethics requires prior informed consent and adherence to local laws, customs and national requirements, both of which were upheld during the duration of this project.

The City University of New York Office of Research and Sponsored Programs through the Institutional Review Board (IRB) with assurance from the U.S. Department of Health and Human Services has approved this project (IRB number: 08-05-1563; PI: Lisa Offringa). I was trained in Responsible Research Conduct and updated the IRB approval for this project yearly to ensure the protocol and permissions were current.

## Challenges of Fieldwork

There were challenges to the research process for my work in Thailand. The first of these was the language. The Thai language is a tonal language, setting it apart from English, which is not. Both the word and the tone must be remembered otherwise no one will understand you. The traditional healers speak the northern Thai dialect, or *kam muang*. It is related to Thai, but sounds distinct from central or Siamese Thai, and uses different words. All of my interviews were conducted in the northern Thai dialect, so there was little need for me to learn the central Thai language for my research.

Gender issues did not affect my research, but there are gender inequalities in Thailand. Based on the Buddhist precepts, women are viewed as inferior. Male monks are considered higher than female nuns, and women cannot touch monks because women are perceived as impure. Women cannot attain the same levels of enlightenment in Buddhism as men because of their impurity (Tanja Trautwein, 3 January 2013, personal communication). In the universities, there was a uniform mix of males and females. As mentors, Ajan Panee and Dr. Jintanaporn assisted me with my research. Both are strong women who are successful in their field demonstrating the culturally progressive nature of science in Thailand.

For this project, all but one of my research participants were men. In many cases, traditional medicine is taught in the monastery to monks and, as mentioned above, monks are customarily men. Some of my key participants were taught about herbal medicine from their family and from the monastery, others just from their family, or just from the monastery. My female key research participant learned about plant medicine from her grandmother, so she was the only example of a matriarchal lineage of traditional plant knowledge.

## Data Collection and Analysis

Data from my research were transcribed from the audio taped interviews in Microsoft Word© word processing software. The audio taping software used was the Digital Voice Editor Software supplied with the Sony IC Recorder used to tape the interviews. Lists of the medicinal plants in the formulas were managed using Microsoft Excel© software. Initial data analyses of the in vitro bioassay results were also analyzed in Microsoft Excel©. The ANOVA and post-hoc analyses of my laboratory research results were analyzed in SPSS Statistics© [24] software.

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