POPULATIONS IN TRANSITION, MEDICINES IN MOTION:

MIGRATION, HEALTH, AND HEALING IN ECHANG HAMLET,

REPUBLIC OF PALAU, MICRONESIA

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By
Aunchalee Elaine Loscalzo

Dissertation Committee:

Nina L. Etkin, Chairperson
Nancy D. Lewis
Miriam T. Stark
Geoffrey M. White
Bruce A. Wilcox

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For my parents,

Aunchalee Uphasook

and

Craig Albert Loscalzo

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No act of kindness, no matter how small, is ever wasted.
~ Aesop

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ABSTRACT

This dissertation explores medical pluralism using the theoretical and methodological foundations of biocultural anthropology. In so doing, the evaluation of medical ideology and healing practices occurs simultaneously with cultural interpretations of biologic outcomes and biomedical assessments. Medicine in Echang hamlet (Koror, Republic of Palau) embodies the complexity of cultural adaptation to transformative social, biologic, and ecologic contexts. A presentation of the historical and political circumstances surrounding the resettlement of southwest island communities in Echang provides a lens through which to understand the social marginalization of this population. It also contextualizes the transformation of human encounters with therapeutic and dietary landscapes that has influenced emergent disease patterns, health disparities, and medical practices. Conventional applications of the epidemiologic transition concept are inappropriate in this locale where high rates of infectious and chronic diseases co-exist. Indigenous theories of illness etiology and therapeutic action shape processes of selection, utilization, and cessation of medicines in a setting where a variety of medical paradigms flourishes. The potential physiologic significance of plants in food, medicine, and polypharmacy is considered. The nutritional impact of the declining use of wild and cultivated plants receives special attention. This study contributes to the anthropological literature on medicines in the context of social transformation, medical pluralism, diet and health, and pharmaceutical anthropology.

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A. Overview

This dissertation explores medical pluralism using the theoretical and methodological foundations of biocultural anthropology. In so doing, the evaluation of medical ideology and healing practices occurs simultaneously with cultural interpretations of biologic outcomes and biomedical assessments. Medicine in Echang[1] hamlet (Koror, Republic of Palau) embodies the complexity of cultural adaptation to transformative social, biologic, and ecologic contexts. A presentation of the historical and political circumstances surrounding the resettlement of southwest island communities in Echang provides a lens through which to understand the social marginalization of this population. It also contextualizes the transformation of human encounters with therapeutic and dietary landscapes that has influenced disease patterns and medical practices. Conventional applications of the epidemiologic transition concept are inappropriate in this context where high rates of infectious and chronic diseases co-exist. Indigenous theories of illness etiology and therapeutic action shape processes of selection, utilization, and cessation of medicines in a locale where a variety of medical paradigms flourish. The potential physiologic significance of plants in food, medicine, and polypharmacy is considered. The nutritional impact of the declining use of wild and cultivated plants receives special attention. This study contributes to the anthropological

[1] Echang is the Palauan spelling and the 'ch' represents a glottal stop. Eang is a common alternative spelling.

literature on medicines in the context of social transformation, medical pluralism, and pharmaceutical anthropology.

B. Dissertation Organization

This dissertation presents a comprehensive analysis of key cultural, biologic, and ecologic features of migration, disease, health disparities, and medical pluralism in Echang hamlet. It ties together three domains of health-related data collected during approximately 10 months of ethnographic research in Palau from 1999-2002: migration, indigenous medicines, and dietary change. Biocultural and ecological perspectives in medical anthropology provide the analytical framework for the major thematic areas.

Chapter One outlines the theoretical foundations of dissertation research. It gives an overview of anthropological literature on medical pluralism and highlights key studies that have influenced the present analysis. This chapter explores past and current trends in medical anthropology in Palau (Micronesia). It also articulates the way this study contributes specifically to the medical anthropological literature in Pacific Island societies.

Chapter Two provides a detailed description of research methodology. Organized around the research assumptions addressed in the first chapter, the research methodology facilitates a biocultural analysis of medical pluralism in Echang. This chapter describes quantitative and qualitative methods that have facilitated data collection on health ideology, the use of plants in food and medicine, pharmaceutical selection and use, and other relevant aspects of health and healing. Chapter Two discusses some of the methodological limitations in project design as well as areas that warrant further investigation.

Chapter Three contextualizes research by providing a description of the research site and population. The chapter opens with a survey of the geographical, historical, and sociopolitical context of research in Palau. Then the focus narrows to describe the specific research site, including its location, geography, population composition, vital statistics, and epidemiologic profile. This chapter explores the cultural heterogeneity of Echang, including social structure, cultural identity, and local definitions of community and household. The purpose of this chapter is to explore the key features of sociocultural transformation that have occurred as a result of population migration from the southwest islands and resettlement in Echang. The sociocultural context of migration is possibly the single most important catalyst of change in disease patterns and medical behaviors of southwest island populations.

Chapter Four is the first of a two-chapter presentation of indigenous Tobian medical beliefs and practices. Chapter Four provides the ideological foundations of Tobian health and healing of the past and present. The chapter begins with an historical account of Tobian cosmology before and after the introduction of Catholicism. It goes on to describe indigenous Tobian theories of disease causation etiology and classification. The remainder of the chapter outlines illness terms and categories, which reflect traditional and contemporary concepts.

Building on the ideological component to the medical ethnography in the previous chapter, Chapter Five explores indigenous Tobian healing modalities and the role of medical pluralism in contemporary therapy selection. The process of healing, the methods employed during healing, expected outcomes, and problem solving are all significant aspects of Tobian healing in a pluralistic context. The chapter also discusses

the indigenization of biomedicine[2] that ties into an analysis of efficacy definitions, the complementary use of medicines, and health issues related to perceived quality of care.

Chapter Six integrates the ethnographic data presented in previous chapters with major theoretical issues anthropologists address in the study of medical pluralism. Biocultural and ecological perspectives frame this analysis of the transformation of human encounters with therapeutic and dietary landscapes, which have influenced disease patterns and medical practices. This discussion addresses the overlap of food and medicine in contexts of pathogenesis and healing. It also considers the biocultural aspects of dietary change, polypharmacy, and use of addictive substances. The highlight of this chapter is a discussion of Echang's epidemiological profile with emphasis on the persistence of chronic and infectious diseases in the population and health disparities in Palau. The data bring to light issues that require further inquiry and health interventions.

Chapter Seven summarizes research findings and provides suggestions for future study. This chapter describes the contribution of this dissertation to medical anthropology generally and to studies of health in Micronesia specifically. A focal point is the way this research may potentially improve health care delivery in Palau.

C. Literature Review: Medical Pluralism

This introductory section appraises key medical anthropological literature from which the project's conceptual framework originate. The first part reviews the anthropological literature on definitions of medical pluralism and various methodological approaches to its study. Next is a survey of the contexts of medical pluralism and their

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[2] Throughout this dissertation, I use the term *biomedicine* as a shortcut to refer to the American and European medical paradigm. The term denotes a contrast with medical systems that do not emanate from the U.S. or Europe, such as indigenous Tobian medicines and local Palauan medicines.

associated diseases. The final section outlines key research assumptions and a review of past and current medical anthropological research in Palau.

1. What is Medical Pluralism?

Medical pluralism is a concept that denotes the co-existence and utilization of an array of therapeutic alternatives from different philosophical and cultural paradigms. As a medical system, pluralistic health services encompass the total range of medical resources available to a community (Phillips 1990). Medical pluralism is a compelling avenue of inquiry for anthropologists because the configuration of medical resources, their integration, and the significance of their use vary according to the socio-cultural contexts in which they are found (Cassidy 2001). Discovering the underlying ideological and physiologic basis of strategies people use to navigate through pluralistic medical settings is a key medical anthropological research problem (Nichter 1991).

One notable feature of medicine in pluralistic settings is the synthesis of medical beliefs and modalities from distinct healing paradigms. The introduction of foreign medical systems to new sociocultural settings generally results in an integration of the disparate systems rather than the abandonment of the local system (e.g., Welsch 1991). One expression of this process is the cultural reinterpretation or indigenization of biomedicine and pharmaceuticals (Bledsoe and Goubaud 1988; Etkin, et al. 1990; Haak and Hardon 1988; Nichter 1989; Nichter and Vuckovic 1994). The introduction of biomedical services throughout the world has engendered cross-cultural phenomena that health planners and medical professionals have labeled as irrational drug use and noncompliance. Anthropologists understand the process as a cultural synthesis of biomedical and local paradigms of healing (Conrad 1985; van der Geest, et al. 1996).

The expansion of the global pharmaceutical industry has precipitated the widespread availability of pharmaceutical drugs, ranging from prescription drugs available only in sanctioned biomedical clinics to wholly unregulated distribution by itinerant drug peddlers and injection doctors (Gesler 1994; van der Geest 1981). Studies of the cultural constructions and reinterpretations of pharmaceuticals turn the focus away from hierarchies of resort (e.g., Schwartz 1969) and to a deeper understanding of the ways medicines reflect cultural ideology (Nichter and Vuckovic 1994).

For example, Etkin et al. (1990, 1999) documented a shift from exclusive reliance on indigenous medicines to a substantial increase in the combined use of pharmaceuticals and plant medicines based on comparison of data from two separate field stays (1975-1976 and 1987-1988) in a Hausa-Fulani community in northern Nigeria. By the second period of research, they observed that the same principles guiding plant use informed the utilization of pharmaceuticals in local therapeutic practices. Biomedical illness concepts also emerged from discourse on health and illness that reflected villagers' experiences at the local clinic. Pharmaceuticals were incorporated into local healing strategies according to perceptions of disease egress, definitions of efficacy, and "balance of opposites" (Etkin, et al. 1999:174-5). The organoleptic properties of pharmaceuticals (e.g., taste, color, and texture) provided cues for their use in a manner similar to how they guide the use of botanicals in healing. The processual nature of Hausa healing contributed to the overlapping and concurrent use of pharmaceuticals and plant medicines in ways that contradict biomedical prescriptions, but that make perfect sense in terms of Hausa medical ideology and practice. Pharmacological analyses of plant use in Hausa

medicine provided information with which to measure the potential biological ramifications of phyto-pharmaceutical combinations.

Anthropologists have documented the cultural reinterpretation of biomedicine and pharmaceuticals in pluralistic medical contexts throughout the world. In Feira, Brazil the reconstruction of biomedicine is evident in behaviors such as dosage manipulation, the cessation of treatment due to the disappearance of symptoms or intolerable side-effects, refusal of recommended treatments at biomedical clinics, and extending pharmaceuticals to treat illnesses for which they are not indicated (Ngokwey 1995). Brazilians in Feira consider the popular medicine *tetrex* (Tetracycline) a medical panacea and use it for head aches, tooth aches, colds, and cough. Similarly, many employ the analgesic *melhoral* as an abortifacient. In Sierra Leone those in the Mende population often draw on a doctrine of signatures to guide treatment of culturally constructed blood illnesses with red and brown colored pharmaceutical tablets (e.g., iron supplements, vitamins) and beverages (e.g., cola and beer) (Bledsoe and Goubaud 1988).[3] In the Philippines local interpretations of photosensitive side-effects of a drug prescribed in the treatment of urinary tract infections influenced the ways women assessed their experience with the biomedical clinic, the medication, and the efficacy of the treatment (Nichter and Vuckovic 1994). A widespread belief among Sindhi and Mohajir groups in Pakistan is that pharmaceutical therapies provide a near immediate cure for pneumonia. This belief contributes to an unrealistic expectation that biomedical therapy will instantly restore health (Hussain, et al. 1997) As a result parents often seek out multiple doctors on

[3] The "doctrine of signatures" concept casts medicinal plants as entities that have been endowed with signs, which indicate how they are meant to be used therapeutically (e.g., red plants indicate its usefulness in treating blood illnesses).

consecutive days who will dispense and administer combinations of drugs, looking for the "magic bullet" effect, often with dire consequences.[4] In the Isaan region of Thailand *mot luuk* (female gynecological disorders) entails an array of culturally constructed illnesses, many that do not have biomedical correlates, in which antibiotics such as tetracycline and penicillin are routinely self-administered and purchased without a prescription (Boonmongkon, et al. 2001).

Anthropologists have applied the concept of indigenization to the study of other types of biomedical technology. Maya bonesetters of San Pedro la Laguna employ radiographs as a complement to traditional methods of bone manipulation in order to enhance their marketability, bolster the legitimacy of their services, and increase their clientele (Hinojosa 2004). Bonesetters often encourage their patients to have an X-ray performed and to bring radiographs of their injuries to consultations, so that they may review them before initiating traditional types of manual therapy. They also use radiographs to measure the effectiveness of traditional therapies. Wood et al. (Wood, et al. 1997) report that the women they interviewed in South Africa view the Pap smear as a technique that simultaneously diagnoses sexually transmitted diseases and cleanses the womb. As a result, many women request Pap smears for their culturally constructed cleansing and preventive properties. Throughout the world indigenous healers and itinerant drug merchants reportedly incorporate the hypodermic syringe into their repertoire of therapeutic practices in unconventional ways for a range of treatment, preventative, and protective purposes (Kotwal 2005). The use of injections generally falls in line with local constructions of how the technology works, their ability to deliver

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[4] Erhlich's (1906) 'magic bullet' concept is referenced in Tan (1989).

medicine to the body, and their impact on health (e.g., Birungi 1998; Cunningham 1970; Nichter 1996).

Studies in pharmaceutical anthropology demonstrate that people's acceptance of biomedicines and technologies do not necessarily translate into changes in cultural constructions of disease. In the case of leprosy among the Limba in Sierra Leone the success of pharmaceutical treatment for leprosy replaced traditional botanical treatments; however, nuances in stages of illness, local constructions of the progression of disease and the prognosis of individuals with leprosy remain salient features of Limba ethnomedicine (Opala and Boillot 1996). These cultural constructions of leprosy influence the stage at which people seek biomedical treatment and affect the relative success of biomedical therapy, patterns of morbidity, and mortality in the population. In a similar vein, beliefs about the ability of vaccinations to prevent measles (*kora*) often result in the avoidance of vaccinations for the illness by women in India (Nichter 1996). Many Indian women believe that vaccinations are effective transient protection against childhood measles. Despite this general acceptance of vaccinations, a majority of mothers expressed a desire for their children to have childhood measles as a means to prevent a potentially life-threatening adult episode. Nearly 80% of the women interviewed expressed that they would decline a vaccination for *kora* if made available to their children (Nichter 1996:345).

Investigation into the ways novel medical beliefs and behaviors are incorporated into local paradigms requires the simultaneous exploration of disease ideologies and related cultural conceptualizations of therapeutic processes (van der Geest, et al. 1996). The act of medicating mirrors beliefs regarding disease causation, symptom progression,

and recovery. Nichter and Vuckovic (Nichter and Vuckovic 1994:1509) refer to medicines as "vehicles of ideology" that embody the biological and cultural dimensions of medicines. Likewise, ultimate and proximate outcomes of medicine figure prominently into medical decision-making (Etkin 1988a).

If healing is part of a process, then the body's response to medicines throughout the process guides diagnosis, treatment, and prevention of disease. For instance, the Hausa (northern Nigeria) begin treatment of stomach ache with medicines, which may be plant, pharmaceutical, or some combination, that promote disease egress through vomiting, purgation, and diuresis (Etkin 1992:104). Kannada informants in India described the emergence of skin lesions associated with *kora* (measles) as a sign that heat and toxins from within the body are being expelled (Nichter 1996:344). Therefore, they avoid taking medicines that prevent or attenuate the expression of skin lesions. The Limba in Sierra Leone only consider leprosy as a disease worth medicating once it has progressed to the point of physical disability and extreme pain (Opala and Boillot 1996). The absence of pain in the early stages of the disease signifies that the illness does not require treatment. This belief contrasts with public health approaches in which early signs of disease warrant prompt medical attention. Ndembu healers in Zambia employ pharmaceutical medicines as a first line of response to illnesses in an attempt to diagnose and construct the origin of disease (Nichter and Vuckovic 1994). A positive response to pharmaceuticals signifies that the disease is foreign, while a negative response indicates that the patient needs indigenous modes of healing. In Pohnpei (Micronesia) a number of plants are given to an individual who may have "feeling bad sickness" as a means to initiate healing through diagnostic therapeutics (Ward 1977:140-1). Patients chew the

leaves from *Nephrolepis exaltata, Asplemium nidus, Flagellaria indica,* and *Aglaia ponapensis* sequentially. The patients' responses to the leaves such as difficulty swallowing, gagging, or regurgitating indicate a positive diagnosis for feeling-bad-sickness, which healers treat with medicines unique to this illness.

The use of medicines as diagnostic indicators for appropriate therapy and markers of efficacy is an important feature of indigenous healing systems. People incorporate biomedicines into healing repertoires according to local diagnostic principles. Tan (Tan 1989) describes the concept *hiyang* in Filipino healing ideology, which translates loosely as the compatibility of therapy with and individual or disease. *Hiyang* extends to the relationship between the patient and healer as well. If there is no *hiyang* the therapy will be ineffective and even harmful. Etkin (Etkin 1992:101) describes the concept of *karba*, which Hausa employ to interpret the degree to which a medicine accepts (befits or receives) an individual. Medicines produce different physiological responses in individuals depending on whether the medicine accepts the individual. Conversely, Ward (Ward 1977:155) notes that Pohnpeians explain treatment failure for mangrove sickness (a serious type of spirit sickness) as an indication that the patient's body has rejected the medicine because it "wants to be ill." The concept of people-plant compatibility applies to plant-plant compatibility in indigenous Tobian medicine (Palau). Therapeutic plant combinations, treatment regimens, and healer-patient relationships must have appropriate *paruhar*, or partnerships (ref. Ch.5, p.165). Tobian constructions of efficacy stem from the correct configuration of partnerships throughout all stages of therapy.

Cultural constructions of efficacy are instrumental to studies of medical pluralism because they cast light on the complexity of medical decision-making.

Efficacy may be measured and defined with biologic parameters, cultural parameters, or some combination (Anderson 1991). Exploring the biocultural aspects of therapeutic efficacy is the most comprehensive means of assessing the ways that people use the symbolic and physiologic significance of medicines to make sense of disparate healing paradigms (Browner, et al. 1988; Etkin 1988b, 1996a; Nichter 1991).

Ethnopharmacology is a biocultural inquiry, which combines medical ethnography and the study of pharmacological properties of plant medicines to elucidate the extent to which medicines and their associated biologic actions inform selection, diagnostic potential, and mode of application (e.g., Berlin, et al. 1996; Brett 1994; Browner and Ortiz de Montellano 1986; Brutsaert, et al. 1995; Cox 1991; Etkin 1990; Gollin 2001). For instance, Browner and Ortiz de Montellano (Browner and Ortiz de Montellano 1986) investigate herbal emmenagogues used in Colombia and Mexico by integrating analyses of the cultural, phytochemical, and physiologic basis of their use. Ethnographic data uncovered local theories regarding menstruation, including various liminal stages of pregnancy defined by the nature of blood flow, texture, viscosity, and volume. People used various plants to stimulate blood flow, thin the blood, or warm the blood depending on their hot or irritating properties. During the transitional period between late onset of menstruation and before pregnancy, women employed single plants or plant combinations that were either hot or irritating. In this way, they could induce menstruation in a culturally acceptable way. Phytochemical analysis provided data with which to understand the chemical basis for local descriptions of *hot* and *irritating*. They also allowed researchers to postulate the extent to which such properties actually induce menstruation. The selected botanicals included *Cinnamomum zeylanicum* (cinnamon),

Persea americana (avocado), *Ruta chalepnsis* (rue), and *Citrus limon* (lemon), which contain a range of chemical properties that potentially play a role in stimulating menses or inducing uterine contractions. *P. americana* contains serotonin, which is a neurotransmitter that affects muscle contractions. Both *C. zeylanicum* and *P. Americana* contain tyramine, which produces uterine contractions. Additionally, the combination of myristicin, which is found in cinnamon and rue, with tyramine or serotonin, found in both cinnamon and avocado, has a synergistic effect that prevents their rapid metabolism in the liver and gut and enhances their ability to induce uterine contractions (Browner and Ortiz de Montellano 1986:42-43).

Another example of the biocultural approach to the study of ethnomedicine is Berlin et al. (Berlin, et al. 1996) in which plants used to treat gastrointestinal distress (GID) in Mexico were evaluated for their antimicrobial properties. The study departs from antecedent ethnographic research that emphasized solely the symbolic dimensions of disease in the highland Maya populations in Chiapas. Ethnographic data contextualized the etiology and nosology of GID, indigenous methods for treatment, and expected outcomes of the therapy. Researchers singled out GID as a priority based on their salience in the local population. From there the plants most commonly used to treat these disorders were collected and subjected to pharmacological analyses for activity vis-à-vis *Escherichia coli, Staphylococcus aureus, Candida albicans,* KB and P388 cancer cell lines, and spasmolytic effects (Berlin, et al. 1996:49). The findings support a pharmacologic basis for the therapeutic use of plants based on the anti-microbial activity of disease pathogens and the physiologic response to the plants (e.g., spasmolytic, anti-

spasmolytic, central nervous system depressant, anti-inflammatory, and anti-carcinogenic).

Anthropologists studying ethnomedicine from a biocultural perspective account for the ideological basis of medicine selection, use, and preparation and then analyze these factors in conjunction with the chemical constituents of medicine that produce culturally salient signs of pathological processes (Etkin 1996a). In so doing they consider the emic (insider, local, indigenous) and etic (outsider, foreign, bioscientific) meanings and measures of medicines. These studies contrast with narrowly constructed ethnobotanical and phytochemical analyses that decontextualize plants and their pharmacological properties from their cultural settings (e.g., Del Rosario and Esguerra 2003; Kokwaro 1995; Lessa 1977). Likewise, they depart from ethnomedical inquiries that only consider the ideological, symbolic, and intangible elements of indigenous medicines (e.g., Alkire 1982; Kirmayer 2004; Mahony 1970; Moerman 1991; Ward 1977). Studies in ethnopharmacology illustrate that plants' chemical constituents influence beliefs and practices associated with medical behaviors.

In contemporary contexts of medical pluralism where people use indigenous plant medicines concurrently with pharmaceutical drugs, or they use biomedicines in novel ways, a whole spectrum of novel health issues emerge. Etkin et al. (Etkin, et al. 1999:177) describe the antagonistic effects of tannins, a chemical found in most plants, which reduces the bioavailability of a number of pharmaceuticals and impedes iron absorption. Even when people use pharmaceuticals in their prescribed manner, phyto-pharmaceutical interactions may yield clinical outcomes other than what health and development planners expect. Indigenization of biomedicines only adds texture and

nuance to the complexity of medicines in human society, as does the recognition that active plant constituents are found in multiple contexts (Etkin 1994a). Nonetheless, potential pharmacokinetic and pharmacodynamic potential of plant-pharmaceutical interactions pose serious health concerns. Biocultural studies in medical anthropology are crucial to evaluating the physiologic and pharmacologic dimensions of medical pluralism.

Biocultural approaches to studying plant medicines are inherently ecological in that health and illness are contextualized within a framework of human-environment interactions (Anderson 1997; Armelagos 1987; Etkin 1988b). Plants in the environment form natural therapeutic landscapes that people manage in culturally prescribed ways to achieve health. The multi-contextual position of plants in human culture furthers the potential for human-environment interactions to impact health (Etkin 1994a, b; Johns 1999; Johns and Romeo 1997). Plants in food and medicine are an integral part of human adaptation to disease. Etkin and Ross (Etkin and Ross 1982, 1991a, 1997) demonstrate that plants used in Hausa food and medicine contain oxidative and anti-malarial properties that reduce the morbidity and mortality associated with fulminant malaria infection. Exposure to these plants in a variety of contexts and through different mediums increases the potential for human contact with pharmacologically active plants. Shifts in crop production and consumption of certain plants during times of high rates of malaria aided the biological adaptation of this population to endemic malaria.

A similar example from a Hausa community in Niger highlights the ecological context of disease and overlapping categories of food and medicine that are related to seasonal variability of diet and the onset of night blindness and xeropthalmia associated

with Vitamin-A deficiency (Blum, et al. 2004). This group views these illnesses as two distinct entities with disparate indications of treatment, whereas in biomedicine they comprise different stages in the progression of a single etiological process. Night blindness is treated with therapeutic dietary regimens to restore vision (e.g., ingesting foods rich with blood, applying raw liver blood directly to the eyes), while xeropthalmia is treated with other medicines related to drawing heat out of the body. The former therapy is effective in reversing night-blindness, due to the ingestion of Vitamin-A rich foods, while the latter (an irreversible condition associated with chronic Vitamin-A deficiency) is ineffective in restoring vision. Indigenous and biomedical etiologies and treatment for night-blindness overlap, but diverge for xeropthalmia.

The manipulation of diet to achieve health, and the inclusion of medicinal plants in diet, has implications that extend beyond the analytical paradigms of medical and nutritional anthropology (Etkin 1996b). Medicinal foods are increasingly recognized by anthropologists as fundamental dimensions of human healing systems that have been largely underappreciated because of the intellectual divide between studies of food and studies of medicine (Etkin and Ross 1991b). Etkin (Etkin 1996b:320) proposes "a synthetic, multidimensional approach that builds on the food-medicine intersection and addresses the various and overlapping contexts in which plants are used." Such an approach expands reductionist perspectives in food pharmacology (e.g., Goldberg 1994; Yalpani 1997) by employing anthropological research to contextualize foods and their biocultural significance in human societies. As illustrated by research in ethnopharmacology, medicinal plants routinely used in food are more than vehicles of ideology. They also carry with them biological implications and the potential to alter

pathological processes. Given that the preparation of plants may differ dramatically from one context of use to the next (e.g., medicine, food, cosmetic, utilitarian) differential pharmacologic and physiologic activity will emerge depending on mode of preparation (Etkin 1994b, 1996b). This comprehensive multicontextual approach to evaluating plant use provides an analytical framework for the present study of medicine and food in Echang.

2. Contextualizing Medical Pluralism

The study of medical pluralism requires an understanding of the contexts in which disease and healing occur. One of the most useful ways to frame the dynamics of medical pluralism is with an ecological perspective. An ecological framework refers to the human-environment intersections that influence disease and health (Armelagos, et al. 1992). These environments may consist of natural processes and resources as well as sociological processes and anthropogenic resources (Fabrega 1997; Nichter 1991). In this dissertation a broad conceptualization of ecology is employed to embrace the natural and anthropogenic therapeutic landscapes in which diseases arise and humans negotiate health.

The epidemiologic transition model (Omran 1971) describes a shift from high rates of acute infectious diseases to an overwhelming prevalence of chronic degenerative diseases, such as cardiovascular disorders, non-insulin dependent diabetes, and cancers among populations in the Pacific (e.g., Finau 1996; Hanna 1998; Hanna and Fitzgerald 1993; Marshall 1991). The shift is associated with socioeconomic development (i.e., urbanization, modernization, and westernization) population growth, and genetic predispositions to cardiovascular and metabolic diseases (Corrucini and Kaul 1983). As

populations move away from subsistence based economies in rural areas toward market-based, consumer economies in urban areas the types of diseases and epidemiologic profiles for these populations begin to shift. Improved access to medicines lead to lower rates of acute infectious diseases and has been linked to a demographic transition, in which there is greater life expectancy, higher birth rates, and lower mortality rates (Phillips 1994). Nutrition transitions are also integral to the epidemiological transition model (e.g., Armelagos 1987). Popkin (Popkin 1994:286-7) characterizes the trend toward degenerative disease as a shift away from diets high in dietary fiber, fruits, vegetables, and low in total fat to diets high in total fat, cholesterol, refined sugars and carbohydrates and low in polyunsaturated fatty acids and fiber.

Along the way, some researchers have reconceptualized the epidemiologic transition concept as the *health transition* to account for a rise in psychosocial and behavioral health issues associated with a transition to modernization and development (e.g., Caldwell 1993; Janes 1999; Lewis and Rapaport 1995; Marshall 1991; Nero 1990; Ware, et al. 1992). The term *populations in transition* stems from the epidemiologic transition framework and is usually employed as a convenient way to describe populations that are positioned somewhere along a linear continuum of underdeveloped to developed, rural to urban, non-industrialized to industrialized, or traditional to modern. The inevitable question that arises when using such a term is: To what (or from what) are they transitioning?

The concept of transition is useful when it is contextualized. Recent critiques of Omran's epidemiologic transition model have demonstrated that epidemiologic transitions do not, in fact, operate along a linear continuum (Carolina and Gustavo 2003;

Heuveline, et al. 2002). The original concept of epidemiologic transitions assumed that the progression to development were more or less uniform, occurred in homogeneous contexts, arose from uniform causes, and transpired in genetically homogenous populations (Carolina and Gustavo 2003). Moreover, despite the appearance of chronic degenerative diseases throughout the world's population over the last two decades, the actual transitions do not reflect a shift away from communicable diseases as scholars initially postulated. In Pacific island communities, considerable diversity exists in the type and nature of multiple overlapping health transitions (Lewis and Rapaport 1995; Taylor, et al. 1989). Novel emergent and re-emergent infections, which are those characterized by antibiotic and pesticide resistance, present a third phase of the epidemiologic transition (Armelagos, et al. 2005; Barrett, et al. 1998; Garnett and Holmes 1996) that pervades Pacific island societies to varying degrees.

The population in Echang is an impoverished and socially marginalized group in Palau. The village is in an urban area, but the housing infrastructure, standard-of-living, sanitation, and health trends are analogous to those typically found in rural settings. The epidemiologic profile of the Echang population is comparable to the rest of Palau. However, they experience slightly lower rates of chronic degenerative diseases relative to other Palauans in Koror and considerably higher rates of chronic infectious disease, re-emergent, and newly emergent infectious disease than Palauans nationwide.[5] One of the most urgent health concerns in Palau is renal disease associated with obesity, diabetes, and hypertension. Yet, tuberculosis, dengue fever, typhus are among recent emergent

[5] Assessment is based on observations, limited public health profile data, census data, and personal communication with physicians, public health workers, and epidemiologists in Palau.

and reemerging communicable disease concerns (Ashford, et al. 2003; Durand, et al. 2004; Radway 2003) experienced primarily among southwest Palauan island populations.

Since medical choices reflect health problems that are present in each population, understanding epidemiologic shifts in Pacific island populations ties into the study of medical pluralism. Moreover, the configuration of institutionalized health services in which health-seeking behaviors operate generally mirror the epidemiologic concerns identified by health and development planners (Lewis 1990; Lewis and Rapaport 1995; Pollock and Finau 1999). New statistics support the view that the common undercurrent to epidemiologic trends in populations globally is actually poverty and inequity (Worthman and Kohrt 2005). Poverty and inequity are associated with high rates of infectious *and* non-communicable diseases among the most disadvantaged populations regardless of whether they are situated in contexts of development or contexts of transition (Heuveline, et al. 2002). The co-existence of chronic degenerative diseases with emergent, re-emergent and chronic infectious diseases in Palau provides yet another example of the dynamic and complex nature of health in Pacific island populations. Poverty and inequity within Palau is a major source of differential disease risk and quality medical care. The confluence of these factors all relate to the persistence of indigenous medical practices and medical pluralism in Echang.

A number of factors perpetuate medical pluralism globally. Colonialism, humanitarian development projects, globalization, transnational migration, and urbanization are among the many processes that have brought discrete healing beliefs and practices together throughout the world (Phillips 1990). Addressing political-economic factors that have led to pluralistic medical systems has gained momentum in

anthropological studies of medical pluralism (Nichter 1991). Structural inequalities and political disparities in society play a role in access to and utilization of various therapeutic modalities (Morsy 1996). They contribute to expressions of disease and their reproduction in politically and economically disadvantaged populations (Baer 2001; Scheper-Hughes 1990). Structural inequalities are the social contexts in which cultural constructions of disease and healing are manifest (Dressler 2001).

The prevalence of chronic degenerative diseases throughout the world has influenced the wide distribution of medical pluralism in affluent, industrialized societies as well as in populations in transition (Christakis, et al. 1994). The long-term commitment to therapy for these diseases often leads people to experiment with combinations of medical strategies (e.g., Etkin and Ross 2002). Chronic degenerative diseases can impact well-being in terms of occupational functioning, tending to social responsibilities, pain management, physical fitness, and psychological stability (e.g., Adler 1999). These are aspects of health for which biomedical therapy have proved inept. Medicines from beyond the biomedical paradigm are often chosen because they enable people to address quality of life issues associated with chronic illnesses (Kirmayer 2004). In aging populations that deal with the constellation of illnesses associated with chronic diseases and general health degeneration, complementary therapies provide treatments for multiple health concerns (e.g., Bicknell and Parks 1989; Eeuwijk 2003).

Therapies that were once effective in treating and preventing infectious diseases, such as malaria and tuberculosis, are losing effectiveness as drug resistance to conventional therapies is emerging in both developed and developing societies (Barrett,

et al. 1998; Sommerfeld 1995). The emergence and re-emergence of infectious diseases is a serious concern associated with degradation of natural resources (e.g., Epstein, et al. 1997), human-pathogen co-evolution (e.g., Barrett, et al. 1998; Ebert and Hamilton 1996; Sommerfeld 1995), and population migration and movement (Bentham 1988; Chapman 1991; Meade 1977; Prothero 1977). Biomedical technologies aimed at prevention have failed at the same time as technologies for treating the illnesses (Garrett 1994). Medical pluralism has emerged, then, a means for populations to adapt to changing environments and shifting ecological relationships within unique therapeutic landscapes.

D. Research Assumptions

Biocultural studies in medical anthropology provide the theoretical foundation from which the following research assumptions are made: (a) indigenous medical beliefs and practices are not abandoned as a result of improved access to biomedicine and pharmaceuticals; (b) cultural beliefs about health and healing are used to inform medical choices pluralistic medical settings; (c) plants used in medicine often exhibit measurable health outcomes; (d) food and medicine are overlapping categories, and both are significant to pathogenesis and therapeutics; (e) the extent to which plants are used in medicine in Echang is related to the ecological context of relocation and nature of biomedical health services available; (f) decision-making in pluralistic medical contexts rests on cultural interpretations of therapeutic efficacy. These assumptions provide a conceptual framework used to investigate the biologic and cultural responses to migration and medical pluralism in Echang populations.

E. Past Research on Health and Healing in Palau

This research project took place in a small hamlet outside of Koror, Palau called Echang. Southwest Palauan island communities from Hatohobei, Sonsorol, Pulo Ana, and Merir comprise the majority of Echang's population. These groups are culturally and linguistically distinct from those found in the north islands of Palau and have historically been a socially marginalized ethnic minority.[6] Southwest island groups have resettled in the northern islands in waves since the turn of the 20th century. The location, population composition, ecological milieu, and political-economic context of Echang provide an ideal place in which to investigate medical pluralism, shifts in disease ecology, and cultural adaptation.

The medical anthropological literature for Palau is thin. Studies of health in Palau are marginal and rarely fall outside general discussions of trends in population health for Micronesia. Consequently, the anthropological literature on health in Micronesia tends to be comparative in nature and favors integrated assessments of health (e.g., Collins, et al. 1996; Hankin 1970; Hezel 1992, 1999; Hezel and Dobbin 1996; Marshall 1991, 1993; Rubinstein 1983; Taylor, et al. 1989; Zimmet 1979). Comparative studies certainly have a place in anthropology, because they provide a broad view of diverse health trends in the region. They are also appropriate in Pacific island settings, such as Micronesia, where migration patterns impact the flow of ideas, goods, pathogens, medicines, and health services (Lewis and Rapaport 1995; Pollock and Finau 1999). However, comparative studies of Micronesian health tend to perpetuate a somewhat generic vision of Micronesian societies and cultures and overstate similarities in regional health and

[6] Chapter Three describes the research site and population characteristics in greater detail.

medical systems. A major concern with this approach is the extent to which scholars make these comparisons given the nature of medical anthropological inquiry for the region.

Few ethnographic studies in Micronesia provide a detailed description of indigenous medicines, the cultural contexts in which they operate, and their position relative to medical pluralism. Noteworthy exceptions are two dissertations: a study of Chuukese medicine (Mahony 1970) and a medical ethnography of curing on Pohnpei (Ward 1977). Lessa (Lessa 1950, 1959, 1961, 1962, 1977) has also published on various ideological and symbolic aspects of healing on Ulithi as has Alkire (Alkire 1982) for Wolei and Lamotrek. While these studies and others like them represent a considerable contribution to medical anthropology in Micronesia, they also favor ideological dimensions of medicine without addressing biocultural concerns and the potential impact of medical behaviors on health. One explanation for this dearth of ethnomedical inquiry in Micronesia is the historical context of medical anthropology in the region, namely the applied emphasis that was placed on health research during the years following World War II (Rubinstein 1999). The anthropological health research agenda in Micronesia during this time prioritized the study of major public health issues, discovering ways to integrate biomedical health systems into local settings, and assessing the impact of modernization on local population health.

Behavioral health issues, such as substance abuse, domestic violence, and mental health disorders, especially depression and schizophrenia, have captured the attention of medical anthropologists studying health in Micronesia (e.g., Rubinstein 1983). A handful of anthropological studies of health in Palau reflects these interests. Nero (Nero 1990)

describes high rates of alcohol related domestic violence against Palauan women from their spouses. The study illustrates the effects of social stress and alcohol on marital relations. It reflects the impact of religious conversion, changing patterns of marriage, and household residence on the isolation of women and loss of social networks that historically protected them from domestic violence. Her study provides evidence that structuralist and feminist explanations for domestic violence in other contexts are not entirely useful in Palau. It contributes to the wider literature on violence against women by illustrating the importance of culture in discussions of structure and power.

Black (Black 1984, 1998) has made a contribution to the anthropology of tobacco and alcohol use based on his research in Palau (Hatohobei and Koror). He proposes a model for studying the sociocultural significance of tobacco in terms of practical significance, economic function, and engagement in small-scale global trade networks. He illustrates the multi-dimensional significance of tobacco, moving beyond the study of addiction to include its role in maintenance of social relations (especially "in charge," or *hosuar,* relationships) and cultural constructions of self. Although the focus of this study is on the social significance of tobacco use, he proposes avenues of inquiry that incorporate some aspects of biocultural and psychological anthropology. One proposal involves exploring the role of epinephrine production during tobacco use and the extent to which tobacco enhances emotional expression and the production of social relationships (Black 1984:494). He also notes that the high rates of pulmonary and chronic upper respiratory infections on Tobi in 1968 were probably due to widespread tobacco use, despite receiving only cursory attention in public health research. In his study of alcohol (Black 1998) he offers a comparative analysis of the social contexts in

which drinking occurs on Hatohobei and in Koror and the meanings associated with these contexts. Both studies point to the value of exploring the social meanings of intoxicating substances along with their physiological consequences.

One of the most exciting recent additions to medical anthropological literature in Palau, as well as for Micronesia generally, is an investigation by Sullivan et al. (Sullivan, et al. 2000) in which the biocultural dimensions of betel chewing and schizophrenia are outlined. Based on research conducted among 70 schizophrenia patients in Koror, this study illustrated a reduction of symptoms associated with schizophrenia as a result of prolonged exposure to betel alkaloids. While the study lacked an explanation of the sociocultural dimensions of schizophrenia in Palau, it provided an excellent starting point to understand the impact of betel on expressions of schizophrenia in this population. Sullivan and Hagen (Sullivan and Hagen 2002) take these data a step further to posit a human-plant (i.e., phytochemical-CNS) co-evolutionary framework. In so doing they unpack biomedical notions of addiction and offer an alternative framework to investigate substance use. They employ archaeological, phytochemical, and human evolutionary data to suggest a molecular co-evolutionary framework in which allelochemicals of psychotropic plants mimic mammalian neurotransmitters. They also address research issues that arise when narrow definitions of betel as an addictive substance are used. They argue that an analysis of plant use such as betel may be more suited to analyses as a *food* rather than a *drug*.

Studies of ethnomedicine in Palau are scarce. In 1941 a Japanese researcher documented the use of plants in Palauan medicine according to their use and preparation (Masayoshi 1980). More recently an ethnobotanical compendium of common medicinal

plants for Palau was published by the Palau Community College Cooperative Research and Extension (Del Rosario and Esguerra 2003). The publication provides descriptions of the plants, their preparation, and potential pharmacologic properties in a culturally detached and decontextualized manner. Neither of these studies provides substantive descriptions of principles of Palauan healing or the cultural context of Palauan medicine. A publication of the Palau Historic Preservation Office (Palau Society of Historians 1997) devotes a chapter to survey important themes in the traditional practice of Palauan medicine but without any substantive review of plants used in medicine. It also does not account for cultural variations in healing that undoubtedly were present throughout the northern Palauan islands. Black's report (Black 1968) to the Smithsonian Institute is the only record we have of indigenous healing of Hatohobei. It is a short report produced as part of the Smithsonian Institute's research initiatives and not designed to be an ethnographic account of medicine and healing in Palau. However, it does provide a baseline against which to compare contemporary notes on medicinal recipes and their use.

Commentary on similar and contrasting elements of health and healing in Micronesia are offered throughout the text of this dissertation in order to position present research concerns in the wider literature on health and medicine regionally (Micronesia, Oceania) and globally. One objective of this dissertation is to expand the scope of medical anthropology in Micronesia. The primary goal, however, is to maintain a focus on the theoretical and methodological concerns of biocultural medical anthropology generally.

F. Summary

The anthropology of medical pluralism is a vantage point from which to survey epidemiologic, ecologic, biologic, sociopolitical, and cultural processes that variably produce and ameliorate disease. The conjunction of indigenous healing modalities and biomedical technology in Echang is indicative of macro-level processes involving ecological transitions and social transformations. How does one study such a complex intersection of biology, culture, and environment?

This dissertation integrates the analyses of population movement, medical ethnography, dietary change, ethnobotany, human biology, and epidemiology to describe such an intersection in Palau. While pharmacological analyses of plants used in Tobian food and medicine were beyond the scope of the original research design, it is widely accepted that plants are pharmacologically active, may influence human pathological processes, and potentially interact with other plants and pharmaceuticals in physiologically significant ways. The particular pharmacologic profiles of plant medicines used in Echang are not available, and so it is not possible to discuss the specifics of plant pharmacology in this study. Yet, based on the data that are available, the health implications of plant medicines, their complementary use with pharmaceuticals, and their contemporaneous use with substances such as alcohol, betel, and tobacco raise a variety of crucial health concerns.

There is also a vast literature linking dietary change to onset of chronic degenerative diseases. This study provides an explanation for the manner in which population resettlement generates dietary change and disease. Communities in Echang are no longer able to maintain traditional diets and lifestyles that offset the risk of chronic

degenerative disease in the past. Research findings point to dietary changes, specifically nutritional deficiencies, as the main culprit of widespread infectious diseases in Echang. The ability to meet daily caloric needs does not equal improved dietary nutrition. Oral histories and ethnographic accounts of traditional diets of the past and observation of dietary trends in the present lead to the conclusion that southwest islander diets have increased in calories but decreased in nutrients and variability. Of particular note is the decline in consumption of wild plants, fruits, and vegetables. Crowding, unsanitary living conditions, water and air pollution, and exposure to environmental hazards also contribute to persistence of chronic infectious diseases in this population as well as exposure to emergent (dengue fever) and re-emergent (TB, typhus) infectious diseases.

The political and economic dimensions of medical pluralism highlight structural inequalities in access to resources. These inequalities are part of therapeutic landscapes and figure into ecological dimensions of health. In Koror, ethnic discrimination against southwest islander communities is one area where structural inequalities influence quality of health care, utilization of public health services, and cultural constructions of biomedical efficacy. The historical and political circumstances surrounding the waves of population movements from the southwest islands to Echang create temporal and spatial limitations in the natural resources that are available for food and medicine, the social resources available for improved living conditions and sanitation, and the economic and political resources to exact a higher quality of health care.

On a local level, this study presents information that may be useful to health care practitioners and policy makers as they endeavor to provide the most equitable, quality, health care possible. It leads a call for implementation of public health measures to

improve sanitation, water, and air quality in Echang along with public health education campaigns about dietary nutrition, preventive health, substance abuse, and safe pharmaceutical use. On a broader scale, this study illustrates the value of studying medical pluralism from an ecologic, biocultural perspective. It addresses key theoretical and methodological issues in contemporary medical anthropology (ref., Armelagos, et al. 2005; Etkin 1996b; Nichter and Vuckovic 1994). It adds to the anthropological literature on health in Micronesia and offers one of the first comprehensive studies of ethnomedicine in Palau.

II. CHAPTER TWO: RESEARCH METHODS

A. Introduction

This chapter outlines the research methodology used for data collection. It begins with a review of fieldwork in Palau and describes the sociocultural context for the project. It specifies the various strategies used to investigate major research domains: migration, medicine, and food. The chapter closes with a discussion of the methodological limitations of research design and discusses topics worth further investigation.

1. Exploratory Fieldwork

Data collection for this project was executed over the course of three separate field stays: July-August 1999, July 2000, and December 2000 – June 2001. A University of Hawaii at Manoa Arts and Sciences Advisory Council travel grant for preliminary research made the first field trip possible. The Community Conservation Network (CCN) a Hawaii-based non-profit organization funded the second trip. A Pacific Fellowship from the Hawaii Chapter of the American Association of University Women supported the third field stay, during which I collected a majority of the data for this project.

In June 1999, CCN organized a team of researchers who traveled to the Republic of Palau to initiate a collaborative conservation program for Helen Reef. CCN's primary objective was to assist Hatohobei State in establishing a community-based research, monitoring, and conservation plan for Helen Reef. The research team included marine biologists, a geographer, and an anthropologist. The anthropologist, Dr. Peter Black, was a Professor at George Mason University, and had over 25 years of research experience with Tobian Islanders in Palau. His role was to evaluate the cultural appropriateness of

the proposed project. I became interested in the relationship of ecology and health and was eager to conduct ethnographic research in this community. Participation in the CCN project provided an opportunity to ascertain whether a dissertation research project would be feasible in this locale. CCN invited me to assist Dr. Black in his investigation of Tobian terms for conservation and community resource management. We interviewed a number of people in order to compile a Tobian wordlist containing terminology for local environment, conservation, and conflict resolution concepts. The results were written up in an advisory report to CCN (Black 2000b).

In addition to valuable introductions to family and friends in Echang, Dr. Black and CCN representatives introduced me to community leaders and government officials in various positions at conservation and government posts, including the Hatohobei State Government, Sonsorol State Government, Palau Conservation Society, Palau Community College, and Belau National Museum. These introductions laid the foundation for attaining institutional support for dissertation fieldwork. Upon return to Hawaii, I began formulating a research protocol based on questions of ecology and health. Specifically, I was interested in the role of place and natural resource management in health choices among southwest island communities.

In July of 2000, CCN invited me to return to Palau to provide technical assistance with preparation of a progress report for their newly established conservation and management plan for Helen Reef, a program run in consortium with the Hatohobei State Government. CCN wanted to discern if the community-based research methods found in the book, *Measures of Success* (Margoluis and Salafsky 1998) were suitable in their Helen Reef project. They recruited Mr. Huan Hosei, a Tobian scholar, to assess the

cultural relevance of the methodology and provide CCN with a written assessment. My role was to provide basic editorial and computer assistance for the report (Hosei 2000). I also provided the Hatohobei State Governor with technical support so that he could create a conceptual model of the State's conservation plan for Helen Reef (ref. Hosei 2000: Appendix 4).

The second field trip offered the unique opportunity to travel to the southwest islands with a group from Echang. The 12-day trip took us approximately 350 miles southwest of Koror to the islands of Tobi, Sonsorol, Pulo Anna, Merir, and Helen Reef (Fig. 2). During this trip I collected migration histories and carried out exploratory interviews regarding food, health, and environment in the southwest islands and Echang. I became increasingly aware of the relationship of place to the cultural identity and health among southwest island groups in Echang as a result of these exploratory interviews.

I spent the remainder of my time in Koror reviewing research archives that were located in the Belau National Museum and the Palau Community College libraries. Review of the literature available on conservation, health, and medicine in Palau revealed that a dearth of medical anthropological research was available for Palau, and I found no previous research on these topics with reference to southwest island populations in Echang. Before leaving Palau, I submitted a formal request to the Hatohobei State Governor and host families to conduct dissertation fieldwork in Echang the following year. With verbal permission to proceed with the project, I submitted a formal research protocol to the University of Hawaii Institutional Review Board and Committee on Human Subjects.

2. Dissertation Fieldwork

I returned to Palau on 1 December 2001 to commence dissertation fieldwork. CCN provided me with lodging in their apartment for the first six weeks. The apartment was located conveniently across the street from the Hatohobei State Government office and approximately 5km from Echang hamlet. I used the time to establish research affiliations with the Hatohobei State Government, Sonsorol State Government, and Palau Community College. I gave all agencies a copy of the University of Hawaii IRB Human Subjects approval letter, a project description, and my curriculum vitae. Upon the request of the Ministry of Health, I presented the research plan to the Palau Belau National Hospital's Institutional Review Board who approved the project. The Belau National Hospital, Belau National Museum, Division of Natural Resources, Supreme Court Library, Belau Bureau of Lands and Surveys, and Palau Community College provided access to their institutional resources, office supplies, workspace, and other miscellaneous research assistance. The Hatohobei State Government subsidized remote internet access and electronic mail. Internet use facilitated my remote collaboration with researchers at the University of Hawaii-Manoa Division of Ecology and Health (DEH) and communication with scholars abroad. Six weeks after arriving in Palau, I moved in with a host family in Echang hamlet.

B. Project Participants

I conducted a census for the entire hamlet in February 2002. The main objective was to gather information on household organization and population composition (Pelto and Pelto 1996.) The census informed my decision to designate the household as a unit of study and provided information needed to design a plan of action for the remainder of

fieldwork. Initially, I defined a household as the group of people sharing a single residence, with the understanding that future inquiry may yield a local definition of household that did not fit into this conventional one. The decision to use the household as a research unit resonated with the way Echang residents defined their own place in the village scheme. Lineage, clan, immediate family, political, and economic networks certainly did not fall neatly into household schematics. The household concept as I defined it made sense in Echang, particularly in terms of food production, medical decision-making, and allocation of economic resources.

I interviewed household members to collect the following information: number of members currently living in the household, number of members currently off-island, age, place of birth, relationship of household members to one another, occupation, and level of education. Additional questions probed into the household members' access to various land and marine resources, such as whether or not they had a garden by their house or access to a fishing canoe.

The census indicated that 238 individuals, ages < 1– 79 years, lived in 49 Echang households. Three households were vacant during the period of field research. A number of Echang residents (N = 60-70) were in transit to the southwest islands during this and one other period during the spring of 2002 as part of a lands survey and monumentation project conducted by the Bureau of Lands and Surveys. The National Census data reflect a similar population tally for Echang in 1999 with a total of 306 individuals (including those < 18) in residence in the hamlet (Office of Planning and

Statistics 2000).[7] My census provided the information required to select research participants that would adequately reflect the cultural diversity of the context of contemporary Tobian life in Echang (Pelto and Pelto 1996).

A total of 98 adults, defined as individuals 18 years of age or older, participated in various research protocols throughout the term of fieldwork (Table 1). The core research population was comprised of Tobians living in Echang hamlet between January – June 2002 (N=58). I based ethnicity on informant self-assessments, which reflected factors such as island of birth, island of parents' birth, clan affiliation, state citizenship, and the primary language spoken at home. I interviewed all adults present in Echang who designated themselves as ethnically Tobian or part-Tobian during the research project. All Tobian households (N=20, 40.8%), which I defined as an Echang residence with Tobian or part-Tobian as head of household, were represented during research.[8] The highest concentration of Tobian households in Echang (N=11) were in an area of the hamlet called Itab (Fig. 5), which was incidentally also the location of my host family's household. Interviews with Tobian informants counterbalanced structured, semi-structured, and open-ended interviews with non-Tobian Echang residents, including people from other southwest islands, Palauans, Americans, and non-Echang residents (primarily Palauan) residing elsewhere in Koror.

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[7] The Palau Census Bureau conducted a detailed survey of Echang in 1999. The national census data fieldwork resonated with the data collected for this project, and actually captured information that my inquiries did not. Together, they provide a good description of Echang in terms of population density, comparative income, household composition, education level, and employment rates.

[8] Head of household determinations were based on informant self-assessments.

Table 1 Breakdown of Study Participants by Category

Participant Category	*N*	%
Tobians Residing in Echang	58	62.4
Non-Tobian Residents in Other Echang Households	14	9.68
Non-Tobian Residents in Tobian Households	6	6.45
Health Care Workers (excluding those living in Echang)	6	6.45
Tobians Residing in Malakal and Koror	4	4.30
Land Records Office Staff	2	2.15
Bureau of Lands and Surveys Staff	2	
Belau National Museum Staff	2	
Palau Community College Staff	2	
Supreme Court Justice	1	1.07
Palau Conservation Society	1	
TOTAL	**98**	

I used non-random judgment sampling as the principal method of population sampling for this project (Bernard 1994). Random sampling is most useful for types of research in which statistical modeling and eliminating bias are priorities. In this project, with such a small population, random sampling was neither a warranted nor an appropriate research tool in light of the research objectives. All adults of Tobian ethnicity living in Echang were interviewed regarding their health seeking behaviors, medical beliefs and practices, medicinal plant knowledge, and attitudes about ethnicity and health. The small size of this population provided a unique opportunity to conduct a variety of interview protocols with informants on more than one occasion. I used quota samples to select individuals who represented the larger population in terms of age, gender, and ethnicity. Individuals selected via quota sampling participated in the majority of structured and semi-structured interviews. I employed snowball sampling, or networking, as a means to identify individuals who were especially knowledgeable on various subjects such as indigenous medical ideology, plant identification, medicinal preparations, and land conflict issues.

The time constraints of this study shaped my decision to conduct intensive structured, semi-structured, and open-ended interviews with individuals in primarily Tobian households. This choice made sense on a number of planes. The distribution of Tobian households represented geographic variability in Echang relevant to questions of access to natural resources, participation in community activities, perceptions of community, and medical decision-making. Tobian households contained an impressive representation of the cultural diversity in Echang. People living in non-Tobian households (N=9 in 5 households) in Echang were chosen by quota sampling or networking in order to reflect the geographical distribution of the population and provide perspective to Tobian viewpoints. These individuals contributed to research with their responses to structured interviews on perceptions of community, natural resources access and use, and health care choices. Participation in activities such as farming, fishing, food preparation, medical rituals, plant collection, celebrations, and church services enhanced my understanding of interview responses.

C. Participant Compensation

I provided non-monetary compensation through a variety of activities. In exchange for room and board, I supplemented the home pantry and contributed other household goods. I also gave my host family a meager monetary payment to offset utility and rental costs, although they were reluctant to accept such compensation. Care-taking host family children while the parents traveled off-island was an important gesture of reciprocation while in residence in their home. Other activities with children in the host family and neighboring families included baking Christmas cookies at the CCN apartment, distributing clothes, toiletries, and other goods as gifts, and transporting

children to and from school. CCN provided use of their vehicle during fieldwork. The CCN car soon became the Echang community transportation system, providing auto access to neighbors and friends without means of their own. I donated boxes of t-shirts and ball caps to families throughout the village at the start and at the end of fieldwork and periodically after returning to the United States. I also assisted my host family and their daughter by helping to raise a substantial donation for the refurbishment of the St. Joseph's church located in Echang.

D. Language

The variety of languages and dialects spoken in Echang presented a considerable research challenge. One of the strengths of ethnographic research in anthropology is the convention that researchers spend adequate time learning the language spoken by their informants. The convention is less clear, however, in contexts where people speak multiple languages and/or dialects of a language, and where the majority of informants are very competent in English.

In Echang the primary languages spoken are Tobian and Sonsorolese. Pronunciation and vocabulary differ between these two languages. They are mutually intelligible, but enough difference exists between them to confer a true distinction (Cappell 1951). Palauan and English are also widely used in various contexts in the household, social life, and in the workplace throughout Palau. The youth in Echang reportedly speak a vernacular characterized as a fusion of Tobian-Sonsorol-Palauan-English. Some residents refer to the product of the recent fusion of these two languages as *Echangese*.

In the end, I decided to reprioritize acquisition of the local dialect and employ English as the primary research language. While problematic on a number of levels, it proved to be a reasonable strategy given the linguistic context. Research assistants provided aide with data collection and translated interviews into English when appropriate. These individuals, who also were key research informants, were virtually fluent in English and able to move between the various languages seamlessly. I conducted all interviews in English and recruited the assistance of a translator when needed. My proficiency in the local dialect was limited to basic phrases and terms for plants and illnesses in Palauan, Tobian, and Sonsorolese languages.

Tobian and Sonsorolese are spoken languages, and there is no present standard for orthography. One of the more challenging aspects of research was working to spell Tobian language terms when recording illness concepts and plant names. Echang residents do not share a convention for spelling their words using English. I recorded all spellings that informants provided in field notes. I based all decisions for orthography on a triangulation of various spellings given for terms in my field notes, recorded pronunciations, and the orthography system currently used by other researchers on the Friends of Tobi Island website.[9]

E. Methods

Three key research domains guided data collection for this dissertation. The first domain is health. It encompasses indigenous disease concepts and therapeutic

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[9] FOTI website: http://cas.gmu.edu/~tobi/. Note: Foreign (i.e., non-English) words and phrases are *italicized* throughout the text. English words and phrases that have culturally specific meaning and usage are "*italicized with quotes*." These phrases and their usages are drawn directly from interview notes, tape recordings, and discourse analyses.

modalities, utilization of biomedicine, medical pluralism, and quality of health care in Echang. The second domain is food and includes research questions that address diet, food procurement, meal preparation, cultural contexts of food, and diet related health issues. The third domain is migration. It involves land use politics, the history of population movement from the southwest islands to Echang, and local perceptions of quality of life, well-being, and health following migration. The goal of this dissertation is to assess each of these domains as an integrated whole.

1. Health and Medicine

The following methods facilitated my investigation of health and medicine in Echang. These methods enabled me to elucidate concepts of disease, indigenous therapeutic modalities, perceptions of health, medical pluralism, health disparities, and quality of health care in Echang.

a. Structured and Semi-Structured Interview Protocols

Various Echang residents participated in a total of 132 structured, semi-structured, and open-ended interviews on the topic of health and medicine (Table 2). Nineteen informants from 17 Tobian households participated in open-ended interviews, ranging from 90 minutes to two hours, regarding indigenous medical beliefs, healing practices, and medical pluralism. The selected informants were individuals representing a varied range of expertise in traditional Tobian medicine. Their responses accounted for a full-spectrum of disease concepts and medical beliefs present in this sector of the Echang population.

Table 2 Semi-Structured and Unstructured Interviews on Health and Medicine

Interview Topic	N	Male Ages 23-79	Female Ages 18-56
Medical Pluralism and Health Seeking Behaviors	35	16	19
Indigenous Tobian Medicine	19	10	9
General Health and Well-Being in Echang	30	11	19
Free-list Exercises	15	8	7
Open-ended non-structured interviews	33	14	19
TOTAL	**132**		

A quota sample of Tobian informants (N=15) completed free-list exercises and elicited the domains of illness and plant medicines (Bernard 1994; Romney, et al. 1986). I initiated semi-structured interviews following the free-lists as a means to probe into local categorization of illnesses, the relative importance of illnesses, illnesses with which people had personal experience versus those that they had simply heard of before, and so forth. I carried out additional unstructured discussions of health and illness during informal encounters with others in Echang throughout the course of the research period and recorded them daily in field notes.[10]

Interviews with Tobian informants on health and medicine complemented semi-structured interviews with non-Tobian Echang residents and health care professionals, including physicians (N=3), a dentist (N=1), public health administrators (N=2), nurses (N=2), and community health aides (3). I developed questions for health care workers by analyzing interview responses from Tobians and other Echang residents. In the absence

[10] One of the things that I learned from my first field visit to Echang was the importance of story telling and use of metaphor to transmit knowledge among Southwest Islanders. Asking informants, "please tell me about all of the illnesses that are common in Echang," for example would always turn into a discussion or story telling session about a few illnesses that came to mind. Usually the story revolved around a person who had the illness, or was a recollection of a story that they had heard about a certain illness. Over the course of casual discussions, many stories, and many metaphors later, I compiled the list of illnesses reported here.

of detailed public health information for Echang or access to patient medical records, questions to health care workers elicited their knowledge of (a) common illnesses in Echang, (b) health care utilization by Echang residents, (c) ethnicity and health care delivery, and (c) any significant difference in disease morbidity or mortality for the Echang population relative to others in Palau. Physicians and public health administrators were also extremely helpful in describing Palau's health care infrastructure.

b. Participant Observation

Participant observation in the following activities enhanced interviews: (a) plant collection; (b) preparation of indigenous plant medicines; (c) hospital visits; (d) utilization of biomedical services and clinics; (e) story-telling on the subject of medicine and healing on Tobi. Simple observations (i.e., unobtrusively observing interactions or activities being performed by others without personally participating in them) were recorded in field notes for the following: (a) discussions leading to health care choices at the household level; (b) indigenous healing rituals; (c) preparation of indigenous plant medicines; (d) discourse regarding the use of biomedicines; (e) and interactions of health care staff with Southwest Islanders; (f) discourse on experience in hospital and clinic settings. These two methods of observation provided information with which to contextualize and process informant responses to formal interview questions (Bernard 1994; Browner, et al. 1988; Etkin 1993; Pelto and Pelto 1996).

c. Ethnobotanical Data Collection

To account for the ecological dimension of health and healing in Echang, I carried out a rudimentary botanical survey of Echang medicinal plants from February - June

2002. The section below contains a description of the methods used to collect and prepare plant specimens for identification.

i. Permit to collect plants for scientific research

The Palau Division of Natural Resources and Development (PDNR) granted a research permit to collect plants for scientific investigation. The permit covered the collection of plants located in Echang and Koror for the sole purpose of identification. I did not collect vouchers for common plants that were easy to identify (e.g., coconut, guava, papaya, ginger, etc.).

ii. Plant identification

Dr. Lynn Raulerson at the Guam Herbarium agreed to identify the plants in the collection. At the Palau Community College (PCC) Dr. Joel Miles in the Department of Agriculture and Dr. Aurora Del Rosario at the Cooperative Research and Extension provided assistance in identifying common local plants and garden cultivars. Dr. Miles also resided in Echang and was very familiar with many of the plants found there. He provided a plant press, blotting paper, and access to the PCC plant dryer, along with a crash course in plant collection and specimen preparation. He identified some of the common plants that were included in the medicinal collection for which I did not collect vouchers. Dr. Rosario's expertise in Palauan sweet potato and taro varieties proved helpful in the identification of cultivars grown in Echang. She has recently published a book on medicinal plants in Palau (Del Rosario and Esguerra 2003) that I found useful as a reference in writing this dissertation.

iii. Plant surveys and collection of voucher specimens

I elicited the names of medicinal plants, the location, and availability of plants in Echang, and illnesses associated with plant medicines through free-lists and interviews. Once I had a comprehensive list, I collected the plants with the help of research assistants. The assistants were key research informants who were familiar with the botanical landscape in Echang, knew Palauan correlates to Tobian plant names, and were able to identify locations beyond Echang in which to find common medicinal plants. Most plants grew in areas that were public, but occasionally we needed to have special permission to collect from private property. Specimen notes included the following information: (a) Tobian plant name; (b) Palauan plant name; (c) collection location; (d) use in treatment of illness; (e) modes of application; (f) use in non-medical contexts; (g) perceived availability; (h) other places the plant may be collected in Echang; (i) plant characteristics (e.g., part of the plant used in medicine, parts collected for voucher specimen, flower, fruit, leaves, bark, root, exudate); and (j) propagation strategy for plant, when applicable. Each voucher had a corresponding digital photograph. Compact discs containing the digital images accompanied the voucher specimens and specimen notes to the herbarium and PDNR.

iv. Preparation of vouchers and plant identification

I transferred plant cuttings to the press as soon as possible after collection. I collected duplicates for all specimens, labeled them, and pressed them between sheets of blotting paper. I placed them in a plant dryer at the Palau Community College. I changed the blotting paper every 8-12 hours, when possible, until the specimens were dry. Dr. Miles at PCC provided technical assistance and advice for drying and preparing

the specimens. I prepared the vouchers for delivery to the Guam Herbarium and the PDNR by placing each individual specimen between sheets of newspapers along with a coded identification tag, a copy of specimen notes for each voucher, and a copy of the digital photographs. I sent one set to Dr. Raulerson in Guam and she identified forty-one plants from this collection. I left another set of vouchers in Palau at the Division of Land and Resources.

2. Food, Diet, and Disease

In order to learn more about the impact of migration on diet and health in Echang, I gathered information about contemporary food ways using a variety of structured and unstructured methods. The original research protocol entailed a substantial oral history component designed to elicit information about traditional food ways and account for dietary change from the past through the present. However, during the research period a parallel project was initiated by the Sonsorol State Government in which their researchers were collecting stories and recipes for traditional foods of the various the Southwest Islands (ref. Watson, et al. 2002).[11] In order to prevent too much overlap in data collection going on in Echang during the research period of 2001-2002, I adjusted my research strategy. I modified data collection to complement the Sonsorol State project and to explore information about contemporary food procurement strategies, diet, cultural contexts of food, and food-related health issues. My interviews captured perceptions of dietary change and beliefs about the impact of food on health. I also recorded any comments about traditional food procurement and preparation practices.

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[11] Sonsorol State had planned to start their traditional foods project prior to my arrival in Echang.

a. Structured and Semi-Structured Interview Protocols

A research group from the UH Manoa Division of Ecology and Health (DEH) designed a questionnaire aimed at capturing cross-cultural concepts of community and ecology in three distinct Pacific Island cultural contexts: Hawaii, Marshall Islands, and Palau. This questionnaire became known as the 'sense of coherence' (SOC) questionnaire. The main objective of the DEH initiative was to investigate the impact of displacement on health and to explore the linkages between environmental degradation, socio-political processes, and human health in Pacific Island communities. The goal of the research was to advance theoretical models used in the study of ecosystem health.[12]

The questionnaire arrived via electronic mail from the DEH in late December 2001, along with a detailed explanation of the survey's background. The scope of the survey was broad, and asked individuals to think about and talk about environment, culture, health, economy, and politics in an integrated way. The survey I used contained 35 open-ended questions, which I adjusted to fit the research context of Echang (Appendix C). I also tailored it to the dissertation project and incorporated specific questions regarding diet, health, and medicine. I use the SOC questionnaire to gather preliminary data regarding food-related health concerns in Echang.

Fifteen individuals, including nine women ages 29-49 and six males ages 46-66, participated in the DEH survey. Seven participants designated themselves as Tobian and two considered themselves ethnically Sonsorolese. Although the two Sonsorolese participants do not comprise a quota or representative sample for this population

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[12] The results of this research were presented at the International Society for Ecosystem Health Conference in Washington, D.C. in 2002 (Gollin, et al. 2002; Wilcox, et al. 2002).

subgroup, I selected them based on their exceptional ability to provide commentary to the contemporary issues facing the entire Echang community. One informant in particular studied public health in the United States and held a high political office. She possessed the unique ability to provide both personal and objective perspectives to key socio-political issues standing in the way of a higher quality of life for the Echang community.

As per the formal research protocol, informants provided informed consent prior to their interview. Before initiating the SOC questionnaire, I debriefed each participant of the scope of the questionnaire and the purpose of the research project. I explained the policy of participant confidentiality and described to each person who I planned to use the information. At the close of the oral informed consent process, I asked participants for their permission to tape-record the interviews. I informed them of their right to conclude the interview at any time, to refuse to answer any questions, and to discontinue taping the interview at any time. In all but one of the cases, the interviews were tape-recorded. I took hand-written notes during the interviews and then recorded supplementary contextual notes at the earliest opportunity following the interview. These notes captured location of the interview, people present, activities taking place in the location during the interview, and other impressions about the interview (Bernard 1994; Sanjek 1990).

The SOC questionnaire was a valuable tool because it encouraged informants to reflect on their present situation in Echang and compare it to their experiences living on their home islands. Questions regarding health, diet, and medicine elicited perceptions of change that are integral to this study. There are no baseline data available to ascertain changes in population health, dietary health, medical utilization, and the like. As a result,

informant perceptions, memories, and stories of personal experience provide a glimpse into the cultural and social context of change in this community.

b. Dietary Surveys

I conducted dietary surveys in Echang from December 2001 to June 2002. The goal of the surveys was to collect data that represented the food consumption patterns and composition diet in Echang households. Surveys primarily reflect data from Tobian households (N=20). However, the considerable level of ethnic diversity within Tobian households provides a good estimate of dietary practices in Echang as a whole. Field notes for this research project contain over 1000 dietary observations.

The methods used to survey diet included random spot-checks, 12-24 hour recall, open-ended interviews, and observation. Spot-checks occurred randomly each week with anywhere from 1-3 households per day in which I recorded an inventory of foods and meals. During spot-checks, I briefly interviewed whomever was at home to gather additional information about the most recent meal as well as the previous meal(s) prepared within 12-24 hours. Dietary inventories included the following information: (a) time of day meal was consumed; (b) foods prepared; (c) mode of preparation for the foods; (d) source/origin of dietary foods (e.g., bottom fishing, spear fishing, market place, home garden, food gifts); (e) condiments included in the meal; (f) medicinal/wild plants used; (g) number of people meal was feeding; (h) notes on meal consumption (e.g., who ate together, who ate first, who ate last, where people ate); (i) relative composition of meals (e.g., proportion of meats to vegetables, processed foods to fresh foods, cultivated/collected foods to foods purchased at the market, etc.). I gathered other contextual information as household indicators, including employment and income of

households, access to land resources in Echang for gardening, and access to fishing poles and canoes in my analysis of dietary behaviors. Whenever I had the opportunity, I recorded in my field notes the composition of meals consumed outside of household settings. This was a considerably less systematic method of surveying diet, but it provided information about an important dimension to dietary behavior in contemporary Echang: the consumption of snack foods, restaurant foods, and meals at the workplace.

Food was not measured or weighed systematically, and so no data are available to assess caloric intake, energy expenditure, or nutritional value of diets in these Echang households (c.f., Messer 1989; Quandt 1987). However, enough data are available to describe the composition of meals in a typical Tobian household in Echang and to assess the degree to which traditional diet has been transformed as a result of migration (Pollock and Finau 1999; Quandt 1996). Informant responses to survey questions yielded information about the cultural significance of foods, perceptions about their relationship to health, and their role in healing.

c. Market Surveys

A majority of foods that people consume in Echang comes from grocery stores, fish markets, convenience stores, farmers markets, and restaurants. I recorded non-systematic, inventories of these markets that included information such as the availability and selection of fresh fruits and vegetables, meats, processed foods, pre-prepared foods as well as general cost. I also asked research participants to describe the frequency with which they bought foods at grocery stores during semi-structured and open-ended interviews. These data help to complete the picture of foods that people consume Echang households.

d. Participant Observation

Participant observation allowed me to collect data on diet and health in the following contexts: (a) cultivation of food crops (e.g., sweet potato, tapioca, taro, sugar cane); (b) daily meal preparation; (c) food consumption; (d) preparation of foods for celebrations; (e) grocery shopping; (f) eating at restaurants; (g) fishing (e.g., spear fishing and bottom fishing); and (h) collection of reef foods. Participating in the preparation of a meal was exponentially more informative than having someone simply describe the process. Besides the list of ingredients that go into making meals, sensory cues such as the heat of the fire or the texture of food often guide the process of preparation. The plethora of other contextual information available through observation helped to complete understandings of food and meals (Etkin 1993, 1994a; Etkin and Ross 1991b; Pelto and Pelto 1996). Food preparation, cultivation, and hunting are all group activities, and participant observation provided *de facto* focus groups within which to discuss various types of food production and their cultural significance.

3. Migration and Land Tenure in Echang

The third domain of this research is migration. The relationship of place and health in Echang was crucial to the project because one of the major social transitions following migration was a shift from life defined by subsistence activities to one in which subsistence agriculture and fishing have been marginalized. Migration also plays a role in health inasmuch as it relates to access medicines and quality health care. Questions pertaining to access to natural resources, which play a role in dietary health and the practice of traditional medicine, are also part of this domain.

The SOC instrument contained a number of questions that allowed informants to voice their opinions regarding the impact of migration to Echang. I also collected several migration histories and stories about life on Hatohobei throughout all three of my field-stays as a way to understand local perceptions of the ways in which life has changed. In semi-structured interviews, I encouraged people to provide commentaries on beliefs and practices of the past and to describe how migration has altered these aspects of culture in the present.

In order to contextualize the historical, political, and legal dimensions of southwest island population settlements in Echang, I reviewed numerous historical documents. I photocopied court transcripts, Supreme Court opinions, and legislation documents at the Law Library of the Supreme Court. I interviewed several individuals at the Land Records Office (LRO), Bureau of Lands and Surveys (BLS), and judiciary to learn about Echang conflicts and general land claims legislation in Palau. These interviews complemented oral historical commentary that Echang residents provided on the subject. I also obtained copies of maps, cadastral plots, and aerial photographs of Ngerekebesang Island and Echang through the LRO and BLS.

F. Library Research

Library resources were valuable throughout the period of fieldwork. The libraries I used were the Law Library of the Supreme Court, the Palau Community College library, the historical archives at the Belau National Museum, the Palau Conservation Society library, and the medical library at the Belau National Hospital. The Sonsorol State and Hatohobei State Government staff provided me with access to various documents they had on file.

G. Internet Research

Access to the internet was available at the PCC library as well as at one of two internet cafes in downtown Koror. The internet provided me with access to online libraries, electronic articles, and reference materials during fieldwork. Electronic mail correspondence also enhanced fieldwork by facilitating remote research-related consultations with advisors.

H. Data Management

I used a portable laptop computer to manage all research data, including field notes, interview transcriptions, photographs, e-mail correspondences, and databases. I had separate databases for medicinal plants, census information, basic vocabulary, foods, and medicines. These databases eased data organization and provided analytical tools for ongoing data analysis. I backed up all electronic data weekly on compact discs and stored them in a secured locked box along with notebooks containing handwritten notes.

I recorded 32 interviews using a voice-activated tape recorder and 90-minute cassette tapes (Table 3). I also recorded two church service sermons, one for Christmas and the other for Easter. Following the confidentiality protocol for this research project, I assigned each tape with a random code that provided me with information regarding the informant's name, the date of the interview, and the interview topic. Hand-written notes that supplemented the taped interviews also had codes that corresponded with the cassette tapes. Keys for the data codes were stored separately from the data in password-protected files on the laptop computer. All confidential data were stored in locked boxes throughout the duration of fieldwork.

Table 3 List of Interviews Recorded on Tape by Subject

Subject of Interviews (semi-structured)	N	Duration (minutes)
'Sense of Coherence'	15	1350
Health Care Worker	3	180
Indigenous Medicines	9	810
Land Surveys and Claims	4	360
Church Services	2	120
TOTAL	**33**	**2820**

A digital camera helped me to record visual images of Echang and various research activities, people, and places. The camera had the capacity to produce high quality images for digital or print reproduction as well as taking short (90 second) video clips in color and with sound. I transferred digital images and video clips to the laptop daily and backed up all images weekly with the other data. I had a separate digital image log for plants we collected.

I. Methodological Limitations of Research Design

The greatest limiting factor in this research project was lack of funding. A larger budget would have provided funding to hire research assistants to aid in data collection among a wider sample of the population. The Belau National Hospital was willing to support a systematic review of medical records, but they required the hire of local research staff to carry out this task. Unfortunately, there were not enough funds to accommodate this request, and so I abandoned review of medical records as a research strategy. Additional funding would also have supported my stay in Palau for a longer period. There are analytical limitations when diet is assessed using data from weeks or months of surveys rather than the entire agricultural cycle or fluctuation of food availability at markets over the course of a year or more (Quandt 1996). An extension of

fieldwork in Palau would have facilitated a trip to Hatohobei to collect voucher specimens for rare medicinal plants. It would also have enabled the collection of fruits, flowers, and seeds for plants that were not fruiting or flowering at the time we collected voucher specimens.

On the subject botanical specimens, there were limitations in the type of ethnobotanical and ethnopharmacological analysis that I could include in the dissertation due to the fact that only one institution identified the vouchers. I made the decision to include a botanical survey after several months of ethnographic research. In other words, I did not anticipate that plants would be such a vital component to the dissertation. Fortunately, I had a great deal of assistance from staff at PCC and from colleagues (via e-mail correspondence) who were familiar with collecting botanical specimens. Nonetheless, a few of the specimens sent to the Guam Herbarium for identification were poorly preserved and thus difficult to identify. Additionally, a second opinion for this collection of is unavailable. Given these limitations, the report of 17 medicinal plants from Hatohobei (Black 1968) identified by the Smithsonian Institute was compared with plants identified at the Guam Herbarium in an effort to gain some type of validation for local and botanical terminology. While the identification of these plant specimens carries less weight than if a secondary or tertiary resource had identified them, they are still reliable enough to include in the discussion of plant medicines, their use, and significance in the health care strategies among Echang residents. Additional validation of voucher specimens would have justified assessing the pharmacological dimensions of plant and facilitate an evaluation of the biocultural significance of medicines in Echang.

The decision to use English as the primary language of research is justified given the research context. However, using English certainly introduces a number of significant methodological limitations. Botanical nomenclature, metaphors encapsulated in plant terminology, illness concepts, and healing techniques, and other nuances in the use of local languages are often lost in translation. Limited and rudimentary knowledge of the language also affects the researcher's ability to confidently report on orthography and English correlates. Luckily, I was able to use a number of resources to remedy some of the issues with orthography and translation, including maintaining correspondences with informants in Palau during data write-up and consulting anthropologists who have previously worked with this rare language.

Collecting dietary data systematically in Echang was challenging. Individuals in a shared household rarely consume meals at the same time with the exception of children up to the age of five, who always eat in the presence of an adult. Individuals graze throughout the day and eat a seemingly endless variety of snacks and store bought foods. Those employed outside Echang eat meals away from the household during the day. The original research protocol called for detailed systematic dietary surveys that incorporated weights and measures of foods consumed as a means of calculating caloric intake. The context of food consumption required more of a qualitative assessment of diet than the original protocol entailed. The methodological challenges alter the tenor of dietary data and influence the extent to which I can draw conclusions about the impact of diet on health.

One piece of information that would have been very useful to this project is anthropomorphic data related to body mass index (BMI) in the population. The data

would have provided invaluable information with which to evaluate relative risks for common chronic diseases such as heart attack, hypertension, stroke, and diabetes. Collecting this data is certainly a research priority for future research in Echang, since there is virtually no public health data to provide a baseline that describes risks to these diseases for this population.

A final methodological limitation that I want to address is my decision to collect information regarding health, illness, and medicines primarily among Tobian informants. Most of the decision had to do with research relationships and level of comfort conducting interviews on a sensitive topic such as indigenous healing. The decision makes sense because to some degree what happens among Tobians also happens among other southwest island groups in Echang. Tobian households are actually households in which individuals from Pulo Ana, Sonsorol, Merir, Koror, Babeldaub, Angaur, Indonesia, Saipan, Chuuk, Yap, and the United States reside. Even though they are unique in that heads of these households are ethnically Tobian, they also offer some degree of representation of the community as a whole. One could argue that the designation of households as Tobian or non-Tobian is superficial. However, the concept carries weight in terms of how individuals in Echang view household composition and distribution, and so that is why it I use it as such in this analysis. Data regarding food, health, and medicine are qualified as much as possible in this dissertation. While there are numerous cultural and social similarities among the various groups in Echang and some generalizations can be made based on the primary research population, the unique cultural history and heritage of each southwest islander group must also be respected.

J. Summary

The research methodology for this project includes qualitative and quantitative strategies. Exploratory inquiries and participant observation prior to initiating dissertation research provided cues for project design. Data collection strategies were developed around three primary research domains: (a) health and medicine; (b) food, diet, and disease; and (c) migration and land tenure in Echang. A variety of interview protocols, participant observation, library research, and survey techniques yielded data with which an integrated picture of migration, health, and natural resource is constructed. A number of considerable methodological limitations emerged throughout the course of fieldwork. These were each addressed on a case-by-case basis. Alterations to research protocols and approached to data analysis echo these limitations. Recognizing limitations is the first step to making improvements in the design of future projects. Research questions that I was not able to address in this dissertation are fertile ground for subsequent research in this community.

III. CHAPTER THREE: RESEARCH SETTING

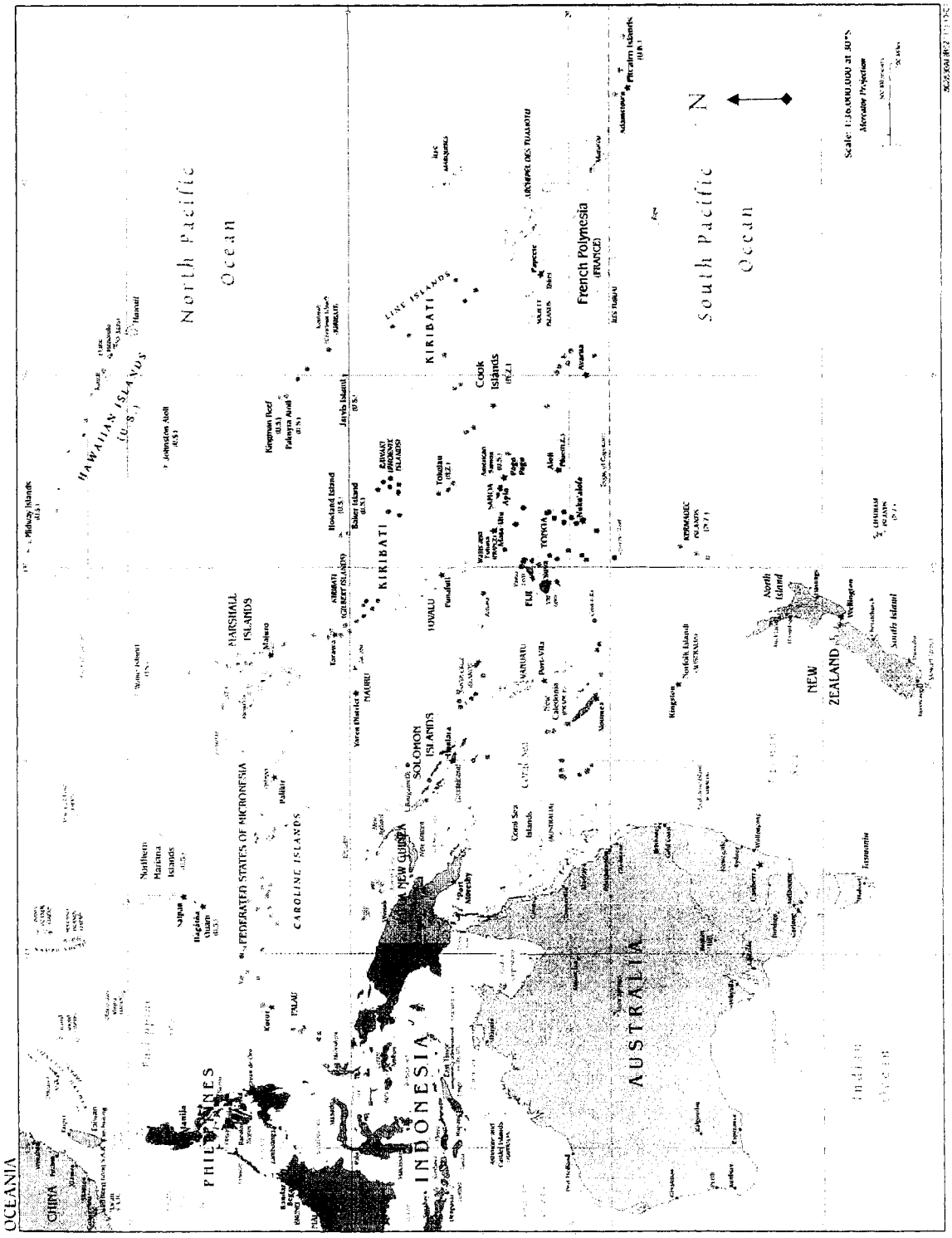
A. Introduction

This chapter presents background information on the geography of Palau and the historical, political, and economic contexts of southwest island population migrations to Echang. It also describes the research setting, including some important features of life in Echang like geography, vital statistics, household composition, and community organization. This chapter sets the stage for subsequent discussions on the relationship between migration, sociocultural change, disease patterns, and health-seeking behaviors in southwest island populations.

B. Where is Palau?

The Republic of Palau is an Archipelago found in the western Pacific Ocean, approximately 850 km southeast of the Philippines and 1287 km southwest of Guam. It is located at latitude 2° to 8° N and longitude 131° to 134° E (Fig. 1). Palau is the western-most cluster of islands in the Caroline chain and is oriented along a north to south axis stretching roughly 400 miles (644 km) along the Kyushi-Palau Ridge. It is part of a group of islands within Oceania referred to as Micronesia.

Palau is comprised of two distinct archipelagos: the northern archipelago, referred to as the main Palauan islands, and the southwestern archipelago, known as the southwest Palauan Islands (Fig. 2). Together they provide some of the most biologically diverse flora and fauna in all of Micronesia (Donaldson 2001). The main archipelago includes the high volcanic islands of Babeldaub, Koror, Peleliu, and Angaur, the low-lying coral atolls of Kayangel and Ngeraungel, and the hundreds of uplifted coralline limestone



U.S. Central Intelligence Agency (1995)

Figure 1 Map of Oceania

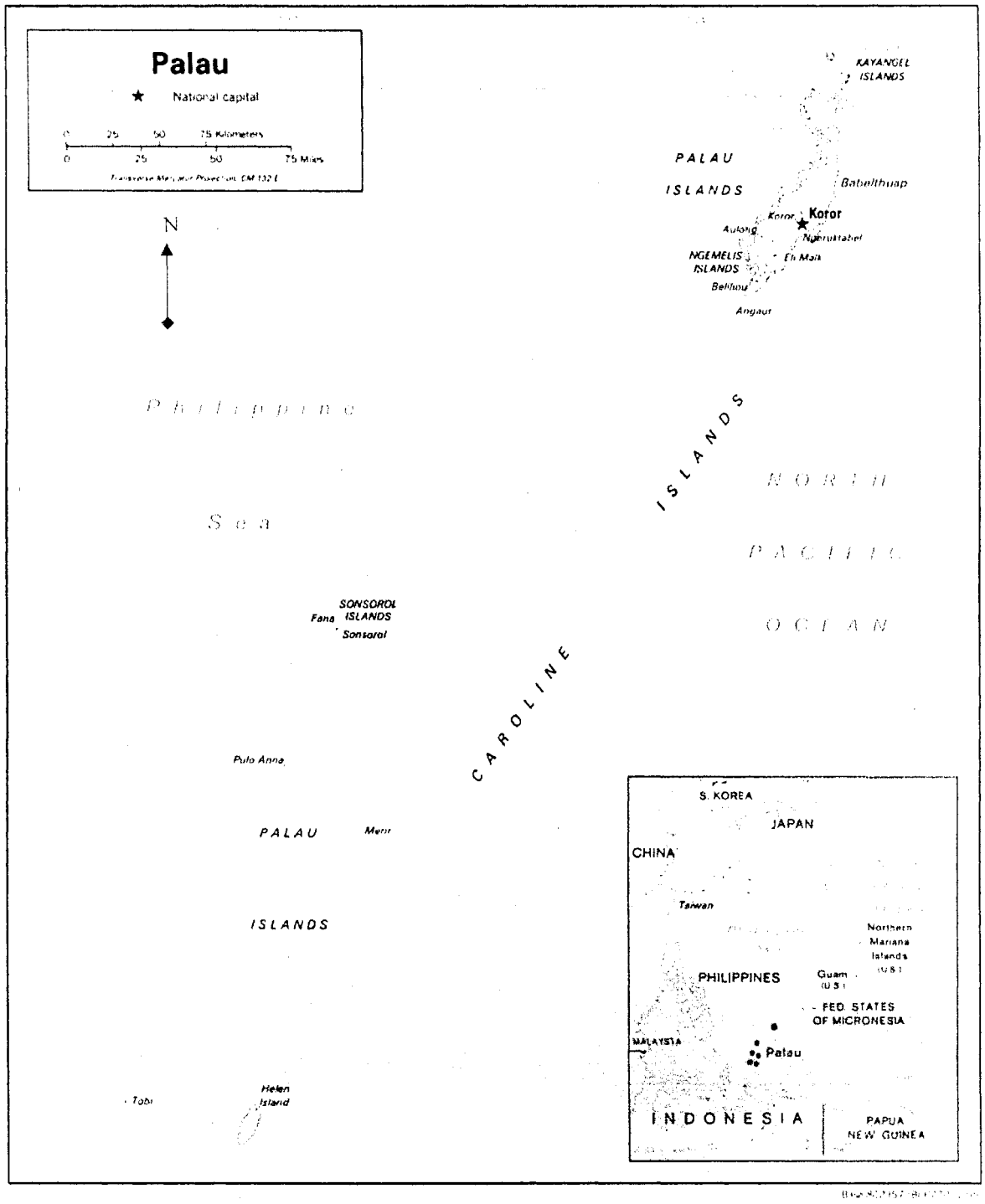


Figure 2 Republic of Palau U.S. Central Intelligence Agency (1995)

formations known as the Rock Islands. The major high volcanic islands have characteristically diverse habitats with rich soil and ample freshwater streams, lakes, and estuaries, making them ideal for human habitation. The landscape of these islands ranges from forests thick with vegetation to savannahs to mangrove forests. A vast fringing reef surrounds the main Palauan islands, except for with Kayangel and Ngeraungel in the north and Angaur in the south. Inside lies an enormous lagoon that spans 370 km^2 making it the second largest lagoon in Micronesia (Johannes 1981). Beyond the lagoon and past the southern tip of Angaur, 595 km southwest of the main archipelago are the southwest Palauan islands of Sonsorol, Fana, Pulo Anna, Merir, Hatohobei, and Helen (also known as *Hotsarihie* or Helen Reef). They lie between latitudes 3° and 6° N and longitudes 131° and 133° E. These islands are a series of small, low-lying reef flats, which shifting Pacific tectonics have uplifted (Fryer and Fryer 1999).

The Sonsorol Islands (Sonsorol, Fana, Pulo Ana, and Merir) are approximately 300 km southwest of Angaur. Hatohobei and Helen sit at the southernmost point of the Republic approximately 450 km southwest of the main islands. All the southwest islands, except for Helen, share similar morphological features including characteristic raised coralline limestone platforms resting on table reefs with low swampy interiors. A combination of brush, mixed forested areas, and large stands of coconut trees superimpose the sandy soils of these low-lying islands. In contrast, Helen is a single islet within a large lagoon enclosed by a perimeter reef. Helen has a more biologically diverse marine ecosystem than all of the other southwest islands combined (Donaldson 2001; Johannes 1981; Maragos and Cook 1995).

Like other island chains in the Caroline archipelago, Palau's climate is generally hot, humid, and wet. The average annual rainfall ranges from 4m in the main archipelago to about 3m in the southwest islands. Seasons shift between hot, humid, and relatively dry to cooler, humid, and very wet. The average temperature in the islands is 30°C (87°F) with humidity averaging 80% and moderate diurnal variation.

January and February are typically the coolest months and April the warmest. The heaviest rains and winds tend to appear between June and August. September through February brings still more rain, relatively cooler winds, and lower humidity. By March, the southwesterly monsoon winds transition to easterly trade winds, with regular intermittent scattered showers. In short, periods of prolonged dryness or drought are very rare in all of the Palau islands. Both the northern and southern Palau archipelago lay beyond the main Pacific typhoon zone and do not bear the brunt of severe tropical storms that pass through the region (Snyder and Butler 1997). However, occasional deadly and destructive typhoons have left their mark.[13]

Palau is a relatively small country. The estimated population for Palau in 2002 was 20,000 people. Palau encompasses a total land area of 458 km^2 and has 1,519 km of coastline. The population density for Palau in 2004 is approximately 43.67 persons per km^2.[14] The World Health Organization estimates that in 2002 the average life expectancy for Palauan males was 66.4 years and for females was 70.9 (2003).

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[13] The most notable and important exception was the typhoon of 1905 that swept through Micronesia.

[14] This figure is somewhat deceptive. Babeldaub is a large island. However, the majority of the population resides in Koror, which is a significantly smaller island and exceedingly more densely populated.

C. History of Human Settlement in Palau

Humans currently inhabit only a fraction of the estimated 200 islands and islets that comprise the Republic of Palau. Moreover, 70% of the population resides in Koror, the capital and most densely populated city. The largest island is Babeldaub, which boasts an impressive land area spanning 396 km^2 and 158 km of shoreline. It is the second largest land area in Micronesia after Guam and the oldest island in the archipelago. In contrast, the remaining Palauan islands combined amount to a mere 96-km2 total land area.

Although a geo-political boundary unites the north and southwest Palauan islands, their inhabitants do not have common roots of origin. Archaeological evidence indicates that humans colonized the northern Palauan islands perhaps as early as 2000 years ago, but no later than 100 A.D. (Irwin 1992; Rainbird 1994; Thomas 1997). Lapita pottery has been found in Yap and Palau dating approximately 2000 years ago. On the basis of linguistic analysis, it appears that these first settlers most likely originated from Southeast Asia (Pawley and Ross 1993).

The archaeological record for the southwest islands is scarce. It is unclear how long humans have settled in the southwest Palauan islands and there is minimal archaeological evidence to indicate the place of origin of the indigenous settlers. While some archaeological sites have been evaluated (Hunter-Anderson 1992; Osborne 1966; Snyder and Butler 1997) most of what we know about the pre-contact history of southwestern Palau originates from linguistic analyses and oral histories.

Ethnographic research suggests that the ancestors of contemporary Southwest Islanders probably migrated to these islands from the outer islands of Yap (Black 1977,

1983; Snyder and Butler 1997). The language spoken in the main islands is almost totally unrelated to those languages spoken among southwest islander groups. Southwest Islanders speak dialects of a single language, which is closely related to that spoken in Ulithi (Black 1977; Cappell 1951; Johannes 1981; Kakkenbusshu 1970; Quackenbush 1968). Ethnographic research has elucidated unique stories of origin and migration histories for Tobian islanders and islanders from Sonsorol, Pulo Anna, and Merir (Black 1977, 1982; Mohitso 1968; Olsudong, et al. 2003; Sound Recording 1978). The distinctiveness of these cultures from the indigenous peoples of the main Palauan islands persists to this day.

D. Historical Context of Southwest Islander Migrations to Koror[15]

Germany acquired the Palauan Islands in 1899 from Spain, whose presence in the Western Caroline Islands (including the Southwest Palauan Islands) dates back to the early 16th century (Black 1977; Hezel 1972). Germany was interested in expanding their influence in global trading and commerce through trading stations throughout Micronesia, and they established phosphate mining companies and copra plantations in the main Palauan Islands to that end. In order to maximize their labor force and enhance productivity, the German administration began to move people from remote areas of the islands into large, more centralized settlements (Snyder and Butler 1997).

The German Administration's methods for administering lands contrasted with local custom, in large part due to the Germans' lack of adequate understanding of

[15] This history is reconstructed from interviews conducted for this research project, extensive review of court proceedings, newspaper documents, and scant academic literature on the subject. Historical events that are recorded in court proceedings are based, in part, on witness testimonies. Because the names of certain individuals involved in the matter of relocation from the southwest islands to Ngerkebesang is a matter of public record in Palau, the names of individuals involved in the legal proceedings of relocation are also included here.

Palauan culture. The Germans only recognized lands that were developed and cultivated as locally owned lands, and sought to claim unfortified lands as public property for their various enterprises. They did not recognize indigenous systems of land distribution and use. Palauans had complex systems of land ownership that were organized around clan membership and kinship ties, and not all lands that were owned by Palauans were fortified with structures or cultivated. In fact McKnight (1977:18) notes that the Palauan *chutem er buai,* which translates loosely to mean public lands, were communal landholdings by the ranking clans of local villages, and encompassed nearly the entire island of Babeldaub, except village areas, gardens, and other cultivated lands. No single individual would claim sole ownership over these lands, and they often were uncultivated or unfortified for ritual or communal purposes. German land seizures created dissonance between their administration and the Palauan people.

In 1905 a destructive typhoon passed through the region, obliterating homes, farms, gardens, and polluting natural resources. Pulo Ana and Merir in the southwest islands suffered the greatest devastation. A German ship was sent to provide aid and transport approximately 150 people from Pulo Ana and Merir to the main islands (Espangel v. Tirso, Opinion 1991). The Germans had identified an area of land on Ngerekebesang Island as a public land area for relocating the displaced southwest island peoples. After negotiations with Chief Espangel Ewatel, the high Chief of the Omrekongel Clan and overall Chief of Ngerekebesang, the islanders from Pulo Ana were

granted permission to settle in an area of the island called Echol (Fig.3) (Lulk Clan v. Estate of Tubeito, Decision 1997).[16]

The Germans moved Merir Islanders to a separate area of public land in the main islands.[17] This relocation fit perfectly into the German administration's long-term plan to strengthen their labor force and unify all Palauans in such a way that would further their economic ventures (McKnight 1977:17). It served as a gesture of goodwill between the foreign administration and people of the remote southwest islands and helped to strengthen relations between the German administrators and Chief Ewatel. Black (1977) suggests that the chief's decision was motivated by compassion for the displaced Islanders, but also by his own personal political needs of bolstering the size of his village. In any case, initially the relocation appeared to be successful. Shortly after their relocation, the Merir Islanders began suffering further losses in their population. The unfamiliar terrain, soils, and climate of the area made survival difficult for this group and ultimately disastrous. Many people reportedly died and others became ill at an alarming rate (Lulk Clan v. Estate of Tubeito, Decision 1997; McKnight 1977).

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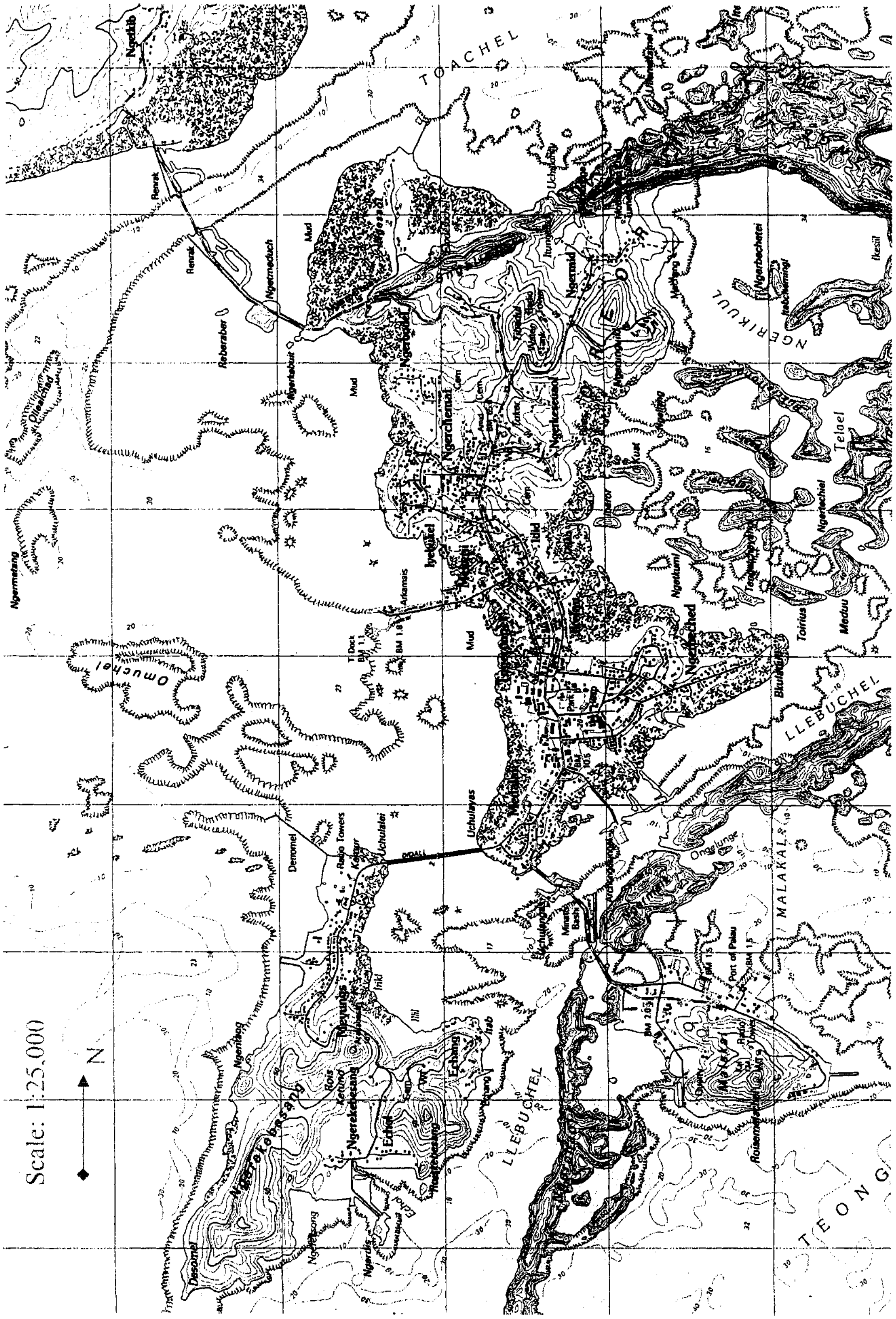
[16] The following story recounts how Chief Espangel acquired authority over Echol: "In the old days, before the Spanish times, much of the subject property was owned by the Tiabed Clan. The Chief of Tiabed was married to a beautiful woman from Peleliu, but her beauty was her undoing, for one day her husband drowned her in a jealous rage. The Tiabed chief sought advice from Espangel, the chief of Omrekongel Clan, regarding how to explain her death to her clan in Peleliu. Espangel advised him to put her body in a canoe, take her to Peleliu and tell her clan's chief that she died on the journey to Peleliu. The plan worked, and the Tiabed chief was able to cover up his act of homicide. When he returned from Peleliu, he gave the Tiabed property in Echol to Espangel as payment for his silence. The balance of the subject property was in those times owned by the Lulk and Odilang clans (LCHO No. 12-18-94 1994)."

[17] There are conflicting reports about the site of Merir Islander relocations. Oral history taken and recorded in (Lulk Clan v. Estate of Tubeito, Decision 1997) suggests that they were relocated in Ngerbodel, which is in the Koror District. However, McKnight (1977:18) recounts that they were relocated to Aimeliik.



USGS (1983)

Figure 3 Koror Municipality

Eventually, the Merir Islanders were moved to Echol (Fig. 3). Echol more closely resembled the southwest islands in terms of soil composition and quality, fresh water sources, and open access to the sea for fishing. The second relocation was successful in terms of both survivorship and satisfaction with the area. Slowly, increasing numbers of people from all southwest slands began to join settlers in Echol via passage on German ships, which periodically conveyed supplies to and from the north and south island chains. Southwest Islanders remained undisturbed in Echol until the end of World War I.

The German administration ended in 1914 when the Japanese seized the Palau islands during World War I. The League of Nations gave the Japanese administration a mandate to govern Palau in 1922, and they occupied the islands until 1945. The Japanese sought to foster economic development in Palau as well as cultural and social transformation. In short, the Japanese had hoped to set up a colony in Palau. Mass emigration from Japan and Okinawa to Palau was encouraged by the Japanese government in order to create additional extension of Japanese influence in the Western Pacific (Peattie 1988). The Japanese presence in Palau grew to more than double that of the indigenous population only fifteen years after the League of Nations mandate (Snyder and Butler 1997).

One of the most significant legacies of the Japanese administration was the land hearings held throughout Palau in the early 1930s. The Japanese assumed control over all public lands that the Germans had claimed, and then set out to survey and record the names of individuals or clans, as the case may have been, who had claim to the remaining parcels of land. They recorded results of these hearings in a document called the *Tochi Daicho,* or Land Register, between 1932 and 1941. It seems that the Japanese were not

interested in the *Tochi Daicho* out of interest for customary laws of ownership because they merely recorded who was living on what parcels of land at the time of their administration.

Around this same time the Japanese administration decided that they wanted to use an area of Echol along the waters edge temporarily to build a seaplane ramp and a military encampment. The inland parcels of the confiscated Echol lands were registered in the *Tochi Daicho* under the names of several individuals from Pulo Ana and Merir (Espangel v. Tirso, Opinion 1991; 1939). Through this process, these families were able to formally record their presence on Ngerekebesang in Echol (Division of Lands and Surveys 1979a, b). The *Tochi Daicho* was not completed, however, before the Japanese decided to confiscate the lands. The shoreline areas of these parcels were entered into the *Tochi Daicho* as public lands owned by the South Seas Islands Government Agency, despite the fact that people from the southwest islands had been occupying and cultivating that land since the turn of the century. The Japanese administration moved the settlers in Echol and distributed postal saving bonds as compensation for some of the lands that were seized (LCHO No. 12-18-94 1994). Some Southwest Islanders returned to their home islands, while a small group managed to remain in Echol.

As the Japanese entered World War II, their presence in Palau became increasingly oppressive. The civilian government transitioned quickly to a military administration (Snyder and Butler 1997). Restrictions were placed on Palauans in all aspects of social and political life. Southwestern Islanders in Echol were moved them to military encampments on Ngemelis Island from 1938 until the end of the War (LCHO No. 12-18-94 1994; Lulk Clan v. Estate of Tubeito, Decision 1997). Other Palauans were

forcibly relocated from remote areas of the country into Koror and Babeldaub. They produced food for the Japanese troops as well as build fortifications for military defense.

The Battle of Peleliu was one of the bloodiest battles of World War II. Over 500 American soldiers and more than 10,000 Japanese soldiers were killed as a result of the grueling combat that ensued from September 1944 to November 1945 (Moran and Rottman 2004). All those living in Palau during this time suffered from food shortages, disease, and even starvation. After the Japanese surrender, the United Nations assigned administrative authority in Palau to the United States in 1947. Three years later the Palau islands fell under the jurisdiction of the United Nations Trust Territory of the Pacific Islands (TTPI) along with the Federated States of Micronesia. In the same way as the Japanese had inherited public lands that the Germans claimed previously, the TTPI acquired public lands the Japanese government had seized. As the U.S. assumed administrative authority in Palau, they repatriated Japanese troops and Palauans throughout the country were free to return to what was left of their villages and homes.

The group of Southwest Islanders who had been forcibly removed from Ngerekebesang returned to lands they previously held in Echol, only to find that the war rendered the village uninhabitable. They eventually settled in Echang, an area of the island adjacent to Echol to which they also held claim prior to the Japanese administration. Although it was not practical to reestablish a settlement in Echol, some of the original settlers who held claim there began to cultivate gardens (Lulk Clan v. Estate of Tubeito, Decision 1997). A separate settlement was established by Tobian Islanders in Malakal, which was located in the Koror District near the Palau harbor (ref. Fig. 5, p. 83) approximately 7km from Echang (Black 1977).

Sometime thereafter, members of the various Palauan clans who held claim to Echol and Echang before the German era began to lobby for their return. Although Chief Espangel Ewatel had granted Southwest Islanders the lands in Echol, apparently other clan members did not approve of this decision (McKnight 1977). They eventually stripped him of his title (LCHO No. 12-18-94 1994). These clans claimed that Southwest Islanders had erroneously inherited rights to the lands Echol and Echang, without proper consultation with other clan members, and in a manner that defied customary law. They asserted that the portion of Ngerekebesang Island on which Echol was situated was under the control of a different clan altogether, and that Chief Ewatel did not have the right to give these lands away. Around 1950 the TT High Court Trials Division acquired the burden of resolving the conflict.

Upon the review of this, and other similar land claims throughout Palau, the TT government decided to rely on the *Tochi Daicho* as their definitive guide to privately and publicly owned lands. Individuals or clans were free to challenge the *Tochi Daicho* listings, but reversals of ownership would only be considered along with "clear and convincing evidence" (Baab v. Klerang 1955; Osima v. Rengiil and Rechesengel 1960). The claims to Echol and Echang were of particular interest to the TT government, because according to the *Tochi Daicho* the TTPI obtained these lands when they assumed administrative control over Palau. Claimants declaring rightful ownership of Ngerekebesang lands had to take the TT government to court (Hesbangel and Uchel v. TTPI 1958).

On 5 September 1962 the TTPI High Court instated the Land Settlement Agreement and Indenture. According to this agreement, all areas of Ngerekebesang

Island, except for a few retained areas, roads, and easements, were to be quitclaimed to the lineages and clans who resided on the island at the time the agreement was signed. Furthermore, the 1962 Land Settlement stated that:

> ...no provision of this Deed shall be construed to effect, retroactively or otherwise, or to rescind, revoke, cancel, alter, or change in anyway whatsoever, the rights and interests of any person, family, lineage or clan residing on or using or having members residing on or using that part of the premises herein granted known as 'E-ang' ... in and to the continued peaceful possession, occupancy and use of the said lands for an indefinite period in the future, and the Grantees[18] do hereby expressly covenant and agree further with the Government that the said residents shall and may continue for an indefinite period in the future to peaceably possess, occupy, and use lands within the area know as 'E-ang' without any suit, trouble, molestation, eviction or disturbance by the Grantees, their heirs, successors and assigns, or any other person or persons claiming through, from or under the same, this covenant and agreement to be construed as running with the land.

The Land Settlement Agreement restored the property rights of those settlers who held rights to the land before the Japanese confiscated it.

As one may imagine the relationship between southwest island groups and Palauans remained tenuous even after the 1962 Settlement Agreement (McKnight 1977). Palauans questioned the legitimacy of the decision as well as the TT government's continued reliance on the *Tochi Daicho*. Various parties took dozens of claims, decisions, and appeals to court to fight for ownership. There were so many land disputes throughout the country that in 1972 the Palau Land Commission was established to handle all of the land claims and assist with distributing land titles. The Land Commission resurveyed and reregistered all lands in Palau and distributed new titles and

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[18] The Grantees included: Chief Hespangel of the Omrekongel Clan, Chief Uchel of the Ngitechob Clan, Chief Obak of the Ucheliou Clan, Chief Obak of the Ngeskesuk Clan, Chief Rengiil of the Eluil Clan, Chief Obesongel of the Tikei Clan, Chief Olblai Rengill of the Odilang Clan, and Chief Ngirchonger of the Uchelkumer Clan.

leases. The Land Commission had the authorization to determine ownership of any land within Palau, but it was not adequately equipped to handle complex disputes.

Despite the ensuing conflicts over their presence, the Southwest Islander population in Echang and Malakal[19] continued to grow. Because of the tension surrounding land ownership and use rights throughout Palau, these were the only areas in the main islands where the Southwest Islanders could possibly settle. The TT government sponsored regular field trips that somewhat facilitated population movement between the main Palauan islands and the southwest islands. Every four to six months the ship would depart Malakal Harbor and make its way to the southwest. These field trips served a variety of purposes. Among the most important were transporting food and medical supplies and personnel to these remote communities.[20]

With settlements in Echang and in the southwest islands, people from Hatohobei and the Sonsorol Islands were able to live in either of these locations. People viewed Echang as a place that had more educational and employment opportunities, improved access to medicine and health care, access to travel and education abroad, and modern way of life. Black (1977: 54-55) notes that for Tobian Islanders, life in Echang was centered on educational and vocational achievement in a Palauan socioeconomic context, one that contrasted sharply with the subsistence-based economies and social structures that were influenced by fragile island ecosystem dynamics. Despite the conflicts associated with their presence in Echang, many people from the southwest islands chose

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[19] The area in Malakal in which Tobian Islanders were living was much smaller than Echang. The erection of a sewage processing plant in that area made Malakal a less than ideal place to live in terms of both air and water quality and the cleanliness of seawater. (Peter Black 1999, personal communication.)

[20] Black (1977:5-14) provides a detailed description of these field trips.

security, proximity to medicine, and better schools in Koror over the idyllic, traditional way of life in their home islands. Those who chose to stay in the main islands believed that building a life and raising a family there was the best long-term choice for a more prosperous community. The benefits of expanded access to foods, medicines, and employment security for their families and loved ones outweighed the potential risks and social conflict.

The Republic of Palau (ROP) finally was established in 1981. However, it remained part of the TTPI and financially dependent on the United States. Under the Palau Lands Registration Act of 1987, the Land Claims Hearing Office (LCHO) replaced the Land Commission. Along with a Bureau of Lands and Surveys, the LCHO directed all land surveys, issued all land titles, and attended to all legal land disputes. Any disputes that the LCHO could not handle would go to the Supreme Court Trials Division. The 1962 Land Settlement still protected the rights of all southwest island peoples in Echang, which now included increasing numbers of Tobians, who obtained use rights through kinship ties and alliances with others living there.

Beginning in 1991 Palauan clans from Ngerekebesang recommenced their fight to have the 1962 Land Settlement rescinded by the Supreme Court (Espangel v. Tirso, Opinion 1991). The 17 lots in Echol that were registered in the names of 12 people from the islands of Pulo Ana and Merir were contested unsuccessfully (LCHO No. 12-18-94 1994). Many Palauan citizens grew increasingly weary of the role of the judiciary for land issues that they believed to be a matter of community, family, and custom. Nonetheless, people inundated the LCHO with land disputes and they were unable to meet its goal of completing the registration of approximately 18,000 lots and the

determination of ownership of all lands in Palau within eight years. In 1996 the Palau Congress requested a major revision to the process by which these disputes were adjudicated. The request was granted, and a new Land Court supplanted the LCHO. In response to yet another appeal to revisit the case of *Lulk vs. Tubeito*, the Supreme Court issued an order to deny any petitions for a rehearing of the 1997 decision (Lulk Clan v. Estate of Tubeito, Decision 1997; Lulk Clan v. Estate of Tubeito, Order 1998; Lulk Clan v. Estate of Tubeito, Opinion 1998).

Nationwide opposition to the new Land Court was voiced in the Koror news publication, *Tia Belau,* on 8 November 1997 in a column entitled, "Is the Land Court Legal?" The article reported on a lawsuit claiming that the Land Court's authority to adjudicate property titles in Palau was unconstitutional. Dissatisfaction with the outcome of this lawsuit, along with decades of ethnic tension between Palauan and Southwest Islanders escalated into protests and culminated in violence. In March 1998 protesters in Ngerekebesang set up a peaceful demonstration to express their discontent with Southwest Islander occupation of Echang and Echol. Their hostility toward all southwest island groups was evident in their slogan of choice, written in three languages: "*Taiwoh yangi sirou chuchuh.* No more typhoon go home. *Mia modiak a yolt bomeri* (Anonymous 1998a)." Shortly thereafter, on 6 May 1998, the Sonsorol State office was reduced to ashes by an arsonist (Anonymous 1998b).

Life is considerably more peaceful today in Echang, and relationships between southwest island groups and Palauans continue to mend. Still, the historical, political, and cultural context of Southwest Islander migration is crucial to our understanding of contemporary socio-political issues facing they face in Koror today. Despite garnering

the support of the various foreign administrations and political powers that have occupied Palau, the past oppression and ethnic discrimination of people from the southwest islands continues to influence their present status in Palauan society. They are still minorities in Palau and struggle considerably in the arenas of education and politics. Their marginalization is also evident in the health disparities found in Echang.

Protests did little to change the legal protection for southwest island populations in Echang. The influence of the United States in Palauan government, law, and education, only serves to solidify the currency of the 1962 Land Settlement Agreement and Indenture. A majority of Palauans today embrace the legitimacy of Southwest Islander presence in Ngerekebesang. So long as the United States remains a prominent figure in contemporary society, economics, and politics, the Land Settlement Agreement will ensure that peoples of the southwest islands have a home in Echang.

E. Contemporary Government in Palau

The Republic of Palau achieved total political sovereignty in 1994 with a new constitution and the dissolution of the U.S. Trust Territory administration. The U.S. preserved their ties to the Republic of Palau through a Compact of Free Association. The Compact essentially provides Palau with financial support in exchange for a military presence in Palau should it become necessary in time of war. Under the Compact of Free Association the Palau is entitled to 700 million U.S. dollars over the course of 15 years.

The Republic of Palau is a constitutional government modeled after the United States. In the Executive Branch of the federal government there is the President and Vice President, each elected by popular vote to serve a four-year term. The President serves simultaneously as the head of government and Chief of State. In the Legislative Branch

there is a Senate, comprised of nine elected officials who each serve 4-year terms, and a House of Delegates, also elected by popular vote to serve a 4-year term. Sixteen independent states comprise the Republic of Palau (Fig. 4). Table 4 shows the population breakdown for each state. The House of Delegates (*Olbiil Era Kelulau*) has 16 members, one representative from each state.

Table 4 List of Palauan States and their Populations

State Name	Population
Aimeliik	272
Airai	2104
Angaur	188
Hatohobei	23
Kayangel	138
Koror	13,303
Melekeok	239
Ngaraard	638
Ngarchelong	286
Ngardmau	221
Ngatpang	280
Ngchesar	267
Ngeremlengui	367
Ngiwal	193
Peleliu	571
Sonsorol	39

Source: Office of Planning and Statistics 2000

The Judicial Branch of the government includes a Supreme Court as well as a Court of Common Pleas. The legal system in Palau is based on Trust Territory laws as well as Acts of Legislature passed by the OEK, municipal laws, common law, and customary laws.

Hatohobei ratified its State Constitution in 1983 and Sonsorol State ratified theirs in 1984. Hatohobei Island and Helen Reef fall under the authority of Hatohobei State,

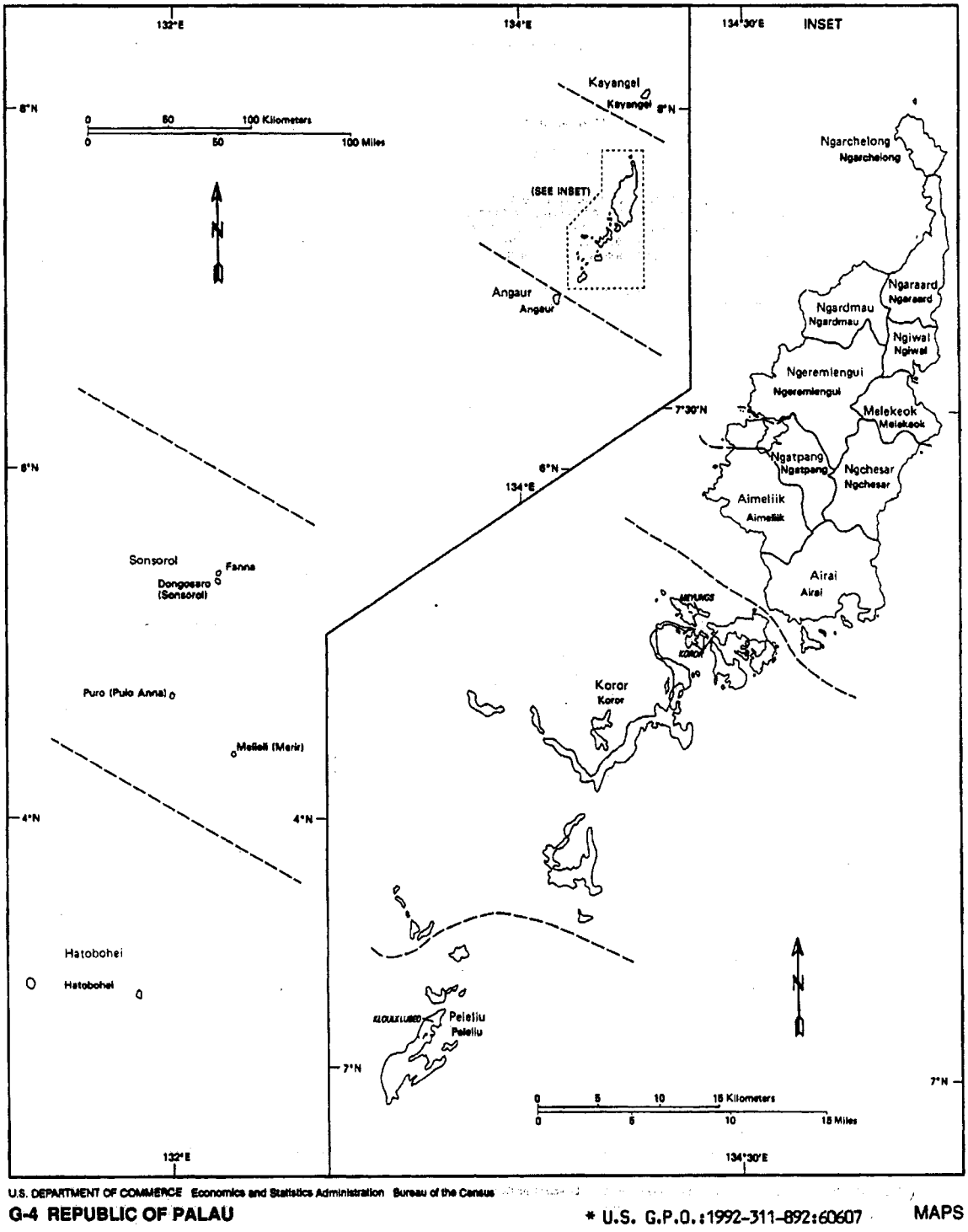

Figure 4 Map of Palauan States

U.S. Census Bureau (1990)

while Fana, Merir, Pulo Anna, and Sonsorol Islands all fall within the jurisdiction of Sonsorol Sate. Each Constitution outlines the criteria for elected officials as well as the duties and services elected officials of each state are expected to follow. Each state has a Governor, Lieutenant Governor, State Legislature, a Legislative Clerk, and Treasurer. Within the State Legislature are specific positions, such as Speaker, Vice Speaker, and Floor Leader. Each official is elected by popular vote.

Men and women are both eligible to hold important offices in the State and Federal government in Hatohobei and Sonsorol. All positions are salaried positions and bestow the incumbents with considerable respect and somewhat elevated social status within their community. Typically, officials who are elected to the highest state government offices are individuals who have acquired an education beyond the high school level in Palau or abroad (usually the United States), are relatively fluent in English, Palauan, and the language of their home island (Tobian or Sonsorolese). Specialized training in politics and government is not a requirement, and in fact, many officials have received training in fields totally unrelated to politics. Basic eligibility requirements for elected office are spelled out in detail in the State Constitutions (Hatohobei State Constitution 1983). However, contemporary government positions require conducting work at an office, using a computer, making presentations, and often engaging in discussions or negotiations with local and international leaders. All of these things together are taken into consideration when electing a government representative.

In contrast, positions in the State Legislature and the other departments do not rely heavily on the ability to type, use a computer, or fluency in the English language.

However, they do require participation in meetings, group discussions, and a commitment to public service. Representatives in the State Legislature are responsible for important community decisions, and they bring community concerns to the Governor. In this manner they act as community leaders.

Participants in the state government are often nominated and elected based on antecedent cultural traditions of kin and clan affiliation and/or chiefly lineages. Clan affiliation is extremely significant for Palauan and Southwestern Island societies alike, and representatives from highest ranking clans in the communities are often called on to be represented in the State Legislature and other service-oriented state government positions.[21]

F. Research Site

1. Where is Echang?

Ngerekebesang is a small volcanic island (5.2 km^2 of total land area) thick with forest vegetation (Fosberg 1979). It is also surrounded by Kobasang Harbor, which contains over 117 corals in 40 genera and 125 fish species (Earthwatch International 1988). A large portion of the island is occupied by the most exclusive tourist resorts in Koror, including Palau Pacific Resort, Sunrise Villas, and the Caroline's Resort. The town of Meyuns[22] is also located on Ngerekebesang, at the edge of the causeway that connects it to Koror Island. Here, one can find a number of small businesses as well as

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[21] Black (2005, personal communication) questions the importance of clan affiliation among Tobians and other southwest islanders. He notes that, "Except for regulating marriage through the rule of clan exogamy, in the historic past (i.e. since the Germans) clans have played a very little role in Tobian social life. For Palauans, of course, the situation is very different. Its one of the differences that tends to baffle Palauans. Traditional Tobian clans certainly were not ranked in the way that Palauan clans are." Any similarities in contemporary Tobian and Sonsorol society is a novel development.

[22] An alternate spelling for Meyuns that some use is *Meyungs*.

the Palau National Hospital and Radio Control Towers. The remainder of the island is a mix of residential areas, cultivated land, and forests.

Echang is a hamlet on the southwest corner of Ngerekebesang Island, less than 5km from the capital city of Koror (Fig. 5). It is situated on 0.15 km^2 of land that is divided into roughly 25 parcels (Ngiraingas 1988). There is approximately 1.76 km of shoreline access that is a mix of sandy beach, fringing mangrove, and rocky outcroppings that open into Kobasang Harbor. There is ample shore access along the sandy beach that is ideal for taking canoes and small skiffs out to excellent fishing sites close to the village as well as further away in the Rock Islands.

About two thirds of the total land area in Echang is used for housing. The rest is either unsuitable for building a home or it is used for small-scaled cultivation of a variety of root crops, fruits, and vegetables. Echang village is located on a hillside, and the elevation ranges to about 15 - 30m above sea level. The soil composition on Ngerekebesang varies from deep, well-drained soils on level ground to moderately steep slopes with some fairly deep soils over rock outcroppings and ridge tops (University of Hawaii Manoa College of Tropical Agriculture and Human Resources Soil Map, USGS, 1981). At the higher elevation soils are richer with more clay than sand, while at the middle and lower level elevations (15m and less) the soils transition to soils with higher proportions of sand and silt.

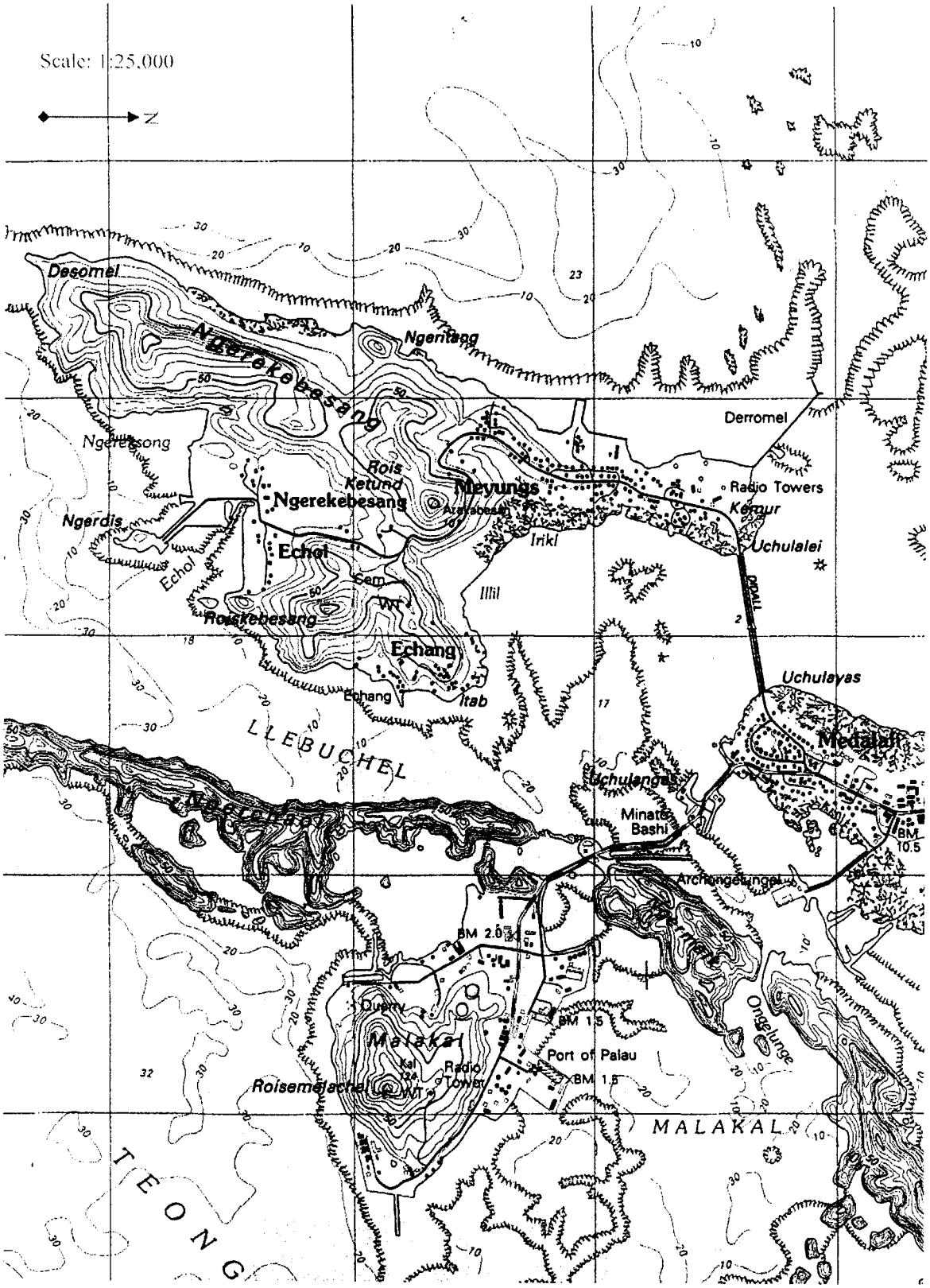

Figure 5 Ngerekebesang Island and Malakal Island U.S.G.S. (1983)

2. Echang Vital Statistics

Echang is densely populated. Approximately 300 people occupy less than .25 km^2 of land area. In 2001 Echang had 52 housing structures, two of which were dilapidated, and another that was in good condition but uninhabited. The median household size in Echang is approximately six persons per housing unit, although the surveys I conducted revealed that 16 households were comprised of eight or more individuals. This is relatively higher than the rest of Koror, which according to the 2000 Census had an average household of 4.8 individuals per housing unit.[23]

The population of Echang is in a constant state of flux, with movement between the main islands and the southwest islands, as well as from Palau to other countries. Movement between the main islands and the southwest islands has increased in the past decade in part due to the Hatohobei State Government's new ship, the *Atoll Way*, which it purchased in the late 1990s. The *Atoll Way* and supports the transport of people, primarily Hatohobei and Sonsorol State citizens.

Beginning early in 2000, the ship's schedule was set up so that approximately every 4-6 weeks a ship went to the southwest islands as part of a joint surveillance and marine conservation and monitoring project with the CCN at Helen Reef. While the main purpose of these regular trips was to transport enforcement officials to and from Helen Reef, Echang residents also made use of the opportunity. The State government and the grant monies associated with the Helen Reef conservation projects supported expenses associated with the maintenance and operation of the *Atoll Way.* Palauan

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[23] The Office of Planning and Statistics defined a housing unit as one in which all occupants prepared food together.

tourists who were interested in seeing the Southwest Islands, and who would normally not be able to afford the cost of a private charter, paid a small fee to travel to the southwest islands. These fees and activities helped to defray the costs of running the ship.

A national census estimated that just over 300 individuals were residing in Echang during December 2001- June 2002. In 1982 the population of Echang was about 150 people. In 2001 it was over 300. Migration from the southwest islands to Echang in recent years has been substantial. The Tobian presence in Echang during the 1960s and early 1970s included approximately 40-50 Tobian Islanders in Echang with 50-60 who remained on Hatohobei. During 2001-2002, only 6-10 individuals were living on Hatohobei and approximately 80 were living in Echang and five in Malakal. There are more people living on Sonsorol Island than on Hatohobei Island at present (approx. N=40), primarily senior adults and young school aged children (Office of Planning and Statistics 2000). A majority of the southwest islander populations in Palau currently resides in Echang.

There are slightly more men than women in Echang. The census indicates 161 men between the ages of less than 1 year and 74 years and 145 women between the ages of less than 1 year and 79 years. The median age for the men in Echang is about 24 years and the median age of the women in Echang is 21.7. This figure is lower than that of neighboring villages, as well as the rest of Palau. Over half of the current inhabitants of Echang were under the age of 18 and only 12% between the ages of 45-65 years of age (Office of Planning and Statistics 2000). The majority of Echang

residents were born in Koror, and most of the eldest members of the hamlet were born on one of the southwest islands.

In 2000 the estimated median income for Echang households was between $11, 964 - $13,125 inclusive of total family income. Based on the 2000 National Census, Echang residents have the lowest income relative to other hamlets in Koror in terms of both household and family income. The average household income for Koror as a whole was $16,607 and median family income was approximately $17,795. The poverty level used by the Palau Census Bureau for the 2000 Census is the same that was used in the United States in 1989. The average U.S. poverty threshold for a household with four members was $12, 674 in 1989. Relatively speaking, the average household income in Echang falls well below this poverty threshold, considering that the average household size of six people per housing unit. Household structures throughout the village reflect a variety of construction and materials including poured concrete, plywood, and corrugated tin, or some combination of the three. A few of the wealthiest households have indoor plumbing and poured concrete structures, but the majority rely on outhouses and rain catchments for bathing and cooking.

3. Household Composition and Social Organization

As a community sharing space and resources on a single plot of land, people from the southwest islands in Echang recognize that they share a geographic heritage. Similarities in language and social organization have provided common ground upon which they have developed a community distinct from, albeit it connected to, those found in their respective home islands. Historically, they have worked together to secure a place in Echang where their families can prosper. Despite cultural differences between

all of the societies in the southwest islands, Southwest Islanders in Echang recognize their affiliation to one another as a community.

The household is one of the most significant social units in Echang. For Palau in general, and for southwest island groups in particular, household composition is complex and varied. There are many ways to delineate a household for research purposes. One can frame households in terms of kinship relations or in terms of age and gender of household members. Households may be defined by the number of members who are employed, by occupation, or and level of income. For this project, a household included all people living in a single, shared, residence.

Previous ethnographic research among various southwest island societies in Palau has elucidated the importance of sharing and preparing food together as the key factor in how these groups define a household. In his dissertation based on fieldwork on Hatohobei, Black (1977) describes Tobian households as one in which clan affiliation and household membership were often superimposed. He also notes that household membership is not limited to those residing together within a single housing structure. Household composition on Hatohobei may also include smaller residences were actually satellite households of a primary household. The primary household was generally occupied by more people than the satellite households, but the most important distinction between satellite residences and the primary household was the presence of a kitchen/fire where food was prepared and shared by all within the residence and affiliated households (Black 1977:54). Members of the household would contribute food for everyone to prepare and consume together, typically with men contributing fish and meat and women providing taro, fruits, and vegetables. To complicate matters further the definition of

household on Hatohobei, adolescents and small children had a great degree of flexibility in terms of where they resided or shared food (*Ibid.*).

Household organization among those living in Echang closely resonates with this account from Hatohobei in 1977. Echang households are comprised of individuals that were both related and unrelated. Many households have extended family, friends, and visitors who formed the household unit. Households in Echang are not static, and their composition changes regularly. Typically, members of a single household prepare and share meals together and pool resources to provide shelter and food for household members. Members of households also sleep under the same roof and share water, bathing and toilet facilities.

Household affiliation is one way to understand community organization in Echang. It makes sense in this research project because people make decisions surrounding food and medicine in household settings. Other relationships also influence the way people mediate health, distribute foods, and share medicines throughout Echang. Kin affiliation and identity among Southwest Islanders is dynamic and multifaceted.[24] Although the basic archetype for kinship and descent among Southwest Islanders is matrilineal descent and exogamous marriage, even clan affiliation may be redefined at various points throughout an individual's lifespan (Black 1977:37-49). At the level of kin, the relationships are complex, as marriage, adoption, birth, and death influence the ways people form and define social relationships. Age and generational divisions guide social prescriptions of individuals' positions in their community, particularly in terms of their responsibilities for contributing to their kin, their clan, their church, and their

[24] See also Tibbetts 2002.

households. Ancestry, island of origin, religion, and political affiliations remain extremely important dimensions of social organization among Southwest Islander communities. Increasing numbers of inter-ethnic marriages continue to redefine the ways southwest island peoples in Echang solidify their relationships to one another and to other ethnic groups. Although people in Palau refer to the residents of Echang as Southwest Islanders, this phrase is little more than a term of convenience to describe a considerably more diverse community.

Language is one dimension of both community and individual identity in Echang worth mentioning. Fluency in the language of origin is highly respected and regarded as one of the most significant measures of both cultural competency and assimilation into modern society. Fluency in Palauan and English is related to economic prosperity (Office of Planning and Statistics 2000). Echang elders comprise a minority in the population, but they also speak the languages of origin with the highest degree of fluency. Those middle-aged adults and young adults educated in Koror still speak their languages of origin, but often forget words and remark how their own pronunciation of their parents' language is imperfect.

Language in Echang provides a cue for individual and community identity. Although people recognize that their neighbors in Echang are part of their community, language and affiliation to their home islands remain important in Echang's group dynamics. Yet, even these lines have blurred in recent years as the language spoken by the youngest in the community wield the languages of Sonsorol, Hatohobei, Palau, and English in novel ways.

One of the most prominent aspects of group affiliation in Echang is political affiliation. Hatohobei and Sonsorol have separate governments, whose citizens happen to reside as neighbors in Echang. The respective state governments seem to have taken over the role of traditional chiefs in terms of deciding how various resources are to be acquired, managed, and allocated to community members. The spheres of custom and culture may overlap, but they are distinct. While leaders are elected based on their prominence in the community, the role of the chief seems overshadowed by those in political power. For example, the Governor of the State is not necessarily also the customary chief of the state, although s/he may have descended from a chiefly clan. It is not mandatory that any political leader have customary position of leadership in order to assume a civic position.

Sonsorol Islanders currently agree about who their chief is. There is less consensus among Tobians with regard to their chief. The modern political system in which Tobians participate affords an unambiguous means of assigning leadership that is separate from a traditional chief. At present this appears to be beneficial for the Hatohobei community insofar as it provides a degree of social coherence despite the contentious debates of who is the rightful Tobian chief.

Another interesting feature of politics in Echang is the ease with which citizens interact with their elected officials. Each state is relatively small and state officials are highly accessible. The intimate proximity of government officials helps to eliminate any pretense associated with holding a political office. Achieving a position in the government as a representative is attainable for most people in the community, should

they really desire it. People know their representatives, are probably related to them somehow, and can identify with them.

Sonsorol and Hatohobei States are unequal in size and resources, and have very different degrees of success in terms of fostering support and relationships among Palauans. Sonsorol State encompasses the land and population of four islands, portions of Echang and Echol, has a larger budget, and greater number of human resources. Differential success in the economic and political arenas is related to socioeconomic differences within Echang in terms of employment, household income, housing structures and amenities. In general, members of Echang who are Tobian experience slightly more poverty, have lower income, have a lesser access to resources such as clothing, medicine, and school supplies, and are less educated than their Sonsorolese counterparts. There are, of course, exceptions to this observation, but even in the case of the exceptions, the prosperity of Tobian community members appears to be directly related to their affiliation (e.g., through marriage or adoption) to non-Tobians.

Despite real differences between the various ethnic groups in Echang, no one goes without food or shelter. While people in Echang frown upon begging for food or seeking shelter in someone else's home, no one will turn away someone who is in need. Southwest Islanders in general consider it shameful to beg for food or shelter. Such behaviors may result in community resentment or ridicule. However, despite the relative poverty in Echang, there is a true sense of community and taking care of others in need. Based on interviews with Echang residents, it appears that this style of humanitarianism developed as a cultural adaptation to migration, rather than a continuation of an indigenous system from the southwest islands.

Various recreational and group activities within Echang help to unify its residents and serve to reinforce a community identity in Echang. Among the most important is participation in the Catholic Church. Echang has its very own church located at the shores of the marina. Affiliation to the Catholic Church is vital to perceptions of individual morality and community loyalty (Black 1978a; Hezel 1971, 2001). St. Joseph's church in Echang offers various programs throughout the week, including mass, choir, recreation, social events, and fundraising events. Women's groups often convene as an opportunity to share food and conversation. Subsistence agriculture is not a primary source of food any longer among women in Echang. There are a few families in Echang with access to land on which they regularly cultivate tapioca, taro, sweet potato, and other fruits and vegetables. Most households have small gardens, or access to gardens and farmland, in Echang, Echol, or the Southwest Islands from which they can garner food crops. Today, it does not matter so much where the food comes from as much as the spirit in which the community shares the foods. Fishing provides a means for community solidarity as well. Subsistence fishing is still a relatively an important source of income and food for many men in Echang. Men provide food for their families through fishing. They also build strong community ties through fishing activities. Women and children often collect sea cucumber, seaweed, and clams for food and for fun.

The money made from employment enables many individuals to purchase tobacco, alcohol, and betel nut. People exchange these products in recreational contexts to strengthen social relationships. Social drinking, betel chewing, and smoking is one of the most common ways men, and also women, engage their neighbors and maintain

social relationships in Echang. Individuals who are not employed often earn their access to a friend or family member's stash of betel by providing some sort of service in exchange, for example, cleaning their house for them while they are at work, watching their children, or fixing a roof. Regardless of employment status or level of income, there is always a supply of alcohol, betel nut, and tobacco, and there is always a way for someone without money to acquire these goods, provided they have the necessary social connections.

G. Summary

This chapter entails the geographical, historical, political, and social context of southwest island population migrations to Echang. Originating from distinct islands and unique cultural traditions, southwest island peoples in Echang have formed new definitions of self and community. They continue to grapple with their place in Palauan society and the world at large. Among the many changes that accompany life in Echang are modifications in access to natural resources, modes of subsistence, political structures, and social organization. The extent to which cultural adaptations have resulted in transformations in patterns of disease and the ecological context of health and medicine is at the heart of this research project.

IV. CHAPTER FOUR: MEDICAL IDEOLOGY

A. Introduction: Indigenous Medical Ideology

Chapter Four presents the theoretical principles of indigenous Tobian medicine (*tafei Hatohobei*). It is the first part of a two-chapter series describing Tobian indigenous medicine of the past and present; this chapter presents the ideological foundations of Tobian healing, while the next (Chapter Five) examines indigenous therapeutics and the practice of medical pluralism in Echang. Together these chapters comprise the first medical ethnography of its kind available for Tobi. They make a significant contribution to the anthropological literature on indigenous medicines in Palau.

This chapter begins with a general description of early Tobian cosmology and provides an historical and cultural framework for understanding Tobian disease etiology and classification. It examines the influence of Catholicism on Tobian society and the reasons religious conversion transformed indigenous medical practice. The remaining sections outline themes in Tobian medical theory, disease explanatory models, and illness categories.

The information on illness concepts and categories in this chapter originates from interviews with Tobian medical experts and reflects their personal views of medical knowledge and practice of the past. Some elements of indigenous medical ideology remain salient in contemporary perceptions of health and illness in Echang, while others do not. In order to understand the full meaning of illness and healing in Echang it is informative to survey ideological frameworks of the past and present. As the next two

chapters will demonstrate, Tobian medicine in its contemporary context is simultaneously of the past and of the present, of memory and of experience, local and foreign.

B. Medical Ideology

1. Indigenous Tobian Cosmology

Cosmology refers to the cultural construction of reality or "world view" that underlies medical beliefs and practice in human societies (Wellin 1977). Numerous discussions with Tobians reveal that prior to conversion to Catholicism in the 1930s indigenous epistemology and practice was quite different from beliefs held today.[25] Encounters with foreigners before 1930 appear to have had a minimal influence on local belief systems (Black 2004; Buschmann 1996; Eilers 1936a, b; Holden 1836; Matoda 1939). The major difference of post and pre-Christian Tobian cosmology is the degree to which Tobians interacted with the spirit world.

A pantheon of supernatural phenomena influenced all aspects of human life on Tobi before the arrival of Christianity. Tobians recognized a hierarchy of gods, spirits, and ghosts that included an array of "ancestral, lineage, clan ghosts, localized nature spirits, anthropomorphized and spiritually powerful birds, turtles, whales, and sharks, as well as a host of remote creator beings (Black 1985:274)." Malevolent ghosts occupied various corners of the island as well as the areas surrounding the island, like the reef, open ocean, and winds (Black 1994). The Tobian spirit matrix resembles those found in other Micronesian societies. In Pohnpei spirit categories included sea spirits (e.g., ocean,

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[25] The introduction of Christianity to Tobi marks an important milestone in Tobian history and culture (Black 1978a, 1983, 1985, 1994). Tobians refer to the time before Catholicism as *ifiri mosuwe,* or distant past. For this reason it is used here as the primary point of reference. It is also one of the earliest points in Tobian history for which we have some ethnographic research, based on oral histories, about beliefs and practices prior to the 1930s.

barrier reef, mangrove swamp, and lagoon) land spirits (e.g., rock formations, burial places of ancient chiefs, rainforest) clan gods, lineage spirits, ancient gods, fishing net spirits, house spirits, and canoe spirits (Ward 1977). A vast number of discrete spirits were associated with illness and healing in Chuuk (Mahony 1970). Palauans recognized various levels of village gods and household gods that guarded property, protected people from danger, and prevented illness (Palau Society of Historians 1997).

Tobian cosmology centered on a belief that humans were innately prone to doing harm to one another, and that religion and ritual were required to maintain social order and prevent disasters (Black 1983, 1994). Tobian religion entailed a dimension of human agency whereby humans could influence supernatural phenomena through use of magic and ritual. Interaction with ancestral spirits, clan gods, and malevolent ghosts took place at both individual and communal levels (Black 1994). The efficacy of communal rites and rituals to protect against malevolent spirits was a function of the relationship between the chief and supernatural spirits.

Chiefs (*tamor ri faruh*) traditionally held the highest level of spiritual power in Tobian society. They had an unsurpassed ability to engage spirits. They directed social adherence to customs and rituals that ensured collective safety and well-being. According to Black (1978) social harmony was rooted the chief's ability to placate spirits (*yarus*). Chiefs used divination rituals to learn specific behavioral protocols necessary to pacify gods and influence ancestral spirits. They committed songs and chants containing magic words to memory and passed this knowledge, along with other sacred paraphernalia, to their successors.

A chief's magic was referred to as *heirenichob* (Black 2000a). Sorcerer chiefs performed sacred rituals that suppressed the malevolent tendencies of *yarus* (Black 1978a). These chiefs convened with the spirit world through religious objects that were housed in a spirit house (*faar; faar yarus*) (Friends of Tobi Island n.d.; Holden 1836).[26] The *faar* accommodated both private and public fellowships with the supernatural world. It had an open space in the front room that was for group gatherings and ceremonies, as well as a restricted area with an altar and a spirit canoe (Eilers 1936b). These sacred objects included miniature spirit canoes and wooden phalluses to divine knowledge from the spirit world. Trances opened a door of communication with spirits. Tobians participated in trance ceremonies by singing songs and or chanting as the chief carried out the ritual incantations (Holden 1836). During ritual trances, various spirits communicated with people through the chief (Black 1994).

Although the chief held the expert knowledge that enabled him to interact with the supernatural world, his rituals alone were insufficient to prevent natural disasters, illness, or famine. The collective practice of rituals and observance of taboos (*tab*) on a daily basis was required to placate malevolent spirits, weaken their power, and maintain social harmony (Black 1994). The failure to adhere to taboos led to various types of adversity, including natural disasters (e.g., drought, famine, typhoon, and flooding) social calamity (e.g., population decline and murder) and individual tragedy (e.g., illness, sterility, insanity) depending on which spirit had been offended. Group participation in sacred ceremonies solidified social ties and increased the likelihood that uninvited

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[26] Eilers (1936:107) uses the terms *galis* (spirit house) and *fare kikak* (cult house) although these phrases do not appear in my field notes.

encounters with ghosts on the island would be curbed, since these types of interactions were likely to result in illness, insanity, or death.

Tobian society had general magic specialists that may or may not have also been the island chief. These specialists were called *watoutub* and the type of magic that they practiced was called *heimatari* (Black 2000b). Magic was potentially protective or harmful depending on its application and the context in which it was practiced. Sorcerers could direct their magic against other people or beings of the supernatural world. The term *fauh yarus* referred to the use magic by a lay person for general purposes (Friends of Tobi Island 2004). Tobians also recognized a malign application of magic called *fei yarus*, which is black magic involving recitation of incantations and songs that caused various types of misfortune. Tobians associated this type of black magic with serious illness. It also had the power to remove the efficacy of medicines. *Heimatari* and *fauh yarus* could also counteract *fei yarus*.

The power of spoken words is a recurring theme in Tobian culture. Although only the chief and others who were deemed responsible enough to steward this powerful knowledge for communal use, lay people also engaged in *fauh yarus* privately for a variety of purposes, ranging from communicating with ancestral spirits (e.g., Black 1985) to placing a curse on medicinal plants. People could use magic words to engender illnesses or to counteract black magic. The improper use of magic words, however, held the dreaded potential to cause unintended, unpredictable events. Tobians often attributed phenomena of ambiguous origin to the inappropriate use of words and magic.

The significance of spoken words is a prominent feature of indigenous healing in Micronesia. *Hamoungungu* (whispering the language) in indigenous Tobian medicine connotes a highly private, even secretive, practice. It refers to the ritual used during illness diagnosis, preparation of medicine, and application that would ensure success in healing. When a medical practitioner needed to use magic to learn the proper types of plants to use for medicine, he would whisper magic words (*hirichibor*) specifically reserved for that purpose. Black (1994) notes that *hamoungungu* translates loosely as *gossiping* when it refers to talk in a social context. Tobians also believed that speaking the name of one's deceased father was dangerous because it could lead to insanity (Black 1978a). Similarly, Chuukese Islanders viewed gossiping as an activity that could render a person more vulnerable to sorcery and lead to insanity (Mahony 1970). Ward (1977) describes how the verbal exchange of medicinal recipes outside a context of ritual healing in Chuuk leads to a reduction of therapeutic potency. Chuuk healers traditionally used spirit chants or *feeriieru* (fixing the spirits) to amplify the potency of medicines. Chuukese islanders note that the abandonment of spirit chants after conversion to Christianity has weakened the contemporary practice of traditional plant medicines (Mahony 1970).

Traditional Tobian cosmology was one in which the secular and sacred were inextricably linked (Black 1994). A belief in the sacred world of spirits, ghosts, and gods permeated social life on a daily basis on Tobi, influencing their behavior at an individual and communal level. The introduction of Christianity transformed beliefs about the organization of power in the universe.

2. Catholicism and a Neo-Tobian World View

In the early 1930s a Spanish priest was dispatched to the southwest Palauan islands with the intent to introduce Christianity and establish mission churches there (Hezel 1971, 1991). To this day Tobians convey their knowledge of Catholic dogma with great accuracy down to the terminology. They are extremely devoted to their religion, adhering to daily rituals and celebrating important religious holidays like Lent, Easter, and Christmas. They are well versed in Biblical passages and believe in the sacredness of the Holy Trinity, the Virgin Mary, and saints as well as hold a belief in heaven, hell, and purgatory. Black (1978:307) observed during his research on Tobi in the late 1960s to early 1970s that "all pre-Christian religious and magical rituals have been abandoned and the old sacred chants are heard no more." Black has published extensively on the subject of Tobian conversion to Christianity, providing eloquent analyses of the socio-cultural circumstances on the island that led to the undeterred, island-wide acceptance of Catholicism as their new religion (see Black 1977, 1978a, 1983, 1985, 1994).

Several aspects of Tobian indigenization of Catholicism are relevant to an understanding of contemporary Tobian medical ideology. This section will illustrate how the demise of traditional political leadership on Tobi eventually led to a segmentation of religious ritual from human-*yarus* interactions. Tobian political history is pertinent to medical ideology and practice because a decline in shared communion with *yarus* marked an increase in private, individualized relationships between Tobians and ancestral spirits and gods. Catholic mores placed on recognition of *yarus* introduced concepts of shame and embarrassment associated with traditional beliefs and practices and amplified the

privatization of medicine. Over time the increased marginalization of traditional beliefs led to a decline in the retention and transfer of indigenous medical knowledge.

The acceptance of a new religion on Tobi was motivated by a need to restore social order, which at the time of the arrival of the Spanish priest was reeling from a major upheaval of the traditional political structure. Just prior to the arrival of the missionary priest, Tobians suffered the loss of their chief who had died unexpectedly while working in Angaur. The assistant appointed to act in the chief's stead asserted himself as the new leader, even though his legitimacy was suspect and the manner in which he assumed leadership was extremely controversial (Black 1977, 1978, 1994). Traditional Tobian protocol required that the incumbent chief prepare his successor for the throne by passing on knowledge and chants required to perform arcane rituals properly.[27] The chief did not pass his knowledge onto the assistant, and so most people deemed him inept to provide interlocution with gods and spirits. Without chiefly mediation of interaction with spirits on a communal level, Tobians were left without the most effective means to exert influence in the world around them. The arrival of Japanese traders on the island, the introduction of illnesses that ensued, population decline, the long period of infertility among Tobian women, and increased community conflict were among the many events indicative of a fractured relationship with *yarus* and loss of sacred magic (Black 1994).

The last symbols of communal ties to Tobian spirits was ultimately severed years later when the spirit house, the women's menstrual house, religious paraphernalia, and

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[27] See http://cas.gmu.edu/~tobi/peopleandfamilies/marino/chieflybusiness.htm for a more detailed description of chiefly succession.

other structures designed specifically for sacred rituals were destroyed. Black (1994) describes this event as a covert attempt to force Tobians to abandonment traditional belief systems and behavioral protocols, which the culprits (primarily youths from Koror and Japanese administrators) viewed as archaic and impractical in a rapidly changing world. Black (1978) characterized this period in Tobian history as an experiment in secularism, which eventually segued into the period of Christianity.

Catholicism provided a partial solution to this social and political crisis in Tobi. Through the adoption of Catholic beliefs and rituals, Tobians discovered a novel means to engage the spirit world without a chief. Christian standards of morality and mandates of various colonial administrations increasingly influenced social behavior. The sacred and secular realms of Tobian society, which had been superimposed traditionally, separated into two distinct yet overlapping dimensions. With a Catholic priest who mediated human communication with the supernatural, the chief became less important in day-to-day spiritual lives of the people. The chief's position eventually emerged as one of cultural competency who along with magistrates of the various colonial administrations helped to maintain social order and facilitate providing Tobian islanders with basic needs. The chief was no longer was viewed as the spiritual leader, and the relationship between Tobians and previously recognized spirits was transformed.

Interaction with the spirits that Tobians traditionally recognized was no longer a communal practice. Participation in Catholic rituals at church replaced public social performances of sacred magic. Interactions with Tobian spirits became a strictly private matter, one enshrouded in secrecy and even an element of shame (see Black 1994). Even at a private, individual level, the performance of magic still required appropriate use of

words and practices to communicate safely with *yarus*. Knowledge of the private practice of magic and ritual was bequeathed secretly to family members. Each family had their own means of interacting with spirits. They kept private knowledge alive in many arenas of Tobian life, including medicine and healing.

The impact of Catholicism on indigenous Tobian cosmology had ramifications in conceptualizations of disease causation and healing. Today the concept of *yarus* simply refers to a much-abridged category of supernatural beings of generalized spirits or ghosts. Illnesses that Tobians once ascribed to spirit mischief or black magic now have different explanations. Some explanations reflect biomedical influence, and others mirror a belief in fate controlled by a Christian god. The vast continuum of spirits that once provided eloquent explanatory models for phenomena seemingly beyond explanation have been overshadowed by scientific theories and biomedical technology.

Tobians do not shy away from novel theories and innovative thinking. However, Tobians have not completely abandoned a belief in *yarus*. Occasionally they hold spirit mischief responsible for strange phenomena and unexplained illnesses. Tobians and others in Echang will be the first to admit that there are not definitive explanations for everything. Most people never dismiss completely magic or spirits as an explanation for serious illnesses, especially ones with ambiguous origins. Few people in Echang claim to possess the knowledge required to engage spirits safely using magic. Thus, the fear of black magic and sorcery is not as prominent as it once may have been. The case is different in other Carolinian islands. Many Tobians believe that magic is still strong on Ulithi and other outer islands of Yap. It is common to hear a Tobian say that ghosts and other spirit illnesses are more likely to occur there and that the traditional methods of

healing used there are still powerful, unlike traditional Tobian medicines used today. Likewise, an individual is more likely to encounter a ghost on Tobi than they are in Echang or elsewhere in Koror.

Geographic relocation, political upheaval, religious transformation, and culture change have not eliminated indigenous ideology from contemporary discourse of illness and healing among Tobians. One of the most resilient features of indigenous Tobian medical ideology the inextricable link of spiritual/sacred to the physical/profane aspects of the human condition.

3. Tobian Theories of Illness Causation

Medical anthropologists typically describe etiological theories of disease based on whether illnesses are defined as personalistic or naturalistic (Brown, et al. 1998; Foster 1976; Foster and Anderson 1978; Lieban 1977; Wellin 1977). Personalistic illnesses originate from actions of one person against another, using sorcery. They also arise from actions of a supernatural being, such as a ghost or god, on a particular individual. In contrast naturalistic illnesses are those that occur because of natural processes, which are characterized as those illnesses generally devoid of malicious intent by human or spiritual agents.

The application of naturalistic/personalistic dichotomy has been challenged by some anthropologists who have found it to be culturally inappropriate as an explanatory framework in some contexts (e.g., Laderman 1990). Explanatory frameworks for disease causation throughout the Carolinian islands feature various degrees of naturalistic and personalistic illness concepts, and so the personalistic/naturalistic framework seems to be a useful foundation for understanding theories of disease causation in the region (e.g.,

Alkire 1982; Lessa 1959, 1961; Mahony 1970; Ward 1977). Given our limited understanding of Tobian indigenous cosmology of the past, it appears that while a separation between natural and personal is apparent, it is also somewhat less palpable than the naturalistic/personalistic oppositional scheme implies. Laderman (1990) suggested that to separate naturalistic from personalistic was employing a Cartesian separation of mind and body and division of religion and science that people in non-western societies do not always recognize.

In a Tobian context the caveat associated with using Foster's (1976) paradigm pertains less to whether Tobians recognize a separation of mind and body, and more to the extent to which people differentiate between supernatural and natural. From what we do know of past Tobian cosmology, supernatural phenomena pervaded all aspects of human life and sacred processes guided experimentation in healing. Christianity broadened the separation of Tobians from the ancestral spirits and gods that they once recognized. In the present day Tobians employ Catholic saints, God, the Virgin Mary, and the Holy Spirit in explanatory models to a greater extent than they do ancestral spirits and ghosts.

Tobians in Echang share a number of common beliefs about disease causation that reflect indigenous ideology, introduced knowledge, and personalistic/naturalistic explanations. Western biomedicine has transformed personalistic explanations for illnesses as well as the ways Tobians and others in Echang think about human anatomy and physiology. The degree to which supernatural phenomena explain natural occurrences varies individual by individual, and corresponds with age, education, the number of years a person lived on Tobi, and the age at which the individual left Tobi. In

other words, the explanations depend in large part to the degree of acculturation to life in Echang.

Similarities in Tobian etiological theories and those found in other Carolinian societies are striking. Referring to ethnographic research that has been conducted throughout the region can enhance our understanding of what Tobian medical thought may have once been like. Medical ethnographies based on research carried out during the 1960s and 1970s from Woleai and Lamotrek (Alkire 1982) , Chuuk (Mahony 1970), and Pohnpei (Ward 1977) provide extremely detailed theories of disease causation and illness classification systems. Alkire (1982) detailed the hierarchy of spirits in five Carolinian societies, including the names of 16 spirits, their assigned positions in a spirit canoe, and the types of activities that were associated with each spirit or combination of spirits. Ward (1977) and Mahony (1970) provide the names of spirits that were associated with specific physiological manifestations of illness as well as spirits that were attached to particular plants and other medicines.

While many of the characteristics presented in these medical systems were probably also once part of Tobian medical ideology and practice, dissertation research conducted in Echang reflects a more generalized system for defining and classifying illnesses and medicines. Specifics such as spirit names, protocols for religious rituals, and the meanings behind various rituals and sacred paraphernalia are not part of the contemporary discourse on health and illness, even among individuals with the greatest expertise.

Elucidating disease etiology is neither crucial to the process healing in Tobian medicine nor is it a priority in other Micronesian societies.[28] Ward (1977) noted that the initial physiological manifestations of illness were not usually the most important component of illness diagnosis in Pohnpeian medicine. In Pohnpei an individual's response to therapy played a far more prominent role in healing than identifying the causative agent. Moreover, the physiological responses to therapy over the course of hours or days provided medical practitioners with the information needed to continue, adjust, alter, or cease the application of various treatments. Isolating the cause of illness was often a post-hoc concern of medical practitioners. Even though healing in Chuuk revolved around identifying the spirit agent of illness, diagnosis occurred during the course of therapy (Mahony 1970). Each Chuukese medicinal plant was associated with a particular spirit, and Chuukese spirits corresponded with specific symptoms. Isolating the spirits responsible for a particular illness was crucial to therapeutic discovery. The failure of patients respond to a given therapy indicated that the wrong spirit agent was identified, while exacerbation of symptoms or the appearance of different symptoms were physiological signs that hidden spirits were being driven out and additional plant medicines were required. In other words, the true cause of an illness was not ascertainable until therapy started and the individual responded to the therapy. A similar system of diagnosis existed on Woleai and Lamotrek where the relationship between the spirit associated with an illness, the symptom, and the medicinal plants must all line up in the proper way in order for healing to be effective (Alkire 1982).

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[28] Black (2005, personal communication) notes that a lack of focus on finding a cause for illness is similar to a lack of interest in discovering the cause of social disruption, as in the case of attempted murder reported in (Black 1978b).

Despite differences in the degree to which identifying disease etiology plays a role in these therapeutic systems, in all contexts diagnosis happens during a process of healing. This medical practice accounts for the keen observance of culturally relevant signs and symbols throughout the course of an illness that guides application of therapeutics (Etkin 1988a, 1992). The etiological dimension of the Tobian medicine is linked inextricably to medical practice. Indigenous Tobian therapeutics require healers to monitor patients' physiological responses to therapy attentively throughout the course of an illness. An individual's recovery is the utmost priority of Tobian healing. Although some evidence suggests that disease etiology was once important, deconstructing an illness to discover its cause in a contemporary context is a far lower priority.

a. Yarus ma Fei Yarus (Spirits and Sorcery)

Tobian etiological theory of the past dictated that *yarus* of all types (i.e., ancestral ghosts, gods, malevolent and benevolent spirits) were capable of influencing human health. Benevolent spirits and gods could be divined in order to discover a new medicine, to help lift a curse from an afflicted individual, and to protect humans from harm. Malevolent spirits did not necessarily need human intervention to cause illness, but it was possible to use the evil force of these spirits to inflict harm on others. Malevolent ghosts or *yarus* could potentially cause all sorts of illnesses, accidents, or injuries. Illnesses commonly attributed to *yarus* were internal illnesses such as fever, cachexia, wasting, general malaise, and mental illness. *Yarus* could produce illness in a number of ways: (a) direct contact with humans; (b) through sorcery performed by one individual against another; (c) spirit manipulation and invasion. Though once pervasive on Tobi, *yarus*-related illnesses are rare in Echang.

Direct contact with a ghost is probably the most dreaded of *yarus* induced illness. On Woleai and Lamotrek, a separate classification exists for fright illnesses (*rius*), which cause shock following an unexpected encounter with a ghost. Black (1985) discusses a widespread dread of ghosts on Tobi, even though Tobians were often vague about the specific consequences of encountering a ghost. Ghosts on Tobi lived in transitional areas around the island such as the reef edge, along the boundary of the taro patch, or near the cemetery. Interestingly, these liminal areas were spaces of illness at the same time they were places of healing. They were the most dangerous places to roam alone at night because of the elevated risk for encountering a ghost. Ghosts garnered more power from these areas, and so here, a person was especially vulnerable to the influence of *yarus* and black magic. At the same time, many of these transitional areas contained some of the most powerful plant medicines in the Hatohobei landscape.

Just as Black (1985) observed during his research, Tobians in Echang did not describe specific health consequences related to individual *yarus* entities. They conveyed a shared belief that one could attribute nearly any type of illness to *yarus.* Tobians tell stories of several different ghosts. One in particular, *Manruharuhoch* the reef ghost, resembles ghosts associated with reef spirits and *mangrove sickness* elsewhere in the western Carolines islands. This reef ghost smells like decaying flesh and the air at low tide. When he walks from the reef through the taro patch, he causes a flood (c.f., Black 1985: 274). If he touches a person, they will become very cold and sick and may start to "*act crazy*." A similar ghost on Pohnpei, called Nahnsau, was the spiritual embodiment of all sea and reef gods. Pohnpeians believed that Nahnsau caused an array of illnesses by engaging in sexual intercourse with humans. Illnesses caused by Nohnsau were

characterized by fever and chills (which coincided with the ebb and flow of the tide), diarrhea, headaches, abdominal pain, and loss of appetite. There were also behavioral symptoms such as introversion, talking to oneself, and withdrawing sexually from a spouse or sexual partner (Ward 180: 82-85). Chuukese people also recognized several classes of reef spirits that caused illness, though these ghosts were associated specifically with fishing activities on the reef (Mahony 1970). The ways these various reef spirits cause illness vary with cultural context. Yet, they are similar in that they cause illness without the intervention of sorcery or divination. These ghosts do not act randomly. They cause illness in humans who engage in some type of behavior that the spirit finds offensive.

Spirit possession on Tobi includes several different types of manipulation by *yarus*. The first type is religious in nature and devoid of dangerous health consequences. Spirit possession during religious divination occurred during sacred rituals in which a chief acted as human conduit for benevolent spirits. In a highly controlled social and ritualized setting, humans invited *yarus* to enter the body temporarily. Spirit divination was a serious business, but it was not a health risk.

Spirit possession during divination is different from the *ghost-like* behavior Black (1985) described in which an individual exhibits unpredictable, unconventional, and relatively irrational behavior. Individuals exhibiting ghost-like behavior did not adhere to the rules and regulations of moral human action. Society gave considerable social latitude to a person who was acting ghost-like, whereas in normal contexts their behavior would have been unacceptable. A person acting like a ghost generally did so for a transient period and did not exhibit any somatic manifestations of spirit illness. Black

(1985) interprets this behavior as a metaphor that links unusual behavior with the behavior of *yarus* rather than a mental state caused directly by spirit mischief. There does not appear to be *tafei* for ghost-like behavior.

One type of spirit possession, which had the most severe health consequences, was the uninvited invasion of malicious ghosts. Various factors would render a person more susceptible to spirit invasion, for example, being physically weak (e.g., already suffering from an illness) or psychologically vulnerable (e.g., a menstruating woman, a senile adult, or very young child). Signs indicating that a person was under the influence of a spirit were fever, chills, and night sweats, periodic vacillation between consciousness and unconsciousness, and the appearance of physical symptoms (e.g., skin rash, bruising) that "*move around the body.*" Spirit invasion could also lead a person to exhibit symptoms of acute mental illness. The symptoms are similar to ghost-like behavior, but distinct in that the state of illness was more severe, persistent, and required medical intervention. Woleai and Lamotrek islanders described a similar class of illnesses, called *yalius* (spirit) illnesses, which resulted from spirit theft during sleep or while a person walked alone at night. It was marked by *sigalabusholag* (crazy behaviors) as well as physical manifestations such as headaches, weight loss, and tuberculosis (Alkire 1982:34).

Tobians in Echang recall that sorcery posed a constant threat of illness on Tobi. The types of illnesses and symptoms of black magic are very similar to those described above. The primary difference is the origin of disease. People divined malevolent spirits in order to procure knowledge needed to inflict illness upon another person. Armed with this malign knowledge, a sorcerer could curse any number of physical objects, which

would cause illness if an unsuspecting victim handled or consumed them. Plants and foods were among the material objects commonly used to transmit black magic, although nearly any type of material object associated with humans sufficed. Expert sorcerers collected personal objects, such as hair, nail clippings, and pieces of clothing, of the person they planned on cursing. By garnering these personal objects, they practiced remote sorcery against their target. One of the primary reasons people adhered to so many behavioral protocols in the past was to reduce the likelihood of personal belongings falling into the hands of immoral magic practitioners. People protected themselves from black magic by placing various types of amulets (e.g., *hachinechin*) around fruit trees. The amulets provided protection from theft or witchcraft, and rituals such as chanting before eating foods also could remove a curse (Eilers 1936b). Serious internal illnesses, including sicknesses in the blood and in the gut, were associated with consuming cursed foods in adults. Foods harboring black magic could cause death in children. For this reason, children always ate a plate of food that a trusted adult prepared for them. They ate separately from the rest of the adults and their father or other trusted person always accompanied them while they ate. Spirit illnesses and fear of black magic influenced indigenous health beliefs and practices in the past.

b. Tab (Taboo)

Strict behavioral protocols observed on a daily basis reflect the extent to which early Tobians attempted to maintain harmony with the spirit world. Black (2000) outlines several different classes of prohibitions that Tobians recognized including:

> ***toutub*** – religious regulations and rituals
> ***yauyo*** – customs practiced in the old days
> ***moumu*** – traditional rules of behavior or customs that must still be practiced in the present day

piheimoaru – natural resources restricted for purposes of conservation

bau – seasonal periods the year, such as those designated for harvesting and hunting, in which the chief regulated resource use

These taboos pertained to all areas of secular and sacred life, ranging from proper behavior during religious rituals to the language used to address elders in the community. Appropriate behavior served the function of maintaining social order, but also was a means by which Tobians attempted to prevent illness.

Taboo and ritual regulated arenas of traditional Tobian life like food cultivation, preparation, distribution, and consumption. Broken food taboos gave rise to health problems. Various protocols organized the production, distribution, and consumption of food from the individual to the social level. Each clan had a set of food taboos and other rules pertaining to matters including: who ate first, to what foods certain individuals were entitled, the amount of food on each plate, and who was permitted to eat with whom. Foods available for consumption were distributed according to the gender and age of an individual.

Certain occupations like fishing, taro cultivation, chief, and magician required individuals to follow occasional dietary restrictions and other behavioral protocols. For example, fishing was an activity surrounding by numerous guidelines. A complex system of rituals related to the construction and use of fishhooks further solidified Tobian relations with the spirit world. Only fish hooks that were fashioned according to the specifications of *yarus* were allowed to be used (Holden 1836; Johannes 1981). The use of unsanctioned materials to make fishhooks outside the context of sacred ritual increased the likelihood of that torrential rain and windstorms, famine, and other misfortune would plague the island. Fishermen followed sexual taboos before fishing to placate

supernatural forces of the ocean, to protect the safety of the fishermen, and to ensure a bountiful catch. They often refrained from sexual activity for periods up to several days prior to fishing or voyaging and followed various food taboos. Consuming lobster before a fishing trip was a violation of a food taboo. Such an action would cause a man to become cold and potentially seriously ill, hindering his ability to fish. It also put the entire crew and others on the island at risk for unexpected tragedy.

During their first menstruation, women performed special rites and entered confinement in a menstrual house (*ifarim*). This public rite of passage signified that young women were eligible for marriage and childbearing. Because women were particularly powerful conduits of spirits and magic during menstruation, the *ifarim* protected her and others from unusual spirit activity. Women's vulnerability to the activities of ghosts throughout the menstrual cycle meant that men refrained from touching or interacting with women before fishing.

Pregnant women wore protective adornments and were required to participate in rituals designed to protect her and child. Peri-partum confinement in a birth house (*imeripar*) was customary for Tobian women. Confinement of a mother and her child lasted up to 6 months post-partum. New mothers wore a special cloth around their waists to protect their open wombs from spirit illness after giving birth. Children, like the very old, were weak and required protection from the elements as well as from malicious spirit activities.

c. Hamoungungu (Whispering or Gossip)

The role of language and verbal communication in individual cognitive and emotional development, constructions of identity and personhood, and interpersonal

relationships has been a topic of interest for anthropologists working in Micronesia (e.g., Lutz 1988; Lutz and Abu-Lughod 1990; Poyer 1990). The sociocultural context of various types of discourse, including whispering and gossip, have been linked to social dysfunction and suicide in Micronesian societies (e.g., Nero 1990; Rubinstein 1983, 1984). Tobians believed that gossip could indeed lead someone to "*go crazy.*" Black (1985) provided an analysis of this phenomenon as a reflection of Tobian folk psychology. Similar references to mental and physical illnesses engendered by *hamoungungu* emerged in discussions with Tobians in Echang.

Hamoungungu was the primary means by which a healer learned the formula for a medicine, especially new medicines for novel illnesses. The words whispered during healing rituals also carried with them the power to amplify the strength of medicines. Whispering secret words was a therapeutic catalyst. The omission of this verbal component rendered the healing process benign. If a medical therapy had failed, one of the possible reasons for this failure was the omission of the correct use of *hamoungungu.*

Spoken words uttered both in private or in public speech were potentially harmful to human health and well-being. Illnesses related to careless speech resembled black magic illnesses, including internal ailments and psychological distress. Black (1985) provides a case study of social gossiping that led a young man to behave like a ghost and attempt suicide on several different occasions. During interviews for this dissertation, one mother in Echang explained that she needed to be very careful of the words she spoke softly (*hamoungungu*) when in the company of other children. If she whispered and gazed lovingly towards another child while her own baby was around, her child might become sick. If they were separated, her baby could also become ill if she spent

too much time thinking of him or talking about him. Hence, *hamoungungu* is a complex concept that encompasses speech as well as unspoken thoughts.

d. Bech / Fugh (Hot / Cold)

The concepts of hot (*bech*) and cold *(fugh*) figure into the practice of Tobian medicine more so than in discussions of illness causation. The theme of hot and cold are not prominent in the other indigenous Carolinian medical systems, although symptomology in cultures throughout the region often includes descriptions that relate to body temperature. According to Tobian informants in Echang, fluctuations of temperature in the body sometimes give rise to illness.

Hot and cold reflect the perceived physical temperature of objects, foods, medicines, and the body. Tobians often describe the etiology of fever as, "*too much heat in the body that is trying to get out.*" Various cold foods cause the body, usually the skin, to cool. Seafood like lobster, snails, mangrove crab, eel, and sea cucumber were cold foods that children did not eat. Being physically cold caused illnesses in general, but often caused skin ailments like *busuru*, for example. In Echang people avoided eating these cold foods due to a perception that a cold person was more likely to succumb to illness.

Just as some foods are cold, others contain heat or act as a vehicle that delivers heat to the body. Medicines often were prepared with heat to encourage the ingredients to become active and as a way to impel heat into the body. In Tobian medical thought, the body retains heat through the blood, skin, water, and air. For instance, people in Echang use betel nut recreationally and therapeutically. Pregnant women chew it to bring heat into the body after childbirth, because the loss of blood and fluid carry out heat.

Steam baths, warm massage, and other heat transferring therapies keep the body warm to the touch and close the womb. Pregnant women try to avoid cold foods such as clam, coconut meat, coconut juice, cold water, and ice cream because they can cause the womb to remain open.

e. Manguch / Pou (Weak / Strong)

The terms indicating strength (*pou*) and weakness (*manguch*) describe a person's intrinsic physical and psychological constitution, both of which relate to illness susceptibility and the capacity to heal. Tobians reckon that weakness begets illness and strength begets healing. Physical strength pertains to the proper functioning of the body's internal mechanisms and the integrity of the body's external structure. Weakness indicates corporal dysfunction. Traditionally, strength and weakness also alluded to mental capacity and psychological strength, which influences a person's ability to resist *yarus* and *heimatari* during illness.

The very young and the elderly are the groups most vulnerable to illness. They lack the strength needed to recuperate from illness with ease or to stave off illnesses effectively. The internal pathways of a small child are not fully developed, nor are the structural elements sturdy enough to hold the body together yet. Their bodies are still tender and they are susceptible to a host of internal and external illnesses. Both the internal and external structures of elderly adults do not function optimally because of age. Both groups require care, protection, and leadership.

An interesting paradox exists in the strong/weak dichotomy in indigenous Tobian medical ideology, as it does in many non-western societies where supernatural phenomena (i.e., ghosts and spirits) prey on those whose with compromised health. A

person who was physically ill and weak was at high risk for spirit invasion and sorcery. Despite the weakening of body and mind during illness, the ailing were potentially powerful conduits of spiritual malfeasance. On the one hand, illness compromised their humanity, while on the other making it more likely for them to acquire supernatural/spiritual power. Inherently strong individuals could resist both illnesses and *yarus*, while it was more difficult for weaker individuals, such as pregnant or menstruating women, young children, and the elderly, to do the same.

Menstruating women and women who had just given birth occupied a similar social space as the ailing children and elderly, at least in terms of illness susceptibility. Tobians do not define parturition and menstruation as illnesses, but they did perform ceremonies similar to those used in healing for both. During menstruation women were simultaneously weak and strong. Loss of heat and blood weakened the body, and they became more vulnerable to *yarus* activity. Following parturition new mothers who were still weak from childbirth required special care to close the womb, restore the body's strength, and deter spirit mischief. Because *yarus* often sought entrance into a woman's body through her vagina (see also Ward 1977) having sexual intercourse with a woman was dangerous in general, but especially during menstruation or post-partum. The numerous avoidances for menstruating women and women post-partum are indicative of the seriousness with which people held the risk of spirit manipulation during this time. While not as prominent in the present day as in the past, Tobians in Echang still practice behavioral avoidances and traditional rituals throughout pregnancy, parturition, and menstruation.

Tobians in the present day do not articulate a fear of *yarus* when a person is ill, yet there is still the impression that children, elderly, and sometimes women are inherently weaker and may be more likely to become ill. Pre-existing or superimposed illnesses render an individual more vulnerable to subsequent illness and prolong recovery. Explanatory models for illnesses may have changed for Tobians in Echang, but the concepts of weak/strong still have currency in contemporary discourse on health and medicine.

f. Etamal (Pollution and Contagion)

People in Echang understand concepts of infection and contagion in biomedical explanations for disease causation. While traditional Tobian medical theory does not have the equivalent terminology, *etamal* sometimes describes contamination in local illness causation theories. Tobians describe a number of illnesses that occur after eating contaminated foods or touching contaminated objects. The concept of pollution is the closest Tobian parallel to a biomedical theory of contagion. Tobians in Echang regularly use the English words *contagious* and *infectious* to express contagion in contemporary contexts.

Indigenous conceptualizations of pollution encompass physical contamination with dirt (e.g., filth, waste, decay) along with symbolic contamination (e.g., sorcery). Eating rotten or cursed foods caused illness on a regular basis. In the past Tobians practiced food avoidances and rituals to prevent accidental contamination that led to illness. For example, adults did not permit children to eat fish stomachs because they were unclean. Illnesses due to pollution could occur anywhere in the body. Those

located in the gut were frequently associated with food pollution, but as with most illnesses, etiology was dependent upon each individual, their gender, and age.

The way people used food avoidances to deter illness was similar, but not the same as, adhering to food taboos. Breaking a taboo was a deliberate offense to *yarus,* and to do so was extremely dangerous because the entire society often suffered the consequences. Contamination or pollution generally occurred when someone consumed or touched contaminated objects inadvertently. Sicknesses caused by pollution were not as severe as sicknesses caused by breaking a taboo.

On Woleai and Lamotrek, people used ornaments similar to Tobian *hachinechin* as a way to protect people and island resources from contamination during disease outbreaks (Alkire 1982). In cases where widespread contamination led to illnesses in large numbers of people, Yapese islanders traveled from island to island to warn others of the disease outbreaks. Islanders hung up amulets called *peomas* during times of quarantine. Placed along pathways, at canoe landings, and in individual homes, these objects warded off malevolent spirits while also warning passersby of the imminent threat of illness (Alkire 1982). Although we do not have ethnographic data to support the Tobian use of *hachinechin* for quarantine or disease prophylaxes, is it conceivable that Tobians may have used them for similar purposes given the cultural affinities of these island groups.

Tobians commonly associate pollution with infectious diseases. Gonorrhea, intestinal worms, amebic dysentery, influenza, pneumonia, and tuberculosis were among the earliest infectious diseases to which Tobians were exposed following contact with Europeans. As a result Tobians often conflate concepts of pollution, infectious disease,

and contact with foreigners. People in contemporary Echang society convey a rudimentary understanding of bacteriology and virology. Yet, indigenous metaphors of contamination and pollution and biomedical epidemiological concepts are striking in their conceptual similarity.

Indigenous Tobian conceptualizations of pollution and human weakness/strength in disease etiology resonate with general biomedical constructions of the human immune system. People with weak immune systems, such as children and the elderly, are more susceptible to numerous infectious, autoimmune, and chronic diseases. The importance of the weak-strong dichotomy and pollution concepts in Tobian theories of disease causation underscore the value placed on disease prevention in Tobian medicine. Chapters Five and Six explore these specific aspects of Tobian medicine in further detail.

g. Circulation

Although none of the informants in Echang used the word circulation to describe the etiology of any illness, the term encapsulates the nature of the metaphors and descriptions they did use. Circulation in Tobian medical theory refers to the smooth flow of elements inside of the body. Numerous Tobian medical therapies promote circulation by removing accumulated waste from any one area. Therapies that stimulate proper circulation include massage, steam baths, and vomiting.

Tobian ethnophysiology describes a system of internal organs and pathways through which blood, water, waste, air, and food move. Anything that impedes proper movement of these elements through the body can give rise to illness. Congestion and swelling evidence a disruption of the flow of air and water through the body. Diarrhea, constipation, and painful urination signify a malfunction in the systems that regulate the

removal of waste. Tobians consider the disruption of blood flow anywhere in the body extremely serious. Internal bleeding and pooling of blood inside of the body, which some Tobians express by saying, "*the blood gets stuck inside with no way out*," are primary sources of internal infection and fever. Fever also indicates the growing seriousness of an illness. One informant described a common childhood illness, *moh* (*Candida albicans*), as an illness that arises when "*the stomach becomes like a swamp or taro patch and the heat inside cannot get out.*" This swamp and taro patch metaphor ties together dysfunctional circulation with the accumulation of heat and waste in *moh* etiology. The emergence of blisters and rashes on the skin indicate the exit of heat from the body. Diarrhea and vomiting marks the evacuation of accumulated waste from the gut.

While it is interesting to note that the movement of air, water, blood, and waste are important themes to maintaining health in Tobian medical ideology, none of the informants described a system that resembles a humoral theory of health and illness (e.g., Tedlock 1987). The notion of equilibrium or similar metaphors are also notably absent from the discussions of Tobian therapeutics. Hot/cold and wet/dry oppositions are not important components to the nosology, etiology, or treatment of illnesses in Tobian medicine. Rather, Tobian constructs of circulation reflect a similar type of ethnophysiology that Bastien (1985) describes among the Qollahuya-Andean in which bodily functions parallel topographic and hydraulic systems found in nature. To some degree indigenous Tobian theories about the workings of internal human physical systems echo their in depth knowledge of island ecosystems, hydraulics, ocean currents, and seasonal environmental fluctuations. Concepts of circulation, pollution, strength, and

weakness permeate environmental discourse as well as medical discourse (e.g., Black 1981; Black 2000b).

h. Iatrogenic

Iatrogenic illnesses are those that arise from the therapeutic treatment of a physician. In contexts of indigenous medicines, this definition applies to local healing therapies that actually generate additional illnesses or complications (e.g., Inhorn 1993). From an etic, biomedical perspective, the emergence of negative side effects resulting from indigenous therapeutics may be construed as iatrogenic. In contrast, signs of healing in indigenous Tobian medicine, including the emergence of a skin rash, vomiting blood, fever are acceptable, even expected, during therapy, since many of these symptoms are actually cues that the body is shedding illness (e.g., Etkin 1988a Etkin 1992). A biomedical practitioner may interpret these side effects as evidence that the body is rejecting the medicine, but an indigenous Tobian healer may view the side effects merely as the natural course of therapy in progress.

There are some circumstances where illnesses that result from medical therapy cause suspicion. Many Echang residents share the sentiment that pharmaceutical medicines contain harmful chemicals that cause illness rather than restore health. Skepticism regarding the safety of certain medicines or types of health care stems from peoples negative experiences with biomedicine. One such case involved a woman whose prescription medication was of such a high dose that it caused her child to become lethargic and ill. Upon further investigation she and her physician discovered that the hospital pharmacy staff had dispensed the wrong medication and instructions. This case

in point and others like it have led to underlying doubts about the quality of medical care at the hospital and a preference to seek medical care from private practice physicians.

Generally, people in Echang prioritize the health and safety of their children over care for themselves or other adults. Echang residents concur that pharmaceuticals are dangerous when taken for long periods and that the potential side effects outweigh the benefits. Though no objective data corroborate stories of pharmaceutical malpractice in Palau, several interviews with doctors, nurses, and health care practitioners throughout Koror echoed past cases of discrimination and maltreatment of Southwest Islanders by lower level staff and health care aides. Suspicion about pharmaceutical drugs circulating in Echang relates largely to partial understandings about the chemicals used in the drugs, how they are made, how safe they are, and where they come from. The perceived strength and potentially harmful long-term effects of using pharmaceutical drugs also leads to experimentation and self-medication.

i. Lifestyle

Tobians and other southwest island groups in Echang attribute a subset of chronic illnesses to changes in lifestyle. Tobians identify the root cause of chronic diseases as major changes in diet and food ways, especially the inclusion of rice and canned foods into the diet, along with reduced opportunities for physical activity. Heart disease, hypertension, obesity, and diabetes are diseases that have recently become primary health concerns among Tobians and others living in Echang. For the most part Echang residents do not articulate detailed understandings of the biomedical etiologies for these diseases. Nor have they constructed any innovative indigenous medical theories around them. Tobians consider these diseases the domain of biomedicine. Biomedical physicians

diagnose and orchestrate the treatment of these illnesses. People have employed indigenous medicines, however, as complements to biomedical treatment for chronic diseases. Specifically, people use indigenous plant medicines and topical therapies to treat secondary illnesses associated with chronic illnesses.

The preceding sections of this chapter presented important concepts in indigenous Tobian cosmology and theories of disease causation. The remainder of the chapter centers on the major themes that organize Tobian disease classifications. An understanding of Tobian medical etiology and nosology provides a framework for understanding decisions involved in healing practices and medical decisions.

4. Themes in Tobian Illness Nosology

Indigenous disease nosology is the key to understanding medical systems as a whole. Disease classification systems reflect indigenous concepts of human physiology and often provide medical practitioners with a guide for applying therapeutic knowledge. Information pertaining to Tobian disease categorization was explored through semi-structured and open-ended interviews about illnesses and healing.

Illnesses within a contemporary Tobian cultural context do not fall neatly into a well-defined classificatory scheme. Pile-sorting is one method that educes the cognitive basis of disease classification (Bernard 1994; Weller and Romney 1988). Tobian is not a written language. Tobian illness concepts do not translate into English in a standardized fashion among all Tobians, creating an obstacle for assigning individual illnesses to cards. Furthermore, literacy in English among informants varies from very good to non-literate. Therefore, creating cards with Tobian illness concepts was difficult as well. For

these reasons discussions of diseases and medicines and categorization of these domains was explored through structured and unstructured protocols and participant observation.

The following assessment of indigenous disease nosology revolves around several prominent themes that emerged from the analysis of structured and semi-structured interviews on health and medicine. Informants described three pairs of binary opposites that loosely organize discourse of illness categories: (a) illnesses of the past/illnesses of the present; (b) local illnesses/foreign diseases; and (c) external/internal illnesses. Overlap between each of these three categories may exist (e.g., an illness from the past, foreign in origin, that is internal) and certain illnesses may occupy a position on each end of the binary continuum.

a. Past and Present

The separation of past and present organizes much of the contemporary discourse of Tobian medicine. Tobians and other southwest island peoples often ground their discussions of health, medicine, marriage, religion, politics, fishing, and education in a dichotomy between past and present and between here (in Echang) and there (southwest islands). While there are various dimensions to the past (e.g., recent past, distant past, ancient past) in the context of this discussion of Tobian medicine the past implies a time when most Tobians were still living together on Tobi.

Often during conversations informants would designate an illness to the past or to the present by indicating, "*we didn't have this sickness on Tobi*," "*we had this sickness on Tobi but not here*," or "*we don't believe in that one anymore, because now we are Catholic*." The designation of illnesses to the present (i.e., "*here in Echang*") or to the past (i.e., "*there on Tobi*") always led into a discussion of the therapy used to treat the

illness. In other words, Tobians always discussed illnesses in the same context of Tobian medicines. It was common to hear the phrase, "*we used to have this medicine for (illness)*" referring to a traditional therapy for an illness that was no longer very common in Echang.

As stated earlier in the introduction, the past/present binary opposition contains a continuum. Many Tobians discuss illnesses of the past and the present as if the opposites are mutually exclusive. However, in historical context many illnesses that Tobians ascribe only to the present may actually belong to the past and vice-versa. A distinction for these ambiguous illnesses can be drawn based on how prominent the illness was in the past population. The presence of the illness, and thus the significance of the illness within the society, may have changed over time making the past/present dichotomy important in local perceptions of the illness.

Tuberculosis ("*TB*") is a disease that was once common on Tobi, and for which Tobian plant medicines were developed. Tuberculosis is not widespread in Echang, although at least one individual in Echang carries a latent infection. While there is overlap between illnesses of the past and illnesses of the present, the assignment of an illness to one category or the other lies in the degree to which it was perceived as more common in one place versus the other. Active tuberculosis requires therapy to attenuate the affects of the illness in the body, while dormant tuberculosis does not require therapy or continual monitoring of the illness. Dormant tuberculosis is not apparent by observing an individual, and so it may appear that the disease is less common or even absent, rendering its assignment to the past.

There are not adequate medical records for southwest island populations to support the perception held by Tobians that certain illnesses were more or less common in the past than in the present. Individuals base their opinion of where an illness falls in the past/present continuum on first-hand experiences or stories told by families and friends. Regardless of the mechanism by which these perceptions move throughout the community, the perceptions of illnesses in the past and present were consistent across all of the interviews. Interviews with community members who were trained as nurse aides, as well as non-Southwest Islander health aides and physicians with some experience in delivering health care in the southwest islands corroborated these perceptions in interviews.

b. Local Sicknesses and Foreign Diseases

Echang residents describe a conceptual dissonance between local notions of illness and the biomedical definition of a disease. A disease or syndrome is defined as a group of symptoms that together are characteristic of a specific disorder, disease, or the like (McGraw-Hill 1991). When presented with the question, "What are the diseases that were common on Tobi in the past," participants would explain that diseases were not common on Tobi, only "*simple sicknesses*," broken bones, cuts, deep wounds, sore muscles, skin rashes. Any diseases that were present on Tobi came from foreigners and foreign ships.

In the Tobian language *ehameteri* means pain or "*it is painful.*" It also denotes a general state of ill health or malaise. Types of illnesses in a traditional Tobian context are akin to individual symptoms of disease complexes. Congestion, fever, swelling, and a runny nose are individual illnesses, or states of disease, and addressed as such

therapeutically. Depending on the situation, multiple symptoms may be dealt with as separate or related entities. Analogous illness categorization schemes exist throughout Micronesia. This phenomenon was described in Chuuk where symptoms of illness (*semmwen*) are viewed individually, and each *semmwen* was attributed to a separate spirit power (Mahony 1970). Chuukese symptomology was not ordered around disease taxonomy, but around the structure of the spirit world. Tobians distinguish between diseases and simple illnesses or injuries, and they categorize most diseases as foreign in origin. Diseases are more complex than the injuries and minor illnesses Tobians recognize.

Foreign-local designations of disease refer to origin of disease. Tobians hold foreigners accountable for the introduction of infectious diseases. They note that ships carried foreigners along with "*air from other places that was not clean*" to the southwest islands. Foreign diseases were very serious inasmuch as they generally produced a constellation of symptoms that were more extreme than the illnesses usually encountered on Tobi, which were generally merely minor injuries, aches, and pains. Furthermore, foreign diseases often produced significant population loss in relatively short time periods.

Aside from infectious diseases that are foreign in origin, a class of diseases has emerged following the resettlement of southwest islanders in Echang. These diseases are related to the foreign introduction of new foods, medicines, and lifestyle. Diabetes, high blood pressure, and obesity related illnesses are an artifact of Japanese and American influences in Palau. Tobians often talk about living an American lifestyle as a reason for people being overweight, developing diabetes, and having high blood pressure. It is

unclear how long these chronic diseases have been present in the Tobian population. Insulin dependent diabetes is not common among Tobians, although it is common in other groups in Echang. Asthma is as a local illness that has probably been present in the Tobian population for a long time.

c. External and Internal

Tobians distinguish between illnesses that manifest themselves internally versus externally. This level of distinction is arguably one of the most significant levels of classification because of its pivotal role in Tobian therapeutics. It is important to note that Tobian definitions of external and internal do not parallel those found in biomedicine.

External illnesses often manifest with visible symptoms on the outside of the body. They are characterized by structural abnormalities, misalignments, or injuries. In Tobian ethnophysiology the skeleton (*chil,* bones), muscles (*fitihor*, meat), and skin (*hihn ruh*) comprise the primary structural components of the human body. Usually, illnesses involving the bones (*chil*), skin (*hihn ruh*), teeth (*ngi*), eyes (*mat*), and ears (*taring*) are external.

Internal illnesses arise from a dysfunction of circulatory processes and internal organs. Injuries often cause internal trauma, and most types of sorcery involved various levels of internal malaise. Foreign diseases are thought of as primarily internal illnesses the require internal medicines. While this group of illnesses may have physical manifestations that can be appreciated externally, the origin of these illnesses is believed to be from invasion of the body and a disruption of the body's internal system, either through the circulation of air, blood, and water, or through injury or infection.

The categories of internal and external are not necessarily mutually exclusive. Disorders whose etiology involves accumulation of heat (e.g., chicken pox, *belebel*, *moh*) or contamination related to food consumption (e.g., skin allergy) become manifest externally in the form of a rash, blister, and skin that is warm to the touch. The underlying cause is internal but these illnesses are visible externally. People treat dermatological symptoms with external medicines and the fever or contamination element of the illness with internal medicines.

C. Illness Terms and Categories [29]

During interviews from December 2001 through June 2002 72 discrete illness terms were recorded (ref. Appendix A). These illnesses are most likely a representative sample of all the illnesses recognized by Tobians in Echang. They were compiled using results of free-list exercises, semi-structured interviews on illness concepts, medical preparations, and health seeking behaviors, unstructured interviews, and observation of healing rituals. Depending on the context and topic of the interview, informants were asked the following questions:

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[29] The terminology used here is based simply on words and phrases translated into English by Tobians during specific discussions. These lists of terms do not serve as an authoritative glossary of Tobian medical terminology. Not all English concepts have Tobian language equivalents. Often times an informant or translator would describe a medical concept using a metaphor or story rather than directly transcribe a Tobian concept into English or vice-versa. Some individuals actually "invent" new Tobian phrases in an effort to formulate a literal one to one Tobian-English translation, which has virtually no currency in daily Tobian discourse. I recognize the potential, and probability, that many terms listed herein as Tobian terms, may not actually be used, or even recognized by all Tobians. Nevertheless, these terms emanate from real conversations and thoughtful descriptions of diseases by Tobian informants, and I have faithfully reported them here as they were imparted to me during interviews. Tobian explanations of illness terms are contextual, and meaning is often derived from the discussion of the illness as a whole. For example, informants described several distinct types of skin illnesses; however, most of them were just called *matamat*. In regular conversation, the finer details regarding the type and origin of that *matamat* would be made clear from the context of the discussion of that illness.

Please list the illnesses that are common in Echang.
Please list the illnesses that you can treat with local medicine.
What kinds of illnesses were there on Tobi in the past?
Which illnesses do Tobian medicines treat?
What are the symptoms of _____ illness?
How do you know if you have _____ illness?
How does the medicine work for _____ illness?

Fifteen participants ages 24 -79 (seven female, eight male) were asked to list the most common illnesses in Echang. The results of the free-list appear below (Table 5). The free-list helped to elicit illnesses that people perceive to be the most common. All of the illnesses in the list below are illnesses for which there are traditional plant medicines.

Table 5 Illnesses Listed Most Frequently During Free-List Exercises (15 Respondents)

No.	Tobian Illness Term	English Gloss	Frequency	%
1	*ehameteri*	muscular pain	13	86.7
2	*ifou*	fever	13	
3	*etewas*	external injuries (bruising, pain)	13	
4	*finchingirichil*	broken bones	12	80.0
5	*ehameteri*	general malaise	10	66.7
6	*mehitariga meta*	minor injuries, cuts, abrasions	10	
7	*hameteri chimei*	headache	9	60.0
8	*hameterisi*	stomach pain	9	
9	*hameterisi*	diarrhea without blood	9	
10	*moh*	oral thrush	9	
11	*yeturong tafaief*	deep cut, wound	9	
12	*fahafah*	cough with mucous	8	53.3
13	*hameteri retip*	non-specific internal illnesses	8	
14	*mut*	vomiting	8	
15	*tobotoborchil*	arthritis	8	
16	*yehamete taringei*	ear pain	8	
17	*etai inou harai*	loss of appetite	7	46.7
18	*matsirip*	flu; influenza	7	
19	*hachouess*	asthma; shortness of breath	7	
20	*hameteri ngi*	tooth pain	7	
21	*humuhung*	persistent dry cough	7	
22	*matamat*	food related skin allergies	7	
23	*matariwa*	cyst or boil with pustule	7	
24	*yehangahang metaiei*	conjunctivitis	7	
25	*yehochohoch metaiei*	black eye; bruised eye; eye injury	7	

The illnesses fall into six categories roughly organized around human anatomy (Table 6). Groupings reflect informant responses to interview questions that probed into cognitive groupings and illness etiologies. These responses mirror local perceptions about the location of illnesses within the body and culturally salient categories. Informants would often say, "*We have medicine for the eyes*" and then would describe all of the possible eye injuries and methods used to treat them. Interview responses also revealed nuances in disease categories, including illnesses that are simultaneously part of more than one category. For instances, a single illness may fall into both dermatological and hematological categories.

Table 6 Tobian Illness Groupings

Tobian Nosology	English gloss	Biomedical Category	*N*	%
hihn ruh	skin	dermatological	19	26.8
ehameteri/etewas	pain/injuries (external)	external illnesses	15	21.1
cha	blood	hematological	13	18.3
hameterisi	stomach pain	gut-related disorders	13	18.3
hameteri retip	pain/injuries inside	internal illnesses	11	15.5
chimh (bout, mata ri ngarungor, wohang)	head (nose, chest, throat)	respiratory disorders	10	14.0

The category *hameteri retip* is broad and comprised of 11 illnesses with rather vague etiologies, such as sorcery, the accumulation of waste, or poor circulation. For illnesses with ambiguous locations, people generally describe them as "*something wrong inside*," "*something gets stuck inside*," or "*too much heat*." Dermatological (*hihn ruh*) disorders are comprised of 19 distinct illnesses with unique etiologies. Illnesses they describe as *in the blood* are those that have a hereditary component to them. They also include a number of febrile illnesses, skin illnesses, and general internal illnesses. The circulation metaphor is common in blood related disorders, but pervades explanations of a majority of illnesses generally. Illnesses associated with circulation of

air (i.e., respiration) include disorders of the nose, throat, and chest (N=10). Muscular and skeletal disorders and injuries (N=8) are grouped together with eye, ear, mouth disorders (N=7).

A majority (N=55, 77.7%) of the illnesses were described as common on Tobi in the past and still considered common now in Echang. Only 10 (14.1%) illnesses were listed as common in Echang and absent on Tobi. All 10 are perceived as either foreign in origin (i.e., chicken pox, hepatitis, dengue fever, and pneumonia) or resulting from the adoption of a foreign way of life (i.e., stomach ulcers, carcinoma, obesity, diabetes, and stroke).

Tobians living in Echang described 37 (52.1%) of the 71 total illnesses as internal and 30 (42.3%) as external. Of the 55 illnesses that are significant in health patterns of the past and in the present, 25 (35.2%) were categorized as internal and 22 (31.0%) were categorized as external. Eleven (44.0%) of the 25 internal illnesses were considered foreign in origin, while only one (4.5%) of the 22 external illnesses were considered foreign. All illnesses that were considered common in Echang but absent on Tobi were described as internal illnesses. Only one disease, chicken pox, also appears in the external category due to its dermatological component. All of the diseases exclusive to Echang are either foreign diseases or diseases associated with the adoption of foreign lifestyle, diet, and medicines. Thus, the appreciable trend in illnesses among Tobians is the addition of novel illnesses to the population in Echang that are primarily internal.

1. *Hihn Ruh* (Dermatological)

Tobians listed more skin illnesses than any other type of illness (Table 7). They usually describe skin illnesses as "*simple sicknesses.*" Simple sicknesses contrast with

serious ones in that they are generally diagnosed and treated at the household level and do not usually require a consultation with outside medical experts. Simple sicknesses are not life threatening while serious illnesses are often internal illnesses.

Table 7 Dermatological Disorders

Tobian Terms	Signs/Symptoms	Possible Biomedical Correlate	Tobian Etiology	Tobian Categories
belebel	large blisters on the trunk that resemble a rope; red in color; itchy; bad odor; accompanied by fever; when the blisters completely encircle the trunk, the patient will die	Herpes zoster; shingles	accumulation of heat in the body, especially around the chest; blisters signify heat exiting the body	- internal (fever) - external (skin) - foreign - past and present
busuru	hard bump under the skin; warm to touch; redness around bump; filled with pus; foul odor	subcutaneous boil or cyst with pustule; Staphylococcus infection	accumulated waste or infection in the skin that is coming out	- external - local - present
"chicken pox"	itchy red skin with blisters; high fever; the blisters open and a scab forms; blisters also come out in the mouth; diagnosed by a hospital doctor	chicken pox	virus; too much heat in the body; heat causes blisters when it is coming out	- internal (fever) - external (skin) - foreign - present
ebuehei	red, itchy skin, no blisters; rough skin; symptom of most types of *matamat*	contact dermatitis; skin allergy	something in the skin; redness indicates heat or exit of waste	- external - local - past and present
eripung	red itchy skin with small raised bumps, no blisters	scabies (Sarcoptes scabiei)	small bugs crawl into the skin and make it very itchy;	- external - local - past and present -
hubuehihichi	red itchy skin with small raised bumps, no blisters	may also be scabies or other type of mite infestation (chiggers, fleas, lice, etc.)	small bugs crawl into the skin and make it very itchy;	- external - local - past and present

Tobian Terms	Signs/Symptoms	Possible Biomedical Correlate	Tobian Etiology	Tobian Categories
etafaiei	scars; dark spots on the skin after it has healed; scars are sometimes raised and very black in color	scars, keloids, and hypertrophic scars	infection in the skin while it is healing; bad skin; no medicine to help the healing; scratching or picking at skin	- external - local - past and present
herisabou; besokel [Pal.]	red, rough, itchy skin, in shape of a circle	fungal skin infection, *Tinea corporis*	caused by ringworms	- external - local - past and present
etewas	pain in the skin from an injury; bruise	generalized pain from broken bones and external injuries	injury to the skin	- external - local - past and present
matamat	skin rash of irritation due to an unspecific or unknown cause; may or may not be itchy	general dermatitis	something gets into the skin	- external - local - past and present
matamat; bikodel [Pal.]	skin rash due to food allergies	probably allergic dermatitis, such as hives (urticaria) or eczema	eating certain foods; breaking a food taboo	- external - local - past and present
matamat; makngitelrakd [Pal.]	skin rash	contact dermatitis, unspecific	swimming in dirty water	- external - local - past and present - very common in Echang
matamat masusuhr	"skin fungus"; thick raised rash on the skin with rough edges, very red and itchy	dermatitis of unspecific origin; most likely psoriasis and not a fungal infection	fungus	- external - local - past and present
matamat merifirif	"skin fungus"; flat and whitish in color, not itchy	unspecific skin disorder; possibly vitiligo	fungus	- external - local - past and present
mehitariga meta	cut that is not very deep; simple cut, not serious; usually when someone falls or was in a fight	cuts, abrasions	accident; injury	- external - local - past and present
matariwa	same as *busuru* except there is no "eye", the pus has not come out yet; very painful; sometimes needs to be cut open to relieve the pain and apply medicine	boil or cyst without a pustule, often caused by bacterial infections	accumulated waste or infection in the skin that is coming out	- external - local - past and present

Tobian Terms	Signs/Symptoms	Possible Biomedical Correlate	Tobian Etiology	Tobian Categories
yehuh	skin burn	burn	exposure to fire	- external - local - past and present
yehuh fario	skin burn	sunburn	exposure to sun	- external - local - past and present
yeturong tafaief	deep cut or wound	serious wound	accidental injury	- external - local - past and present

Tobian healers use the skin as a barometer to evaluate the extent of illness. The skin provides cues regarding the amount of heat in the body, the location of illness, internal circulation, and disease egress. A majority of indigenous Tobian plant therapeutics is salutary for skin illnesses (ref. Appendix B). The primary modality for treatment is the external application of plant therapies that provide symptom relief rather than a cure for the illness. Generally, external therapeutics treat external illnesses and internal medicines treat internal illnesses, though exceptions to this trend exist.

2. *Chimh, Bout, Wohang, Mata Ri Ngarungor* (Respiratory)

The biomedical concept that best describes the next category of Tobian illnesses is respiratory disorders (Table 8). Biomedical science defines the human respiratory system as one that includes the tissues and organs involved in circulating oxygen and orchestrating the exchange and removal of carbon dioxide from the body. The nasal passages, lungs, diaphragm, pharynx, trachea, and bronchi are all components of this system. Tobians also recognize a group of illnesses related to the entrance, flow, and exit of air into the body. Illnesses included in this group are located in the head (*chimh*), nose (*bout*), throat (*wohang*), and chest (*ngarungor*) and involve the flow of air, blood, and waste through this region of the body.

Table 8 Respiratory Disorders

Tobian Terms	Tobian Description	Possible Biomedical Analogue	Tobian Categories
yefeter chanbout	bloody nose; pain in the head accompanied by blood running out of the nose	bloody nose, not due to injury or impact	- internal - foreign - past and present - more in the present
humuhung	dry cough; cough with no mucous; lasts many days, sometimes 1 or 2 weeks	dry cough	- internal - foreign - past and present - more in the present
fahafah	wet cough; cough with mucous; lasts many days, sometimes as long as one month	cough with congestion; bronchitis	-internal -foreign - past and present - more in the present
hachouess; asthma	shortness of breath; cannot breathe easily because the air gets stuck inside, especially when there is a lot of mucous that gets inside the lungs; short breath and wheezing	asthma	- internal - local - past and present - more in the present
yungut bout	runny nose; accompanies flu; mucous coming out of the nose; hard to breathe through the nose	Nasal congestion	- internal - local - past and present
hameteri chimei	head ache; pain in the head; usually happens when you have congestion or blood is stuck in the head	headache	- external - local - past and present
"pneumonia"	illness in the lungs, diagnosed at the hospital; mostly happens in babies and young children	pneumonia	- internal - foreign - past and present - more in the present
"T.B."	coughing and blood, usually with no fever	Tuberculosis	- internal - foreign - past and present - more in the past
yehamete hapiriwohangehi	sore throat from a cold or flu, because of *moh*; or because of food allergies	sore throat	- internal - foreign - past and present
yungut bout; taringungut meta ngurut	stuffy nose and head; nasal and chest with mucous	upper respiratory congestion	- internal - foreign - past and resent - more in the present

Respiratory related illnesses rank among the most prevalent of illnesses in Palau (World Health Organization 2005). Tobians in Echang recognize that according to biomedicine microorganisms, which Tobians call germs, cause respiratory infections. However, they refer to indigenous metaphors of circulation in local descriptions of these infections. Runny nose, the flu, and coughing are symptoms thought closely associated with breathing in germs from unclean air. They frequently discussed ship travel and the unclean air and water in Echang in the same context as respiratory illnesses indicating an association of these things to the high occurrence of respiratory illnesses in Echang. One informant stressed that the winds around Tobi and the other southwest islands blew more often and so the air there was always very clean, in contrast to the air in Echang that is still and "*gets stuck.*" Tobians on Tobi would only become sick with respiratory illnesses when the ships would come to the island. They would be sick for a short period, and then eventually the ship would go away and people were not sick again until the next trip. The consensus among Tobians and other southwest island groups in Echang is that runny noses, the flu, and coughing are much more common in Echang than they are in the home islands.

Asthma is a local illness, because people are usually born with asthma and it is "*in the blood,*" referring to the perception that the illness is passed from one generation to the other. Doctors and nurses familiar with Southwest Islanders' health ranked asthma as one of the most common illnesses that they have seen in Echang, particularly among infants and small children. One doctor noted that the high incidence is due to a number of factors, not the least of which was the practice of chewing cigarettes with betel nut (*Areca catechu*) and smoking cigarettes during pregnancy. Several individuals explained

that they had developed asthma as an adult, probably because of years of heavy smoking. It is unclear how long asthma has been around in the Tobian population. It is also unclear if the biomedical diagnosis of asthma is the same illness that many Tobians refer to as "*shortness of breath*" even though the symptoms are very similar.

While congestion is an indication than an illness is present, the elimination of mucous from the body through the nose or by coughing signifies that the body has started healing. For example, although *yefeter chanbout*, *yungut bout,* and *fahafah* are all general states of illness, their manifestations indicate that illnesses are in the process of moving out of the body. Common traditional therapies for congestion include massaging coconut oil onto the chest, throat, around nasal passages, and forehead. This type of therapy eases breathing and helps the air move better through the body. Preventing mucous from moving out of the body contradicts Tobian healing philosophies.

As mentioned previously in this chapter, tuberculosis is an interesting disease because of its ambiguous presentation especially during latent infection. Without the aid of biomedical technology to diagnose infection with tuberculin bacteria, an individual may not ever be aware that they were infected or had the potential to develop the disease. Because of the nature of tuberculosis infection and illness, the perceived presence or absence of the illness in the population would have been skewed without modern biomedical technology. Tobians incorporated tuberculosis into their local medical system by identifying culturally salient symptoms and experimenting in treatment via indigenous plant medicines.

3. *Hameterisi* (Gastrointestinal)

Tobian gut related illnesses (*hameterisi*, stomach pain) ranked as the fourth most common type of illness described by Tobians (Table 9). A majority of the thirteen (15.5%) gastrointestinal disorders were food related. All gut related illnesses are internal illnesses. Injuries that cause blood to pool in the stomach confer the greatest risk of infection. Plant medicines that induce vomiting help to reduce the potential for infection, because blood left in the stomach will rot, causing a foul odor in the mouth. Tobian healers induce vomiting in order to accelerate the healing process. The idea that vomiting is a negative health condition or requires suppression is a relatively recent introduction of biomedicine.

Four other gastrointestinal disorders relate to the elimination of waste from the body. Diarrhea and constipation develop from excessive or incomplete elimination of waste from the body. Dysentery and infestation with intestinal helminthes ("*worms in the stomach*") entail the intrusion of the body with parasites. Tobians described having worms as an illness where there are worms in the stomach and intestines that come out with bowel elimination. Several people described ameba as a type of intestinal worm, and although amebas are not visible in the stool, they cause bleeding and other lower abdominal discomfort. Some Tobians speculated that amebas and other worms might exist in the food or water, while others noted that Tobians used to believe that worms were a sign of black magic.

Like vomiting, diarrhea is so common in Echang that Tobians rarely discuss it as an illness. The exception is diarrhea in children. Tobians consider diarrhea in children more serious than in adults, and chronic or excessive diarrhea in children warrants a swift

visit to the hospital emergency room. Health campaigns that promote diarrhea as a serious health concern have increased the currency of diarrhea as a bona fide disease in Echang. Parents often demand oral rehydration salts from dispensaries and hospitals when children have diarrhea and other gastrointestinal disorders.

Loss of appetite (*etai inou harai*) is an illness that may be transient or it may lead to severe weight loss (*yaoch sewa*). The chronic disinterest in food causes a person to become thin, weak, and pale. The lack of appetite or desire to eat is a crucial behavioral symptom that something in the body is not working properly and indication of illness, which may or may not be gut-related. For example, a person suffering from internal bleeding or poor blood circulation may exhibit a low appetite and weakness.

Over-eating to the point of obesity (*yarorupa sewa*) is not a disease *per se*, but it is a behavior that leads to recognized health problems. Recent health education campaigns have emphasized obesity as the cause of numerous common health problems in Echang such as cardiovascular disease, hypertension, and diabetes. Being overweight has earned the status of a health problem. Tobians consider obesity an illness as it relates directly to specific chronic diseases. Most southwest islander peoples describe their ancestors as fit, slim, and strong and reiterate that obesity was not an issue for them while they were on Tobi in the past. Food shortages and chronic caloric deficiencies were more likely to be the status quo for early Tobians, and so obesity as an illness category is relatively recent.

Table 9 Gut Related Disorders

Tobian Terms	Tobian Description	Possible Biomedical Analogue	Tobian Categories
"ameba"; *ekeri pahecha*;	abdominal cramping with bloody stools caused by amebas, which is some kind of worm that gets into the stomach and intestines, but you cannot see it	amebic dysentery	- internal -foreign - past and present - more in the past
buchita	indigestion; heart burn; gas; stomach ache and cramps; some also describe this as "stomach ulcers"	pyrosis possible *Helicobater pylori* infection	- internal -local - present
etai inou harai	loss of appetite, usually only temporary; also is a symptom of black magic	anorexia as a result of an illness	- internal - local - past and present
hameterisi	diarrhea without blood	diarrhea	- internal - local - past and present
hameterisi	stomach ache, usually diet related	abdominal pain; stomach ache	- internal - local - past and present
yeieou yangisiei	when you cannot make a bowel movement for several days; stomach ache	constipation	- internal - local - past and present - very common in Echang
mut	vomiting because of a sickness in the stomach; can also be a symptom of black magic	vomiting due to illness; self-induced vomiting	- internal - local - past and present
"worms"	bowel movements that include worms, which you can see with your own eyes	intestinal infestation with helminthes (e.g., pinworm, tapeworm, etc.)	- internal - local - past and present - more common in the past
yaoch sewa	chronic loss of appetite that causes the person to become very thin; more common among very small children and elderly people; can also be a symptom of black magic or internal injuries	cachexia; wasting disease	- internal - local - past and present
yarorupu sewa	eating too much; becoming a very large size or having a fat body	clinical obesity	- internal - local - present

Local definitions of obesity are not standard in Echang. Lay people do not have clear measures for weight-associated health risks, such as body mass index or weight charts. Individuals within the community have their own opinions about who is "*too big*," "*too skinny*," or "*a good size*." Most Tobians embrace the opinion of their family doctor or community health aide regarding the affect of their body size to their personal health. A small number of Tobians mentioned that they felt they needed to lose weight for health reasons, but very few of these people took active steps to do so. In conversations about body image and size among Tobians and others in the Echang community, size is relative to those living within their community and in Palau. Several people alluded to chronic diseases as an important health issue, but the vast majority of Echang residents consider themselves to be at an acceptable weight. Various types of indigestion, such as heartburn and acid reflux, have increased in frequency among southwest island populations. Tobians correlate dietary change and sedentism with increased occurrences of indigestion and heartburn. Doctors, nurses, and health aides who were link ulcers and other types of indigestion with excessive chewing of betel nut quid made with cigarettes, a practice that is widespread throughout Palau.

4. *Cha* (Hematological/Circulatory)

Blood related illnesses comprise 18.3% of the total illnesses described by Tobians. These illnesses include any type of disorder related to various types of blood dysfunctions (Table 10). Tobians expressed their uncertainty about the degree to which these illnesses affected people in the past, but they also imply that it is possible, because people in those times did not diagnose the illnesses until the arrival of western biomedicine. The consensus among informants is that most of these illnesses have

emerged following Tobian migrations to the main Palauan islands and dramatically changed their daily activities and diets.

Table 10 Illnesses in the Blood

Tobian Terms	Tobian Description	Possible Biomedical Analogue	Tobian Categories
"carcinoma"; "cancer"	cancer inside of the body that makes people very sick; a hospital doctor must diagnose this disease; usually caused by smoking cigarettes	cancer	- internal - foreign - present
"dengue fever"	disease caused by mosquitoes; an infection in the blood that causes fever; usually found in places that are dirty, where there is a lot of trash; diagnosed at the hospital; usually causes fever with aching bones and vomiting	dengue fever	- internal - foreign - present
"diabetes"; *suka*	disease where people eat too much sugar become sick; causes sores on the skin that cannot heal; diagnosed by a hospital doctor; usually runs in the blood, or in families	diabetes; non-insulin dependent diabetes	- internal - foreign - present
ifou; bechriruh	fever; the blood is hot; the body is hot; heat is stuck in the body	fever; elevated body temperature	- internal - local - past and present
"flu"; *matsirip* (Echang slang)	the flu; runny nose and fever; lots of congestion in the head and coughing	flu; influenza	- internal - foreign - past and present - more in the present
"high blood"; "hypertension"	high blood pressure; diagnosed at the hospital; usually people get this when they are a very big size and do not get much exercise; also smoking and chewing cigarettes causes it; it can also mean to be short-tempered; it runs in the blood, or runs in families	hypertension	- internal - foreign - present
"stroke"	blood gets stuck in the brain; people can die from this; usually this happens when people get old and the blood does not flow easily through the body	stroke	- internal - foreign - present

Lethargy and fever stem from blood poisoning or stagnation in the movement of blood in the body. Fever is often present concurrently with other illnesses, but it is a discrete illness that warrants separate medical attention. The flu in Echang encompasses everything from a runny nose, fever, cough, to congestion, headache, and tiredness. Use of the term *flu* in Echang can imply any type of upper respiratory infection. Tobians talk about blood contamination and germs in their descriptions of flu etiology. They recognize that living in close proximity to others who are sick and breathing "*dirty air*" contribute to the problem. Respiratory illnesses are ubiquitous in Echang. People pay little attention to behaviors that help to prevent respiratory illnesses, such as covering the mouth when coughing or sneezing, washing hands with soap before eating, and avoiding contact with the ill. Instead, flu and colds are part of normal daily life in Echang. They only cause alarm in cases of children who run high fevers and produce mucous excessively. Most people receive treatment for respiratory illnesses at the household level.

Carcinoma, dengue fever, diabetes, hypertension, flu, and stroke were all mentioned in conversations about the health of Tobians in Echang. Few people provided an explanation of illness causation or a description of how the illness altered the body. Tobians link *suka* and *high blood* to eating too much, drinking too much alcohol, and being overweight. Tobians conceptualize these illnesses as hereditary. One woman described carcinoma as the result of poison in the blood that caused this illness to impair the body's functioning. Another informant discussed the relationship of smoking cigarettes and cancer. She said that she had heard smoking cigarettes can cause carcinoma, but that she never had met anyone with cancer and she did not know really

what cancer was except that people died from it. This woman, a pack-a-day smoker living in a house full of smokers, also said that she was not worried about the possibility of developing cancer as a smoker.

These chronic illness terms appear regularly in the daily discourse of health and medicine among Tobians in Echang. Echang residents associate chronic diseases with diet and body weight, and they emphasized the need for people with these diseases to take medication regularly. The association between diabetes and the inability for external wounds to heal was very prominent in these discussions, as were other debilitating effects of the disease, such as blindness, seizures, and limb amputation. Similar themes surrounded the discussion of hypertension and stroke. Tobians are relatively well versed in the risk factors and symptoms of chronic diseases, but their understanding of biological processes and the science of western biomedical therapy is not well articulated.

Tobians have adopted biomedical terms and therapies despite incomplete understandings of their meanings. This blind acceptance may be rooted in what Black calls the "in-charge complex" that characterizes much of Tobian social organization and interpersonal relationships (Black 1982). It refers to deferring to, or in this case following the advice of, someone who is deemed more responsible, intelligent, and mature than oneself. Black (1982) notes that the people who were most "in charge" on Tobi were men who were no longer adolescents but had not yet become senile. It is interesting to note that the hospital personnel, namely physicians who provide medical care for Tobians in Echang, fall within this demographic group.

5. *Ehameteri/Etewas* (Pain/Injuries)

A number of illnesses do not fit neatly into any of the categories previously listed but share a number of qualities that are important for their categorization (Table 11). The most prominent characteristic is that they are illnesses that are located externally. These common external illnesses are directly related to injuries or simple overexertion of the body. Contusions, broken bones, and muscle pain all fall within this category.

Table 11 Miscellaneous External Illnesses

Tobian Terms	Tobian Description	Possible Biomedical Analogue	Tobian Categories
finchingerichil	broken bones	broken bones	- external - local - past and present
hamete; bauchuch	muscle aches and pain; sore muscles	muscular aches, pains, and strains	- external - local - past and present
hameteri ngi	tooth pain; tooth ache	tooth ache	- external - local - past and present
hamateri chirfaria	breast pain	breast pain of unknown origin	- external - local - past and present
yehochohoch metaiei; matari wor	black eye; "turtle eye"; usually happens when someone is punched in the eye	black eye or bruised eye caused by trauma	- external - local - past and present
tobotorchil; "arthritis"	pain in the bones and joints	arthritis	- external - local - past and present
yehangahang metaiei	red eyes; pain in the eyes with redness and sometimes mucous coming out of the eye	viral or bacterial conjunctivitis; pink eye; eye irritation	- external - local - past and present
yehameta taringei	pain in the ear ; sometimes with mucous coming out; ear pain with pus and sometimes with a fever	inner ear infection; serous otitis media; suppurative otitis media; either may become a chronic condition	- external - foreign - past and present - more in the present

Interviews with dentists and dental assistants in Koror revealed that tooth decay was not the major complaint for most dental patients in Palau. Tobians only discussed tooth and gum pain when also talking about chronic betel nut chewing and the process of cessation. Rather the effects of chewing a betel nut quid that contains *aus* [Pal.], a type of slaked lime (calcium hydroxide) powder made from limestone, shell, or coral, was the most common reason people had to have teeth pulled or cavities filled. The acidity of this type of betel quid is at a high enough concentration to kill plaque-causing bacteria. On the one hand, chewing a traditional betel quid (*buuch* [Pal.]) made with lime (*aus*), leaf (*kebui* [Pal.]; *Piper betel* L.), and betel nut (*elaus*, *buuch* [Pal.]) helps to keep the mouth cavity-free. The fibers of the nut and leaf also remove plaque buildup and tartar from the teeth and neutralize foul mouth odor. The other side is that the lime is very destructive to tooth enamel and can eat away at gums causing a great deal of pain. People who chronically chew betel nut are exposed to pain-numbing chemicals, so that during the time they are chewing, any pain from decaying teeth and gums is temporarily relieved. Indigenous medicines address the pain associated with tooth decay and gingivitis rather than the actual cavities or gum damage.

Eye ailments in this group of miscellaneous external illnesses are due to either injury or infection. "*Black eyes*" are usually caused by a puncture or injury that leads to swelling and bruising around the eye. "*Red eyes*" are slightly more serious because they involve irritation, burning, pain, and even discharge. The Tobian category *yehangahang metaiei* encompasses various types of conjunctivitis and eye disorders, such as sties, bacterial conjunctivitis, and viral conjunctivitis. Regardless of the biomedical distinctions, in a traditional Tobian context all of these types of conjunctivitis are treated

the same, because the symptoms of these discrete biomedical illnesses are very similar. Likewise, black eyes and red eyes are similar enough to warrant use of similar plant medicines for treatment.

Breast pain is an illness experienced exclusively by women. It commonly occurs when a woman receives a blow to the breast, although it may also occur spontaneously without any direct physical trauma. In biomedicine breast pain is a common symptom in various types of internal breast disease including breast cancer. However, because Tobians describe the pain as muscular pain and use external, topical medicines to treat breast pain, the illness appears in this list as an external illness.

Tobians characterize arthritis as pain in the bones and joints and associate it with old age and years of doing hard physical labor. It is interesting to note that arthritis is also an illness that people develop if their broken bones heal incorrectly. A majority of informants believe that the treatment of broken bones at the hospital, with the use of plaster casts, slings, and the like, is substandard when compared to indigenous bone setting and other forms of manual medicine. The practice of manual medicine is the cornerstone of Tobian medicine, and manual medicine is the most commonly employed indigenous form of healing practiced in Echang today.

6. *Hameteri Retip* (Internal Illnesses)

When Tobians use the phrase *hameteri retip* its meaning shifts with the context in which it is used. It may encompasses specific illnesses inside of the body when the location is known (e.g., in the blood, disease in the liver, illness in the stomach). It may signify that an illness is present inside of the body when the precise locus is unknown (Table 12). People often describe feeling sick internally with phrase *ihamete* ("*I am*

sick") or *ye temau tipei* (*"I feel nauseated"*). These phrases contrast with *itewas* (*"I am injured"*).

Table 12 Miscellaneous Internal Illnesses

Tobian Terms	Tobian Description	Possible Biomedical Analogue	Tobian Categories
hameteri siei	pain when urinating and white pus coming out with a bad smell	gonorrhea	- internal - foreign - past
"hepatitis"	some kind of liver sickness	Hepatitis	- internal - foreign - present
hameteri retip	internal illnesses and injuries; can refer to the category of all internal illnesses; sometimes used to describe illnesses that are inside but the cause or location is uncertain, as in the case of illness caused by black magic	unspecific internal illness	- internal - local - past and present
moh; *bao* (Palauan)	sickness inside the mouth that children usually get; painful blisters inside of the mouth and white film on the mouth and tongue; causes drooling; the sores make it difficult for the baby to eat	oral candidiasis; oral thrush	- internal - local - past and present
mamasuhuchu	sleeping too much; sometimes caused by black magic	unexplained loss of energy or lethargy	- internal - local - past and present

In contrast to simple sicknesses, illnesses inside of the body are considered relatively serious. The perceived severity of internal illnesses is a function of the ambiguity of illness location and the means to address the illness therapeutically. Traditional Tobian medical specialists mentioned that one of the strengths of hospital medicine is that with x-rays, blood tests, and the like doctors can "*really see what is going on inside of the body.*" Tobians value these scientific tools. In a traditional Tobian

cultural context the inability to locate the locus of illness leads to uncertainty about how to treat an illness. The longer it takes to heal a person, the less likely it is that medical interventions will be efficacious

The most significant type of ambiguous *hameteri retip* is illness related to sorcery (*fei yarus*). Illnesses commonly associated with black magic include anorexia, lethargy, cachexia, and chronic exhaustion (*mamasuhuchu*, "*sleeping too much*"). Spirit possession that leads to odd or socially deviant behaviors (e.g., *ebuch*, "*acting crazy*"), which in biomedicine would be referred to as mental health disorders, may also arise from sorcery. Mental illness is a psychological phenomenon so prayers, saying the rosary, and attending church services are more likely to be the contemporary course of action for mental illness than traditional rituals and counter-magic.

Moh is one of the most complex and interesting illnesses that Tobians discuss. Its constellation of symptoms include, fever, loss of appetite, painful sores in the mouth, excessive drooling, and a white film lining the mouth. Children are most vulnerable to *moh*, but adults are susceptible. Adult forms of the sickness are more serious than childhood *moh* because it treatment is less successful in adults. Tobians consider *moh* life threatening illness if treatment does not occur promptly. Tobians use separate types of indigenous medicines to treat the fever, to relieve pain from the oral sores, to encourage the shedding of the white film from the mouth, and to stimulate appetite.

Moh is an illness of the mouth and shares many physical characteristics with certain skin illnesses, such as blisters and sores. A number of the therapies used to treat *moh* are similar to medicines used to treat skin abnormalities. *Moh* is included with these other internal illnesses because of its internal origin. Most people describe *moh* as an

illness that results from high fevers or being very weak. As heat moves out of the body blisters develop and release the heat. Given the role of heat moving through the body in the origins of *moh*, this illness may fit in with blood related illnesses, if you take into consideration that blood carries heat through the body. Likewise, perhaps *moh* would also qualify as a respiratory related illness, inasmuch as respiration and wind can also carry heat and cold through the body.

Some people included a discussion of gonorrhea and hepatitis in their interviews. Gonorrhea was an illness that Black mentioned as well in his 1968 study of Tobian medicine. The symptoms associated with gonorrhea are painful urination with blood and pus. The preferred treatment for this illness is with antibiotics, although there are individuals who experimented with applying traditional plant medicines to treat gonorrhea. Aside from the mention of gonorrhea in Black's (1968) earlier study, only two informants mentioned indigenous medical treatments for it. Hepatitis is also disease that people commonly mention, although it has been a major public health priority in Palau. Hepatitis is an example of an illness recognized only recently by southwest island groups in Echang. Further, it was the only internal illness associated with a specific internal organ. This feature of medical pluralism in Echang reflects people's willingness to accept and incorporate new ideas about the human body and biomedicine despite differing beliefs about how the body works.

7. Illnesses in Special Populations

Studies of indigenous medical systems elsewhere in Micronesia have revealed that population subsets are important to disease classification (Alkire 1982; Mahony 1970; Ward 1977). Women, men, children, or senior adults are the primary

subpopulations that may be susceptible to unique health conditions. An individual's position within any of these special populations influences treatment protocols.

During interviews on traditional Tobian health concepts, participants delineated the following subgroups as having special illness concerns: women, men, babies, young children, or senior adults. Biological differences distinguish the health concerns of women and men. The only illness listed exclusively for women was breast pain (*hameteri chirfaria*). Several Tobian medicines existed for women including medical rituals for pregnancy and post-partum period as well as medicines to prevent pregnancy, end a pregnancy, and to help a woman become pregnant. Tobians also have a set of rituals that surround a woman's first menstruation. While neither event is an illness, both require a woman and her family to attend to her health more carefully than usual. Tobians listed one illness, *tahuh mar* (men's backache) which refers simply to overexertion or backache possibly due to kidney infection or urinary tract infections. More illnesses probably do exist, however, they were not described during this research project.[30]

The health of very young children and very old adults mirror each other in the discourse of traditional Tobian medical ideology. These two populations are vulnerable particularly to illnesses and death. Both groups are more likely to have *moh* than others

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[30] It is my personal belief that discussions of gynecological, penile, and sexually transmitted diseases were a topic that most men and women purposely avoided in interviews. Interviews with health care providers and review of public health reports suggest that these diseases are present within these populations. Rapport may have been an issue, as well as language. However, lack of rapport is not the only explanation. Open discussion of health and medicine is not common among Tobians, much less with an American researcher who happens to be a young woman. I believe many informants would have perceived engaging in such a topic with me as impolite. A local Tobian, Sonsorolese, or even Palauan researcher on the other hand may be very successful in elucidating knowledge about these important illnesses, which are notably absent from this project.

are in the population and both require considerable family and social support during their healing process because of their inherently perceived physical weaknesses.

Occupation also influences the types of illnesses to which certain individuals are susceptible. Tobian men are expert fishermen. In the past when most Tobians were still living a traditional lifestyle on Tobi, fishing and farming activities were the primary occupations of Tobian islanders. Accidents and injuries, exposure to the sun, wind, and saltwater, exhaustion, dehydration, and muscle strain from overexertion are all very common types of ailments to which fishermen were prone. The long hours spent cultivating taro in an environment where taro did not grow easily was extremely arduous for Tobian women. Harvesting coconut and thatching a roof exposes individuals, usually men, to serious injury from falling. Alkire (1982) noted that on Woleai and Lamotrek, individuals with occupational specialties, particularly fishermen and canoe builders, had their own unique subset of illnesses and medicines, which could only be used by others with their shared expertise. Fishermen went to other fishermen for medicine and canoe-builders consulted other canoe-builders for medicine. Occupational hazards of traditional life on Tobi undoubtedly elevated certain groups' risk for injury and illness. Based on review of the illnesses listed alone, it appears that accidental injuries and skin ailments were the primary health concerns of Tobians prior to European colonization.

D. Summary

This chapter presents the foundations of Tobian medical ideology, including cosmology, disease explanatory models, and illness classification. Cultural systems are adaptive, continuously in flux, and flexible; they are receptive to change in some respects and resistant to it in others. Even though supernatural forces were the primary cause of

illness in traditional Tobian thought, physiological symptoms guide diagnoses, therapies, and healing. A separation of religion and science, natural and supernatural, or body and mind are not entirely appropriate in indigenous Tobian medical ideology, but in contemporary contexts, these dichotomies are gaining more currency. Many changes in the Tobian worldview have led people to reassess the position of indigenous medical theories in contemporary society. Biomedical explanations for diseases are helping to fill the gap in Tobian medical ideology left by the abandonment of traditional religion and magic. Still concepts of strength and weakness, hot and cold, internal and external, circulation and stagnation permeate local descriptions of illness causation and healing. Local metaphors of physiological processes remain extremely important in the conceptualization of disease etiology. They also have some bearing on the manner in which Tobians conceptualize and organize illness categories, which are relevant to decisions for healing strategies. Biomedical explanations and medicines work well for foreign diseases, but they are not so clear-cut for other types of illnesses. While the threat of *yarus* no longer looms in daily life, Tobians never completely deny their existence. The persistence of this and other indigenous cultural beliefs continues to provide flexibility in explanations for illnesses that are otherwise beyond comprehension.

V. CHAPTER FIVE: PREVENTIVE AND TREATMENT MODALITIES

A. Introduction: Medical Practice

Which elements of indigenous medical ideology and practice have been preserved in medical decision-making among Tobians and other Southwest Islanders? What are the biological and cultural dimensions of medicine that affect health-seeking behaviors in Echang? What is the role of indigenous therapeutics in a wider cultural and social context of contemporary Palau? These questions provide the framework for Chapter Five.

Beginning with a description of the major modes of healing in indigenous Tobian medicine, this chapter uncovers the cultural basis for medical decision making in contemporary Echang. One of the primary factors involved in the transition of medical practices in Echang is the cultural heterogeneity and knowledge exchange that occurs there. Land use issues, plant availability, and ethnic relations in wider Palauan society all figure into health seeking behaviors and perceptions of medicine in Echang. The data presented in this chapter illustrate the significance of cultural construction of efficacy in medical decision-making, which involves both biological and cultural dimensions of healing.

This chapter forms the second half of the Tobian medical ethnography presented in this dissertation. It contributes to the ethnographic record for Palau by providing the first comprehensive description of indigenous Tobian healing. It is also the first anthropological study of medical pluralism in Echang. This chapter examines the medicinal plants most commonly used in Echang, the principles of traditional plant

collection and their therapeutic use, and various types of healing methods. It addresses some important changes in the use of plants in Echang's pluralistic healing context. The chapter describes the range of medical alternatives available to Echang residents along with the key social, cultural, and political factors that influence their use. Finally, it closes with a discussion of Tobian healing in a wider context of medical pluralism in Koror.

B. The Context of Indigenous Tobian Medical Knowledge: Past and Present

Traditionally, Tobians protected the knowledge of healing practices and medicinal recipes. As recent as 1968 a majority of Tobian informants did not share their knowledge of plants and medical therapies with each other or with foreigners (Black 1968). Tobians managed medical knowledge in much the same way as they did private property and other types of specialized knowledge like fishing, canoe carving, and making fish hooks (Johannes 1981). Access to this knowledge was regulated carefully and most Tobians still refer to medical practice of the past as highly secretive. On rare occasions, people did share medicinal recipes or healing techniques, but they did so only with others who had earned the privilege of learning medicine or who were engaged in medical apprenticeships. The secretive aspect of medical practice was a prominent theme of interviews regarding medicine on Hatohobei in the past. One woman noted:

> Before this time, knowledge of local medicine was so important to some of the old people that they would rather die with that knowledge than share it with anyone. You really have to earn it.

The private nature of medical knowledge and practice on Hatohobei mirrors medical systems found elsewhere in Micronesia. Ward (1977) observed that individuals with the greatest healing expertise in Pohnpei were also the least likely to participate in

his research project. He noted (1977:44) that Pohnpeian curers described their medical knowledge as "my life" and the sharing of this knowledge as "giving away half my life." Each time someone spoke of a medicine, its potency diminished (Riesenberg 1948). Indigenous Palauans of the main islands also treated medicines as individual property and recipes or healing techniques were not shared publicly (Masayoshi 1980). Chuukese healers used their medicinal knowledge to protect and heal immediate kin, and only passed it on to younger generations in the lineage (Mahony 1970). Medicines provided Chuukese families with supplemental income, and so the secrecy helped them to preserve the medicine's monetary value.

One of the most profound changes in the practice of Tobian medicine in Echang is that people share openly the same medical knowledge that was protected at one time. Many informants conveyed a concern that this knowledge will be lost if they do not share what they know with others in their community. The main issue raising concern among custodians of traditional knowledge is a growing population of youth who are disinterested in traditional culture. One person noted, that although people may share their knowledge now to a greater degree than in the past, the medicines imparted to each other and to foreigners probably constitute simple recipes for minor illnesses that have a low social or cultural value. Several people mentioned the use of chants and different magic techniques to acquire new medicines in the past, but no one claimed to know the details of these traditional practices.

Medical systems are cultural systems that consist of shared knowledge as well as a degree of consensus among individuals within a given social grouping (Romney, et al. 1986). Despite the secretive practice of medicine in the past, people Echang share their

knowledge of plant identification, botanical nomenclature, plant collection techniques, medicine preparation, and healing methods regardless of ethnicity, household, or kin affiliation. Although people from the various southwest islands share a common cultural heritage, there is inter-cultural variation in plant combinations and their indications. The exchange of medical knowledge has transformed healing practices and beliefs in Echang.

An innovation in traditional healing among Tobians and other Southwest Islanders in Echang is the forging of social partnerships via knowledge exchanges. Echang residents often request advice or instructions on how to prepare a medicine, usually for minor illnesses and injuries, from a neighbor who they believe knows a strong medicinal recipe. In such as case a person who has a recipe for medicine is no longer required to be the primary person in charge of the healing process. Yet, they are able to lend assistance to neighbors by providing them with the knowledge that they have. Sharing a traditional medicinal recipe with a neighbor or friend is a great gesture of generosity that strengthens interpersonal relationships throughout Echang. There are more opportunities now than ever in Echang for people to share their medicines with other families in the hamlet. Because of the cultural heterogeneity in Echang, there is also a broader array of indigenous medical knowledge in circulation.

Contrary to received wisdom indicating that medicinal plant use was waning and that it was irrelevant to the treatment strategies in Echang, data collected in 2000-2001 indicate that the Tobian botanical pharmacopoeia has expanded since their resettlement in the hamlet. Tobians, and other Echang residents, have incorporated plants that are exclusive to the northern Palauan Islands into the therapeutic landscape of Echang. They have integrated disease concepts and medicines from other ethnic groups into their own

repertoire of healing strategies. The number of plants reported along with their utility in medicine and healing is striking, especially since a majority of these plants figure into the health seeking strategies of Echang residents to some degree still today.

C. Plants in Tobian Healing

1. Botanical Pharmacopoeia

Nearly every type of Tobian therapeutic involves botanicals at some level. Plants have uses in every stage of Tobian healing beginning with the ritual identification of individual plants for medicines and throughout the processes of illness diagnosis, treatment, recovery, and prevention. In his survey of medicinal plants from Hatohobei, Black (1968) recorded 17 plant species, 14 distinct recipes, and 12 discrete illness-injuries. During the 2001-2002 research period a total of 29 individuals ages 25-82 exclusively from Tobian households, including 18 women and 11 men, participated in several structured interviews regarding the practice of traditional Tobian medicine.[31] Three of these individuals assisted in the collection of voucher specimens and acted as interpreters during interviews with non-English speakers. Plants collected in Echang included 76 genera representing 42 plant families, 106 unique recipes for 51 illnesses (ref. Appendix B). All of the plants referred to in Black (1968) were mentioned during interviews in 2001-2002. Vouchers from Echang were collected and identified for 15 of them, yielding classifications consistent with identifications provided by the Smithsonian Institute.

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[31] A Tobian household is defined as on in which the head(s) of household identifies him/herself as ethnically Tobian, which typically means that one or both of their parents were born and raised on Tobi, they themselves were born and/or raised on Tobi, Tobian is the primary language in their household, they hold title to land on Hatohobei, and they are registered as citizens of Hatohobei State.

The plants that Southwest Islanders in Echang use grow throughout Echang, Koror, Malakal, Babeldaub, the Rock Islands, as well as the southwest islands. The flora of the southwest islands is quite similar to the northern islands with a handful of rare species found only in the southwest (Fosberg, et al. 1980; Keppler 1992; Space, et al. 2003). Most of the medicinal plants used for local medicines in Echang grow throughout the hamlet (Table 13). The botanical pharmacopoeia of Echang is comprised of non-cultigens (N=51, 67.1%) and cultigens (N= 25, 32.8%). Informants described seventeen plants as wild plants that they could collect only on Hatohobei. Some food plants from the southwest islands that also are used in medicine (e.g., giant taro, coconut, citrus), have been transplanted in Echang.

Table 13 Location of Medicinal Plants in Echang and Surrounding Areas

Collection Location Medicinal Plants (N=76)	Plants *N*	 *%*
Home Garden/Ornamental Landscaping	23	30.26
Forest Pathways	19	25.00
Roadside[a]	15	19.74
Village Footpaths	14	18.42
Yard/Dwelling Borders	14	18.42
Marketplace[a]	12	15.79
Farm	7	9.21
Littoral Borders	6	7.89
Taro patch	5	6.58
TOTAL Locations = 9	115[b]	

[a] Located outside of Echang hamlet
[b] Sum is greater than total due to plants found in multiple locations

There is no evidence to suggest that people from southwest island groups brought medicinal plants to Echang with the intent to recreate indigenous therapeutic landscapes. However, informant responses to interview questions regarding their home gardens, healing strategies, and food resources reveal that individuals in Echang value plants that have significant cultural meaning, including healing and nutritional properties. The

Echang landscape does reflect anthropogenic alterations and includes plants that are culturally significant to both southwest island groups and indigenous groups of the main Palauan islands (e.g., betel nut trees, coconut palms, citrus, ornamental landscaping). There are cultivated, wild, and semi-cultivated food-medicinal plants located in home gardens and in forested areas throughout the hamlet. People in Echang weed around culturally salient wild plants in areas that are cultivated or regularly cleared, such as small taro patches, home borders, garden borders, tapioca stands, and footpaths throughout the village and surrounding forests. This strategy of preserving the medicinal plants is one best described as managed (Etkin and Ross 1994:88) and actually plays a role in preserving the botanical diversity of Echang.

Medicinal plants flourish in a wide array of habitats. Forested areas surround Echang on three sides. Echang residents refer to these areas as the "*jungle*." Two uninhabited forested areas situated on opposite ends of the hamlet border shallow ocean coastlines. One end is a highland area adjacent to a residential settlement and several cleared areas of cultivated lands called farm land. A few select Echang residents stake claim to these farmlands, including those who inherited lands during the original land settlement and others who have forged recent alliances with Palauan titleholders. Only those with permission to use these lands continue cultivate food crops. Many non-cultivated medicinal plants thrive in areas that border these cultivated areas. Echang residents generally have equal access to the jungle. At least four areas within these tropical forests have one or more small plots where some households grow taro. People who collect medicinal plants find them anywhere they can in Echang. Since most of the plants are non-cultigens, there are not limitations on who may access them, although it is

polite to ask a neighbor to collect a medicinal that happens to be growing around their home or home garden. Positive social relations factor into access to medicinal plants to a small extent.

Another notable feature of plant use in Echang is that plants occupy a place in multiple overlapping contexts.[32] The following table reflects the variety of contexts in which to find medicinal plants (Table 14).

Table 14 Other Contexts of Medicinal Plant Use

Contexts of Use Medicinal Plants	**Plants** N=76	 %
Food	38	50.00
Cosmetic/Ornamental	18	23.68
Utilitarian	15	19.74
Social/Recreational	3	3.95
TOTAL	74	

The food category includes dietary food plants (e.g., tubers, fruits, vegetables), plants used in the preparation of food (e.g., cooking oils, leaves in which to wrap foods to bake or barbecue), plants that enhance the palatability of foods (e.g., condiments and seasonings), and tonics that periodically complement daily food consumption. Cosmetic or ornamental plant use is comprised of plant products used in oral hygiene, soaps, shampoos, emollients, and perfumes. It also includes the use of plant materials in ritual food preparations, decoration, dance, and art. The utilitarian category refers to botanicals used in construction of technology such as canoe making, rope, home construction, and fishing gear. Finally, the social and recreational category includes the use of plant

[32] A detailed discussion of plants in multiple contexts is included in Chapter Six.

constituents in social contexts of recreational intoxication, such as consumption of fermented coconut liquor and chewing betel nut quid made with slaked lime (*aus)* and *kebui* leaves.

2. Partners in Medicine and Healing

Southwest Islanders in Echang regard individual medicinal plants as having inherent healing properties. Tthey combine plants into partnerships to achieve the full therapeutic potential of each plant (Table 15). The Tobian phrases *pahuh charuhfaruh* ("*partner*") or *itei hiri charufaruh* ("*it is not a good partner*") describe the degree to which plants' healing properties are complementary and together treat a particular ailment effectively.[33] These partnerships strengthen plants that are relatively weak on their own. Partnerships in Tobian medicine reiterates that the therapeutic application of botanicals is not a haphazard phenomenon and is guided both by culturally salient principals and biological outcomes (e.g., Browner and Ortiz de Montellano 1986; 1994b; Etkin 1996a; Etkin and Ross 1991b; Johns and Romeo 1997).

Table 15 Plant Partnerships in Tobian Medicine

No. of Plants in Preparation	Frequency (N)	%
Single plant	44	41.5
One partner	30	28.3
Two or more partners	32	30.2
	106	

Plant partnerships allow Tobian healers to create personalized therapies for particular illnesses. Plant partners enhance the palatability of medicines, particularly

[33] Note: One informant gave a different spelling for the term, partner. They spelled it *paruhar* instead of the more common pronunciation and spelling, *pahuh charuhfaruh.*

ones with a bitter taste or an unpleasant odor. Chuukese healers refer to this type of pairing as *tonaan s'afei* or "medical mixers" (Mahony 1970:89). Pohnpeian healers employ a similar practice in the treatment of spirit illnesses. Certain illnesses called *soumwau en lider* or "side dish sicknesses" require the addition of one or more plants to address the spiritual dimension of the disease in certain individuals (Ward 1977:149).

Plant partnerships create the desired healing combination for a given illness. Tobian medical practitioners employ partnerships to adjust the dose of plant medicines so that they meet individual needs. For instance, the plant *yaho* (*Premna obtusifolia*) is a foundation plant for many Tobian medicines. Tobians call it the "*mother of medicine*." They regard it as extremely potent on its own and use it in a number of preparations. Indigenous healers often combine *yaho* with plants that attenuate its strength so that the individual taking the medicine can tolerate it. In the same way that biomedical pharmacists adjust dosages according to the age and weight of patients, Tobian healers configure plant partnerships to achieve appropriate dosages for each individual.

Tobians differentiate between male and female plants. The metaphorical sexual identity of plants corresponds to leaf shape. Plants with round leaves are designated as female and plants with elongated leaves as male. Tobians characterize male plants as notably stronger than the leaves from the female plants. Female or male plants are often used to manipulate the strength and palatability of other plants.

Tobians living in Echang no longer practice rituals to aid in the discovery of new partnerships. People have memorized recipes for medicines with precision. In the practice of medicine, patients' responses to medicines determine the way in which a healer reconfigures plant partnerships. Three days is the standard amount of time a

person should show some response to therapy. Tobian healers interpret signs of illness progression, egress, and recovery to guide the adjustment plant combinations, dosages, and strength throughout the healing process. These adjustments follow the principles of inherent strengths and weaknesses of plants, their chemosensory properties, their interaction with other plants, and their influence on particular illness symptoms. They also mirror beliefs about inherent physical characteristics of individuals.[34]

Therapeutic partnerships may also involve plant byproducts and non-plant materials. Coconut leaves, seed, seed husk, fibers, and exudates are included in over half (N=56, 52.8%) of all medicinal preparations. Various coconut products make medicines more palatable and easier to apply to the body. Coconut is also used widely for its ability to warm the skin, increase circulation, or clear congestion. Fresh water, certain types of fish, food products, and seawater are partners for plant medicines and guide the delivery of the medicine to the appropriate part of the body.

Several key medicinal plants are difficult to procure in Echang and in the northern Palauan islands. As a result, numerous indigenous medicines are no longer used. Without the proper partnerships, Tobians believe that medicines are incomplete and relatively benign. Incorrect plant partnerships are dangerous at worst and impotent at best. For this reason, the majority of indigenous Tobian medicines that circulate in Echang are those for which all plants are procured easily. The traditional recipes that Tobians use in Echang are time-tested and people employ them with a degree of confidence. The risk of placing a family member, neighbor, or friend in danger by using

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[34] Refer to the previous chapter for details on Tobian theories of individual physical variation and their responses to illness and medicines.

unknown medicines is too high to warrant experimentation in Echang. The broad range of medical alternatives available to those living in Echang such as Palauan medicine, Yapese medicine, or Chinese medicine further supplants the need for precarious experimentation. The convention for partnerships is more flexible when people combine medicines and healing techniques from distinct healing practices. The integration of indigenous Tobian healing with practices from other medical paradigms grows out of the theory of healing partnerships. People are more likely to experiment with complementary use of therapeutic techniques from other medical systems than they are to create new plant medicines or try out new plants in traditional recipes.

Tobian theories of efficacy hinge on the harmonious interplay of partnerships at all stages during the healing process. Plant partnerships represent just one level of complementary medical theory in Tobian medicine. A second level is the use of complementary healing techniques during the healing process. Tobian healers pair different healing modalities to complete therapy. Physical activities such as ritual swimming and bathing constitute yet another group of potential therapeutic partners. Tobians believe that seawater calms the body, relaxes the muscles, increases circulation, and prepares the body to accept the medicine. Together, these physical activities promote the efficacy of medicinal plant preparations.

A final type of partnership is essential to Tobian healing processes. This partnership exists between the healer and the recipient of medicine. As explained in the previous chapter, the relationship between healer and patient is one that once was based on a great deal of trust. In a time of sorcery and black magic, rarely did people ask for healing assistance from anyone other than a trusted friend or relative. It appears that fear

of black magic does not play into contemporary healing strategies in Echang. However, the healer-patient partnership remains paramount in local explanations of healing efficacy, both in contexts of indigenous healing as well as in pluralistic contexts. People do not use medicines they do not trust. Whenever possible they seek medical care from trusted and respected individuals, whether it is a nurse, physician, or local healer. Likewise, those who prepare plant medicines must consider whether they can create a safe and effective medicine responsibly. They also should reflect on the type of personal relationship they have with the person asking for the medicines. In the same way that inappropriate plant combinations hinder therapeutic processes, weak healer-patient relationships hamper the quality of medicine and the potential for healing to take place.

3. Ritual Plant Selection and Collection

Most plant medicines used in Echang derive from memorized formulae that were passed down from one generation to the next. Tobians describe a variety of magic rituals that their ancestors used to acquire secret medical remedies from ancestral spirits and gods. The two most prominent modes of divining healing knowledge were whispered magical chants (*hamoungungu*) and divining medicinal recipes from interpreting the knots of coconut leaf fronds (cf., Lessa 1959; Palau Society of Historians 1997). According to Tobian wisdom, these rituals led to the original plant medicines and therapeutic partnerships.

Ritual chanting and reading coconut fronds were methods that provided healers with specific information about plants and medicines, including particulars like the part of the plant to collect, the quantity and proportion of plants, medicinal recipes, and therapeutic combinations. It was then up to the healers to decide, based on their talent

and expertise, how to prepare the medicines, how to apply them, how often to administer the medicines, and the proper medicine combinations to use. It was possible for the healers to receive some clues about preparation and administration of medicines from the spirit world, but Tobians describe the art of applying the medicines as one perfected by qualified individuals only after years of practice. Both men and women gained medical expertise through mentorships. Knowledge passed from older to younger generations starting in childhood. Children accompanied adults to collect plants and observed them making preparations and administering medicines. Tobian medicine specialists living in Echang acquired medical knowledge from their parents and grandparents.

At one time, ritual accompanied all medicinal plant collection on Hatohobei. Tobian healers followed numerous behavioral guidelines before, during, and after the entire healing process in order achieve a state of relative purity. The proscriptions varied from person to person and reflected healer characteristics like age, gender, and marital status. Food avoidances and sexual abstinence were the most common restrictions. Healers usually collected plants following a fast of 24-48 hours. They gathered plants cautiously in the darkness, usually very early in the mornings. If a medicine required five different types of plants, the healer would collect more than five different types of plants to ensure that no one else would be able to copy or curse the medicine. Healers also diagnosed illnesses, prepared the medicines, and administered therapies. They held the sole responsibility of evaluating their patient's response to therapy throughout the healing process. In order for healing to occur, the person in charge of medicine was required to follow behavioral protocols until their patient recovered fully. In Tobian healing, the

healer carries the burden of recovery. For this reason, individuals agreeing to assume the healer role took every possible precaution to evade contamination.

To a limited degree those who engage in plant collection and medicinal preparations, continue to observe behavioral guidelines such as food avoidances and sexual abstinence prior to collecting plants. People often collect plants early in the morning before they eat their first meal, although they do not make a point to collect in secret as they once did on Hatohobei. Individual variation exists in the extent to which contemporary indigenous medical practitioners follow traditional behavioral protocols. The distribution and abundance of plants in Echang and surrounding areas, along with differential access to these plants, has influenced the manner in which people collect and use plants in medicine.

At one time Tobian healers were experts of the physical, chemical, and symbolic botanical landscape. They used their knowledge of therapeutic landscapes to collect the proper plants both in the dark and in secret. Medicinal recipes that called for specific plant constituents and required plant collectors to discern various plant characteristics including species, age, sex, and stages of growth. The skill required for plant collection in Tobian medicine resonates with other medical traditions of Micronesia. On Pohnpei only *Flagellaria indica* leaves that were curled completely were acceptable for use in certain recipes (Ward 1977:163). Palauans were required to study trees as a way to ascertain whether they were suitable to be used in medicine Palau Society of Historians 1997). Tobians regard plants with certain chemosensory properties as strong medicines. The strongest Tobian medicinal plants have a notably bitter taste or pungent odor. The bitter taste is associated with "*cleansing*" properties of the plant, a characteristic probably

associated with diuretic, emetic, and purgative actions. Healers employ bitter medicines to rebuild broken bones, "*make the body strong*," to "*remove waste,*" and to "*clean the blood.*" Sweet taste that is characteristic of young coconut juice, coconut syrup, and coconut milk is associated with "*pushing heat out*" of the body and cooling the body's core temperature. Indigenous medical practitioners monitor chemical reactions in decoctions or infusions to determine when a medicine is ready for consumption. Variations in color, odor, and texture signify the strength of a medicine. For example, tonics containing *fariap* (*Syzgium malaccense*) range from a pink color, indicating a weak infusion, to a deep red color, indicating the most potent infusion. A number of coconut oil based skin ointments require the plant constituents to soak in the oil for one to two days before the first application, or until the oil has reached the appropriate color and odor (e.g., yellow, brown, green).

Tobians in Echang no longer employ organoleptic properties of plants during selection and collection since the medicinal recipes they use already have clear guidelines. However, the sensory properties of plants do play a role in individual strategies for integrating new plants and pharmaceutical drugs into traditional healing practices at the household level.[35] In general, chemosensory properties play a role in individual interpretations of medical efficacy. The taste, color, and odor of medicines from various healing paradigms influence the ways individuals understand, and potentially adopt, new medical practices. For example, in indigenous Tobian medicine sweet medicines promote the treatment of fever, flu, congestion, and other symptoms associated with cough or cold. Tobians in Echang associate the sweet-taste of over-the-

[35] Detailed descriptions are provided in the discussion of medical pluralism, later in this chapter.

counter cough medicines, lozenges, and Gatorade with plant medicines that are salutary for fever. Bitter tasting pills purportedly work because of their ability to promote internal healing.

Echang is a truly multicultural community. Tobian resettlement in Echang required social and cultural integration with other ethnic groups from the southwest island, Palauans, other Pacific islands, Southeast Asia, and Europe. In the same way that space and resources are shared in Echang, medical knowledge is also shared. Although this type of sharing is a (very) recent phenomenon, even in Echang, people throughout all the various cultural subdivisions exchange ideas, practices, and knowledge, particularly during medical problem solving. While Tobians agree that innovations and substitutions in medicinal protocols are not practiced in Echang, they also reported learning about new plants and uses for familiar plants from neighbors and friends. Non-Tobian plant-based therapies are used by Tobians but with the clear understanding that they are not Tobian. Since they are not Tobian, certain protocols regarding the preparation, application, relationship of the healer to the patient, and so forth, are not followed necessarily when using non-Tobian healing alternatives.

4. Modes of Indigenous Tobian Healing

Tobian healing encompasses a variety of plant-based therapeutic alternatives, each of which addresses a variety of physical manifestations related to an illness or injury (Table 16).

Table 16 Tobian Medicinal Preparations by Type of Illness

Tobian Nosology	Biomedical Analogue	Medicinal Preparations (N)
hameteri retip	general internal disorders	23
hameterisi (pahecha)	stomach, GI disorders	19
matamat	dermatological disorders	18
ehameteri, etewas	muscle aches, pain	17
mehitariga meta, yeturong tafaief	minor cuts, wounds	15
-	peri-partum preparations	11
finchingerichil	broken bones	8
yehameta taringei	ear infections/injuries	3
yehangahang/yohochohoch metaiei	eye infections/injuries	4
moh	oral thrush	7
hameteri chimei	upper respiratory illnesses	7
ifou	febrile disorders	3
		135

As described in the previous chapter, Tobian medicine aims to treat the most obvious symptoms of illness and injury. Pinpointing the cause of illness has a place in Tobian healing, but it is not the fundamental component of healing that it is in other medical systems of Micronesia (e.g., Alkire 1982; Lessa 1959, 1977; Mahony 1970; Palau Society of Historians 1997; Riesenberg 1948; Ward 1977).

Tobian medicine offers a range of internal and external therapies, some topical and others ingested (Table 17). In general, Tobians categorize medicines based on mode of preparation (e.g., boiled, barbecued, pounded, infused with oil, soaked in water) or on mode of application (e.g., massage, medicine that you drink, medicine that you inhale). Neither of these methods of categorization appears to be more prominent or important than the other, and both are significant to understanding the range of indigenous Tobian medicines. For ease of discussion, the following section is organized according to mode of application, and each section contains a description of common methods of preparing these types of medicines for therapeutic use.

Table 17 Tobian Healing Modalities

Healing Modality	Medical Preparations N	%
topical	36	30.0
drink (includes tonics)	34	28.3
massage	11	9.1
bathe	10	8.3
masticatory	8	6.6
sleep in medicine	7	5.8
oral-gargle	6	5.0
eat	6	5.0
inhale vapor	2	1.7
	120[a]	

[a] This sum is greater than total number of preparations (N=106) because a single preparation can be applied in more than one modality

a. Medicine to Eat or Drink

Typically, Tobian medicines are consumed as a drink *(tafei rur)*. Rarely, medicines are made into solid form and eaten (*tafei mangau*). The major component of *tafei rur* is a liquid base that is infused with plant constituents. Seawater, juice from a young coconut (*yator*), or fresh water comprises the liquid base for these medicines. Sometimes Echang residents will substitute a homemade saline solution (store-bought salt mixed with fresh water) for seawater.

Medicines to drink include decoctions, cold and hot water infusions, or extracts. Decoctions and infusions are prepared by gathering the plant materials and pounding them together with a mortar and pestle. The resultant pulp is placed into a container and filled with the appropriate liquid base, usually plain water or young coconut juice. The pulp may be strained through a coconut fiber cloth (*uhr*) before consumption. The extract of plant materials, usually leaves, fruit, and roots, are prepared by pounding the

plant medicines and straining them through an *uhr* until they render their own liquid. The extract may be consumed on its own or mixed with water, coconut milk, coconut juice, or coconut oil. Medicines that are eaten are usually pounded and mixed with coconut oil to facilitate ingestion.

b. Tonics

Although rarely used in Echang, tonics (*taferi hamoho tetipach*)[36] are important features of indigenous Tobian medicine. Tobian tonics are medicinal drinks that supplement diet and prevent disease. They are administered and prepared in the same was as other *tafei rur,* but the context of their use is more complex than other medicines.

Tonics are simultaneously part of food and medicine, but they carry different meanings depending on the circumstances of their use. Tonics are primary medicines that have specific actions such as removing waste and connecting injured tissues and internal circulatory pathways. They often supplement other therapeutic modalities such as massage to address the internal disorders that may not be obvious externally, as in the following recipe:

> *Taferi homoho tetipach* for use after a bad fall with broken bones, to "connect the inside and clean it out": pound *uhn chaowor, uhn ngou, uhn chichi, uhn yohoma, and uhn yerao.* Mix with the juice of the young coconut. Drink this after a fall with broken bones when internal injuries *hameteri retip* are suspected. Use it with *tafeieri chouchou* and also *warurani tafei.* This can be taken anytime to strengthen the body.

In the absence of illness, tonics prevent sickness and provide nutrients to the body, a use that reflects Tobian awareness of the healing properties of botanicals and the role of nutrition in susceptibility to illness.

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[36] An alternative spelling is *tafeieri hamoho tetipach.*

It is reasonable to postulate that tonics were a significant source of nutritional supplementation for Tobian islanders.[37] Interviews indicate that tonics were consumed regularly to "*strengthen the body*," "*prevent sickness*," and to "*add vitamins*" to the diet. Household members shared tonics made in large batches. A number of factors influenced the preparation of tonics. Illness within a household, illness spreading throughout multiple neighboring households, seasonal variation in food availability, the availability of plants to make the tonic, variation in knowledge of tonic recipes and their use shaped the frequency with which Tobians consumed tonics in the past. Tobians in Echang provided 13 distinct recipes for *taferi homoho tetipach* (ref. Appendix B), a majority of which belong to the category of medicines that healing internal illnesses and injuries (*hameteri retip*) (ref. Appendix A).

People only used one type of tonic, *noni*, with any regularity in Echang. It is made with fruits from *Morinda citrifolia*, which Tobians call *nuhr*. Tobians and other southwest island groups did not use *nuhr* as a tonic in past indigenous medical practices. Yet, the use of *noni,* with its diuretic action, resonates with local perceptions of the plant's cleansing properties. People's familiarity with *nuhr* in indigenous medicines has facilitated the widespread use of *noni* in contemporary health practices. Tobians refer to the tonic as *noni*, denoting the non-indigenous preparation of a familiar plant. The pervasive use of *noni* in Echang is yet another example of the growing popularity of this plant throughout the world (e.g., Dixon, et al. 1999). Several women in Echang incorporated *noni* into diet as a supplement, taking it several times a day for a variety of purposes ranging from weight loss to stomach pain and ulcers.

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[37] The next chapter deals with the nutritional significance of plant use, including tonics.

c. Massage

Tobians often describe therapeutic massage *(tafeieri chouchou*[38]*)* as a "*good first medicine*" that prepares the body to accept therapy as well as a "*good final medicine*" that helps the body to settle after medicine has been taken. They also use massage to relieve symptoms of internal or external illnesses and injuries as well as muscular pains from daily activities and overexertion. Tobian approaches to healing are holistic. The entire body is massaged even if there is a specific location from which illness emanates. Tobian theories on the healing properties of massage center on a belief that massage helps to open the body's circulatory pathways facilitating the removal of impurities. Massage reduces swelling in the skin due to infection, edema, and inflammation. Knots and adhesions in the musculature are symptoms that contaminants have accumulated in the body. Tobians use massage to reduce muscle tension caused by stress, headaches, and pain.

Massage serves a dual purpose in Tobian healing. On its own, it provides therapeutic benefits by boosting circulation and moving impurities out of the body. It also accelerates delivery of medicines into the body. Tobians in Echang described eleven distinct medicinal preparations specifically for their use in therapeutic massage (ref. Appendix B). Basic medicinal preparations for therapeutic massage involve pounding the plant materials together and mixing them with coconut oil. Today, people use homemade and store-bought coconut oil interchangeably, depending on what is available.

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[38] The original term I had recorded in my field notes was *tafei choucher.* When the term was posted on the FOTI website in October 2005 Huan Hosei suggested an alternative and perhaps more accurate, spelling: *tafeyeri tsoutsou.* The "ts" he proposes is the phonetic equivalent of "ch" in English. In an effort to standardize the orthography of Tobian terms in this dissertation, I changed the spelling to *tafeieri chouchou.*

Massage and bone setting are overlapping therapeutic domains in indigenous Tobian healing. Tobian bone setting entails the manipulation of muscles and bones using massage. It involves the use of bindings (e.g., soft casts, splints) and poultices to attend to the external facets of injuries. Internal medicines like *tafei rur* or *taferi homoho tetipach* augment manual therapy and "*put back together*" or "*connect*" the broken bones and tissues. Tobians in Echang concur that traditional means of bone setting are far superior to biomedical casting techniques. They note that with Tobian *tafei* injuries seem to heal more quickly, the alignment of the bones is more precise, and there is virtually no long-term residual pain once the injuries have healed. People who have had a broken bone repaired at the hospital report significant chronic pain years after the plaster cast was removed. Many Echang residents ranked indigenous bone setting or massage as a first resort for broken bones or strained muscles. They also use traditional massage to complement any treatment of bone fractures at the hospital.

Heat therapy is a vital component of Tobian manual therapies. Healers use warm oil or heated poultices during massage and bone setting. Leaf pouches made out of *wich* (*Musa sp.*), *wot* (*Cyrtosperma chamissonis*), or *buroh* (*Colocasia esculanta*) are filled with a mixture of pulverized medicinal plants and coconut oil. These pouches are placed over smoldering coals, heated, and then placed directly on the body. Because it is so painful, Tobians regard this type of heat therapy as exceptionally strong medicine. One woman described the use of such a medicine when her mother, who was born and raised on Hatohobei, used this type of medicine to set her neck after she fell from a tree as a child:

> ... Eight bundles of the medicine was made and then applied all over the body from the head to all the way down to the toes. This you do two times so that 16 bundles are used. After the first eight are used, then you heat again and you rotate them. You also sleep on the medicine, the one that is inside the bundle. Do this for two weeks. Each morning you get up to swim in the sea, then put the medicine on the same way, then massage the medicine. You also sleep on it. You know the one, *warurani tafei*? Every 2 days, maybe even every day, you also go to get new medicine to put inside. This one I learned from my mother, when she moved from Hatohobei to live here in Echang.

People in Echang describe individuals who are skilled at therapeutic massage as having "*good hands*" or "*strong hands*." Indigenous massage therapists have mastered manual healing techniques, and they understand the ways to manipulate tissues and bones to induce healing. They acquired this expertise from mentors in the same way healers learn to identify plants and prepare medicinal recipes. Four people in Echang, two Tobian women, a woman from Sonsorol, and a man from Yap, were particularly skilled in massage. Indigenous healers may be well versed in both massage and plant medicines or they may specialize in only one of these two domains of healing.

Basic massage, which consists of applying medicinally infused oils into the skin, does not require special instruction. Mothers often massage plain coconut oil, mentholated ointment, or medicinal oils on their children's chest, back, and forehead to treat cough and congestion. It is also common for mothers and grandmothers to massage newborn babies as part of a daily bathing ritual during infancy. Ritual bathing massage helps infants to relax, to encourage their body grow strong, and to promote proper alignment of bones and muscles. People apply self-massage to boils and areas of the skin swollen from infection to help break up the infection and remove the pus. Individuals often massage coconut oil into their own forehead to relieve headache pain.

d. 'Sleeping in the Medicine'

Tobians describe a therapy called *warurani tafei*, or "*sleeping in the medicine*," as salutary for internal and external injuries or illnesses. This healing modality involves plant preparations and is always a secondary partner to a primary medicine. Methods of preparing plants for *warurani tafei* and massage are the same. A mixture of pulverized plants and coconut oil are spread onto a sleeping mat made out of *fach* (*Pandanus sp.*) or coconut leaves. Following a massage or taking an internal medicine, the patient lays on the mat for a specified period ranging from one night to several weeks. The quantity of the medicine and the number of days required to sleep in the medicine is determined by the intensity of the pain, severity of the illness, and individual patient characteristics. Sleeping in the medicine confers the longest exposure of patients to the medicinal plants.

e. Topical Application of Plants

Pulverized plant, poultices, and medicinal oils are applied to the skin for a range of external injuries, wounds, and skin ailments. These topical medicines differ from those used in *warurani tafei* and *tafeieri chouchou* in that they are not massaged into the skin. Their superficial application reflects their use in treatment of skin ailments and not internal tissues and organs. These medicines stop bleeding, disinfect wounds, clear irritation and redness, and mend the skin. Medicines in this group include single plants and complex preparations. Topical medicines are the most common type of Tobian medicine. Tobians in Echang described 36 distinct topical preparations for a variety of external illnesses and injuries (ref. Appendix B). The following vignette illustrates the use of one such topical medicine in Echang:

During April 2002 over the course of five days, a 27-year-old man received indigenous Tobian treatment for an infected wound. He had fallen on a sharp piece of metal that caused a deep laceration in his forearm. The area immediately surrounding the wound was swollen, bruised, and filled with yellow pus. Despite its impressive presentation, he called the illness 'mehitariga meta,' an ordinary injury. The man's mother, a respected indigenous medical practitioner, prescribed a multi-faceted course of action.

Each morning the young man was required to swim in the sea for 15 minutes. This would relax the muscles in his body, and the salt water would clear the impurities and help close the wound. Before eating his morning meal, he was required to collect the medicinal plants for his mother. All of the plants were procured easily in Echang. Both his mother and father were well versed in Tobian medicine, and he himself had a considerable repertoire of medicinal recipes committed to memory. He also knew of places to find plants for Tobian medicines in Ngerekebesang, Koror, Malakal, and the Rock Islands. Part of his continuing education in Tobian tafei was to collect the plants for his own medicine.

Upon returning home after a day's work, the young man swam in the ocean for 15 minutes to prepare his body to receive the medicine. His mother prepared the medicines while the young man was swimming. She pounded mountain apple leaves and store-bought coconut oil together in a mortar, placed the mixture into four taro leaf pouches, and tied the pouches closed. Then, she placed the sealed pouches on top of smoldering coals and covered them with half shells of coconut husks. After several minutes, she removed the pouches from the heat, opened them, and applied the steaming hot mixture from inside the pouch directly to the wound. The heat from the medicine caused extreme discomfort. After the medicine had cooled on the body, the mother removed it from the skin, replaced it into the pouch, and put the pouch onto the smoldering embers again. Each pouch was recycled once for eight total applications. This healing process took five days. At the end of the fifth day, the wound closed with no visible sign of infection. The swelling and inflammation were gone. Two weeks after the healing process, the wound had mended with minimal scarring.

f. Medicine Baths

Tobians use medicinal water baths and steam baths to treat symptoms, prevent illness, or to maintain strength and health. To bathe with the medicine, a person simply splashes ward or cold water infused with a plant medicine on the body. Medicine baths may also include application of medicinal oils before, during, and/or after the bath. Steam baths involve a person inhaling medicinal vapors produced by boiling pulverized medicinal plants and water in an enclosed space such as a tent or bathhouse. Informants in Echang provided ten recipes for medicinal baths (ref. Appendix B). Medicinal baths alleviate congestion, treat upper respiratory infections, and figure prominently into peri-partum bathing rituals.

During pregnancy, women begin bathing exclusively with medicinal oils that act as an emollient to prevent scarring. The medicine also protects mother and fetus from illness and black magic. One recipe includes coconut oil infused with pounded dried ginger root (*Z. officinale*). Pregnant women apply the medicinal oil before, during, and after bathing. Some women practice post-partum rituals using medicinal bath preparations with *fariap* (*S. malaccense*) or *sis* (*Cordyline fruticosa*) for up to 6 months. One preparation calls for a steam bath made with *kare* (*Limnophila sp.*) designed to close the womb. This type of steam bath ensures that stretch marks will disappear and encourages the womb to close properly. Women bathe young infants with coconut oil to warm the baby, massage the muscles, and promote proper circulation.

g. Medicine to Chew On and Spit Out

A number of Tobian remedies involve the mastication (*nguung)* of medicinal plants. Sometimes, healers instruct patients to chew a plant so that the medicine mixes with saliva. The patient will swallow only the saliva and then discard the chewed plants. Another technique is that a healer will chew a plant and then apply the medicine by spitting it out (*hutuf*) directly on the patient's body. Tobians are adamant about the effectiveness of these therapies.

Chewing and spitting medicine occur primarily in treatment for ears and eyes, and to a lesser extent in the treatment of nose and mouth disorders. Tobian healers typically use constituents of young plants for masticated medicines because young plants are cleaner, fresher, and more effective than aged plants. For medicines that require a healer to chew a medicine and spit it on a patient's body, a papaya (*Carica papaya*) stem helps

direct the medicine into the eyes, ears, and mouth. Sometimes they spit the medicine directly from the mouth onto an injury.

Tobians often apply medicine to the opposite ear or eye from the one that is infected. For instance, if the left ear is infected and draining, a healer will apply masticated medicine to the normal ear first. The same holds true for eye injuries. The reason for this is to prepare the good ear to resist illness if it should migrate from the bad ear. The medicine applied to the first ear is preventative. The medicine applied to the second ear is therapeutic.

D. The Healing Process

Despite household variability in medicinal recipes, use of therapeutic modalities, and treatment indications for particular illnesses, Tobian descriptions of the healing process reveal remarkable consensus. Tobian healing is a cultural system in which people share theories of healing, but where the specifics of therapy encompass a wide range of variation. Tobians explain that healing is a process that involves observation, diagnosis, medicine, recovery, and prevention. Tobian definitions of healing as a process resonate with those of other southwest island groups. Such conceptualizations of healing resounds with Etkin's (1988:299) definition of healing where there are "stages to which are ascribed different meanings and for which the outcomes expected at each stage of prevention and therapy may vary from one medical system to another." The following sections detail the various stages of healing in indigenous Tobian medicine of the past and present.

1. Preparing to Heal

Tobian approaches to healing are holistic in the sense that somatic and psychological aspects of the individual are addressed simultaneously and continuously. According to the Tobian healing ideology, the primary burden of recovery from an illness or injury rests with the healer. As we saw in the previous chapter, every illness implies varying degrees of inherent weaknesses in the body and mind of a person. The more serious the illness the more responsibility a healer acquires when s/he agrees to participate in the healing process.

The terms pure, clean, and empty pervade Tobians' descriptions of the ideal physical and mental state a healer should achieve before initiating any type of therapeutic ritual or procedure. Food avoidances, restrictions on sexual behaviors, and spiritual meditation are healing rituals designed to purify both the body and mind of a healer so that they will be able to deliver the most potent medicine to their patient. The inherent mental and physical strength of an individual receiving treatment contributes to recovery, but to a lesser extent than the skill of an experienced healer.

Ideally, a healer gives their full attention to the process of diagnosis, plant collection, medicine preparation, and application. Treating an illness with traditional methods can take anywhere from days to several weeks, depending on the seriousness of the illness and complexity of the therapy. The practice of medicine is a full-time endeavor and Tobians describe it as physically taxing and intellectually demanding work. It is time-consuming, requiring frequent periods of rest, reflection, plant collection, medicine preparation, and observation. Among the many possible explanations for treatment failure is that the healer did not prepare appropriately for the task. An

experienced healer understands the correlation of psychological and physical preparation with recovery. As a result, they try to incorporate such mental and physical preparation into all aspects of the healing process.

2. Therapeutic Diagnostics

Therapeutic diagnostics involves the interpretation of physical symptoms during the healing process and the designation of a therapeutic regime to address these symptoms. Although elucidating illness causation has its place in Tobian healing, it is peripheral to discovering a therapeutic protocol that is most effective for each individual. A person's response to therapy provides the healer with important cues about the location, extent, duration, and progression of illness. When an illness or injury presents itself, the cause of the health issue may be apparent, unknown, or some combination of the two. Even in cases of injuries with a straightforward cause, healers understand that the location and extent of illness is not always as obvious as it may seem initially.

A single illness often morphs into several once therapy begins. For instance, if a person has a fever with no other appreciable symptoms at the time that therapy begins, a Tobian healer will most likely prepare a medicine simply to push heat out of the body. Since fever is often associated with the accumulation of blood and heat inside of the body, massage or medicinal baths make appropriate partners for the initial therapy. Appearance of a skin rash is one possible indication that heat is moving out of the body. A separate medicine may be in order to alleviate any associated discomfort. Tobian healers may treat various emergent illnesses concurrently, or they may delay treatments for the secondary and tertiary illnesses, depending upon the manner in which the discrete medicines interact with each other. Patient observation throughout the course of therapy

is necessary to examine and treat latent illnesses. The art of Tobian medicine rests in large part on the healer's expertise and interpretation of physical symptoms. Not every healer will interpret symptoms or prescribe treatment in the same way.

Tobian healers often use plant medicines to tease out concealed illnesses. For example, bitter medicines (*tafei meugh*) induce vomiting when internal injuries are suspected. Vomiting expels pooled blood and other impurities that may have accumulated in the stomach because of internal injuries. The volume, color, odor, and frequency of vomit all provide clues as to the extent of illness and next steps in treatment. Skin eruptions, sweating, loss of appetite, vomiting, and shaking are key physical signs that healers use to determine whether illnesses are leaving the body. The plant *hauhuh* (*Erythrina variegata*) helps healers determine the right time to initiate massage following an internal injury. After the patient takes *hauhuh,* the healer observes pulse rate, skin temperature, color of the skin, and odor of the breath as a way to ensure the absence of internal infection, since it is dangerous to do a massage while internal infection is present.

Indigenous Tobian healing accommodates the ever-changing conditions of individuals and the variety of physical manifestations of illness that may arise. The potential for continuous presentation of novel illnesses during the healing process is the reason for fluidity in Tobian medical protocols. Therapeutic flexibility allows for individualized therapy and room for the unexpected. If a particular medicine does not precipitate any change in a patient, then a healer may amplify its strength. Healers adjust dosages by varying the ratio of primary plants with secondary and tertiary ones. They may also simply increase the frequency of doses. Repeated adjustments that do not yield the desired outcomes usually lead to a discontinuation of a particular medicine, therapy,

or group of therapies. It is important to note that during the early stages of therapeutic diagnostics, a desired outcome may actually manifest itself as the appearance of new illnesses, which signals illness egress, rather than the elimination of primary symptoms.

The unpredictable nature of illness presentation, the subtle hints of illness, and the signs of healing often require a high level of expertise to understand them. Tobians in Echang explained that while they may know a recipe or two for a medicine and have watched others give the medicines they themselves would not feel comfortable practicing the medicine without the help of an elder who had the experience to use the medicine. Only a handful of people in Echang have the skills to practice therapeutic diagnostics. However, a belief that therapy may give rise to latent secondary illnesses provides a conceptual framework from which medical pluralism in Echang originates.

Echang residents describe biomedicine as a system that addresses one illness at a time and addresses illnesses in a compartmentalized, incomplete manner. One of the reasons people in Echang continue to use indigenous medicines is that they want to treat what they interpret as secondary or emergent illnesses (e.g., side effects from medications or residual pain after a medical procedure) that manifest after biomedical treatment has started. In this sense, indigenous medicines complement biomedical therapies. People in Echang may not practice therapeutic diagnostics, but they understand its concept and principles, which provide an explanatory framework for side effects of pharmaceuticals and other biomedicines.

3. Food and Healing

Foods permeate numerous Tobian healing contexts. People observe food avoidances to prevent illnesses. Dietary proscriptions provide the strength needed to

speed illness recovery. Tonics are both a food and a medicine, and most medicinal plants are food plants. Many foods complete partnerships in medical therapies.

One example of food as a partner for medicine is the therapeutic use of reef fish in the treatment of *moh* (oral thrush). Feeding infants barbecued reef fish is one way some parents in Echang attempt to prevent *moh* in their children. Echang residents provided four different medicinal recipes for *moh* in addition to the one reported in Black (1968). Five species of small reef fish qualify as partners, or as the final step, for the treatment of *moh*. They include *horech* (convict surgeonfish, *Acanthurus triostegus*), *hathi* (small toothed emperor, *Lethrinus microdon*), *herisonoboi* (highfin rudderfish, *Kyphosus cinerascens*), *herimuou* (low fin rudderfish, *Kyphosus vaigiensis*), *mor tamuch* (big scale soldierfish, *Myripristis berndti*). Parents consider these fish healthy for small children in general but particularly effective in treating children with *moh*. Children with *moh* eat the fish barbecued so that the meat is warm but still mostly raw. Since swallowing is difficult for a person with *moh,* the slippery consistency of the fish along with their intrinsic healing properties delivers medicine as well as food nutrients. The fish also helps to increase appetite. Tobians believe that the exclusion of fish in the *moh* treatment causes recovery to slow.

Taro is another food that acts as a therapeutic partner. It prevents vomiting when people take medicines that are strong, bitter, or otherwise difficult to digest. While certain medicines induce vomiting as part of therapy, diagnosis, or both, others aid ingestion and absorption by the body. When eaten before taking bitter medicines (*tafei meugh*), baked giant taro (*buroh*) forms a buffer that prevents indigestion and nausea. Mountain apple fruit (*fariap*), sugar cane (*suka kein*), coconut syrup *(richo*), coconut

juice (*yator*), and coconut milk also enhance the palatability of medicines as well as foods in general.

4. Recovery

Tobians describe recovery as a process that involves passing through a period, or sometimes multiple periods, of illness before returning to a state of relative health. Recovery also encompasses a variety of social and spiritual components. At the center of Tobian healing and recovery are the patient and healer. Situated around a metaphorical periphery are the immediate members of the household, extended family, neighbors and community members, and religious leaders. Illness severity, which is measured in terms of number of symptoms, duration of illness, response to medicines, and length of time before the patient responds to medical therapy, influences the extent to which members at the periphery become actively involved in the recovery process.

Numerous Tobians in Echang speak of caring for an individual's mental-spiritual health as an important component of recovery. Members of the household participate in caring for individuals who are ill by preparing meals, bathing, cleaning, performing basic massage, and simply keeping them company. Tobians and others in Echang consider people who are lonely, frightened, and weak as more susceptible to illnesses, and so the psychological and social support that community provides is valuable. Group prayers are important activities that kin and community members can participate in to show their support for their friend or family member. Echang residents from all groups explain that recovery occurs more rapidly for sick individuals who have family and friends who participate in the process than those who have no one to rely on for support. The role of kin and community becomes increasingly important in the treatment of chronic illnesses

and illnesses that require continuous care and rehabilitation for very young children and the elderly.

5. Strengthening and Prevention

According to Tobians in Echang, adhering to behavioral protocols, appeasing ancestral spirits, and avoiding witchcraft used to be the primary means of preventing illness on Hatohobei. A person's physical and mental strength also related to their susceptibility to illness. Activities that promoted strength and vitality, such as daily physical activity and eating a good meal, were important in maintaining health. Tonics regularly enhanced strength and prevented illness. Healers often administered tonics to a patient at the end of the healing process as a way to mark its conclusion and stimulate appetite.

The concept of strengthening and prevention remains salient in contemporary medical strategies in Echang. Massages, bathing in medicine, special diets, swimming in the ocean are all healing activities that can help a person regain strength when recovering from an illness. A strong body also prevents the onset of illness.

E. Medical Pluralism in Echang

The emigration of southwest island populations to Echang precipitated a major transition in medical practices and beliefs. For the greater part of its history, indigenous Tobian medicine operated in relative isolation. The arrival of foreigners and the manufacture of medical dispensaries in the southwest islands provided limited access to pharmaceutical drugs and basic healthcare. Opportunities to travel to the main Palauan islands in order to access comprehensive health care was sporadic at best and offered only minimal health care security for Southwest Islanders. Furthermore, for many of the

infectious disease outbreaks in the southwest islands during early periods of colonization, there were few if any known biomedical cures for these illnesses. Two notable examples were outbreaks of syphilis and tuberculosis during the Japanese administration for which no medicines were available to address these diseases (Peattie 1988).

Despite the weaknesses of foreign medicine, reliance on foreign biomedical care in Palau gained momentum steadily throughout the Trust Territory period until present. American biomedicine is by far the primary health care system of choice throughout Palau. Its influence in the life of people living Echang cannot be underestimated. Tobians residents often cite improved access to hospital care and pharmaceuticals as one of the chief reasons for the nearly complete emigration of their populace to Echang.

Today in Echang, all residents have access to comprehensive biomedical health care through physicians in private practice, hospital services, medical dispensaries, and volunteer community health projects. They also have access to non-biomedical alternative therapeutics, including but not limited to Palauan plant medicines, traditional Chinese medicine, and Yapese medicine. Prescription pharmaceuticals and over-the-counter drugs are found easily in any number of department stores, drug stores, markets, dispensaries and pharmacies throughout Palau. The proximity of Echang to the medical diversity in Koror has indelibly shaped Tobian and others' beliefs about health, disease, and medicine.

The following discussion outlines the context of medical pluralism in Echang. It describes the range of health and medical care from which Echang residents may choose. Emphasis is placed on the position of indigenous medicines in a pluralistic context, perceptions of medical efficacy among Echang residents, the complementary nature of

medicines in Echang, and the role of ethnic identity in Southwest Islander constructions of quality biomedical health care.

1. Hospital Care and Public Health

The Republic of Palau subsidizes medicine so that all citizens have access to health care. The Palauan government contributed approximately seven percent of the nation's gross domestic product (GDP), which totaled about $633 USD per capita (World Health Organization 2005), on health care in 1997. This amount is substantially higher than the total spent by a majority of other Pacific Island nations. The expenditure was made possible with the large subsidy Palau receives from the U.S. as part of the Compact of Free Association as well as humanitarian aide from several United Nations agencies.

The major health center in Palau is the Belau National Hospital (BNH) located in Koror, only five kilometers from Echang and no more than a two-hour drive or water commute from areas in the main Palauan Islands. The BNH provides comprehensive medical care at costs based on a sliding scale relative to income for Palauan citizens. Foreign citizens pay the full cost of health care. Several primary health care dispensaries are located throughout the country that provides Palau's citizens in remote areas with essential medicines and basic health services and education. They house prescription and over the counter (OTC) pharmaceuticals and are generally staffed by nurses and/or health aides. The range of medical services available to Palauans is comprehensive (Table 18).

Table 18 Public Health Services in Palau

PUBLIC HEALTH SERVICES IN PALAU
BNH Out-Patient Clinic
Respiratory Clinic (Ear, Nose, Throat)
Hypertension
Diabetes Mellitus
Eye
Orthopedic
Out Patient Night Clinic
BNH Department of Public Health
Perinatal Care
Well-Child Care
Communicable Diseases
Gynecology
Physical Examination
Sexually Transmitted Diseases
Geriatrics
Family Planning
Immunization Program
Community Dentistry
Public Health Night Clinic
Emergency Medicine
Surgical Clinic
Physical Therapy
Hemodialysis
Field Visits/Community Health
Dentistry

Source: Bureau of Public Health, Ministry of Health, Republic of Palau

A survey of the national health care workforce conducted by the Ministry of Health in 2005 reflects that there are currently 25 doctors, two dentists, 26 nurses, one midwife, one pharmacist, and 106 health care personnel comprised of nursing staff, laboratory technicians, medical assistants, and other auxiliary staff (World Health Organization 2005). The BNH has 80 beds, a surgical ward, a dedicated dialysis center with eight dialysis machines, an outpatient clinic, a pharmacy, a computer lab, and an in-house medical library. Among the medical specialties represented by the hospital staff

are general practice, pediatrics, obstetrics, gynecology, orthopedic surgery, general surgery, dentistry, geriatrics, allied health, epidemiology, and public health. Physicians practicing in Palau have been trained in various places like the United States, New Zealand, Korea, Thailand, and the Philippines. Many are foreign expatriates while a growing number of Palauan physicians are joining the healthcare workforce as both doctors and leaders in health care planning. In fact Palau's only general surgeon trained and certified by the American Board of Surgery and member of the Fellow of American College of Surgeons is a native Palauan.

2. Specialized Foreign Health Care Services

Palauan citizens with unique or especially challenging medical issues have the opportunity to receive medical attention abroad. Affiliations with a number of foreign aid programs supplement care available through the BNH at costs that local and foreign agencies subsidized partially or fully. For example, medical consultations and subsidized treatment are available to patients at the BNH through the Pacific Island Health Care Program (PIHCP) and Akamai Project, both of which are administered in conjunction with Tripler Army Medical Center (TAMC) in Honolulu, HI, U.S.A (Dever 2000). Within the PIHCP, physicians at BNH may present difficult cases to Tripler Army Medical Center (TAMC) where doctors there make determinations about eligibility for treatment in the PIHCP as a teaching case. Once accepted into the PIHCP the patient is then transferred to TAMC for a fully subsidized consultation and treatment protocol (Dever 2000). The Akamai project is a telemedicine program that allows BNH physicians to communicate easily with other physicians for real-time consultations using the World Wide Web and the Internet (Rutstein 2000). The Akamai Project effectively

facilitates the referral and consultation process for the PIHCP (Dever 2000). In 2002, at least two people from Echang had participated in the PIHCP at TAMC. Other Echang residents have received medical attention abroad in Guam, Saipan, and the Philippines.

Telecommunications and distance learning has revolutionized health care and medical education in Palau. One example of this technology in action is the newly established distance learning Pharmacy Technician Training program offered jointly through the University of Hawaii-Hilo and University of Alaska-Anchorage that provides continuing education for pharmacy technicians in American Samoa and Palau.[39] The Pacific Basin Telehealth Initiative is another program designed specifically to unite practicing physicians in Pacific Island nations with colleagues abroad to facilitate the process of medical consultations for local health care issues.[40] Distance learning programs such as these provide Palauan health care personnel with opportunities to gain education and training in the health sciences that they may not have been able to attain otherwise. Telecommunications technology such as videoconferencing, the Picasso Phone system, Internet access, and online resources has decreased the alienation and isolation of biomedical practice in Palau (Dever 2000; Feasley and Lawrence 1998; Yano 2000).

Palauan citizens may benefit from the medical expertise of foreign medical practitioners from the United States who routinely provide specialized medical care at no cost or reduced cost in Palau as part of medical programs designed to deliver

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[39] For more information please refer to the University of Hawaii-Hilo College of Pharmacy program description: http://www.uhh.hawaii.edu/academics/pharmacy/ .

[40] A description of the Pacific Basin Telehealth Initiative is available at the following URL: http://telehealth.hrsa.gov/pubs/pacific.htm.

humanitarian aid. The BNH is an Area Health Education Center (AHEC) as well as part of the Pacific Basin Medical Officers Training Program (PBMOTP) and a public health service corps site. Through these programs, resident physicians at the BNH may participate in a three-year program leading to a diploma in the Family Practice specialty. One role of such programs is also to provide support to foreign physicians as they travel to Palau to provide a range of health care related services, from instruction at BNH for continuing medical education (CME) courses for physicians and hospital staff to specialized clinical services in community health settings. Visiting physicians often provide medical expertise in fields underrepresented by permanent BNH staff.

Palau has implemented extremely progressive approaches to health care delivery for its citizens. The supplementary health care services as well as educational and training opportunities available to Palauan health care practitioners of all levels has created a unique and truly one of the most comprehensive medical care systems among Pacific Island nations.

3. Essential and Non-Essential Pharmaceuticals

Both prescription and over-the-counter (OTC) pharmaceuticals are available widely in Palau. There are four pharmacies in Palau in which prescriptions may be filled (United States Department of State 2004). One is located within the BNH, one is an independently run private pharmacy, and two are located within the clinic of two private practice physicians. Each pharmacy dispenses a unique array of pharmaceuticals, which in general reflects the medical specialties and populations that the pharmacies serve. Individuals with higher incomes generally support the private pharmacies or may be more able to afford brand name pharmaceuticals at private clinics. Individuals with lower

income tend to use the BNH pharmacy or clinics that offer subsidized pharmaceuticals because of the affordability and selection of generic brand drugs.

Patients may choose to have their prescriptions filled at any pharmacy, regardless of which doctor writes the prescription. Many Echang residents prefer consultations with one family practice physician in particular, who runs a private clinic outside of the BNH. Because this clinic is not able to subsidize their services or pharmaceutical drugs for all patients, it can sometimes be too expensive for them to see this doctor as well as have their prescription filled through the clinic pharmacy. In this situation, many Echang residents choose to spend the extra money on the office visit with the physician they prefer but to have their prescriptions filled at BNH or another pharmacy where the cost is lower.

Several department stores, grocery stores, and markets in Koror also carry an extensive range of over-the-counter pharmaceuticals, the majority of which are salutary to upper respiratory infections, analgesics, and gastrointestinal disorders. The inventory and cost of OTC drugs and medical supplies in Koror is comparable to what one would find in drug stores across the U.S. In addition small village market kiosks carry limited selections over-the-counter pharmaceuticals. There were two of these markets in Echang hamlet in 1999-2002.

The electronic purchase of pharmaceuticals is also a valuable tool for physicians in Palau who may use the Internet to stock their pharmacies. Internet access to online vendors of pharmaceutical drugs has enhanced the availability and selection of pharmaceuticals and medical supplies utilized by health care professionals in Palau. It is convenient and cost-effective to place orders online for pharmaceuticals and have them

shipped to Palau. Pharmaceutical and other medical supplies that are not in stock may be ordered easily through one of many Internet medical supply and pharmaceutical sales sites. Purchasing pharmaceuticals online also allows physicians to bargain-hunt from a variety of vendors. Finding reputable pharmaceutical suppliers online is a challenge and so quality control is still a concern for physicians using the Internet to shop for pharmaceuticals.

Physicians and public health care workers emphasized their concern with the lack of a regulatory infrastructure to ensure the quality safety of the drugs sold and distributed in Palau's pharmacies and markets. None of the health care workers suggested that unconventional utilization of pharmaceuticals was a concern in their practice. In other words, patient compliance with physicians' instructions about proper use of pharmaceuticals did not appear to be an issue for physicians and health care staff regardless of their position at BNH or in a private clinic.

4. 'Local Medicine': the Other Alternative Medicines

Echang residents and Palauans in Koror use the term "*local medicine*" to refer to differentiate biomedicine from all other types of healing. The healing beliefs and practices of local medicines (herein referred to as alternative medicines) in Koror is an important part of the therapeutic landscape of Echang. An array of non-biomedical therapeutic alternatives is available in Koror that reflect the city's cultural diversity. Koror is host to immigrant workers, expatriates, and tourists from many countries including Japan, the United States, China, Indonesia, Korea, and the Philippines to name a few of the most common. Moreover, a number of foreigners have married into Echang families.

People from the southwest Palauan islands living in Echang incorporate various types of alternative medicines into their therapeutic repertoire. The majority of alternative medicines have been introduced to Echang through personal relationships with individuals from abroad who have their own ideas about healing and medicine. Among the most common types of alternative medicines people in Echang use are Yapese massages, Chinese mentholated green oil for massage, *noni* tonic, and a variety of Palauan plant-based therapies. Southwest Islanders in Echang use by far more Palauan plant medicines than all of the other alternative medicines combined. Nearly every instance in which Tobians in Echang used local alternative medicines recorded during this research project involved the use of plant-based medicines.

F. Indigenous Healing in a Context of Medical Pluralism

The theme of this section is persistence and change in indigenous medical ideologies and practices in Echang. Special emphasis is given to the use of indigenous medicines along with therapeutic alternatives from other healing systems. Three factors bear on medical-decision making in Echang: perceptions of medical efficacy, beliefs about therapeutic synergy, and the politics of ethnicity health care delivery. The data presented here reflect interviews carried out with individuals from a cross-section of all households in Echang. Despite intercultural variation among southwest island groups in Echang, responses to questions about medical decisions resonate with one another regardless of ethnic heritage or island of origin. These similarities may speak to the cultural affinities in various southwest island groups, or perhaps they indicate an emergent system of medical beliefs and practices emanating from cultural exchanges taking place in Echang. Excerpts from transcribed interviews conducted in Echang

during 2001-2002 are woven throughout the discussion to illustrate how individuals have negotiated between various medical choices based on the notion of strength as well as observed responses to therapy.

1. Perceptions of Therapeutic Efficacy

Culture affects the way individuals interpret experiences with illnesses and medicines. Similarly, perceptions of medical efficacy relate to individual and group expectations for the outcomes of medical intervention. Perceptions of efficacy stem from culturally contextualized understandings of illness and the processes through which the body passes in order to become healthy again (Etkin 1988a). In a pluralistic medical context such as Echang, assessments of efficacy play an integral role both in how medicines from distinct paradigms are chosen and also in how they are used. The major concepts pertaining to medical efficacy in Tobian discourse about medicine involve the strength of medicines, the amount of time it takes for symptoms to dissipate, the body's response to the medical therapies, and the competency of the individual orchestrating the healing process.

Perceptions of efficacy in Echang are constructed around personal experiences, religious beliefs, medical ideologies, and healing traditions. Efficacy also is subject to shared wisdom and second-hand observations about healing. Illness and healing in Echang is a public matter given the high population density and type of housing in Echang. Neighbors consult with one another often about what to do for children's illnesses, and people volunteer their own unsolicited opinions about actions to take on a regular basis as well. The opinions of family members and friends carry as much weight

as personal experience when it comes to evaluating the efficacy of medicines, whether they are Tobian, biomedical, or another alternative medicine.

According to Tobian medical ideology, the strength of medicines is indicative of how quickly a given medicine will restore health. Strong medicines work quickly and weak medicines work slowly. Slow medicines may be effective in restoring health eventually. If a swift recovery is the priority then medicines that work quickly are the preferred choice. Strong medicines work most quickly in individuals with intrinsic strength. Strong medicines are dangerous in individuals who are intrinsically weak, such as infants, pregnant women, elderly men and women, individuals already weakened by prior illnesses. The use strong medicines in these populations leads to an elevated risk for developing further complications.

The basic criterion for assessing the strength of medicine, whether it is a topical plant medicine, pharmaceutical, manual therapy, tonic, or some combination of therapies, is the number of days before one can observe a positive change in health. As Etkin (1988) notes, the signs of recovery are different depending on the cultural context within which healing is taking place. Illness egress, which takes the form secondary illnesses that erupt after treatment has been initiated, is not necessarily a sign that the medicines are making the patient more sick. Indeed these secondary illnesses (i.e., side effects in biomedical speak) may indicate that illnesses are moving out of the body. With reference to the strength of medicine, depending on the expected signs and outcomes of therapy, the number of days before the healing process is obviously progressing toward recovery correlates with the strength of a given therapy.

Echang residents will often say, "*local medicines work fast*," especially with reference to external illnesses and injuries. This sentiment describes a shared perception regarding the effectiveness of their indigenous medicines. In traditional Tobian medical contexts, the time allotted for evidence to mount that a given therapy is efficacious was two to three days. After three days if there were no changes, or the patient exhibited signs of regression, the person in charge of the healing process adjusted the therapy. Generally, a healer would fine-tune medicinal recipes, alter therapeutic partnerships, and reevaluate the frequency with which they gave medicines to the patient.

Tobians still apply a two-to-three day trial period to assess the relative strength of pharmaceutical medicines and other alternative local therapies they use. Adjustments to dosages are made by altering how much medicine is taken and how often. For example, if a physician advises that a patient should take 5ml of prescription cough syrup every 12 hours, the patient will probably adjust the dosage to fit their personal needs. They may take 5ml once a day, 2.5 ml twice a day, or 2.5 ml once a day, depending on the action of the medicine and the extent to which their own modifications meet preconceived notions about expected outcomes. With the exception of small children, elderly adults, and other individuals who are dependent on someone else to administer therapy for them, patients in Echang self-medicate with and self-regulate dosages of pharmaceutical drugs. The practice of self-medicating in Echang is contextual, flexible, dynamic, and extremely individualized in a manner reminiscent of the way indigenous healers employed plant medicines in the past. The primary contextual differences in contemporary Echang is that healing and medication are no longer the exclusive domain of a sole medical expert, and now there are more types of medicines and therapies from which to choose.

In Echang perceptions of strength and weakness translate into medical choices in a variety of ways. The strongest prescription pharmaceuticals are associated with a single private pharmacy, and the weakest pharmaceutical medicines are associated with the BNH and public medical dispensaries. A number of factors affect choice of pharmacy including age, gender, cost of the medicine, type of illness, and anticipated response to the medicine. The decision to follow physician instructions or to adhere to directions printed on a pharmaceutical label also varies by individual and involves consideration of physiological responses to therapy. Illustrations of the process of medical decision-making using concepts of efficacy are provided below.

The first example demonstrates that the way in which perceptions of pharmaceutical strength affect one woman's decision to have prescriptions filled at a private practice pharmacy first and then at the BNH as an alternative:

> Dr. [*Name, private practice*]'s medicine is very strong, more than the hospital. My son was very sick. We took him to Dr. [*Name, private practice*] He gave [*Son's Name*] medicine that made him very sleepy. He didn't want to wake up when he was taking the medicine! The medicine was too strong. So I only gave him a little bit of the medicine, so he would not be so sleepy. I don't like it when he takes the medicine and won't wake up when I touch him or pick him up. If he sleeps it's okay, but he should wake up at least open his eyes when I talk to him or pick him up. Then, I took the medicine for him to the pharmacy at the hospital and asked them to give me a new one. They said that the dosage was wrong on the one from the other doctor and then they gave me a new medicine with new instructions. Some people like it very strong, though. They believe the stronger is the medicine the faster it will work. *Female, age 25, Hatohobei*

In this case, the stronger medicine turned out to be inappropriate for the young child, given the mother's parameters for the desired proximal responses of the medication. While the medicine clearly relieved the child of his symptoms, which included high fever, sneezing, coughing, runny nose, and congestion, the medicine also made the child disturbingly drowsy and unresponsive. This example illustrates a contrast in biomedical

and Tobian expectations for the therapeutic outcomes. The mother did not want to compromise the alertness of her young son in order to achieve a quick recovery with the pharmaceutical. She also assumed the role of interpreter of maladies, a role that an indigenous medical expert would have played in the past. She observed that the strength of the medicine had put her son into a deep sleep, and so she ascertained that either the medicine was the wrong dosage or it was the wrong kind of medicine for a child his age and with this particular constellation of symptoms.

Just as a Tobian healer may have done with a plant medicine, the woman's first response was to adjust the dosage of the pharmaceutical by decreasing the amount of medicine the child consumed as well as the frequency with which he consumed it. Her second course of action was to try an alternative. Since the hospital pharmacy was located conveniently near her home and it was affordable, the woman was able to bring the child and the prescription to the hospital for a second opinion with ease. In the end, this woman was satisfied with the physician's recommendations and the new medicine. The medicine from the hospital pharmacy proved satisfactory in treating the child's illness, both in terms of relieving the symptoms (biomedical efficacy) and in terms of retaining the child's alertness and responsiveness while he was on the medication (Tobian efficacy).

In her discussion of this case, the woman was careful to note that some people prefer to use the strong medicines. Many parents are not willing to take any unnecessary risks with the health of their children, and will do whatever the doctors says they should, even if it appears that the medicines are too strong. The distribution of indigenous medical knowledge varies from household to household, and households lacking

individuals who have knowledge of indigenous medicines are more likely to follow physician recommendations carefully, especially in the care of children. Her statement reflects the infinite variation in medical-decision making in a pluralistic setting such as Echang. There is not a generic, standardized approach to medical choices in pluralistic settings.

A doctor's instructions regarding pharmaceutical use are secondary to personal choices about dosages, consumption, and expected outcomes. An individual's response to medicine may carry multiple meanings. An adverse reaction may indicate that particular individuals have an intrinsic intolerance to certain medicines. It may also mean that the medicine is not salutary for the illness. Likewise, a weak reaction may indicate that the patient is exceptionally strong and requires medicines that are more potent. Weak responses to medicines also imply that the medicine is of questionable quality or that the individual healer lacks merit (including biomedical physician). The next excerpt is a case in point:

> Family is healthy. We are all okay. Usually go to see the doctor when my kids have a problem, that's the time we'll go see Dr. [*Name, private practice*]. Dr. [*Name, private practice*] is the doctor for all my kids. We don't ever go to the hospital; because one time [*Daughter's Name*] had a problem with her leg. We took her to the hospital and they gave her medicine. She kept on taking the medicine but the leg didn't feel better. We went to see Dr. [*Name, private practice*] and he changed the medicine. Told her to stop the medicine from the hospital and gave her new medicine. After she started taking it, she felt better. Some like the hospital, some they prefer Dr. [*Name, private practice*]. *Female, age 52, Hatohobei*

Here, the weaker medicines from the hospital were the first option, and when they did not produce the desired outcome ("*didn't feel better*"), the patient resorted to a stronger second alternative. Personal experience, shared knowledge, and beliefs about healing inform medical behaviors. Contexts of knowledge and experience are unique for

each household and even for individuals within each household. The negative experience with the hospital medicines led this woman to rely exclusively on the medical services of a private practice physician, reiterating the impact that perceptions of efficacy has on medical choices.

The strength of medicines and their ability to produce desired health outcomes shape decisions about when to suspend therapy. In the past Tobian plant medicines were given on a flexible time table that corresponded with the patient's response. Although healers used a period of two to three days in the initial stages of therapeutic observation, there were virtually no minimum or maximum time limits on the use of plant medicines. Patients were instructed to use the medicines were given until the healer observed the desired outcome(s). For one individual this could mean using the same medicine for five days, for another, it could mean twice as long.

The following excerpt sums up a common sentiment among Echang residents with regard to physicians instructions for taking pharmaceutical medicines:

> Sometimes I only take the medicine just until I feel better. If the pain is done, I don't need to take any more pills. I just save the pills until the next time I feel sick, even when the doctor says to finish all of them. If I don't feel the pain, I don't take the medicine. But, if the doctor explains to me that I need to finish, then maybe, sometimes, I will finish. Usually, stop taking when pain, cough, runny nose stops. *Male, age 59, Hatohobei*

This sentiment is not unique to Echang. In fact it reflects the frustration of many biomedical practitioners in the United States as well as physicians around the world in developing countries where erratic use of antibiotics, for example, have led to drug resistant strains of infectious microbials.

The cost of pharmaceuticals does factor into the choice to complete a prescription, despite the fact that these medicines are available at a price that the government deems

affordable. Affordability is relative, and the amount of money that people are willing to spend on medical care is not universal. Medicines and health care fees are at the bottom of the list when it comes to prioritizing household expenditures in Echang. Contrary to popular belief, the cost of medicines and physician consultations are too high for many households in Echang, even with the subsidies and discounts. Consequently, these individuals make choices about completing a course of prescription medications based, in part, on whether they think they will be able to use the medicine later. This strategy helps them save money for food, clothing, school supplies for their children, and transportation costs. Given the likelihood that bacterial infections are more likely to recur when a course of antibiotics is discontinued prematurely, the observation that antibiotics will be useful in the future for the same illness certainly is warranted. Partially used and expired prescription pharmaceuticals sit on shelves in most Echang homes. People with unused prescription medications often redistribute them to others who exhibit similar symptoms for which the medicines were prescribed originally or if they happen to believe that the medication will be salutary for their ailment.

Serious health issues arise when people use medications in the manner other than for which they were prescribed (Fugh-Berman 2000). According to interviews with physicians and health care workers patient compliance, including the degree to which Echang residents followed physician instructions about pharmaceuticals, was not a concern. All of the physicians were quick to point out that patients from Echang were excellent patients who did not "complain" about the medicines and seemed to have "no trouble following physician instructions." Similarly, Echang residents did not express concern with unconventional pharmaceutical use. Most people said they would make

modifications in order to amplify the medicine's health benefiting health and to prevent future illness.

Many patients do not complete a prescribed course of pharmaceuticals because of the belief that, in the absence of an expert to observe their progress, they themselves are the most qualified person to ascertain medical effectiveness. While those in Echang respect physicians in Koror, indigenous beliefs about healing as a process conflict with biomedical notions of the nature of the doctor-patient relationship. In traditional Tobian medical practice, the person taking on the role of healer devoted a considerable amount of time and effort to their patient during the healing process. Tobian healers would accompany their patient diligently throughout their road to recovery. They painstakingly gathered the plants required to create the appropriate medicine, not once, but multiple times. They observed illness progression, interpreted signs of recovery or regression, and even experimented with therapies when initial attempts at healing failed. Tobian healers attend to their patient at all times during the observation periods, including to the outhouse so that they could examine feces and urine, as both activities provided keys to diagnosis. Such actions attest to the intimate relationship of the healer and their patient as well as the personal investment Tobian healers made in the healing process.

Again, the American paradigm upon which the practice of biomedicine in Palau is founded presents a culturally discordant doctor-patient relationship to southwest island groups in Echang. Biomedicine contrasts with traditional Tobian medical practice in that the physician is absent during key moments of administering medicines, observing individual responses to medicines, and making spontaneous improvisations for healing when required. There is also a vast disjunction in the quality of care due to a lack of deep

personal responsibility and investment in the outcome of the patient's health on the part of the biomedical physician. The cultural adaptation in Echang has been that patients have adopted certain aspects of a role that was once exclusively the domain of indigenous healers.

The multicultural setting of Echang and the attendant transformation of indigenous medical practice has led to individuals acting as healer and patient, often at the same time. Individuals with limited expertise engage in monitoring various aspects of the healing process as an indigenous healer would, looking for signs and indications that the medicines are appropriate and effective. Rather than making numerous and repetitive visits to the doctor's office to ask questions and seek additional counsel, patients in Echang rely on their own experiences and received wisdom to interpret the body's response to pharmaceutical medicines during the healing process. A majority of individuals in Echang responded to interviews about pharmaceutical use indicated that they only continued taking pharmaceutical medicines until the point where they believed the medicines had helped them achieve the result that they desired.

Another factor relevant to medical efficacy is the "*freshness*" of medicine, a descriptive tied to relative strength. Black (1968) noted in his report that plants were collected for medicines were when they were still *fugh* (cold). The concept does not refer to temperature of the plant, rather, it relates to freshness especially in Echang discourses of indigenous plant medicines. The relationship between the freshness and strength of medicines can be found in the criteria of plant selection particularly for those medicine that are meant to be taken internally, such as *tafei rur, taferi hamoho tetipach,* and *tafei*

nguung-hutuuf. Young leaves of plants are valued as the cleanest, freshest, and strongest of all plant constituents.

Today in Echang indigenous plant medicines are made-to-order by a trusted friend or family member and then used when the medicine possesses its highest degree of potency. Medicines such as infusions and decoctions age better than others do. These types of medicines are prepared by infusing coconut oil or water with medicinal plants, and so the longer that the medicine is allowed to sit in the liquid the stronger the medicinal component of the final product. Medicines that are swallowed, chewed on, and spit out lose their effectiveness if patients do not take them promptly after their initial preparation. Among the list of reasons that a plant medicine fails to produce the desired health outcome is that "*it is not fresh.*"

Tobians and other Southwest Islanders in Echang hold pharmaceuticals to similar standards of freshness. Echang residents find it difficult, though, to articulate just how fresh various pharmaceutical drugs are because they are detached completely from the manufacturing process of pharmaceuticals. In a survey among biomedical practitioners, physicians were asked to describe any health issues with regard to their patients using local medicines and pharmaceuticals. One physician, who provides medical care to a wide range of patients in Palau (i.e., not only Southwest Islanders), noted that:

> Some older folks want to know the difference in local meds versus pharmaceuticals. I usually tell them, it is the same medicine, except the white men have made it into pills, so they can sell it to you. Sometimes, they question the superiority of the local medicines versus the pharmaceuticals. I usually tell them, the white folks who sell us these medicines, have flown to the moon some thirty years ago. We are still dreaming about going to the moon. That usually answers their question. *Male, physician, private practice, Koror*

The best frame of reference those in Echang have for the origin of pharmaceuticals is the canned, boxed, frozen, and dehydrated foods that are shipped to the islands from abroad. One woman who is extremely knowledgeable about Tobian plant medicines noted that, even though her family goes to the hospital and use their medicine, the pharmaceutical medicines have "*already been cooked*," implying that it may be strong, but it is not fresh. The mystique that enshrouds pharmaceuticals in Palau engenders some skepticism regarding their safety, despite the effectiveness they confer. Overall, Southwest Islanders share a belief that indigenous plant medicines are effective, strong, and actually enhance the body. Pharmaceutical drugs, in contrast, are viewed as effective and strong, but potentially dangerous to the body. The following excerpts illustrate:

> You can use local medicines for sickness that is not that serious. If they don't work, or if the sickness is very bad, go to hospital or to private practice. Chemicals are powerful but bad for the liver...Our local medicines, just two or three days, then the sickness is finished. Safe and no side effects. Yes, local medicines are very healthy. Yapese medicine keeps people very young. *Male, age 52, Hatohobei*

> We understand that the hospital medicines are drugs. They may help your body, but the side effects of using it also affect the body. Our understanding of local medicine is that it doesn't have an adverse affect on the body, you can keep using it and using it. *Male, age 46, Hatohobei*

> When I am sick, like with the flu, I will stay at home and take Tylenol and just sleep. But after a few days, if it's not better, I will go to the hospital and ask them to give me a shot or something to stop it. They usually give me, but there is never medicine that they can give me to stop it soon enough. I use local medicine for minor things; like scratches; eat guava leaves for diarrhea. For some things I would much rather have local medicine. For example, I had an eye injury once, it was very bad, and I wouldn't dare go to the hospital to have them touch my eye. It was too sensitive an area. So I had my aunt give me medicine for it. She blew on my eye and used some plants and it got better. Also, my son broke his arm, and for that I preferred local medicine for it. The trouble here is that there are not too many people who know how to use local medicine anymore. *Woman, age 47, Sonsorol*

> I like to go to hospital because you get the full exam. They can see inside and out. Hospital medicine is too strong, though. Might affect the insides somehow, I'm not sure. *Male, age 27, Hatohobei*

The residual pain, lingering symptoms, or recurrence of symptoms after the healing process has ended is another aspect that defines therapeutic efficacy and influences medical choices in Echang. Most Echang residents believe that indigenous bone setting is far superior to biomedical approaches. Local bone setting incorporates internal and external plant medicines and massage to heal broken bones in the time of a few weeks with no residual pain. Setting aside the issue of biomedical criteria that would measure the effectiveness of traditional bone setting, the fact that Tobians and other Southwest Islanders factor the presence of residual pain into their definition of effectiveness, and use this definition to guide their choice of therapy, is interesting. The absence of residual pain following treatment with indigenous manual therapy enhances the persistence of this time-honored mode of indigenous healing.

Healer competency is arguably the most crucial element in the practice of indigenous Tobian medicine and one that has enormous influence on perceptions of therapeutic efficacy. While most people in Echang will attest to the efficacy of indigenous modes of healing, the same people will also explain that only a few people live in Echang who "*really know*" how to prepare and employ these medicines:

> Many people here still use local medicine. You can see people walking on the roadway looking for medicine. Maybe they trust local medicine is better than drinking hospital medicine. The people who *really know* [emphasis added] local medicine are better than the hospital. *Female, age 51, Hatohobei*

> Depends on what kind of illness my kids have, but mostly I prefer to take them to the hospital. If they had a broken bone, or cut, or something I would find someone who *really knew* [emphasis added] local medicine, rather than do it myself. My daughter had a broken bone when she was three years old and Tobian medicine treated it. All Southwest Islanders have similar local medicines, maybe it's even the same. According to the history, some Sonsorol people settled on Tobi, and they also brought some medicinal knowledge to Tobi. *Male, 46, Hatohobei*

Even in the case of those select individuals who are competent enough to prepare plant medicines, most of them have part-time or full-time employment and do not have adequate time to devote to making the medicines or attending to people. The time and energy demands required to practice indigenous medicines on par with traditional standards of excellence is not feasible for most people living in Echang. The practice of indigenous medicine among Tobians in Echang no longer includes all the elements of traditional practice. As alluded to earlier in this discussion, the most obvious change in indigenous medical practice is the lack of an extensive observation process in contemporary healing. Individuals who prepare indigenous plant medicines in Echang make them to-order and dispense them much as a biomedical pharmacist does. It is at this point that their involvement with the patient generally ends. The absence of continuous observation during the healing process by the same person who prepares the medicines is justified by the fact that most of the local medicines circulating in Echang are simple medicines salutary for relatively benign, minor illnesses or injuries. Observation has a place in medical practices in Echang, but usually it is carried out by a caregiver at the household level or by the patients themselves. People in Echang respect the traditional role of healer even in the treatment of simple medicines for relatively benign health conditions. One informant explained it this way:

> It's very hard for a person from one family to give medicine to someone from another family. That's why it [sharing medicine] is very strict; because if you give medicine to someone who is not in your family and they die, it's very bad. Even though I have medicine, I know some local medicine, my father gave it to me, I learned it from him, I will not go around and use it. If you asked me, I would say, 'I don't know.' Maybe only if you were very sick. I would have to get permission from my father because he is still alive. I would see if he thought I could give it to you. Or he may advise me to go to another family who he thinks has the best medicine. It would depend. It differs from person to person, how they use the medicine. *Male, age 45, Hatohobei*

2. Polypharmacy in Echang

In this dissertation, the term polypharmacy denotes the contemporaneous use of medications and healing alternatives from distinct medical paradigms. A principal force driving polypharmacy in Echang is the belief that odds of achieving optimal health outcomes improve with the use of multiple, overlapping medical alternatives. This medical strategy, which is common pluralistic settings, is what some anthropologists call the "more-is-better" approach (Vuckovic and Nichter 1997). A related explanation for widespread polypharmacy in Echang is that indigenous medical practices set a precedent for therapeutically pluralistic care.

Conventional indigenous therapeutics in the southwest islands has always included an array of modalities into healing regimens configured to enhance efficacy. The Tobian construct of partners for medicine (*pahuh charuhfaruh; paruhar*) captures the intrinsic complementary nature of discrete Tobian indigenous healing modalities. Discrete therapeutic modalities are used sequentially or in conjunction with one another to enhance or diminish the action of the medicines in some way. Tobian medicine is holistic and addresses all aspects of the individual and their body as they heal.. It is not surprising that in a pluralistic medical context, people combine indigenous modes of therapy with medicines from other healing paradigms to enhance desired health outcomes.

Polypharmacy in Echang is dynamic and flexible. Some of the medical combinations used in Echang are simply pluralistic, not complementary. Thus, the use of one or an array of medicines happens without regard to specific interactions of

these therapies. People often employ medicines as a therapeutic safety net in the event one or more of the therapies proves ineffectual.

Polypharmacy usually occurs in contexts where the first course of action failed to produce a desired outcome. There is no rigid hierarchy-of-resort or predictable pattern for polypharmacy in Echang, only general trends. Sometimes people use discrete therapies simultaneously; at others, they utilize them sequentially. People use indigenous medicines routinely as a first response to simple illnesses. Any worsening of symptoms is enough to motivate most people to seek additional help for these illnesses at a hospital or private clinic. The inverse is also true, particularly when biomedical therapy is ineffective, as in the following example:

> I had this rash that goes around the body. It smells very bad, lose appetite, very hot. You cannot sit. If this one makes it all the way around the body and connects, like this, you will die. I had to go to the hospital. The rash I had was forming for three to seven months already. The American medicine did not work. So I had to take the medicine leaf to cover the rash, massage it, boil it first in the water and then massage it, and put on the sores. This medicine healed it. Went away after one month. Took it with eating Palauan medicine. The doctors were very surprised. Starts itchy. You want to scratch it and then it turns to blisters. Only grows around the chest, like a rope. Called *belebel* in Palauan. *Woman, age 49, Hatohobei*

Financial, geographic, or social access to the array of medicines available in Koror figure into the polypharmacy practices among Southwest Islanders in Echang. Although Palau boasts subsidized health care, the use of biomedical clinics, prescription drugs, and OTC medicines remain connected to socioeconomic status and financial security of Echang residents. People living in households with individuals who are knowledgeable, capable practitioners of indigenous medicine are more likely to incorporate plant medicines and indigenous modes of healing into their therapeutic

regimens. Plant availability in Echang and access to medicinal plants, or lack thereof, also affects when and how indigenous plant medicines are used:

> Some plant medicines we can't find the partner here. It's very hard for us to use local medicine here because we don't have the partner. We can substitute, but it won't work as well. Like I said before, we have combinations of plant, and together they can treat the muscles and bone. But, for example, if you can't find one of the plant partners, the medicine may only treat the muscles, but not the bone. You can try it, maybe it won't work as well. We never experiment. Nobody wants to do that. They will be too nervous that the medicine is dangerous. You can try to use the medicine without all the partners, but you would really not want to try and experiment. *Male, age 59, Hatohobei*

Despite the limited availability of culturally significant medicinal plants, a number of individuals in Echang have managed to broaden their use of botanicals in medicine. One woman in particular has taken her knowledge of indigenous Tobian medicine, which she inherited from her mother, and her knowledge of Palauan plant medicines, which she inherited from her paternal grandmother, to innovate new medicines using the array of plants available in Echang. Not all of the plants Tobians use in medicine are the same plants that Palauans use and vice-versa. However, her synthesis of cultural knowledge led to the creation of new signature medicines, which have elevated her status in Echang as someone who makes strong medicine. She can identify the widest range of medicinal plants in Echang and knows where to locate Tobian and Palauan medicinal plants throughout Ngerekebesang, Malakal, Koror, and in Ngaraard. She is one of the only individuals in Echang who admits to experimenting with plants in Echang to learn about their therapeutic potential:

> When my first son, [*Son's name*] came here from Tobi the last time, he had a rash all over like pimples with water inside, all together, all over his body that was very itchy. The medicine from the doctor did not help. So, I decided to make some medicine of my own. I took the bark of the mountain apple tree, the bark from the pine tree, and another one, and mixed it with coconut oil and put it on his skin with this mixture. The blisters dried up and healed without any scars. *Woman, age 24, Hatohobei*

She went on to explain that her medicine was not a true Palauan medicine or Tobian medicine, but a new one based on her familiarity with the properties of both plants. The multicultural exchange in Echang sets the stage for sharing botanical knowledge from many traditions. The expansion of botanical knowledge in Echang has implications for management of these culturally important natural land resources.

People in Echang use indigenous plant medicines to treat simple sicknesses (i.e., local diseases) and rarely use them for serious illnesses (e.g., serious injuries and infections and foreign diseases). Though most people do not consider plant medicines as cures for foreign diseases like diabetes, hypertension, heart disease, stroke, and influenza, many utilize indigenous therapies for these diseases as a complement to biomedicine (Table 19). Chronic illnesses in southwest island populations do not correspond to any conventional indigenous phytomedicines. Indigenous therapies do provide chronic disease sufferers with an additional layer of therapeutic support at the same time as they enable members of the household to address dimensions of the healing process that biomedicine ignores, such as psychological well-being, companionship, nutritional care, and physical therapy (i.e., massage, sleeping in medicine, and swimming). The therapeutic regimens prescribed by biomedical physicians tend to ignore other elements of healing that are culturally important to Southwest Islanders. Polypharmacy is a means for people in Echang to attend to health in a holistic and culturally meaningful way.

Table 19 Chronic Disease Symptoms and Supplementary Therapies

DISEASE	Secondary Illness/Symptoms	Indigenous Medicine
Type 2 Diabetes Mellitus	Poor circulation, slow healing sores, swollen gums, tooth pain, numbness in the extremities, weight loss	Massage, topical medicines for dermatological disorders, medicine for tooth pain, tonics to enhance appetite
Hypertension	Headache, dizziness, muscle aches, nose bleeds, edema	Massage, medicine to chew and spit, sleeping in medicine
Stroke	Immobility or limited mobility, difficulty breathing, depression	Soak in sea water, medicinal baths, therapeutic massage

Several people in Echang recounted the story of a child in Echang who fell from a tree. A hospital surgeon admitted the child for an operation to repair internal injuries and broken bones. He was also required to stay there for over one month, which is considered an excessive period of time treat internal injuries and broken bones. The prolonged hospital stay was enough to arouse concern. Yet, many people noted that the biomedical treatment at the hospital only focused narrowly on the specific loci of the injuries. Once the boy returned home, his mother applied therapeutic massage and plant medicines along with the pain medication prescribed by the hospital doctor. While the pharmaceuticals provided medicine to the locus of internal and external injury, the local medicines "*made the rest of his body better.*"

The use of medicine to ease pain and suffering is an important feature of medical practices in Echang. For example, when children, or even adults, suffer from *moh*, the goal of indigenous Tobian therapy is four-fold: to encourage disease egress, to heal physical symptoms of illness, to ameliorate the pain associated with the sores, and to stimulate appetite. The biomedical approach to oral candidiasis generally involves a course of antibiotics such as amoxicillin or penicillin and/or oral antifungal medications.

This treatment regimen lasts anywhere from one week to 14 days. Tobians assert that the biomedicine for *moh* takes too long and does not treat the pain, the loss of appetite, the oral bleeding, and fever. One Tobian health aide living in Echang noted that:

> Our local medicine, just two to three days, then it's finished. One drop of medicine three times a day for three days. This one is very strong and works on other viruses, too. Safe and no side effects. *Male, age 52, Hatohobei*

The "safe and no side effects" aspect of indigenous therapy for *moh* is particularly salient as parents seek out the mildest effective dose of medicine for their children. Psychological distress influences an individual's ability to accept medicines and regain strength. Pain and suffering associated with illnesses attributes to weakening of children and elderly, who are already vulnerable.

Indigenous Tobian remedies for *moh* are a variation on a theme. The basic therapy involves applying the residue from boiled coconut milk, and/or the juice from the leaves of a medicinal plant, directly to the oral sores. The plants in Echang that people use to treat *moh* are *taferi moh* (*Achyranthes aspera*), *worung* (*Ocimum sanctum*), and *marmeug* (*Merremia peltata*). *Marmeug* is a plant that has a role in indigenous Tobian medicine for a number of illnesses, but was not used traditionally to treat *moh*. Some Tobians in Echang have adopted the Palauan application of *marmeug*, which Palauans call *kebeas,* to the oral sores along with the traditional coconut residue medicine. The combination relieves pain as well as encourages shedding of the white film in the mouth. After three days of this therapy, raw fish is introduced to the patient in order to facilitate the final healing phase and stimulating appetite. *Moh* is also characterized by fever and so different types of traditional medicines are used to remove heat.

Tobians prefer prescription pharmaceuticals and OTC medicines to treat flu symptoms and upper respiratory infections. Tobians in Echang routinely address symptoms associated with the flu, including fever, congestion, and muscle aches, with supplementary indigenous therapies as well. They may address fever by applying plant medicines designed to push heat out of the body and cool the skin (e.g., *Hibiscus tiliaceus*). They attend to congestion by massaging coconut oil on the chest, back, nose, forehead, and temples to "*open the pathways*" for breathing. Therapeutic steam bath encourages circulation and removal of waste by "*sweating out*" a cold. Seawater soaks and therapeutic massage provide relief from flu-related muscular aches and numerous internal and external circulatory illnesses.

OTC medications in Koror provide easy access to a wide array of medicines for a number of illnesses. Interestingly, Echang residents do not consume OTC drugs to the extent that they do prescription pharmaceuticals and indigenous medicines. Socioeconomic factors play a role since OTC medicines are not subsidized. Many individuals are not confident with their own understanding of how to use OTC medicines, and prefer to have a doctor's input on what type of medicine to purchase and use. People in Echang note that if they are going to spend the money on any type of pharmaceutical, they might as well use the money for the highest quality prescription pharmaceutical they can afford at the hospital, dispensary, or a private pharmacy. The length of time that OTC medicines have been sitting on the shelves of department and drug stores poses a concern for Tobians who are skeptical of the freshness of the medicines. Many adults in Echang find it difficult to read and understand the English labels for OTC drugs. One couple from Hatohobei exclaimed, "*We would never use medicine if we*

could not read the instructions!" Even those who are reasonably fluent in English find it difficult to decipher the language used to describe indications, contraindications for usage on medicine labels. A few households in Echang claim to use pharmaceuticals and OTC medicines to the exclusion of all other therapies, but observation of medical behaviors challenge such statements. These families have incorporated a wider array of OTC drugs into their home medical inventory than families with lower income, but they also used local medicines and plant therapies on occasion. It is worth mentioning one important exception to the general trend that OTC medicines are used to a lesser degree than prescription pharmaceuticals. The use of Tylenol in Echang as a medical panacea warrants major discussion.

Tylenol brand acetaminophen[41] pills are the most commonly consumed OTC medicine in Echang. Parents regularly give Tylenol liquid cough and cold medicine to their sick children. Although an array of Tylenol brand products is available to treat symptoms of various diseases (e.g., cough and cold, headache, flu) adults typically use the basic extra strength brand Tylenol pills to treat flu symptoms, headache, upper respiratory infections, bronchitis, and aches and pains. There are few illnesses for which people would be reluctant to employ Tylenol as part of their therapeutic regimen, particularly if the person is suffering from fever or pain.

People are familiar with the drug and believe that it is safe, especially since it can be purchased in markets and at stores without a prescription. Despite all of the concerns expressed about liver damage that pharmaceutical medicines can cause, people in Echang

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[41] Acetaminophen is referred to frequently in the literature as acetylparaaminophenol (APAP) and/or paracetamol.

do not necessarily seem to attach those concerns to Tylenol. Parents follow physician recommendations or the printed instructions found on the label when giving medicine to their children. Adults who self-medicate routinely ignore printed instructions. Few people report following specific recommendations for dosages and time intervals. When adults self-medicate, personal interpretations replace written guidelines and physician recommendations. The unconventional use of Tylenol in Echang resounds with similar practices reported throughout Koror. One physician observed that his patients consider Tylenol a "magic drug," and that it is probably the most abused drug available in Palau.

The most unusual application of Tylenol was as a prophylactic for alcohol-induced hangovers. A practice popular among young men and women between the ages of 18 and 35, it involved the intentional ingestion of supratherapeutic dosages of the drug before periodic binge drinking in an effort to thwart the after-effects of alcohol, such as headache, nausea, and vomiting. Dosages in excess of those that recommended on the labels were taken immediately before outings that included social binge drinking. One young man reported that he had taken six 500mg tablets one night.

The utilization of Tylenol by a wider sector of the population to assuage the symptoms of excessive alcohol use after the fact is more common than hyper-dosing before binge drinking. Adults ages 35-65 participate in social drinking and binge drinking as frequently as their younger counterparts do, but the extent to which this segment of the population employs Tylenol to prevent hangovers is unclear. Alcohol dependence and addiction are clearly problems in the community that have far reaching sociopolitical ramifications (e.g., Marshall, et al. 2001; Nero 1990).

The biological impact of using Tylenol unconventionally is serious. Individuals experimenting with high dosages of Tylenol in general are at risk for accidental acetaminophen overdose, permanent liver damage, kidney failure, and even death. The National Library of Medicine via the Internet website, Medline Plus, offers a description of recommended dosages and contraindications of Tylenol use. The maximum recommended dose for adults or teenagers is four grams (4g) in a 24-hour period, assuming the medicine is taken at recommended intervals throughout the day. The NLM site also notes the contraindications of regular or excessive alcohol consumption and Tylenol. Specifically it states that:

> If you will be taking more than occasional 1 or 2 doses of acetaminophen, *do not drink alcoholic beverages.* To do so may increase the chance of liver damage, especially if you drink large amounts of alcoholic beverages regularly, if you take more acetaminophen than is recommended on the package label, or if you take it regularly for a long time. (Source, World Wide Web URL: http://www.nlm.nih.gov/medlineplus/druginfo/uspdi/202001.html)

Weathermon et al. (1999) report that liver injury may occur at doses as low as two to four grams per day in people who drink heavily.

There are no public health data from Palau to indicate whether Tylenol overdoses have been recorded. Hundreds of cases have been reported since the 1980s, however, in Denmark, the United Kingdom, and the United States (Lee 2004; Schmidt, et al. 2002). In fact in 1977 the U.S. Food and Drug Administration (FDA) summoned an advisory panel to review the safety of acetaminophen and the growing number of liver related diseases that were attributed to use of the drug (U.S. Department of Health and Human Services 1997). They recommended to the FDA that a new label be placed on all products containing acetaminophen that read: "Do not exceed recommended dosage because severe liver damage may occur" and/or "Do not exceed recommended dosage for

more than ten days [consecutive] because severe liver damage may occur." After review of the advisory panel's recommendations, the advice was discarded (Food and Drug Administration 2002).

Twenty years later the issue was revisited, and in 1997 the FDA announced that an alcohol warning be added to all OTC pain reliever medications, specifically those which include aspirin, other salicylates, acetaminophen, ibuprofen, ketoprofen, and naproxen sodium (U.S. Department of Health and Human Services 1997). In 2002 another committee was called to discuss the need for yet additional labels to raise awareness of potential hepatotoxicity due to acetaminophen overdose. Based on their recommendations, the FDA Center for Drug Evaluation Research sent a letter to state pharmacists in 2004 acknowledging the role of acetaminophen in liver disease and initiating a call to re-label drugs containing acetaminophen (Food and Drug Administration 2004). The current 2005 labels on Tylenol brand products read:

> **Alcohol warning:** If you consume 3 or more alcoholic drinks every day, ask your doctor whether you should take acetaminophen or other pain relievers/fever reducers. Acetaminophen may cause liver damage.

The warning implies that there is risk of liver damage around three alcoholic drinks each day. Review of the literature suggests that this is merely a conservative estimate of the amount of ethanol required to increase an individual's risk of acetaminophen toxicity (Rumack 2004). That fact is that the specific blood alcohol levels that are required to cause acetaminophen related hepatotoxicity are unknown and almost certainly unpredictable given the array of confounding behavioral and genetic factors that play into liver disease (Rumack 2002; Weathermon and Crabb 1999). What is clear from the current research is that therapeutic doses of acetaminophen are not toxic in chronic

drinkers or occasional drinkers (Rumack 2004). On the other hand, supratherapeutic doses of acetaminophen along with alcohol present serious health risks.

Alcohol-acetaminophen hepatotoxic events are related to liver metabolism. The liver metabolizes alcohol. Once it enters the liver from the bloodstream it is broken down by alcohol dehydrogenase (ADH) and human cytochrome P450 (CYP450). Normally, ADH is responsible for breaking down the majority of ethanol in the liver. Ethanol is reduced to acetaldehyde, which is alcohol's toxic byproduct. The enzyme aldehyde dehydrogenase (ALDH) then metabolizes acetaldehyde.

CYP450 plays a key role in medicine-alcohol interactions (Weathermon and Crabb 1999). CYP450 comprised of two enzymes. The enzyme that is integral in the metabolism of ethanol is called Cytochrome P450 2E1 (CYP2E1). In the absence of ethanol CYP2E1 levels are relatively low. CYP2E1 only breaks down a small fraction of the liver ethanol in concert with ADH and ALDH (Weathermon and Crabb 1999). The body assimilates acetaminophen in a manner that delivers the appropriate amounts of medicine to the bloodstream.

People who chronically consume acute amounts of alcohol exhibit elevated CYP2E1 activity during ethanol metabolism (Carriere, et al. 1996). When these individuals drink alcoholic beverages, CYP2E1 replaces ADH as the primary process for ethanol metabolism (Lieber 1994) even without ethanol in their system. CYP2E1 levels remain higher in chronic drinkers than in non-chronic drinkers. The hepatic response to chronic ethanol exposure induces accelerated acetaminophen metabolism (Weathermon and Crabb 1999). Alcohol drinkers perceive less therapeutic benefit because their bodies excrete the medicine more quickly than normal. In other words, chronic alcohol drinkers,

particularly those who regularly drink to become intoxicated, may not benefit from normal dosages of acetaminophen, even when they are sober.

The combination of alcohol and acetaminophen produces a toxic metabolite called *N*-acteyl-p-benzoquinone imine (NAPQI). All individuals produce NAPQI when ethanol and acetaminophen are metabolized in the body contemporaneously. NAPQI is linked to potentially life-threatening liver damage, but the risk requires a combination of ethanol and supratherapeutic dosages of acetaminophen (Rumack 2002). Nutritional status, sex, alcohol related cirrhosis of the liver, concurrent illnesses, and other factors play a role in acetaminophen related toxicity. Some researchers postulate that there is a genetic component to CYP2E1 production and alcohol-acetaminophen related hepatotoxic events (Carriere, et al. 1996; Weathermon and Crabb 1999).

It is interesting to note that amplified levels of CYP2E1 in chronic alcohol drinkers actually provide protection from potential liver toxicity in certain contexts. When chronic drinkers have acute levels of ethanol in their system along with recommended doses of acetaminophen, the preexisting high levels of CYP2E1 protect against potential hepatotoxicity (Schmidt, et al. 2002). The buffer against liver damage is only apparent when high blood alcohol levels and acetaminophen are in the body at the same time. In this scenario, the liver uses CYP2E1 to breakdown ethanol so that the metabolism of acetaminophen into the toxic metabolite NAPQI decelerates (Schmidt, et al. 2002). Nonetheless, chronic alcohol drinkers who ingest supratherapeutic dosages of acetaminophen are actually at higher risk for hepatotoxicity than non-chronic drinkers, regardless if there is alcohol in their system or not (Weathermon and Crabb 1999). In other words, chronic alcoholic users are at higher risk for liver injury when they take

supratherapeutic doses whether or not they are sober or have low-to-moderate levels of alcohol in their system. Rumack (2002) asserts that most of the research to date has exaggerated the stated risk, however. He notes that in chronic alcoholics a dose of somewhere between around 13- 15g of acetaminophen would be required to achieve hepatotoxicity (Rumack 2004). In contrast Schmidt et al. (2002) report that in 28 cases of severe hepatotoxicity, 21 of them occurred among individuals with a history of regular alcohol abuse who had ingested less than 12g of acetaminophen. Clearly, there are elevated risks of acetaminophen poisoning and liver damage among chronic alcohol drinkers.

Occasional alcohol users are at risk for liver injury when they combine alcohol with acetaminophen. CYP2E1 levels in occasional drinkers are relatively low and most of it is recruited to ethanol metabolism when these individuals consume alcoholic beverages. Acetaminophen metabolism slows when occasional drinkers combine recommended doses of acetaminophen with moderate to large quantities of alcohol. They also exhibit a reduction in the excretion of metabolites and show higher levels of the medication in the body. Herein lies the danger for liver damage. Moreover, these individuals are more likely to suffer hepatotoxic events when they ingest recommended doses of acetaminophen along with acute amounts of alcohol (e.g., during binge drinking) than are chronic alcohol drinkers. Schmidt et al. (2002) report that, in their retrospective study of 645 patients admitted from 1994-2000 with single-dose acetaminophen poisoning, occasional alcohol users who drink moderate to acute amounts of alcohol around the time they took acetaminophen are at the highest risk for hepatotoxic events. In summary, occasional drinkers, who take even just therapeutic doses while binge

drinking, are at high risk for liver injury because they do not have the protective elevated levels of CYP2E1 that chronic drinkers do.

The literature on acetaminophen-alcohol interactions does not address issues of long-term effects of repeated mild liver injury that may be caused by taking doses of acetaminophen that are borderline overdoses with alcohol. Rumack (2002) notes that the half-life of a therapeutic (and most supratherapeutic) doses of acetaminophen is about two hours. He asserts that even in the case of overdoses, the half-life is normal at the time of ingestion and increases over the course of several days because of liver injury and dysfunction (Rumack 2002:16). Most of the literature on acetaminophen-alcohol hepatotoxicity reflects anecdotal evidence from case studies, retrospective research, and data from laboratory studies in animals (Rumack 2004). Scant data are available on the impact of long-term, chronic liver injury due to repeated exposure to supratherapeutic doses of acetaminophen with alcohol that are not toxicogenic. Based on the data that are available, one can postulate that over time, liver injury due to chronic excessive alcohol consumption alone would elevate a person's risk of acetaminophen poisoning. If supratherapeutic doses are taken repeatedly over the course of several days, there is a risk of accumulating toxic metabolites in the body that would lead to severe liver injury (Weathermon and Crabb 1999). Depending on the role of alcohol in this scenario, the potential risk could be elevated further.

In order to understand Tylenol use in Echang one must consider the cultural lens through which individuals interpret physiological responses to acetaminophen. *Therapeutic misadventure* is a term used throughout the biomedical literature to describe the non-intentional ingestion of supratherapeutic doses that lead to adverse reactions

(e.g., Barker, et al. 1977; Ho and Lam 1996; Makin and Williams 2000; Prescott 2000; Seef, et al. 1986; Zimmerman and Maddrey 1995). While it is commendable that physicians have taken into account a behavioral dimension to acetaminophen related toxicity, this term does not sufficiently describe the biocultural dimensions of potentially dangerous behaviors.

The practice of hyper-dosing with acetaminophen prior to alcoholic binging would fall under the medical anthropological category of an indigenization or cultural reinterpretation of Tylenol (Etkin 1992; Etkin, et al. 1990, 1999; Nichter 1989; Nichter and Vuckovic 1994; Tan 1989; Vuckovic and Nichter 1997). Based on observation and interviews with Echang residents about their approach to illness and healing, the vast majority do not deem Tylenol a dangerous medication. They use other prescription pharmaceuticals and OTC medications with caution but appear to use Tylenol according to the guidelines that govern the use of indigenous plant medicines. These guidelines include: (1) the amount of medicine required to treat an illness varies from person to person; (2) each person responds to medicine in a different way; (3) a higher dosage is stronger and leads to faster results; (3) more medicine is better and can still be safe.

The biological explanation for acetaminophen poisoning and ethanol mediated acetaminophen pharmacokinetics provides a scientific perspective of the potential ramifications of a culturally specific behavior. Adults in Echang report taking medications, such as Tylenol, according to their own perceived responses to the medication rather than the instructions of the label or a health care professional. Research demonstrates that chronic alcohol users may not feel the benefits of Tylenol with a normal dose because these individuals metabolize the drug too quickly. People

who are alcohol dependent require higher doses of Tylenol to treat symptoms of a headache or muscular pain, even when they were not intoxicated. They are also at high risk for acetaminophen poisoning if they consume acute supratherapeutic doses. Over time, the liver damage associated with chronic alcoholism and poor diet may lead to a decrease in the amount of acetaminophen required to induce a hepatotoxic event. Thus, as they age the population of chronic alcoholic users Echang will become more susceptible to the acetaminophen toxicity.

A majority of adults in Echang drink alcohol socially on a regular basis. The role of alcohol in social relations and the history of alcoholic binging in Southwest Islander culture are relevant to the practice of drinking in Echang. Among Tobians, the consumption of alcohol in Echang has roots in traditional ritual drinking on Hatohobei. In fact, on Hatohobei drinking parties were one planned in advance to accommodate the preparation of the traditional alcoholic beverage made out of fermented coconut (*hajii mwen*) (Black 1998). Once the coconut toddy was ready, people drank it until it was gone; the process sometimes took days or weeks. While the context of drinking has changed since Tobians migrated to Echang, the practice of drinking until one is completely inebriated, drinking until the drinks are gone, and drinking for days are still apparent in the culture of drinking in Echang.

The most common type of alcohol consumption in Echang is alcoholic binging. This occurs anywhere from monthly binging, or weekly binging, depending on the financial status, age, and sex of the individual. Not all of these individuals take supratherapeutic doses before drinking; however, it is very common for people to medicate with Tylenol following a social drinking event and to use high doses of Tylenol

in contexts completely separate from drinking alcohol. Binge drinkers are at high risk for acetaminophen toxicity if they exceed the recommended dosage prior to binge drinking. They are also at high risk if they take only moderate to acute amounts of Tylenol directly following a social drinking event. Symptoms of acetaminophen overdose include diarrhea, increased sweating, loss of appetite, nausea, vomiting, stomach cramps, or pain. These symptoms are remarkably similar to that of being intoxicated with alcohol, so it is unlikely that someone suffering from moderate acetaminophen overdose would seek treatment.

Based on the biomedical literature available, the reported behavior in Echang, and field observations of alcohol consumption, the situation is Echang reflects chronic exposure to borderline toxic dosages of acetaminophen. The symptoms of liminal exposure to toxic levels of acetaminophen are unexamined in the biomedical literature as are the implications for this type of exposure over the long-term. The dearth of information results from a reliance on retrospective clinical data upon which to draw conclusions about dosage recommendations and potential interactions with alcohol (Rumack 2004).

The health implications of alcohol-Tylenol interactions among adults in Echang are serious. Yet, because of the limited medical data for acetaminophen toxicity in non-western populations, it is still difficult to quantify the extent of the risk. Further, if there are genetic components to alcohol-acetaminophen reactions, there could be physiological issues that are unique to the Echang population. Obvious questions emerge regarding the long-term cumulative effects of mild to moderate acetaminophen toxicity (i.e., those that

may cause elevated levels of toxic metabolites and adverse events but do not require hospitalization).

Alcohol has significant pharmacokinetic and pharmacodynamic interactions with other medications and botanicals aside from acetaminophen (Weathermon and Crabb 1999). Continued biomedical research is needed to clarify specific health issues associated with long-term acetaminophen-alcohol interactions. Anthropological investigation can contribute by deconstructing biomedical discourse on polypharmacy and other therapeutic misadventures. Further research is needed on the social significance of alcohol and patterns of alcohol and drug use in Echang.

Polypharmacy is one facet of medical pluralism in Echang. The use of multiple therapeutic regimens and the incorporation of new medical knowledge and technologies reflect indigenous medical beliefs in which multiple therapies were combined to achieve health. Biological and ideological frameworks affect the ways people in contemporary Echang choose and use medicines.

3. Ethnicity and Quality of Health Care

> Echang is not a real place for Southwest Islanders. - *Female, age 36 Hatohobei*
>
> Tobi is home. Tobi is my first place. Provided for me when I was small. - *Male, age 66, Hatohobei*
>
> Where is my home? Echang is where I live. I live here and have a house in Echang. My real home is on Tobi. - *Female, age 38, Hatohobei*

The political context of southwest island population migrations to Echang has led to ethnic discrimination in many social arenas. Health care discrimination is one such arena. Ethnic disparities in disease risk and health care are a concern among health care

workers and public health officials of all levels in Koror. According to interviews with a variety of health professionals, Echang residents receive substandard health services at the national hospital in particular.

Prejudice and unethical treatment of southwest island groups has been reported at the BNH outpatient clinic and pharmacy. Reports of ethnic discrimination involve subjecting to patients to excessively long periods of waiting for service for no reason, prescribing careless treatment protocols for illnesses, and dispensing the wrong prescriptions. Interestingly, reports of discrimination do not emanate from within the Echang community but come from inside the healthcare workforce at the BNH and private clinics in Koror. Overt discrimination was not observed during field research. The data reported in this section reflect the opinions of individuals personally involved in Palau's health care profession pertaining to issues in Southwest Islanders' utilization of biomedicine in Koror. The first person to allude to ethnic prejudice in health care delivery during this research project was a private family practice physician in Koror. He noted that,

> ...The village here in Echang, it's actually very close to the hospital. Echang is not a wealthy place. It's a poor place. But, instead of accessing the hospital health care services, which is very close to the village in a setting that is very affordable, I have seen many patients in my clinic, which is further away and more expensive, for many, many years. Sometimes many of them really cannot afford treatment at the clinic. It concerns me. The medical services are available [at the hospital] but they are not accessing it. Why is this? How do you remedy it?

Reports from health care practitioners provide clues that elucidate reasons for substandard care that these Echang residents have experienced. Disparities in quality of health care at the BNH, for instance, may be one reason so many Echang residents categorize pharmaceuticals bought at the hospital pharmacy as "*weak*" or ineffective,

relative to drugs bought elsewhere. The cultural constructions of healing in Echang are crucial to understanding people's reluctance to utilize the most convenient medical care available. Perceptions of therapeutic efficacy are a key factor in medical decisions among people in Echang.

Another doctor described care at the hospital as impersonal. From his perspective, patients receive care from people who, "just consider the body and not the individual." The following interview excerpt from a nurse on staff at a private clinic captures a sentiment shared by various medical professionals about the way some hospital staff reportedly has treated people from the southwest islands:

> I think at the hospital they treat them [Southwest Islanders] more like second class, and so, what I hear from the patients here [private clinic], I feel sorry for them, because they go to the hospital for the same problems and they [the hospital] won't treat the problem so they have to constantly keep going back for the same problem. So finally when they come here [private clinic] it's so different because he [private practice doctor] not only shows interest, he educates on what their problem is. But, you know, just like when we first started here, like the first month of September for the two weeks we were coming here, he would prescribe medicine to them, and when they go to the hospital they either just give them – if like if they were supposed to take 28 capsules, they will only give them 14 – no refill whatsoever.

Southwest Islanders in Echang who have expressed their discontent with care at the BNH do not talk about their experiences in terms of ethnic prejudice *per se*. Instead, their experiences inform discourses on the quality of medical staff training, the safety and strength of pharmaceuticals dispensed there, and basic cultural differences in the type of care they can expect from BNH. People in Echang do not expect high quality care from the hospital. They attribute ineffective treatment to physician ineptitude or medicines that are "*too old*" or "*overcooked.*" They describe the failure of the pharmacy to fill a prescription correctly as carelessness. Patients are aware that they can have prescriptions

filled at the BNH pharmacy for a fraction of the cost of a private clinic, but they ultimately make decisions based on a variety of factors including, but not limited to, cost.

The observations Tobians make regarding the quality of care and strength of medicines at the BNH corresponds with cultural constructions of medical competence and the way hospital medicine fits into their own healing paradigms. As illustrated previously in this chapter, some prefer to acquire medicines at the BNH pharmacy if a weaker medicine suits their needs, such as in the case treatment for an infant. In circumstances where people require strong medicines and high levels of expertise, they may combine hospital treatments with other medicines or they may bypass hospital care altogether and seek out care at private practice. Medical decision-making in Echang is contextual and the BNH has its place in local health care strategies. The quality of medical care and pharmaceuticals available at BNH has a direct impact on polypharmacy and medical pluralism in Echang.

According to Echang residents poor quality in health care refers to the relationship health care workers have with their patients in addition to the personal investment health professionals make in healing. Traditional indigenous Tobian healing, for instance, involved a close healer-patient relationship. Indigenous Tobian healing and recovery processes entailed considerable family and community support. Complaints about non-traditional medical care are not directed at individual caregivers as much as it is a general observation about biomedicine as a medical paradigm. Biomedical treatment protocols that require that require long hospital stays or patient separation from family and community lead to perceptions of low quality health care. Language barriers prevent effective patient-doctor communication with regard to diagnoses, pharmaceutical

instructions, or physician recommendations. Biomedicine and hospital care can be confusing particularly for older individuals who are not fluent in Palauan or English:

> One reason that the older generation may not use the hospital as much is that some people do not trust the physicians. My uncle used to be very afraid to go to the hospital. He called the doctors and nurses there "quacks" who didn't know what they were doing. In his case, it turned out to be true. When he was really sick, they were trying to draw blood or give him an IV. Because he was so old it was difficult for them to put in the needle. He just complained, saying 'Yeah, you go ahead, stick me like a pig, and do your experiments on me.
> *Woman, age 39, Pulo Ana*

One of the greatest cultural rifts in traditional healing and biomedical healing in Palau is the generic, socially detached approach to conventional biomedical healing.

When presented with the opportunity to explain why some health care practitioners discriminate against Southwest Islanders, one private practice physician replied that, in Palau one of the ways to get things done is to go to the person in power directly and work with them to solve the problem:

> The way things get done if there's a problem, if you're constantly getting the 'no answer,' you go behind them, and you go above them. And a lot of our people, because of relations, can go to the boss, but... not them [Southwest Islanders].

Their lack of political pull in Palau eliminates any chance for Southwest Islanders to take their issues to those with the power to make real differences. Political incongruity and language barriers (especially among the elderly) also make it difficult for patients to ask questions of their doctors.

G. Summary

Contemporary medical choices of Tobians and their counterparts in Echang reflect a number of basic principles from traditional indigenous healing paradigms. Plant medicines continue to play an important role in the medical practices in Echang. Southwest Islanders, Palauans, and foreigners in Echang exchange various types of

knowledge pertaining to the healing properties of plants so that the repertoire of medical applications of plants in Echang has expanded. The primary types of plant medicines that people use in Echang are medicines to treat dermatological illnesses, minor injuries, broken bones, and pain. Tobians continue to describe the superior ability of indigenous medicines to heal simple sicknesses and external illnesses. However, the number of people who are well versed in the traditional healing arts has declined in the population. People in Echang believe that it is more dangerous to use traditional knowledge incorrectly than to seek care from alternative sources, for instance, at a hospital or using pharmaceutical medicines.

Many aspects of indigenous healing ideology persist in the context of medical pluralism as Echang residents are in a position to select among a range of therapies that vary in efficacy and appropriateness. Indigenous healing in the southwest islands is a process in which the patient and healer are bound together throughout the various phases of diagnosis, therapy, observation, recovery, and prevention. It is highly individualized, flexible, and dynamic. The efficacy of healing rests on the skill of the healer as well as the inherent constitution of the patient. The patient's response to therapy varies with health status, sex, age, and health history. All of these elements are instrumental to a unique therapeutic regimen that addresses the patient's entire body and well-being as an integrated whole.

Medical decisions in Echang are associated with perceptions of therapeutic efficacy, beliefs about the synergistic or enervating effects of therapeutic mergers, and the sociopolitical milieu of Southwest Islanders' migrations to Echang. Individuals define efficacy in terms of cultural constructions of healing and expectations regarding

the particular action the medicine will have in the body. The use of therapies from discrete medical paradigms at the same time to achieve desired healing results is common.

Polypharmacy manifests itself in various ways. One of the most common scenarios is the use of indigenous therapies to complement biomedical therapy in an effort to create a culturally appropriate holistic healing regimen. Anthropological inquiry elucidates the biological and cultural dimensions of polypharmacy. It is at the conjunction of biology and culture that potentially dangerous consequences of polypharmacy arise, as in the case of the panacea, Tylenol. The confluence of cultural parameters of healing with their biological implications is an area requiring further research in Echang.

The political and social marginalization of southwest island peoples following migration to Echang has lead to differential treatment of these patients in the health care arena. Health care practitioners of all levels in private practice and public health venues raise concerns about the quality of health care delivery for Echang residents at the BNH. Echang residents themselves have not couched their treatment at BNH as ethnic prejudice. Rather, they use these experiences to assess the quality of hospital care and determine whether such care is suitable for a given illness. The decision to use the hospital for care is based on preconceived ideas about the appropriate type of medicine for a given illness.

This chapter contributes to our understanding of indigenous healing and medical pluralism among southwest island groups by exploring the biological and cultural dimensions of healing in Echang. It builds upon the previous chapter by illustrating how

indigenous medical ideologies can influence medical practices and transform healing in pluralistic settings. The next chapter evaluates data from Echang in light of the anthropological literature on medical pluralism and populations in transition.

VI. CHAPTER SIX: THE ECOLOGIC, BIOLOGIC, AND CULTURAL DIMENSIONS OF DISEASE AND HEALING IN ECHANG

A. Introduction

This chapter is an integrated analysis of the ecologic, biologic, and cultural dimensions of medical pluralism in Echang. Data from Echang are discussed in relation to the larger literatures on migration, global disease patterns, dietary transitions, and health disparities. In this chapter macro analysis of the factors that have provoked change in Palau's southwest island populations complements micro-level analysis of sociocultural adaptations to transition.

Patterns of population resettlement and mobility have transformed human-environment relationships in southwest island populations. This chapter reveals the manner by which complex modes of migration give rise to both chronic degenerative and infectious diseases in Palau. It discusses the connection between migration and dietary change, the role of nutrition in immune function, and the long-term position of food in disease patterns among Echang residents. The biocultural dimensions of plant use in the overlapping milieus of food and medicine are explored as well as the health implications of polypharmacy and reinterpretations of biomedicine. In addition, the politics of access to natural resources, foods, medicines, and health care that lead to health disparities in Palau are scrutinized.

The diseases with which southwest island populations in Echang presently contend are more complex than in the past. Likewise, the range of technologies, knowledge, and strategies Echang residents have to deal with health issues has expanded. This discussion gives special attention to the indigenous beliefs and practices that

influence medical decisions in contemporary pluralistic healing contexts. This chapter concludes with a review of areas warranting further investigation in Palau.

B. Ecologic Context of Diseases in Echang

Disease patterns result from a number of factors, including but not limited to population dynamics (i.e., size, density, growth, and mortality), human biological variability, environmental hazards, the presence of pathogens, and behaviors that enhance exposure to these pathogens. Nutritional status influences susceptibility to a variety of diseases, both chronic degenerative and infectious, and so dietary behaviors play into disease ecology. People's access to medical technology, along with cultural beliefs and behaviors, may ameliorate or exacerbate disease. The confluence of one or more of these factors results in differential exposure to diseases in various settings.

1. Population Mobility and Disease Ecology

a. Ecology and Epidemiology

Mobility has contributed to global patterns of newly emergent re-emergent infectious diseases (Sommerfeld 1995). Population mobility enhances the spread of communicable diseases by transporting hosts, pathogens, and vectors to new places where they establish themselves. In Pacific Island societies intensive circular mobility in rural, urban, local, and global spheres sustains pathogen distribution throughout the region (Lewis and Rapaport 1995).

Medical geographers were among the first to elucidate the importance of population movement in the regional spread of infectious diseases. Prothero (Prothero 1977) demonstrated the ways in which variable mobility patterns influenced the spread of malaria in African countries. He noted that the concept of migration, which

epidemiologists defined as a static and permanent movement pattern from point A to point B, did not capture the complexity of local population mobility. He highlighted mobility that reflected political, ecological, economic, and cultural factors. For example, seasonal fluctuations in food and water caused Somali pastoralists to migrate across a geo-political border separating Somalia and Ethiopia. Seasonal movements to wet areas during part of the year elevated the potential for human exposure to malaria parasites and enhanced the reproductive cycles of regional malaria vectors (*Anopheles gambiae*). Movement away from these areas, following the rainy season to find other locales capable of supporting livestock and human occupation, amplified the dissemination of mosquito vectors. Pastoralist migrations parallel other patterns of mobility between urban and rural settings because they perpetuate the spread of disease in like manner.

Prothero (Prothero 1977:264) defined four types of circular migration that promoted the continual spread of malaria throughout the region: daily, periodic, seasonal, and long-term. Daily circular migration described the periodic movement of individuals who routinely move from rural to urban areas and back again for employment. These individuals are at high risk for acquiring new infections and then transmitting them to populations in both areas. Periodic and seasonal migration patterns are longer than a single day but shorter than 12 months. They often coincide with seasonal fluctuations and periodic employment away from areas of primary residence. Long-term circular migration is movement away for periods longer than one year with a subsequent semi-permanent return to the original locale. Each type of circular migration confers variable risk of acquiring new infections. Extended residence in areas with endemic malaria augments the potential for infection. Population movement increases

the distribution of infectious diseases in general, particularly those that do not require a vector for their transmission.

Meade (Meade 1977) advanced the study of disease ecology by challenging narrowly conceived definitions of environment. She asserted that the concept of ecology should encompass the multiple layers of natural and anthropogenic environments. Micro-level analyses of environments (e.g., household) are equally important to understanding differential disease risk as are macro-level analyses (e.g., inter-island, transnational). Disease risk is a product of combined spatial and temporal dimensions of disease exposure. Population mobility patterns, such as the four types of circular migration Prothero describes, entail different styles of movement in terms of place and time spent in a place. Both factors influence relative categories of disease risk in populations.

These geographic studies aid our understanding of population mobility and disease in Palau. Variable patterns of circular mobility in Echang's population influence broad epidemiological trends in Palau. Echang is a small hamlet in Koror, which hosts hundreds of international travelers each year. It is also the transient residence for many Southwest Islanders who live part of the year in the southwest islands, in Echang, and abroad. Echang residents travel frequently between Koror and the southwest islands, neighboring Pacific Islands (e.g., Saipan, Guam, Chuuk, Indonesia, and the Philippines) or further abroad to Hawaii, the continental United States, Japan, and Australia. Palauans throughout the nation engage in this type of mobility. Population mobility among Echang residents is slightly different from other Palauans, because the routine passage to and from the southwest island chain involves primarily people from Echang.

Regular trips between Echang and the southwest islands sustain a mutual flow of goods (e.g., medicines for the dispensaries, foodstuffs, kerosene, tobacco, and school supplies) and allow individuals to care for personal property in one or both locations. It also provides a relatively reliable means to evacuate those who require medical attention in Koror. Both Hatohobei and Sonsorol states have access to the ship. The combined demand for transit has enabled individuals to live periodically in the southwest islands or in Echang with a relatively reliable conveyance.

Frequent circular mobility at local and international levels predisposes Palauan citizens to a wide array of novel and re-emergent infectious disease threats. Periodic trade with crews of illegal foreign fishing vessels supports the dissemination of infectious diseases in southwest island populations. Infectious pathogens that originate with foreign fishing crews find their way to Echang as individuals travel between the island chains. Likewise, individuals living in Echang carry pathogens to the southwest islands. Common infections are influenza, respiratory illnesses, and gastrointestinal disorders.

The recent emergence of scrub typhus and dengue fever in Palau illustrate how convergent modes of circular population mobility contribute to disease patterns among populations in Echang and the southwest islands. Dengue fever is a growing threat throughout the Pacific region due to the widespread presence of mosquito vectors and the expansion of urban settings in which these vectors thrive (Lewis and Rapaport 1995). Dengue fever had not been reported in Palau since 1988 (Ashford, et al. 2003) and scrub typhus in southwest island populations appeared for the first time in October 2001 (Durand, et al. 2004). Both diseases are a direct result of local encounters with foreign pathogens.

In 1988, a majority of the serious dengue fever cases originated in Echang and adjacent villages (Ashford, et al. 2003). This outbreak was due to infection with the type-2 dengue viral strain. A previous outbreak in 1995 was due to the type-4 strain. Only one individual in 1995 presented hemorrhagic complications associated with dengue super-infection. However, the 817 estimated cases of dengue related febrile illness in Palau comprise a population that is now at higher risk for dengue hemorrhagic fever should they become infected with serologically different strain of the virus in the future (Gonzales, et al. 2005; Guzman and Kouri 2004). The primary risk factors associated with the dengue outbreak were human contact with infected *Aedes aegypti* and *Ae. Hensilli* mosquitoes. The ecological contexts that conferred an elevated risk of infection in Palau were taro patches (a distinctively rural setting) and areas with containers suitable for breeding mosquitoes (urban settings or city dwellings) (Ashford, et al. 2003). Essentially, all of Echang (and Koror for that matter) was at high risk.

The source of the 2001 scrub typhus outbreak in the southwest Palauan islands was the pathogen *Orientia tsutsugamushi.* This organism spreads through biting mites, *Trombicula alfreddugesi* (also called chiggers, harvest mites, and red bugs). The mites acquire infection after feeding on rodents that harbor the disease. Scrub typhus is a zoonotic rickettsial disease that causes fever, lymphadenopathy, headache, sweating, conjunctivitis, loss of appetite, and a rash. Secondary symptoms are pneumonia and respiratory distress. More serious complications, including splenomegaly, neuralgia, and delirium may develop without treatment. If treated promptly with antibiotics, it is rarely fatal. Epidemiologists speculate that the outbreak in the southwest islands originated

with Indonesian or Filipino fishing vessels harboring infected rodents and mites (Durand, et al. 2004).

Southwest island population migrations to Echang have resulted in extreme population density. A decline in infant mortality rates, an increase in birth rates, and improved perinatal care have all contributed to population growth. Population density is a problem in Echang because its inhabitants cannot expand their residences beyond the small confines of the hamlet. They may move back to their home islands, but this option is highly undesirable because of the remoteness and lack of opportunities to earn monetary income. Populations living in the southwest islands are comprised primarily of young school age children and senior adults (Office of Planning and Statistics 2000). Young children and the aging population carry the highest burden of infectious diseases in the southwest island population generally. They have an elevated risk of disease because of their inherently weaker immune systems (Beers and Jones 2005). Crowding in Echang contributes to high rates of infectious diseases, particularly respiratory and gastrointestinal infections, in these population subsets.

Densely populated households have elevated rates of acute respiratory illnesses like tuberculosis, leprosy, pneumonia, influenza, bronchitis, and asthma (McLafferty 1992). In Pacific Island populations respiratory illnesses are related to a variety of viral and bacterial infections and are associated with malnutrition, poor hygiene, alcohol use, and co-morbidities (Lewis and Rapaport 1995). Shannon (Shannon 2002) identified crowding, lack of sewage, and nutritional deficiencies to disproportionate rates of pneumonia among Australia's indigenous peoples. These health problems are not limited to Pacific populations. A study among Inuit children in Greenland correlated their

significantly higher rates of acute respiratory distress with household density, sharing a bedroom with adults, attending child care facility, sharing a bedroom with other children less than 5 years of age, and exposure to passive smoking (Koch, et al. 2003). Likewise, researchers investigating risk factors for *Streptococcus pneumoniae* infection in urban Massachusetts children found that poverty, lack of plumbing and sanitation, household crowding, unemployment, low education level resulted in a two to three fold risk of pneumococcal carriage (Huang, et al. 2004). The study emphasized that children who lived in with several other children had higher rates of *S. pneumoniae* infection. Similar risk factors, particularly related to household density, sanitation, and air quality, were identified for tuberculosis diagnoses among children in Uganda (Guwatudde, et al. 2003).

Crowding also correlates with gastrointestinal disease due to poor sanitation, hygiene, and living in close proximity to livestock and wild animals (Garnett and Holmes 1996). Gastrointestinal distress and diarrheal diseases are extremely common throughout the Pacific Islands. Low lying atolls with poor sanitation and water quality report numerous morbidities associated with viral and bacterial gastroenteritis (Lobban and Schefter 1997). Intestinal helminthes and cholera have been reported in Papua New Guinea, Kiribati, and the Federated States of Micronesia over the last couple of decades due to similar risk factors (Lewis and Rapaport 1995). Poor sanitation, water quality, and hygiene undoubtedly contribute to gastrointestinal disorders in Echang. Individuals in Echang defecate in pits located in outhouses that are adjacent to living quarters. Only a few households enjoy indoor plumbing and most collect water in rain catchments. GI disorders are significant to the overall health of the population since diarrheal diseases often lead to malnutrition and weakened immune function (e.g., Bentley, et al. 1992).

The ecologic dimensions of disease in Echang intersect with other biologic and behavioral aspects that further our understanding of health disparities in southwest Palauan island populations. Changes in dietary behaviors and food ways over the last 50 years, as a majority of southwest island groups has resettled in Echang, also correlate with the numerous health issues they currently encounter.

b. Mobility, Dietary Change, and Disease

As described in Chapter One, a combination of chronic degenerative and infectious diseases presents considerable health challenges in populations throughout Pacific Island societies (Lewis and Rapaport 1995; Pollock and Finau 1999). In Palau nosocomial infections, otitis media infections, GI disorders, and tonsillitis ranked consistently as the leading cause of morbidity while cardiovascular and circulatory diseases, injuries, and cancer were among the top five leading causes of death in 1998 (World Health Organization 2005). Similar trends were reported for the years 2000-2003 with circulatory diseases ranking as the leading cause of mortality in the nation and infectious diseases as the leading cause of morbidity (Office of Planning and Statistics 2005). Intercensal health data tables for 2003[42] delineate the prevalence of chronic diseases among a representative sample of adult citizens of Sonsorol and Hatohobei States (Office of Insular Affairs 2003). Comparative analysis of the data reported in these tables reveals that Hatohobei State reported notably higher percentage of chronic diseases per household (59.09%) than reported for the national average per household

[42] Data are based on tabulations provided by the Office of Internal Affairs Statistical Enhancement Program. These supplementary intercensal surveys were conducted with a population sample based on national population census surveys. No further descriptions of data collection methods, definitions, or analytical methods used to create these tables were available. Thus, the figures and statistics presented should be interpreted judiciously.

(38.13%), Koror (37.18%), and even among households of Sonsorol State (35.29%). Rates of cancer and diabetes mellitus in Sonsorol (5.85%, 29.41%, respectively) and Hatohobei (4.55%, 54.55%, respectively) households were higher than rates in Koror households (2.55%, 14.14% respectively) and the National Average (2.37%, 15.72% respectively).

Studies in nutritional immunology suggest that diet and nutrition are integral to the etiologies of chronic and infectious diseases alike in terms of pathogenesis, prevention, and treatment (Blumberg 1999). Finding solutions to the health problems associated with poor nutrition and obesity in Palau is an urgent public health initiative (World Health Organization 2005). Southwest island population resettlement in Echang has led to transformations in food production strategies and dietary patterns. These changes correspond with the demands of life in an urban setting and market-based economy that conflict with traditional subsistence lifestyles. This migration has resulted in increased access to biomedicine, educational opportunities for children and young adults, and the chance to earn a wage to better support household needs. The tradeoffs are higher rates of diseases, lower dietary nutrition and diversity, and increased sedentism.

One obvious trend in dietary transitions of the population in Echang is the shift from calories and nutrients derived primarily from whole foods, which were gathered or cultivated for subsistence, to imported processed and preserved foods. Comparisons of past and present dietary practices (see also Watson, et al. 2002) point to a trend away from dietary diversity and nutritional richness of foods to dietary homogony, substantially increased sodium and fat intake, and decreased nutritional diversity.

Although people still consume wild and semi-wild plants, fruits, and cultivated vegetables in Echang, their inclusion in food and medicine has dropped significantly. Field observations reflect a low ratio of plant foods to protein and rice. The decrease in use of tonics, which people once consumed routinely to strengthen the body and prevent illnesses (ref. Chapter Five), has accompanied a generalized decline in nutritional diversity.

Dietary transitions across the globe reflect a shift away from diets high in dietary fiber, fruits, vegetables, and low in total fat to diets high in fat, cholesterol, refined sugars and carbohydrates and low in polyunsaturated fatty acids and fiber (Popkin 1994). Indigenous populations in Australia have moved away from hunter-gatherer subsistence lifestyles to a post-colonial sedentary lifestyle, which is associated with high rates of diabetes, cardiovascular disease, and renal dysfunction (Shannon 2002). Calorie and energy dense foods that are low in nutritional diversity have replaced foods with greater nutrient content and nutritional variety. Diabetes has emerged with nutrition transitions in Ojibwa-Cree populations who relied heavily on hunted and gathered foods in the recent past (Wolever, et al. 1997). Contemporary Ojibwa-Cree food consumption patterns reflect the dietary preferences of the mainstream Ontario Canadian population. The foods they prefer are high in saturated fats and sugars but low in dietary fiber. Numerous nutritional deficiencies in this group manifest as a result of the poor quality of their diets. Health issues that stem from micronutrient deficiencies are high rates of pneumonia and anemia in the pediatric population and atherosclerosis in the adult population.

These examples show that dietary change can mark the degree to which a population has transitioned away from indigenous lifestyles towards standards of living that reflect foreign (e.g., non-indigenous, colonial, or other socially dominant) influences. Acculturation is a term some researchers use to describe this type of shift in a context of disease transitions. Studies have revealed a strong association between differential social acculturation and stress biomarkers of Samoans in Western Samoa, American Samoa, and the United States (Hanna and Fitzgerald 1993; McDade 2001). Samoans living in urbanized areas excreted higher levels of epinephrine, a stress hormone, than their less acculturated counterparts in rural areas (Hanna 1998). The relatively high levels of the stress hormones correlated with regular alcohol consumption, dietary patterns consistent with obesity, and a variety of chronic degenerative diseases. Acculturation that leads to obesity and chronic degenerative diseases is evident among Cambodian refugees in California (Palinkas and Pickwell 1995).

Despite similar examples from geographically distinct populations throughout the world, the transition from life in rural areas to that of urbanized areas does not uniformly result in poorer nutrition and health. One study of diet in South Africa demonstrates how nutrition transitions vary according to social, ecological, and cultural contexts (MacIntyre, et al. 2002). In the North West Province of South Africa food consumption in urban areas corresponds with enhanced nutritional status over that available in traditional diets found in rural areas (Kruger, et al. 2005). Food consumption in rural regions of South Africa includes a low intake of fruits, vegetables, and protein and high intake of staple carbohydrates. Lifestyle transitions in urban resulted in more dietary variety, the incorporation of fruits, vegetables, dairy products, and protein and higher

levels of serum micronutrients. The direction of dietary transition is slightly different in the examples provided above, yet the relationship between dietary diversity and improved nutritional quality of foods remains constant. They key point here is that nutritional diversity and a balance of calorie intake and expenditure are at the heart of epidemiologic and nutritional transitions.

The impact of dietary transitions and obesity in the etiology of chronic degenerative diseases has been widely studied in Pacific Island populations (e.g., Hankin and Dickinson 1972; Hanna 1998; Pollock 1975; Zimmet 1979). Marshall (Marshall 1991) and Collins et al. (Collins, et al. 1996) have also highlighted the role that tobacco and alcohol play in chronic degenerative disease onset. Case studies conducted in indigenous populations of Australia (Shannon 2002) and New Zealand (Barnett, et al. 2004) illustrate this relationship between tobacco, alcohol, and chronic diseases. Despite the great interest in various Pacific health transitions, the literature reflects less concern with the role of poor nutrition in infectious disease patterns.

Plants in indigenous medicines and foods are a vital source of dietary micronutrients (Etkin 1994b). Even small daily doses of phyto-nutrients can improve metabolic processes and improve immune function (Chandra 2002). Wild greens and fruits are the primary source of calcium and Vitamin A in the Shambaa diet (Fleuret 1979). Wild plants have a superior mineral content than cultivated plants (Doughty 1979; Sundriyal and Sundriyal 2004). They provide dietary fiber, protein, fat, vitamins, carbohydrate, and essential amino acids. Fruits and vegetables are significant sources of vitamins, minerals, trace elements, and proteins that enhance nutritional diversity (Lieberman 1987).

Dietary nutrition is related to overall health and many diseases can be attributed to nutritional deficiencies (Quandt 1996). For instance, Vitamin A deficiency has been linked to night-blindness and xeropthalmia (Blum, et al. 2004). Numerous nutrient deficiencies are known to inhibit fertility, elevate risk of neonatal death, and negatively impact fetal growth and development (e.g., Haas and Harrison 1977; Pobocik, et al. 2000). A classic example is iron deficiency that inhibits malaria parasites to reproduce optimally in chronically malnourished individuals (Chandra 1988). In turn, individuals who are afflicted with infectious diseases are also more likely to become malnourished as a result of associated morbidities (Scrimshaw, et al. 1968).

Of course, anthropologists have demonstrated that not all nutrient deficiencies and their associated pathologies are disadvantageous. The opposite is true in the case of populations exposed to malaria over long periods. Lepowsky (Lepowsky 1985) demonstrated the significance of cultural taboos to dietary nutrition, childhood growth and development, and biological adaptation to endemic malaria in Papua New Guinea. The confluence of G6PD deficiency, favism, and endemic malaria among a Hausa population in northern Nigeria illustrates the co-evolution of people, pathogens, and diet (Etkin and Ross 1997). The overlap of diet and culture are complex, and investigations of the relationship between diet and disease require exploration of the biological and cultural dimensions of human foodways.

In contexts where diet is a known factor in the etiologies of chronic degenerative and infectious diseases, the link between nutrition and immune function becomes more compelling. A number of dietary nutrients are required to build and maintain a healthy immune system. Key nutrients that enhance immunocompetence include vitamins A, B_6,

B_{12}, C, D, and E, β- carotene, and zinc (Mitchell, et al. 2003). Certain dietary fats, amino acids, purine and pyrimidine nucleotides, and minerals also have immunomodulatory properties (Blumberg 1999). Fruits and leafy vegetables are primary food sources of these important nutrients. Diets that lack substantial proportions of these foods or their equivalents (i.e., vitamin tablets, fortified foods, nutritional supplements) probably also lack immune-building nutrients.

Nutrient deficiencies lead to weak immune responses, which are associated with increased acute infections, extended duration of illness symptoms, elevated chances of co-infections, and slower response to medical interventions (Johns 1996). Data from the present study indicate that poor dietary nutrition in Echang leads to high rates of infectious and chronic degenerative diseases. The term over nutrition often describes the excessive consumption of calories leading to obesity in developed countries as well as in populations in transition in the Pacific region. In Echang a more appropriate description may be super-caloric malnutrition, or the excessive consumption of calories and inadequate intake of micronutrients.

Approximately 70% of foods consumed by Echang residents are processed canned, frozen, and imported goods bought at markets in Koror. Fresh fruits and vegetables are supplementary to diet (consumed 1 to 2 times per week as food) rather than a primary source (consumption of several servings per day) of energy and nutrition. Whole foods are available at farmers markets, grocery stores, home gardens, and from wild plants in both Echang and the southwest islands. Fresh fish and seafood are also available at various market places and procured through fishing or reef collecting in Koror or southwest islands, in which case fishermen bring their catch to Koror via the

ship and then distribute it in Echang. It is interesting to note that meals in households where local plant medicines were regularly used also incorporated plants and fruits into diet to a greater degree than in other households.

Results of one week of random spot-check surveys are reported below in Table 20. During this survey, 51 discrete observations of 15 households occurred over the period of seven days. This survey represents dietary patterns that are typical for Echang households at any given time. Food categories that are represented in the survey include fruits, vegetables, staple carbohydrates, protein, condiments, snack foods, and beverages. A total of 59.65% of these foods are processed (e.g., canned, frozen, restaurant foods, and otherwise precooked) 40.35% are whole foods (fresh fish, fresh meats, cultivated vegetables, or fresh vegetables purchased at the marketplace, etc.) and 15.87% of whole and processed foods combined are prepared by deep frying in hot vegetable oil.

Modes of food preparation affect the nutrient composition of diet. Various forms of processing foods for human consumption alter the bioavailability of nutrients (Johns 1999). Heat labile nutrients, such as linoleic acid, Vitamins E and C, folic acid, pantothenic acid, biotin become unstable and break down when cooked (Lieberman 1987). Grilled, baked, dried, pickled, boiled, and grilled foods contain less fat and calories than foods that are deep-fried or stir fried in oils. The practice of deep frying fish, eggs, and processed meats (e.g., Hormel Spam luncheon loaf, corned beef hash, canned mackerel, anchovies, and tuna) and stir-frying vegetables and meats with oil has increased dramatically among those living in Echang.

Table 20 Dietary Observations for Five Echang Households

Household Code	Morning Meal	Afternoon Meal	Evening Meal	Snacks
HHA1	Mother and children (N=3): White bread with peanut butter, milk, water Father: no morning meal	Father: fried fish with white rice Mother: white rice, canned corned beef with canned vegetables; milk and water	All (N=5): fried fish with white rice; water	Mother: canned fruit cocktail
HHI1	Mother and children (N=2): Fish sashimi (*tocho*; big eye redfish) with soy sauce and rice; water	Children: Peanut butter and bread; milk Mother: No afternoon meal	All: store-bought fried chicken and rice; water	
HHIT2	All (N=5): Ramen noodles; instant coffee	All: sashimi, rice, and clams with shoyu sauce; water	All: grilled fish and rice; water	
HHIT3	All: (N=8): Rice and fried eggs; Tang drink mix; milk	All: Fried fish and rice (white snapper) or rice and fried egg; water	Adults (N=5): Rice and corned beef; cabbage stir fry with soy sauce and garlic; Children (N=3) Cereal and milk	Child (N=1) Campbell's condensed chicken noodle soup
HHIT1	Adults (N=3): Hormel luncheon loaf; white bread; white rice; Tang orange drink mix	All (N=4): grilled fish (parrot fish) and rice; water	All: Fried fish (1 red snapper, 1 unicorn fish) white rice, Tang drink mix	

Cooking with oils raises the total caloric value of foods. One tablespoon of vegetable canola oil contains 124 calories and 14g of fat and one tablespoon of coconut oil has 117 calories and 13.6g of fat. Since people use more than one tablespoon of these fats to prepare foods, the addition of calories and fats during cooking is substantial. Fresh coconut cream has 325 calories and 32.3 fat grams/ 100g servings. This amount is roughly equal to the amount found in dishes such as fish marinated in coconut cream and rice boiled with coconut cream. Table 21 illustrates the contrast in fat and caloric gain when cooking with oils instead of steaming, baking, boiling, grilling, and dry-preserving

foods. An excess of caloric intake relative to energy expenditure leads to obesity and its associated diseases.

Table 21 Increase in Fat and Calories by Mode of Food Preparation

Food Item Per 100g, unless otherwise specified	Fat g	Energy kcal
1 whole Banana fruit, raw	0.2	265
1 whole Banana fruit, fried	9.2	1109
Taro baked, earth-oven	0.4	122
Taro chips, fried	29.4	503
Anchovy, whole fresh	1.1	80
Anchovy, canned in oil, drained	9.7	20.3
Mackerel, raw	3.1	168
Mackerel, fried	11.3	187
Mackerel, canned in natural oil	12	182
Tuna, smoked	3.7	152
Tuna, fresh, raw	4.7	150
Tuna, canned in oil, drained	13.7	220
Beef, blade steak, lean and fat, grilled	6.8	206
Corned beef, canned	11.2	192
Chicken, baked in earth-oven	11.3	213
Chicken, breaded and fried	18.1	296
Chicken egg, hard boiled	10.9	151
Chicken egg, fried	21.3	256

Source: Dignan, et al. 2004.

Earth-ovens are scarce in Echang. Maintaining an earth-oven or even an open fire is labor-intensive and requires natural sources of fuel, such as coconut husks or firewood. Many Echang residents prefer a cooking stove for its convenience. Here, the primary sources of cooking fuel are gasoline and kerosene. Most households do cook meals on an open fire several times in a week, and households with the lowest income are more likely to employ combination of cooking over a gasoline or kerosene stove and cooking over an open wood-burning fire or grill.

Aside from the dietary implications of increased consumption of foods cooked in oil is the exposure to carcinogens and environmental pollutants due to cooking with kerosene and gasoline as fuels, or even cooking over open fires in densely populated and semi-enclosed spaces. 42 out of 49 (85.71%) Echang household cooking facilities are located indoors (Office of Planning and Statistics 2000). Household exposure to air pollutants from cooking with gas, kerosene, and wood burning stoves elevated children's risk of developing asthma, persistent cough, wheeze, and general compromised lung function in two studies conducted in the U.S. (Belanger, et al. 2003; de Bilderling, et al. 2005). Household exposure to air contaminants from cooking may explain high rates of acute respiratory illnesses in Echang, especially in children.

Tobians in Echang describe a complete meal as some kind of meat in the form of fish, seafood, meat, or poultry coupled with a vegetable (see also Watson, et al. 2002). Locals consider tubers, such as sweet potato (*Ipomoea batatas*), taro (*Cyrtosperma chamissonis* and *Colocasia esculenta*), and cassava (*Manihot esculenta*), and breadfruit (*Artocarpus atilis, A. mariannensis*) as vegetables. These vegetables belong in the same category as swamp cabbage (*Ipomoea aquatica*), onions (*Allium sepa*), garlic (*Allium sativum*), ginger, and napa cabbage (*Brassica oleracea*), which are the five most commonly named vegetables consumed in contemporary Echang households. Rice varieties (white medium and short grain) provide a substitute to staple tubers. Chicken eggs and assorted canned meats provide a substantial source of protein in contemporary diets. Rice and eggs is a popular meal in many households. The table below illustrates the composition of typical Echang diets based on the proportions of foods by categories based on seven days of random dietary observations (Table 22). These proportions do

not meet the new dietary guidelines for Pacific Island communities, which suggest that diets should be comprised of: 50% starchy vegetables, rice, fats, and sugars, 34% fruits and vegetables, and 15% protein, milk, and eggs (Secretariat of the Pacific Community 2004).

Table 22 Foods Consumed in 15 Households, Based on 7-Day 'Spot-Check' Observations

FOOD CATEGORIES[†]	N[*]	%
Protein	21	33.3%
Staple Carbohydrates/Grains	14	22.22%
Beverages	12	19.05%
Vegetables	10	15.87%
Condiments	3	4.76%
Fruits	2	3.17%
Snack	1	1.59%
TOTAL	**63**	

[†]A comprehensive list of traditional foods that fall within these food categories is available in Watson et al. 2002.
* Foods that were observed multiple times were counted only once for this tabulation.

Dietary observations indicate that fresh fruits, vegetables (excluding tubers and grains that are staple carbohydrates) and gathered wild plants do not comprise an important mainstay of Echang diets. At best, people consume fruits as snack foods or enjoy them during special ritual feasts and celebrations when available. For example, 10 individuals divided a single mango fruit into small pieces in order to share. Several individuals may share a single young coconut depending on the number of coconuts available at any given time. It is common for adults and children to report eating a serving of fruit only one to two times per week. It does not appear that this is a phenomena based on low inventory fruits, but rather a combination of access and cultural ideas regarding the relative importance of fruit in the diet. The marginal importance of

fruit in Echang diet contrasts with diets in the Sikkim Himalaya (India) for example, where 65% of the total edible wild plants collected were fruits and berries (Sundriyal, et al. 2004).

An intercensal survey comparing fruit and vegetable consumption patterns reflect similarities between respondent data from Sonsorol State, Hatohobei State, Koror State, and National averages (Table 23). Such similarities are interesting because they suggest that dietary habits in Echang resonate with those of other populations in Koror and the main Palauan islands, despite notable cultural differences in food preferences and cuisines (e.g., McKnight 1977). In other words dietary practices in Echang approximate patterns found elsewhere in Koror, suggesting southwest island population acculturation to Palauan society. These data do not reflect the actual amounts of fruit consumed by individuals, but do provide a glimpse into how frequently individuals in these populations incorporate fruits and vegetables into their diets.

The aging population of Palau continues to expand. The public health implications of an increasing aging population are important. Age, obesity, co-morbidities, medication, and diet all impact how well an individual's immune system functions (Chandra 1988). Aging is associated with a decline in the efficiency and effectiveness of immune responses (Beers and Jones 2005). Epidemiologic studies indicate that individuals over the age of 65 are at the highest risk for hospitalization due to influenza and its associated complications (Beers and Jones 2005; Centers for Disease Control 2005). The aging of the immune system may begin as early as age 50 since nutrient deficiencies were observed in individuals ages 50-65, and dietary

supplementation was effective in improving their immune responses to infections (Chandra 2002).

Table 23 Self-Reported Fruit and Vegetable Consumption Patterns

Fruit Consumption Days/week	Sonsorol State N (%)	Hatohobei State N (%)	Koror State N (%)	National N (%)
1	4 (26.67)	8 (32.00)	2006 (24.69)	2740 (24.68)
2	3 (20.00)	7 (28.00)	1670 (20.55)	2422 (21.82)
3	0	6 (24.00)	1562 (19.22)	2242 (20.20)
4	5 (33.33)	1 (6.67)	537 (6.61)	682 (6.14)
5	3 (20.00)	0	358 (4.41)	476 (4.29)
6	0	0	131 (1.61)	171 (1.54)
7	0	3 (20.00)	1862 (22.91)	2367 (21.32)
	N=15	N=25	N=8126	N=11,100
Vegetable Consumption Days/week				
1	2 (14.29)	6 (22.22)	759 (8.61)	1141 (9.49)
2	3 (21.43)	7 (25.93)	960 (10.89)	1438 (11.96)
3	2 (14.29)	3 (11.11)	1701 (19.30)	2418 (20.11)
4	2 (14.29)	1 (3.70)	860 (9.76)	1190 (9.90)
5	5 (35.71)	2 (7.41)	683 (7.75)	931 (7.74)
6	0	0	225 (2.55)	303 (2.52)
7	0	8 (29.63)	3625 (41.13)	4605 (38.29)
	N=14	N=27	N=8813	N=12,026

*Based on OIA data (Office of Insular Affairs 2003). N reflects number of individual respondents. Percentages calculated are based on total number of people who actually responded to the survey, and exclude unknown, or non-respondent, data.

In the United States chronic lower respiratory diseases, influenza and pneumonia, and septicemia are ranked fourth, sixth, and tenth respectively in the top 10 leading causes of deaths among individuals age 65 and older (Hoyert, et al. 2005:29). Chronic degenerative diseases often weaken the immune system and subsequently compromise individual immune responses to infectious pathogens, such as those related to influenza and pneumonia. Influenza morbidity occurs primarily among the elderly and individuals with chronic degenerative diseases. Over half of all patients that are hospitalized due to

influenza are over the age of 65, and persons in this age group account for more than 80% of all influenza related deaths (Beers and Jones 2005).

Immune senescence refers to a progressive decline in the immune system as one becomes older. This decline leads to weakened immune responses to pathogens. Immune senescence also leads to inappropriate immune responses, such as autoimmune disorders (e.g., arthritis) in which the immune system launches an attack against itself rather than foreign agents. These disorders arise from excess production of autoantibodies, or cells that fail to differentiate self from other. Adults over the age of 70 are more likely to produce autoantibodies resulting in rheumatoid arthritis and atherosclerosis (Burns 2001). Aging is also associated with re-activation of latent infectious diseases such as tuberculosis, herpes zoster, and Epstein-Barr virus (Beers and Jones 2005).

Scientists measure immune senescence in terms of how quickly an individual responds to infection, as well as the duration, effectiveness, and specificity of the response (Aspinall 2000). In elderly adults, production of lymphocytes is markedly impaired and T-cells are less effective in counteracting pathogens. Antibodies launched to protect against viral and bacterial infections circulate in fewer numbers for abbreviated periods in seniors than in younger adults. The elderly population in the United States typically present with numerous nutrient deficiencies that exacerbate problems associated with immune senescence.

Research continues to implicate immune senescence and nutrient-related immune dysfunctions in the etiology of chronic degenerative diseases. Patients with diseases such as breast cancer, cystic fibrosis, diabetes mellitus, and alcohol related cirrhosis of the

liver exhibit impaired antioxidant immune function (i.e., a cellular processes that retards oxidation of tissues) (Grimble 1998). Cancer patients with nutrient deficiencies are unable to clear tumor cells as effectively as their well-nourished counterparts are. Nutrients that are directly and peripherally involved in antioxidant defenses, such as Vitamins E, B_6, C, and riboflavin, glutathione, zinc, copper, selenium enhance the body's ability to resist oxidative cellular damage . Other anti-oxidants like β-carotene, ascorbic acid, tocopherals, catechins, and tannins are also significant and are derived primarily from plants (Grimble 1998:1301).

In addition to the effects of poor nutrition on infectious disease patterns, poor nutrition leads to obesity, which also causes immune suppression. The WHO has produced a graph[43] based on 1990-1991 Palau Health Survey to illustrate the distribution of obesity by BMI based on gender and age:

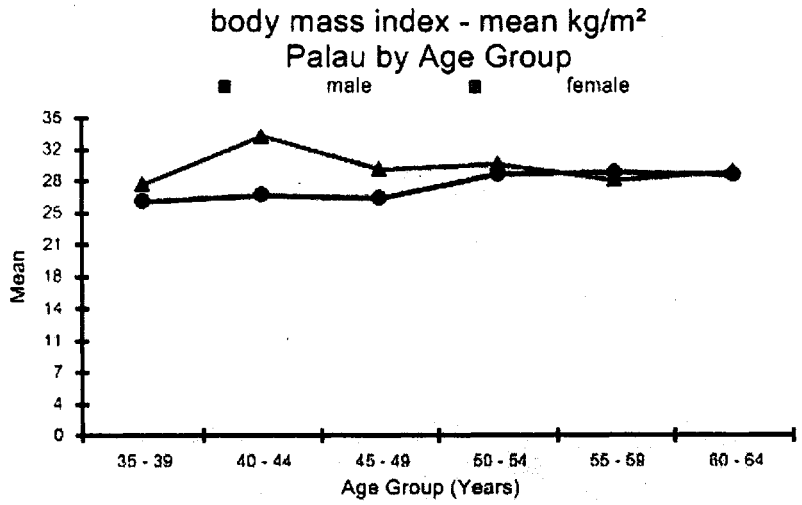

Figure 6 BMI by Age Group: Palau 1990-1991

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[43] Source: WHO website, URL: http://www.who.int/ncd_surveillance/infobase/web/InfoBasePolicyMaker/CountryProfiles/CountryProfile.aspx?UN_Code=585&comp=0&dm=5, accessed 21 October 2005 at 10:25AM, EST.

According to interviews with health care workers, the southwest island populations present fewer obese/morbidly obese (BMI $\geq$ 32) patients than their Palauan counterparts. Echang residents do, however, appear to be at high risk for obesity, which is defined for public health purposes as having a BMI between 27 and 32. The impact of obesity on immune function among the aging population is even more substantial (Moriguchi, et al. 1995).

Obesity caused by super-caloric malnutrition is implicated in direct changes to immune cellular functions and indirectly through metabolic and endocrine modulation (Samartin and Chandra 2001). For example, dietary fats compromise cellular immune responses to mitogens and antigens (extracellular signals that indicate infection by pathogens). Lipids also impair the production of killer cells by reducing interleukin (a type of cytokine that allows cells to interact and launch immune responses) and macrophage activity. This process is one explanation for why obese individuals are at higher risk of nosocomial infections (Kumari and Chandra 1993).

Clearly, a number of factors play into disease patterns in Echang. The ecological and biological aspects of disease are somewhat self-evident. More subtle dimensions of human-environment interactions that lead to disease include those related to issues of politics, equity, and poverty.

2. Political Ecology and Health

Poverty in Echang results from political and economic oppression. Echang residents have limited access to employment opportunities, education, and natural resources in Koror with which to secure foods and medicines. As described in detail in Chapter Three, the political context of southwest island population movement has

engendered their social, economic, and economic marginalization in Koror society. Chapter Five provides an analysis of the ways in which ethnic differences have influenced health-seeking patterns in the context of medical pluralism. Political incongruities parallel shifts in human-environment encounters that produce disease.

Mobility patterns between the southwest islands and Echang, including the exchange of goods between these regions of Palau, are vital to food security of Echang residents. The extreme poverty of many Echang residents necessitates the pursuit of novel means to secure resources that sustain life and promote health in Koror. The current demand for goods from the southwest islands by Echang residents provides justification for as frequent ship travel as is possible, which in 2001-2002 was one round trip every 4-6 weeks.[44] Frequent ship travel is in turn supports the continued circulation of infectious diseases.

Many Echang residents, particularly Tobians, do not have rights to cultivate lands in Echang, but they may own land in their home islands. For many, access to natural resources of the southwest islands maintains a source of food security. Items that Echang residents procure from the southwest islands include foods such as giant taro (*C. chamissonis*), coconut, tobacco, lemons (*C. hystrix*), pigs, sea turtle (*Chelonias mydas*), coconut crab (*Birgus latro*), giant clam (*Tridacna spp.*), lobster (*Panurilus spp.*), and pelagic fishes.[45] These foods do not provide the mainstay of diets for Echang households, but they do play a significant role in periodic dietary supplementation

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[44] During this period, the frequency of ship trips coincided with the operational needs of police enforcement and natural resources monitoring through the Hatohobei State Helen Reef Management Program.

[45] For comprehensive lists of Tobian fish names see Johannes (1981) and the fish lists on the FOTI website: http://cas.gmu.edu.

particularly in poorer households. A number of these foods are marketable in Koror for cash. They also provide means to practice traditional ritual celebrations that include the exchange and distribution of these specialty food items.

To ensure the continued availability of cultivars, especially giant taro, true taro, coconut, and pumpkin, some Echang residents periodically return to their home islands to tend their lands, gardens, and housing structures. These households have a stake in keeping the natural resources a viable component of their overall survival strategy in Echang. Educated individuals with employment in Echang households focus less time, energy, and money on their lands in the home islands and more resources into supporting their life in the main islands or abroad.

Each household in Echang has differential access to farmlands in the main Palauan islands depending on their relationship to Palauan landholders. As a result, some families are able to gather medicinal plants, farm, and fish to a greater degree than others are. In general, individuals in households who devote significant energy to food cultivation, fishing, and preparing medicines are unemployed. Therefore, their ability to engage the market economy in Koror depends on other household members or other social networks.

A number of families in Echang have kin who live abroad for educational, career, or other purposes. These individuals maintain their ties with families in Palau via remittances of money and goods. The growing international network of people from the southwest islands who live abroad provides yet another avenue of economic security. A household that is able to support their children to pursue an education abroad is investing in the well-being of their entire household, since an educated person working abroad is

able to contribute to their family's income and access to the global economy. People educated abroad will find employment more easily in Palau should they decide to return and re-establish residence there. Population density in Echang deters the return of many young adults who have been educated abroad, although there are exceptions. The fact that people from the southwest islands are not able to purchase land in Palau makes it difficult for the population in Echang to branch out. It is likely that in the future, through improvements in conveyances between the north and southwest islands, expansion will proceed in the direction of the southwest islands as well as steady out-migration to foreign countries.

The politics of ecology and health that are associated with various types of migration and resettlement of southwest Palauan island populations contribute to the high rates of chronic degenerative and chronic infectious diseases in Echang. It is expensive to manage chronic illnesses and persistent morbidities associated with infectious diseases over time (Warnes 1994). The economic burden of chronic diseases in Echang is substantial. It will only continue to grow as the population expands and ages. Echang residents cope with the economic burden of health care through traditional healing that complement biomedicines. This practice is also widespread in the United States (e.g., Adler 1999; Eisenberg, et al. 1998; Etkin and Ross 2002; Kakai, et al. 2003).

3. Medical Decisions in the Context of Transition

People from the southwest islands moved from an extremely remote locale to a setting that is relatively urban, culturally heterogeneous, and globally connected. The transition from the southwest islands to Echang introduced new challenges for social

organization, subsistence strategies, and health maintenance.[46] Migration and mobility facilitated encounters with novel natural and anthropogenic therapeutic landscapes that are pluralistic in nature.

Two primary features of indigenous medicine of the southwest islands influence the ways Echang residents navigate through a wide array of medical alternatives available in Koror.[47] The first is the notion of healing partnerships. These partnerships involve specific guidelines for combining plants in medical recipes, the integration of various types of therapeutic modalities in healing, and the relationship between an individual requiring therapy and the healer. The second important feature is the concept of efficacy, which emanates from appropriate therapeutic partnerships. Efficacy has palpable biological manifestations that guide contemporary medical beliefs and choices. Ethnic and political disparities also shape medical choices of Echang residents.

Healing practices in Echang reflect the pluralistic context of medicine in Koror. A combination of biomedical, indigenous (e.g., southwest islands), and local alternative medicines (e.g., Palauan, Yapese, Japanese, Indonesian, Filipino, Chinese, etc.) yield diversity and flexibility in the ways people restore health or prevent illness. One way that people in Echang make sense of these choices is through their understanding of therapeutic partnerships.

Partnerships are the foundation of indigenous medical practice of the southwest islands. Individuals who use indigenous plant medicines in Echang create medicines based upon memorized recipes. These recipes delineate specific instructions regarding

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[46] Refer to Chapter Three for a more detailed discussion of the historical context of migration.

[47] Refer to Chapters Four and Five for comprehensive description of indigenous medical ideology and practice.

the age, quantity, and constituent of the required plants. The combination and preparation of plants depends on their context of use and other characteristics of the individuals who will use them. Migration transformed individual access to plants as well as the variety of plants available for use in food and medicine. The therapeutic landscape in Echang is similar to the southwest islands, but a number of important medicinal plants in the southwest are not available in the north islands. In addition, the move to Echang inspired many individuals to acquire knowledge of the new botanical landscape as well as the indigenous Palauan use of plants that were now easily available. Echang residents who practice plant medicines have maximized their knowledge of indigenous and Palauan plant medicines and expanded the array of medical alternatives available to them even further.

Therapeutic regimens in indigenous medical systems of the southwest islands include the concurrent and serial use of various types of therapy. Tobians and others in Echang incorporate novel healing techniques that they find useful into their local therapeutic regimes following principles of their indigenous medical system. The combined use of medicines from discrete healing paradigms achieves comparable results that indigenous healing partnerships produce. Tobian therapeutic partnerships may enhance the efficacy of one or more of the prescribed medicines, they may attenuate or intensify the effect of another medicine, or they may provide a failsafe in case another medicine is inappropriate or weak. Etkin et al. (Etkin, et al. 1990) report similar findings in Northern Nigeria where indigenous medical theory that guides the selection and use of medicinal plants also informs the integration pharmaceuticals into healing strategies. The cultural reinterpretation of pharmaceuticals according to their appearance in Sierra Leone

(Bledsoe and Goubaud 1988) represents another example of how local categories of medicine impact medical decisions in pluralistic settings. The combined use of plants and pharmaceuticals in other settings also resonate with a belief that combinations of medicines yield desirable outcomes (Nichter and Vuckovic 1994).

Concepts of "*weak*" and "*strong*" in Tobian healing inform the selection of biomedicines and choice of physicians in Koror. Particular plants in the Tobian botanical pharmacopoeia are extremely potent, such as *yaho*, *nuhr,* and *ngou*. Healers manipulate the strength of plants through partnerships at the level of medicinal preparation as well through partnerships with other healing modalities. Strong pharmaceutical medicines occupy a similar position in therapeutic categorizations as do strong medicinal plants: they are good on their own, but in combination with other plants or types of therapy, they become even stronger or weaker. In Echang, local observations that various physicians and pharmacies carry pharmaceuticals of varied strengths influence how individuals choose between several different clinics.

The preference for medical panaceas and magic bullets in other settings reflects similar definitions of strong and weak medicines. Brazilians in Feira use Tetracycline as a medical panacea (Ngokwey 1995) while injections are in high demand throughout Thailand (Cunningham 1970). In both these settings, the demand for pharmaceuticals is based on a belief in their superior strength and potency. In Echang Tylenol is the medical panacea of choice. Its use follows local perceptions of weak medicines being safe and the principle that in order to increase efficacy a higher dosage is required. Serious health consequences result from such beliefs and practices, as discussed in Chapter Five. The perception that strong medicines cure illnesses quickly often leads to unrealistic

expectations of pharmaceuticals when people categorize them as strong medicine. The expectation that antibiotics cure pneumonia within a matter of hours perpetuates dangerous experimentation with medicines in Pakistan (Hussain, et al. 1997). Such behaviors worldwide have supported global emergence of antibiotic resistant pathogens (Barrett, et al. 1998).

Indigenous beliefs about therapeutic efficacy and the role of medicines in diagnosing illness perpetuate the use of complementary and alternative medicines in Echang. Individuals adjust therapeutic strategies throughout the healing process based on observed physiologic outcomes of therapy. Indigenous approaches to healing are not unlike those in biomedicine where doctors alter pharmaceutical dosages or change a prescription altogether if a patient has an adverse reaction to therapy. The difference is that local perceptions of an appropriate response to therapy differ from those in biomedicine. What biomedical practitioners define as adverse reactions or side effects are the same manifestations that signify effective therapy in many local indigenous healing systems (Etkin 1992). Tobians often interpret vomiting, diarrhea, bleeding, fever, chills, sweating, the appearance of a rash, and blistering as symbols of disease egress. Their choice of medicines and manipulation of dosages, both of plants and pharmaceuticals, correspond directly to local ideas about what constitutes efficacy. Likewise, among a group of Kannanda in India the appearance of skin lesions associated with measles is a sign that toxins and heat are leaving the body (Nichter 1996). Because of this belief, they are less likely to adopt biomedicines that reduce these physiological symptoms of healing. In Zambia Ndembu healers use pharmaceuticals to determine whether or not diseases require indigenous therapy (Nichter and Vuckovic 1994). The

absence of any physiological response to the pharmaceuticals, something a biomedical physician may regard as desirable, signifies to local healers that the individual requires traditional medicine.

Echang residents measure efficacy in a number ways. The first is the extent to which a particular medicine or therapeutic regimen leads to expected or desired physiological outcomes. An extension of this definition of efficacy is the nature of the relationship between the person who is ill and the person who is orchestrating therapy. Traditionally the success or failure of therapy rested on the healer's talent. Although many aspects of traditional healing are not practiced in Echang, the idea that therapeutic efficacy is a direct result of healer aptitude remains important. It is particularly salient in when people in Echang choose between various physicians in Koror. Those in Echang believe that practitioners who have strong relationships with their patients, and who have superior talent for medicine, are the most effective practitioners.

The relationship of healer and patient are important in other context cross-culturally, as is the concept of efficacy. In Russia physician-patient rapport is one quality that people prioritize in choosing a physician (Lindquist 2002). In the southern Maya highlands people seek out bonesetters who cultivate strong relationships with their patients, as well as those who possess the ability to incorporate modern technology into their practice (Hinojosa 2004). Among the Hausa in northern Nigeria, healer talent is secondary to a fundamental medical principle called *karba. Karba* refers to the degree to which a medicine is compatible with the patient (Etkin 1992). Similarly, in the Philippines the concept *hiyang* denotes a compatibility of healer and medicine at one level and medicine and individual at another.

The waning of indigenous plant medicines in Echang coincides with a general trend away from cultigens and non-cultigens as food. Reduced access to lands on which to cultivate foods, scarcity of medicinal plants, the marginalization of indigenous medicines, and social transformation are key factors. Interestingly, the shift in the array of plants used and frequency with which Echang residents use them parallels a rise in diet-related disorders and persistent infectious disease morbidities. While it is impossible to quantify the full impact of plants on the health of past southwest island populations, it is possible to infer their significance based on what we know about the plants that were used, the ways in which they were used, and their cultural significance in contemporary society.

C. The Overlapping Contexts of Food, Medicine, and Disease

Plants utilized in medicine, particularly those that strengthen and prevent illness, provide an important source of nutrients and dietary diversity, albeit not from typical food categories (Table 24). This observation is methodologically significant since conventional approaches to dietary analyses tend to exclude medicinal foods (e.g., tonics, medicines to drink, and medicines to eat) in dietary/nutritional analyses (Etkin 1996b; Etkin and Ross 1991b).

Table 24 Nutrient Content of Selected Echang Plants Used in Food and Medicine

Plant *Genus species*	Na (mg)	Mg (mg)	K (mg)	Ca (mg)	Fe (mg)	Zn (mg)	β-carotene µg	Vit A µg	Thiamin (mg)	Riboflavin (mg)	Vit C (mg)	Vit E (mg)
Cocos nucifera - coconut oil	T	T	T	2	T	T	T	T	T	T	0	0.7
- coconut cream, fresh	13	28	280	15	1.8	1.0	0	0	0.02	0.01	1.0	0.06
- young coconut juice	6	4	57	12	T	T	0	0	T	T	1.4	0
- coconut toddy, boiled	122	19	452	T	T	T	T	T	0.05	T	20.2	0
- mature flesh	17	57	370	14	2.2	0.6	0	0	0.02	0.02	2.0	0.6
Carica papaya shoots, raw	3	60	629	290	6.4	0.4	3670	306	0.09	.37	124	2.0
Colocasia esculenta root, baked earth oven	25	37	521	19	0.6	1.2	T	T	0.07		T	2.9
Curcuma longa root, dried	3.8	193	2530	182	41.4	4.4	0	0	0.15	.23	26	3.2
Curcurbita pepo leaves, raw	17	78	438	480	2.5	0.9	3117	260	0.15	0.37	28	2.0
Cyrtosperma chamissonis leaves, raw	5	47	748	276	2.8	0.6	6090	508	0.08	.16	81	2.3
Ipomoea batatas leaves, raw	10	50	420	190	2.0	0.4	1056	88	0.08	.18	25	1.0
Morinda citrifolia leaves, raw	392	96	91	468	1.4	1.4	5274	440	0.04	.17	44	1.0
Zingiber officinale root, fresh	3	28	125	17	2.5	0.4	32	3	0.01	0.03	2.0	0.1

Source: FAO Pacific Island Food Composition Tables (Dignan, et al. 2004). All measures are per 100g of plant material.

1. Is It Food or Is It Medicine?

Studies of human-plant co-evolution suggest that the origins of medicines are a result of human experimentation with different types of plants as potential foods (Johns 1996). There is even evidence that our primate ancestors ingested plants for medicinal purposes (e.g., Glander 1994) and to regulate fertility (e.g., Sauther 1994). Logan and Dixon (Logan and Dixon 1994) note that agricultural societies have produced the largest medical pharmacopoeias. The reasons for this are probably the intensive human

interactions with plants involved in agriculture and the process of domesticating food plants. When one is trying to ascertain the various sources of immune-boosting micronutrients, all ingestive behaviors are important, not simply those that fulfill basic caloric needs.

In Echang, many medicines comprise a category of ingestive behaviors that provide supplementary nutrients and diversity to diet. Over half of the plants used as medicine in Echang are also foods. A vast majority of Tobian medicinal plants are wild or semi-cultivated. Their widespread availability would have provided calories and nutrition in the event that food supplies were low, as was often the case of bad weather when fishing, farming, and reef collection was difficult. Others highlight similar uses of wild plants in periods of famine and food shortage in Africa (Lockett, et al. 2000; Smith, et al. 1996) and Spain (Tardio, et al. 2005). Plants occupy similar positions of importance cross-culturally in contemporary urban and rural contexts elsewhere. A study conducted in Anatolia between 1999 and 2002 revealed 121 wild plant species used in both food and medicine (Dogan, et al. 2004). Wild vegetables used in food and medicine in Vietnam remain important, particularly as sources of dietary folate (Ogle, et al. 2001). A study among Hmong immigrants in Sacramento, California demonstrated the cultivation of important food and medicinal plants in home gardens (Corlett, et al. 2003). Recent research in southern Ecuador highlighted over 300 species of wild edible plants, among which a number are medicinal (Van den Eynden, et al. 2003). Clearly wild food and medicinal plants remain important to human health patterns globally.

An understanding of the criteria by which various plants are considered foods or medicines is helpful in identifying those plants that occupy a position in multiple cultural

contexts (Etkin 1993). Tobians conceptualize plants as medicine when they deliberately use them to treat or prevent illness. The process of Tobian healing involves numerous ritual preparations and behaviors that mark the medical use of plants. Medical efficacy hinges on the proper configuration of plant partnerships during preparation. Tobians believe that individual plants that may have pharmacological properties that influence health when eaten as foods (e.g., *Capsicum frutescens, C. hystrix, Citrus microcarpa, I. batatas, M. citrifolia, Musa sp., O. sanctum, P. scolopendria, Z. officinale*). However, they believe that plants do not reach their full healing potential when decontextualized from the curative process and their therapeutic partnerships.

The Tobian medical system contains a number of dietary proscriptions and prescriptions for illness (ref. Chapters 4 and 5). Still, the use of food to influence health is part of the entire healing process. Tobians distinguish between therapeutic use of plants in food and medicine, and the use of medicinal foods, to a greater degree than those who practice traditional Chinese medicine or Ayurvedic medicine, for example. In these latter two medical systems all meals and foods that are eaten influence body composition, and ultimately, long-term health of individuals (e.g., Anderson 1997; Bentley, et al. 1992; Manderson and Mathews 1981).

Tonics are both a food and medicine. Occasionally, Tobian healers prescribe tonics to treat specific health conditions. Their more common use was as a dietary supplement. In the past individuals used tonics regularly because of their strengthening and preventative properties. Tobians describe tonics as a monthly or bi-monthly form of routine dietary supplementation for entire households. Tonics provided supplementation during periods of dietary scarcity. Tonics have a analogous positions in pharmacopoeias

cross-culturally (e.g., Dixon, et al. 1999; van Esterik 1988; Volpato and Godinez 2004). Approximately 11% of all Tobian medicinal recipes are for tonics. Typically, Tobian tonics are comprised of multiple plant species and a variety of plant constituents, like leaves, bark, fruit, seeds, nuts, and extractions. Tonics epitomize the principle of partnerships in Tobian medicine.

There is almost certainly a biochemical basis to culturally prescribed plant partnerships, modes of preparation, and administration. Plants contain secondary metabolites, called allelochemicals, which are integral to plants' defense against predation. The evolution of human diet entails technological and chemical manipulation of plant allelochemicals in order to reduce toxicity, improve digestibility, and increase bioavailability of select nutrients and pharmacological constituents (Johns 1999). To date there have been no studies of the chemical basis of Tobian plant medicines. Pharmacological studies of individual plants provide information regarding specific biologic actions of plants in humans. They also elucidate biochemical mechanisms for their use in healing paradigms for various illnesses. The study of phytochemical combinations would shed light on the pharmacology of Tobian medicines, including tonics.

A majority of Tobian tonics (61.54%) consist of an unheated fresh water or coconut juice base infused with fresh plant constituents. Given that the process of heating or cooking plant foods may compromise heat-labile micronutrients, cold infusions and other raw plant preparations provide an extremely nutrient dense dietary supplement. On the other hand, applying heat to a preparation is one means to incite a chemical reaction. Heat may provoke changes in phytochemicals that degrade their

toxicity (Johns 1996). The application of heat to prepare medicines, such as tonics, may be a means to detoxify phytochemicals and control dosage in humans to produce desired physiological outcomes.

Peeling, pounding, and grating plant materials prior to adding them to a solution effectively destroys plant cells and facilitates the release of plant constituents into solutions during leeching (Johns 1996). Nearly all Tobian medicine preparations are made by soaking pulverized plant constituents in a solution of water, coconut juice, or coconut oil prior to their use. Chewing medicines and then spitting them out effectively achieves the same result. All Tobian topical medicines contain processed plant materials infused in coconut oil. The use of fresh, uncooked plant materials in the majority of Tobian medicines may maximize their therapeutic potential.

Regular consumption of plant medicines for common illnesses elevates their contribution to overall nutrient diversity and immunological function. Gastrointestinal disorders are extremely common in Echang and so are the plant medicines used to treat them. When ingested these medicines alleviate symptoms of GI distress while also providing nutrients that enhance immune function. Medicines for injuries, pain, arthritis, and muscular aches are widespread in Echang. The human immune system responds systemically to injuries similarly to how it responds to invasion by allergens, toxins, and other foreign pathogens (Gershon 1997; Grimble 1998). The immune-enhancing nutrients in medicines that are ingested may bolster the human inflammatory responses, which clear away and repair damaged tissues. The consistent use of medicines to manage pain, inflammation, bleeding, and infections is worthy of further investigation. Of

particular interest is the effectiveness of transdermal absorption of phytochemicals in influencing human immune responses to injuries and infections.

2. Biocultural Significance of Betel Nut

Another category of human ingestive behaviors that is worth mentioning is recreational plant use. Plants used recreationally for intoxication and other purposes are consumed with great frequency, but are neither food nor medicine. Betel chewing is one of the favorite Palauan past-times and is just as popular among southwest islanders in Echang as the rest of Palau. Researchers often categorize habitual betel chewing as an additive behavior, and so they evaluate the practice in terms of its behavioral health implications along with alcohol, tobacco, and other psychoactive or illicit drug use. They tend to separate the categories of drugs and diet because a temporal separation divides these two types of ingestive behaviors. Cultural practices guide the contexts and frequency of use that, in turn, influence the biological significance of these substances. Combined betel nut-tobacco use in Palau warrants its integration into a more comprehensive analysis of diet and nutrition (Sullivan and Hagen 2002).

The health impact of betel chewing in Echang is multifaceted. Betel contains nine major alkaloids, of which arecoline is the most abundant. It is habit forming and people refer to its ability to allow them to work longer, maintain their alertness, dull pain, warm the body, and stimulate circulation. These descriptions resound with bioscientific analyses of its physiological effects such as elevated body temperature, perspiration, increased heart rate, vasodilation, and bronchial constriction (Chu 2002; Sullivan and Hagen 2002). In Palau women chew betel quids during childbirth and post partum to relieve and bring heat into the body. Its use among schizophrenic patients in Koror is

associated with improved social function and diminished symptomology (Sullivan, et al. 2000).

Betel nut is an important substance in social gatherings. Its shared use solidifies social relationships in Echang (c.f. Sullivan, et al. 2000). Most Palauans assert that betel is a relatively harmless activity, although it is highly addictive, leads to painful toothaches, and often accompanies tobacco addiction. Many believe that chewing the fibrous betel quid removes plaque build up and neutralizes oral bacteria, supplanting the need for fluoride toothpaste and toothbrushes. A potential nutritional benefit of chewing betel nut is the contribution of slaked lime as a supplementary source of dietary calcium (Lieberman 1987). Habitual chewing contributes noteworthy amounts of dietary protein, fat, sodium, potassium, iron, thiamin, zinc, riboflavin, niacin, and vitamin E to daily recommended allowances for these nutrients (Dignan, et al. 2004).

Despite these assessments of the benefits of betel nut, far more evidence suggests that there is serious health risks associated with betel nut use. Research on the effects of chewing betel nut, particularly its association with dental caries and associated tooth pain, suggest that claims it promotes periodontal health are overstated (Neely, et al. 2005). The use of cigarette tobacco or chewing tobacco in lieu of the traditional pepper leaf in the betel quid poses serious risks for oral submucous fibrosis, a type of oral cancer (Zain 2001). Furthermore, alcohol consumption is implicated as an associated risk factor for oral cancer in individuals who chew betel and tobacco (Chung, et al. 2005; Hashibe, et al. 2002). Betel nut and alcohol use overlap in Echang, particularly in social settings, and a majority of betel users in Echang chews a quid laced with tobacco. The addition of tobacco does not impair the bioavailability of arecoline, the betel-nut specific alkaloid,

but it amplifies exposure to carcinogenic nitrosamines (Gupta, et al. 1996; Nair, et al. 1985). Smokeless tobacco is implicated in cardiovascular diseases, periodontal disease, and asthma (Critchley and Unal 2003). The risk of these diseases is significantly higher among those with diabetes and hypertension.

A concern with physical appearance is one reason people in Echang chew betel nut with tobacco instead of a *P. betle* leaf, called *kebui* in Palauan. The traditional betel quid combination (betel nut, slaked lime, and leaf) activates a chemical reaction that turns saliva a bright red color that over time stains the teeth. Stained teeth are something that young adults in Echang consider undesirable, especially among those who work in Koror. Finding the leaves to chew is another factor since they are not always plentiful in the wild or at marketplaces. One informant described cigarettes as cost-effective than *kebui*, because even though cigarettes are expensive, one can use a single cigarette in 3 or 4 quids, but a single leaf is required for each quid. Nicotene addiction undoubtedly amplifies the addictive nature of modified betel quids and the frequency of their use. This simple substitution has far-reaching detrimental health affects, since risk of developing oral cancer rises with the frequency of chewing betel and tobacco together (Sinor, et al. 1992).

Tobian informants cite appetite suppression as one of the many reasons they use betel nut, both with and without tobacco. Usually this behavior is a response to a physician's suggestion that the individual lose weight to prevent hypertension and diabetes. Betel nut has been shown to suppress human appetite (Strickland, et al. 2003). Yet, eating patterns in individuals that chew betel nut to suppress appetite reflect recurrent starve-binge cycles that are more conducive to obesity than weight loss.

Among Echang residents, the effects of appetite suppression were transient. Following a period of food restriction individuals consumed an excess of food. Similar cycles of appetite suppression, food restriction, and indulgence occurred with the use of tobacco, alcohol, and *noni* tonics. Over the long term this type of irregular food consumption leads to obesity, higher circulating lipid and cholesterol profiles, and complications associated with type-2 diabetes (Farshchi, et al. 2005; Wisse, et al. 1999).

There are still substantial numbers of people who smoke cigarettes in Echang. Crowding elevates rates of second-hand smoke and contributes to overall poor air quality, which is related to high prevalence of chronic upper respiratory ailments, asthma, ear and eye infections, particularly among children and the elderly (Patel 1999).

3. Phytochemicals and Polypharmacy

Repeated exposure to plants in various contexts and types of exposure (ingestive, topical, inhalation, masticatory, etc.) confound the potential impact of plants on health (Etkin 1994a). Add to this the use of pharmaceutical medicines and the health implications of medical behaviors increase exponentially. It makes sense that chemical compounds in both pharmaceuticals and plant medicines interact variably to influence individual physiology. Phytochemicals and pharmaceuticals produce physiological results that are not intended by the manufacturer (Fugh-Berman 2000), but are nonetheless eventually selected by individuals based on culturally-prescribed ideas about desired outcomes and meanings of physiological reactions. Some interactions are benign, while others are life threatening.

Physicians in Palau are aware of the fact that people use of local medicines. Yet, they do not address the health impact of plant use in multiple contexts with their patients.

Although the practice of local medicines is common in villages similar to Echang throughout Palau, perhaps an avenue of inquiry that is worth investigating is the chemical interaction of betel nut and common pharmaceuticals. Doctors in Koror note that they advise their patients to abstain from betel, tobacco, and alcohol when these substances are contraindications to pharmaceutical efficacy. However, instructing a patient to avoid these highly addictive substances without the means, education, and resources to enable them to yield such warnings is highly ineffective. Tobian informants in Echang who chew betel habitually, including two diabetic patients and several on treatment protocols for high blood pressure, confess to repeatedly attempting to quit betel nut and tobacco use upon doctor's orders with no success. Cravings, tooth pain, and weight gain were the primary reasons given for failure to adhere to doctor's instructions. Some individuals expressed a willingness to risk the side effects of the drug interactions, while others said they just avoided taking their prescribed medications because of the fact they could not manage to quit using betel nut and tobacco.

Pervasive betel chewing may affect the efficacy of plant medicines and pharmaceuticals. For example, arecoline is an antagonist against procyclidine, a pharmaceutical that is used to treat antipyramidal symptoms in schizophrenic patients (Deahl 1989; Johnstone, et al. 1983). Betel nut consumption is associated with asthma and hypertension in Palau, and so its impact on asthma and blood pressure interventions requires further exploration. Clinical case studies reveal that arecoline inhibits the efficacy of prednisone and salbutamol in the control of asthma (Fugh-Berman 2000). Other pharmacokinetic and pharmacodynamic interactions of betel nut quids, in all their various forms, deserves attention with regard to pharmaceuticals distributed in Palau, in

particular those that are meant to manipulate parasympathetic responses of the central nervous system (Chu 2002).

Assessing the nutritional contribution of plants in the context of concurrent pharmaceutical use is complicated. Do pharmaceuticals influence the nutrient content of plant foods and medicines when used contemporaneously? What are the long-term effects of such interactions? To what extent are phyto-nutrients bioavailable? What dose of plant medicine produces improved immune function? These are among the many questions raised by this discussion that warrant further investigation.

D. Summary and Research Applications

This chapter highlights some of the major themes of medical pluralism presented throughout the dissertation: migration, ecology, social transformation, cultural adaptation, health disparities, and biocultural dimensions of disease and medicine. The analyses presented in this dissertation reflect a biocultural theoretical framework. However, the processes of medical pluralism cannot fully be evaluated in Echang without bearing in mind factors such as politics, economics, ideology, and cultural history (Armelagos, et al. 2005; Nichter and Vuckovic 1994). While inclusion of political economic analyses may be appropriate to a greater degree in some contexts than in others, in Palau it is instrumental to population mobility patterns that perpetuate disease, access to natural resources, and acquiring equitable health care.

The epidemiological profile for Echang is the result of changes precipitated by population mobility and resettlement during the last century. Echang has high rates of acute respiratory illnesses, skin infections, and gastrointestinal disorders that are associated with crowding, unsanitary living conditions, poor air and water quality, and

poverty. Disparities between morbidity patterns in Echang and the rest of the Palauan population are related primarily to poverty and ethnic dissonance. As Heuveline et al. (Heuveline, et al. 2002) have noted, poverty is associated with high rates of infectious diseases globally, even in settings where chronic degenerative diseases are present in the affluent sectors of the population.

One of the risk factors associated with emergent infectious diseases in Palau is the introduction of foreign diseases through foreign fishing crews who illegally pirate the waters surrounding the southwest islands. Southwest island governments are not influential enough to mobilize support needed for effective national level security in the southwest islands. The enforcement teams sent to the southwest islands and Helen Reef as part of the Hatohobei State Government conservation and monitoring program are insufficient to offset the health risks of illegal foreign fishing in this area. The lack of substantial national enforcement efforts to protect these natural resources perpetuates safety risks to the inhabitants of the southwest islands. It also elevates opportunities for foreign pathogens to spread throughout the population at a national level. Future health interventions in Palau must account for the national security risks of foreign fishing vessels, not only in terms of population safety in the southwest islands, but in terms of national health security and protection of precious natural resources.

Over the last century, political and ecological processes have roused variable patterns of population mobility and resettlement from the remote southwest islands to Echang. The diseases with which southwest island populations in Echang currently contend are a direct result of migration, dietary transitions, population growth, and alterations in the way southwest islanders interact with their natural environment on a

daily basis. Likewise, healing in Echang now occurs in a culturally heterogeneous context that is synonymous with medical pluralism.

Local perceptions of illness and definitions of medical efficacy are essential to processes of medical pluralism. Pharmacological analyses of medicines are crucial, especially for plants that are used widely in numerous contexts. This dissertation explores the impact of nutrition transitions on human immune function. Ethnographic data on pre-migration dietary and medical practices provide an historical perspective to contemporary health beliefs and behaviors. One possible explanation for high rates of chronic and infectious diseases in southwest island populations is the gradual reduction in plant use as foods and medicines in Echang. The transition to life in Echang coincides with a shift away from dietary diversity and balanced caloric intake and energy expenditure. Specifically, the use of wild, semi-wild, and cultivated plants and plant products has declined along with traditional subsistence activities and lifestyles. At the same time, consumption of staple carbohydrates and proteins appears to have increased dramatically alongside sedentary lifestyles. Aside from obvious caloric imbalances associated with obesity and chronic degenerative diseases, dietary transitions may also play a role in infectious disease patterns.

One way contemporary Echang residents continue to interact with plants is through the practice of local medicines. It is a stretch to assert that local medicines provide a significant source of dietary nutrients in contemporary Echang, since their use is somewhat erratic, varies greatly between households, and is highly dependent on inter-household ties with individuals knowledgeable about plants in Koror. Nonetheless, at the level of the household, it is apparent that those who practice local medicines more

frequently also incorporate a wider range of whole plant foods, both cultivated and non-cultigens. They rely less on hospital medicine for minor illnesses and injuries and are more likely to combine plant medicines with biomedicines. Based on the data gathered for this dissertation is it difficult to derive any conclusions about how this affects recorded disease patterns or health outcomes. Research that quantifies health at the household level would strengthen the hypothesis that inclusion of plant medicines enhances health outcome. Such an approach could include a detailed review of medical records, analysis of blood samples, dietary surveys that weigh and measure nutrient intake, pharmacological analysis of plants used, and anthropometrics. Perhaps these are issues worth further investigation.

Studies of ingestive behaviors beyond the context of diet have enhanced our understanding of human dietary behaviors on nutritional status. Likewise, dietary interventions aimed at promoting nutritional diversity in Echang will benefit from the inclusion of traditional medicines, such as tonics, that can provide culturally-appropriate means to improve health. By promoting the nutritional and other health benefits of indigenous plant medicines, such an approach provides a foundation for conservation of Palau's cultural important plant resources.

The caveat to this, and applied research health agendas in general, is that whether they are used in foods or medicines, plants have the potential to amplify or attenuate the action of pharmaceuticals. Plants used in combination with each other in various contexts may also affect health in ways that are difficult to predict. Physicians should continue to educate themselves regarding the important pharmacological implications of this particular aspect of medical pluralism. In particular, when physicians collect patient

information regarding local medicines, it is important for them to understand that people use medicinal plants in contexts not conceptualized as medicine *per se*. Since medical pluralism entails the reinterpretation of pharmaceuticals, this aspect of medical behavior should be of major concern to health care professionals as well.

A final suggestion for further research is to build on the talents of a growing sector of Palauan health care students and professionals to carry out collaborative, interdisciplinary, community-based research. The intricacies of nutrition, medicine, culture, society, and health are complex. Through integrative perspectives, methodologies, and expertise health planners increase their chances of producing effective, culturally-appropriate interventions. In a setting such as Echang, providing innovative research opportunities for community members will enable them to acquire research skills and health education leadership positions that remain elusive. Since one of the highlights of this research is the health equity for Echang residents, engaging community members in the design of health initiatives in collaboration with public health workers, health aides, educators, and physicians is a progressive step for generating change in health care delivery in this population.

VII. CHAPTER SEVEN: SYNOPSIS

Only a few people now know about local medicines. This is something that we should have held onto, but now it is lost. – Male, age 48, Hatohobei

A. Introduction

Throughout this dissertation, southwest island population transitions and medical transformations are evaluated using a broad ecological biocultural framework. Current strategies that people employ to manage illnesses on a daily basis resonate with the principles of indigenous medical knowledge and practices. Medical beliefs and strategies in Echang are indicative of the culturally heterogeneous context of medical pluralism in Palau. Local perceptions of the meanings and measures of health, including the manner in which biomedicine is evaluated and used, are founded upon knowledge that once guided the therapeutic use of plants. In Echang hamlet the north and southwest, past and present, food and medicine, and plant and pharmaceutical converge in such a manner as to shape patterns of disease and healing that are unique in Palau.

B. Chapter Précis

Chapter One serves as the conceptual foundation for the dissertation. It is a review of the literature on medical anthropological approaches to studying medical pluralism. It covers literature that addresses cultural, ecologic, nutritional, pharmacologic, epidemiologic, political, and economic dimensions of disease and medicine. Although the scope of the literature is broad, the various perspectives provide analytical tools required to integrate research data and successfully address key research questions.

Chapter Two presents research design and methodology. A combination of qualitative and quantitative strategies was employed to gather data on three distinct, yet related, research domains: migration, medicine, and diet. Together the data from these categories provide a comprehensive appreciation of the complexities involved in population transition and medical pluralism in Echang.

Chapter Three describes the research setting. The purpose of this chapter is to illustrate how the politics of southwest islander population migrations have translated into health disparities. Echang is a culturally heterogeneous settlement near the capital city of Koror. The unique history of southwest island population migration to Echang is explored through a review of court proceedings, oral histories, newspaper articles, and previous research of population resettlement. This chapter recounts events leading to the historical oppression of Echang residents. The sociopolitical marginalization of Echang residents is crucial to this study because it prescribes the extent to which southwest island groups can access lands, acquire employment, and utilize biomedical health care.

Chapter Four describes indigenous Tobian medical ideology, theories of disease causation, and explanations of illness categories. This chapter contributes to the rest of the dissertation by illustrating the extent to which past beliefs influence existing medical knowledge and practice. The introduction of Christianity, migration to Echang, and living in a community with other southwest island groups incited enormous changes in Tobian medical beliefs and behaviors. Today in Echang *tafei Hatohobei* operates in a pluralistic setting where several distinct medical systems function adjacent to one another. This chapter portrays the ways in which the knowledge that informed past understandings of health and medicine persist in contemporary medical decision-making.

Chapter Five describes indigenous Tobian medical practices of the past and present. The significance of plants in multiple contexts of disease and healing takes precedence in this chapter. One of the primary reasons medical transformations have taken place in Echang is the nature of resettlement and limited access to land resources on which to cultivate and collect medicinal plants. Indigenous constructions of therapeutic efficacy are the cornerstone of decision-making in the pluralistic medical context of Echang. What some experts describe as health inequity and ethnic discrimination, Echang residents describe as biomedical ineffectiveness. Indigenous conceptualizations of quality health care, effective medicine, and physiological measures of healing continue to shape medical choices in Echang. This chapter also explores the biologic and cultural basis of indigenous medical efficacy. It provides a starting point for future pharmacological analyses of plant-based medicines in Palau.

Chapter Six is a comprehensive, integrated analysis of the key features of medical pluralism in Echang. The ties that connect social, ecological, and biological dimensions of medical pluralism are elucidated. A key assertion made in this chapter is that a multi-layered analysis of plants, in terms of nutrient contribution to diet, immunological function, and pharmacological action is necessary to understand disease patterns, and ultimately, patterns of medical pluralism in Echang. Medical behaviors in southwest island communities parallel dietary behaviors in terms of plant selection, their modes of use, the frequency with which they are consumed, and their potential pharmacological activity. One methodological advance in studies of plant use that emanates from this investigation is the incorporation of recreational and/or habitual plant use into future studies of human diet and medicine. Such an approach would advance our understanding

of the health impact of habitual plants use, such as kava (*Piper methysticum*), *noni*, marijuana (*Cannabis sativa*), tobacco, and fermented beverages, as well as their social and cultural significance. Areas that warrant further investigation, such as rigorous dietary research, pharmacological analyses of medicinal plants, and biological implications of polypharmacy, are outlined in this chapter.

C. Significance

The biological and cultural dimensions of medical pluralism discussed in this dissertation have parallels in various contexts throughout the world. This study reiterates the notion that cultural traditions and local ideologies about health and healing are integral to health seeking behaviors in contemporary Palauan society, despite its rapid urbanization and modernization. Plants continue to hold a salient position in healing in southwest island societies. The presence of pharmacologically active substances in contexts of food, medicine, and recreational use confound conventional research protocols in both medical and nutritional anthropology. The use of plants in food, medicines, and other ingestive categories has far-reaching implications for health interventions and health care delivery in Palau.

This dissertation makes a significant contribution to anthropological studies of medicine pluralism in Micronesia. With regard to previous research conducted on health in Palau, this study is one of the first to offer a comprehensive anthropological exploration of indigenous medicines. It is the first ethnographic account of local beliefs regarding illness, healing, and medicine in the culturally diverse setting of Echang. The analyses presented here build on theories from medical anthropology, ethnopharmacology, and nutritional anthropology, which emphasize the biocultural

significance of plants in multiple contexts. The opportunities to build upon this research in Palau and throughout Micronesia, both theoretically and methodologically, are countless. Ideally, the present research will provide a baseline from which to compare future trends in health and medicine in Palau.

APPENDIX A. Tobian Illness Terms

Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
ameba	diarrhea with blood and/or worms	**hameterisi**	x			x	x		amoebic dysentery	evacuation of worms and accumulated waste	all	Tx differs relative to etiology
baochuch	throbbing muscle aches, pain, and swelling	**fitihor**		x	x		x	x	muscle aches; pain	muscle strain due to exertion or injury	all	
bechriruh	fever; skin is warm to the touch, flushed; bodily aches; drowsiness	**cha**	x		x	x	x	x	fever; febrile illness	accumulation of heat in the body	all	
belebel	large blisters on trunk that resemble a rope; red in color, itchy, bad odor, accompanied by fever, when the blisters completely encircle the trunk patient will die	**hihn; cha**	x	x		x	x	x	Herpes zoster; shingles	accumulation of heat in the body, especially around chest; blisters signify the heat coming out of the body	all	

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Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
buchita	air in the stomach	**hameterisi**	x		x	x		x	acid reflux; indigestion	too much air in the stomach	people who eat oily foods	
buchita	stomach pain and indigestion	**hameterisi**	x		x	x		x	ulcers, possible Helicobater pylori infection	sore in stomach; swallowing tobacco juice; stress	people who chew **buuch** with cigarettes; people with bad diet; people under stress	
busuru	hard bump under the skin; warm to touch; redness around bump; filled with pus; foul odor	**hihn**		x	x			x	subcutaneous boil or cyst with pustule; Staphylococcus infection	accumulated waste in the skin coming out	all	
cancer; carcinoma	weakness, very sick	**cha**	x			x		x	cancer	smoking cigarettes	chronic tobacco smokers	

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chicken pox	itchy red skin with blisters; high fever; blisters open and scab forms; blisters can come out in the mouth; diagnosed by hospital doctor	**hihn; cha**	x	x		x		x	chicken pox; varicella zoster infection	viral infection; too much heat in the body; heat leaving the body creates blisters	all, especially children	patients are quarantined to their home; public health aides do house calls for these patients
dengue fever	fever, aching body; loss of appetite; chronic exhaustion; vomiting	**cha**	x			x		x	dengue fever (Flavivirus)	bitten by mosquito with virus	people living in Echang	diagnosed at the hospital
ebuehei	itchy, irritated	**hihn**		x	x		x	x	dermatitis, skin allergy	something in the skin; redness indicates heat or waste leaving the skin	all	associated with most types of **matamat**
etemau tipei	feeling dizzy and nauseated; not feeling well inside	**hameteri retip**	x		x	x	x	x	nausea and dizziness	general internal sickness; accumulation of waste; possible viral infection	all	

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ehameteri	muscle aches and pains due to exertion or injury	**fitihor**		x	x		x	x	muscle aches and pain; strains; sprains	injury	all	
ehameteri	not feeling well; feeling sick	**hameteri retip**	x		x	x	x	x	general malaise	internal sickness; possible viral infection		
ekeri	diarrhea with blood	**hameterisi**	x			x	x		amoebic dysentery	evacuation of heat and accumulated waste; black magic	all	Tx differs relative to etiology
emariei chimei	dizziness	**chimh**	x		x		x	x	dizziness	poor circulation; accumulation of waste in head	all	
emanguchota	dizzy; diagnosed at the hospital	**cha**	x			x		x	stroke	poor circulation; accumulation of blood in the brain	elderly	
eripung	itchy red skin, small raised bumps, no blisters	**hihn**		x	x		x	x	scabies (Sarcoptes scabiei) infestation	bugs crawl into skin	all	associated with poor hygiene

Appendix A. Tobian Illness Terms

Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
etafaiei	scars; dark spots on skin after a cut or wound; sometimes raised and very black	**hihn**		x	x		x	x	normal scars, keloid scars, hypertrophic scars	infection in skin during healing; bad skin or no medicine; scratching picking at skin	all	considered unsightly and undesirable
etai inou harai	loss of appetite; excessive weight loss	**hameteri retip; hameterisi**	x		x		x	x	anorexia, cachexia	presence of illness; black magic	all	
etewas	pain to the outside of the body	**hihn; fitihor; chil**		x	x		x	x	generalized pain from broken bones and external injuries	injury	all	
fahafah	wet cough, persistent cough with mucous	**mata ri ngarungor**	x			x	x	x	bronchitis; cough and congestion; productive cough	accumulation of waste in chest; viral infection; cough expels waste from chest	all	
finchingerichil	broken bones; swelling beneath the skin	**chil**		x	x		x	x	broken bones	injury	all	

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Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
hachouess	shortness of breath; wheezing	**mata ri ngarungor; cha**	x		x		x	x	asthma	inherited; poor circulation of air in chest; accumulation of waste	all	
hameteri chimei	headache	**chimh**	x		x		x	x	headache	congestion stuck in the head; poor blood circulation in head	all	
hameteri chirfaria	breast pain	**chirfariya**		x	x		x	x	breast pain	injury	women	
hameteri ngi	tooth ache	**chimh (ngi)**		x	x		x	x	tooth ache	infection in the mouth	children and adults; those who chew **buuch** and then try to stop	

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Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
hameteri retip	general malaise and internal illnesses or injuries	**hameteri retip**	x		x	x	x	x	generalized internal illness or injury	black magic; viral infection; poor circulation; internal bleeding; accumulation of waste	all	
hameteri siei	painful urination; foul odor; white discharge on genitals	**hameteri retip**	x		x		x	x	painful urination due to urinary tract infection	accumulation of waste; waste expelled from body	all	
hameteri siei	painful urination; foul odor; white discharge on genitals	**hameteri retip**	x			x	x		gonorrhea	viral infection	adults	
hameterisi	stomach ache	**hameterisi**	x		x		x	x	stomach ache	diet-related stomach and abdominal pain; eating poisoned food; internal injury	all	
hameterisi	diarrhea without blood	**hameterisi**	x		x		x	x	diarrhea	evacuation of accumulated waste	all	

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hepatitis	yellow eyes and skin	**hameteri retip**	x			x		x	hepatitis infection	viral infection	all	
herisabou	red, itchy skin in shape of circle, rough edges	**hihn**		x	x		x	x	Tinea corporis; ringworm	worm infection in skin	all, especially children	
high blood	overweight	**cha**	x			x		x	hypertension	obesity and not enough exercise	adults; people who are overweight; people who have short-temper	
hoos	lice; white eggs (tir) in the hair and visible bugs; itchy	**chimh**		x	x		x	x	lice infestation	poor hygiene	all, especially children	
hubuehihichi	itchy red skin, small raised bumps, no blisters	**hihn**		x	x		x	x	scabies (Sarcoptes scabiei) infestation	bugs crawl into the skin	all	associated with poor hygiene
humuhung	persistent dry cough	**mata ri ngarungor**	x			x	x	x	cough	poor air circulation chest; viral infection	all	

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ifou	fever; skin is warm to the touch; flushed skin; bodily aches; drowsiness	**cha**	x		x	x	x	x	fever; febrile illness	accumulation of heat in the body	all	
mamasuhuchu	chronic exhaustion; loss of appetite	**cha**	x		x		x	x	lethargy, general malaise	black magic; blood disorder; poor circulation	all; adults who chronically drink alcohol	
matamat	skin rash	**hihn**		x	x		x	x	dermatitis	-	all	
matamat	skin rash after eating food	**hihn; hameterisi**		x	x		x	x	allergic dermatitis, hives (urticartia) or eczema	eating foods to which one is allergic	all	related to food taboos
matamat	skin rash	**hihn**		x	x		x	x	contact dermatitis	swimming in dirty water; bugs in the water	all, especially children	related to pollution and poor hygiene
matamat masusuhr	area of rough skin, thick, with raised edges, red, itchy	**hihn**		x	x		x	x	dermatitis, psoriasis	fungus	all	related to poor hygiene
matamat merifirif	white spots on skin, flat, not itchy	**hihn**		x	x		x	x	possibly vitiligo	-	all	

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matariwa	subcutaneous cyst without pustule, painful, warm to touch	**hihn**		x	x		x	x	boil or cyst, possible bacterial infection	accumulation of waste, poor circulation	all	
matsirip	catarrh, fever, head and chest congestion	**cha**	x			x	x	x	influenza	viral infection	all	
mehitariga meta	ordinary injury or cut	**hihn**		x			x	x	minor cuts, abrasions	accidental injury	all	
moh	ulcers in the mouth; white film that covers the tongue; fever; difficulty swallowing; loss of appetite	**hameteri retip**	x	x	x		x	x	oral thrush; oral candidiasis	accumulation of heat in the body that comes out in the mouth; accumulation of water and waste in the stomach	babies; children; elderly; those who are already very sick	
mut	stomach pain; vomiting	**hameterisi**	x		x		x	x	vomiting	black magic; food poisoning; expulsion of accumulated waste in stomach	all	

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Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
pahecha	diarrhea with blood	**hameterisi**	x			x	x		amebic dysentery	evacuation of heat and accumulated waste; black magic	all	Tx differs relative to etiology
pneumonia	illness in lungs	**mata ri ngarungor**	x			x		x	pneumonia	viral infection	babies and children	
suka	skin sores that do not heal; overweight; strong desire to eat sweet foods; blindness	**cha**	x			x		x	Type II diabetes (non-insulin dependent)	inherited; eating too much sugar and fattening foods; obesity	people who have relatives with diabetes; people who are overweight and eat sweet foods	diagnosed at the hospital
T.B.	fatigue; loss of appetite	**mata ri ngarungor**	x			x	x	x	tuberculosis	viral infection	all	
tahuh mar	pain in the lower back	**fitihor**		x	x		x	x	back pain	muscle pain due to exertion	men	

Appendix A. Tobian Illness Terms

Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
tahuh mar	pain in lower back; painful urination	**hameteri retip**	x		x		x	x	urinary tract infection	accumulation of waste in body; expulsion of waste	men	
taringugnut meta ngurut	head ache, catarrh, cough	**chimh; mata ri ngarungor**	x			x	x	x	upper respiratory infection and congestion	poor circulation; accumulation of waste in lungs; viral infection	all	
tobotoborchil	aches and swelling of the joints	**chil**		x	x		x	x	arthritis	poor circulation; accumulation of waste in the joints	elderly; people who have had broken bones in the past	
worms	weight loss, loss of appetite; defecation of worms	**hameterisi**	x		x		x	x	intestinal helminthes	black magic; worms in the stomach; evacuation of worms and waste accumulated in stomach	all	

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Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
yaoch sewa	chronic loss of appetite; extreme weight loss	**hameteri retip; hameterisi**	x		x		x	x	cachexia; wasting disease	black magic; presence of another illness	all	
yarorupa sewa	obesity	**hameterisi**	x		x	x		x	obesity	eating too much; related to high blood, diabetes, heart attack, and stroke	all	
yefeter chanbout	blood coming out of nasal passages	**chimh (bout)**	x		x		x	x	spontaneous bloody nose	excess blood leaving body; internal injury	all	Tx differs relative to etiology
yehamete hapiriwohangehi	sore throat	**chimh (wohangehi)**	x			x	x	x	throat infection	**moh**; food allergies	babies and children; elderly; those with food allergies	
yehamete taringei	pain in the ear; fluid in the ear	**chimh (taring)**		x	x		x	x	serous otitis media	black magic; accumulation of waste in ear	all, especially children	

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Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
yehangahang mataiei	redness in the eyes; blurred vision; fluid in the eyes; burning and itching in the eyes	**chimh (mat)**		x	x		x	x	conjunctivitis	waste in the eye; injury to the eye	all	
yehochohoch mataiei; 'matari wor'	bruised eye; swelling around the eye; 'turtle eye'	**chimh (mat)**		x	x		x	x	eye injury	injury	all	
yehuh	burn to skin from heat or fire	**hihn**		x	x		x	x	skin burn; sunburn	exposure to fire	all	
yehuh fario	sunburn	**hihn**		x	x		x	x	sunburn	exposure to sun		
yeieou yangisiei	inability to defecate and stomach pain	**hameterisi**	x		x		x	x	constipation	poor circulation; accumulation of waste	all	
yeturong tafaief	deep cut, wound	**hihn**		x	x		x	x	serious wound	accidental injury, injury due to fight or beating	all	

Appendix A. Tobian Illness Terms

Tobian Illness Term	Signs / Symptoms	Tobian Nosology	Internal	External	Local	Foreign	Past	Present	Possible Biomedical Analogue	Tobian Etiology	Susceptible Groups	Notes
yungut bout	difficulty breathing through nose, catarrh	**chimh (bout)**	x			x	x	x	upper respiratory infection; nasal congestion	accumulation of waste and poor circulation in the head; viral infection	all	

APPENDIX B. Botanical Pharmacopoeia of Echang Hamlet, Koror, Republic of Palau

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	AGAVACEAE *Cordyline fruticosa* [H] **sis** [P] sis	AL	**yehangahang mataiei**	L	dilute decoction with cold water; wash eyes	reduce redness stops pain	x		x	x	**home garden/ cultivar**	A
0	AGAVACEAE *Cordyline fruticosa* [H] **sis** [P] sis	AL	pregnancy and postpartum bathing ritual	R	bathe with cold coconut oil infusion	cleanse/kill germs; prevent infection	x		x	x	**home garden/ cultivar**	C
0	AMARANTHACEAE *Achyranthes aspera* [H] **taferi moh, taferi moh†** [P] louch beluu	AL	**moh**	L	coat sores with coconut oil residue, squeeze juice out of leaves into mouth; also bathe with decoction; fish partners: **horech, hathi; herisonoboi, herimou, mor tamuch**	close the sores; cleanse/kill germs; draw out heat					Tobi	R

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	AMARANTHACEAE *Achyranthes aspera* [H] **taferi moh, taferi moh†** [P] louch beluu	AL	**moh**	L	pound, put inside **uhr** cloth, dip into sweet liquid, strain juice until liquid turns blue; coat tongue with coconut oil residue; gargle and swallow cold infusion; eat **horech†**	cleanse/kill germs; soothe pain; close the sores; draw out heat					Tobi	R
0	AMARANTHACEAE *Achyranthes aspera* [H] **taferi moh, taferi moh†** [P] louch beluu	AL	**moh**	L	pound with **yaho** and **hamahuh**; mix with coconut milk; apply coconut residue to sores; squeeze medicine on sores; eat sashimi. fish partners: **horech; hathi**	cleanse/kill germs; soothe pain; close the sores; draw out heat					Tobi	R
22	ANACARDIACEAE *Spondias pinnata* [H] **titimel** [P] titimel	GH	all types of **matamat;** [P] makngitelrakd	R	use outer layer of rhizome; pound with **olmalel a rubak** and **deris**; soak in coconut oil; apply to skin	makes bad skin come off; dry out skin; cleanse/kill germs	x				**farm-forest border**	C
33	APIACEAE *Centella asiatica* [H] **hachereng†**	GH	**matamat; hubuehihichi†**	L	soak in coconut oil; apply oil to skin	reduce swelling, soothe pain; anti- itch; cleanse/kill germs	x				**forest path**	R

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	FAMILY Genus and species [H] Tobi Term [P] Palauan Term	ID	Illnesses [P]Palauan Term	Part(s) Used	Preparation and Administration	Healing properties of medicines	Food	Recreational/Social	Cosmetic/Ornamental	Utilitarian	Habitat	Reported Availability
33	APIACEAE *Centella asiatica* [H] **hachereng**†	GH	**hameteri chirfaria**	L	place pulverized leaves on breast	soothe pain; improve circulation; cool breast	x				**forest path**	R
33	APIACEAE *Centella asiatica* [H] **hachereng**†	GH	**hameterisi; hachouess; hameteri retip**	L	pound with **yaho, wich, nuhr, haisas**; strain juice through **uhr**; drink	open breathing pathways, improve circulation; stop bleeding; repair internal injuries	x				**forest path**	R
33	APIACEAE *Centella asiatica* [H] **hachereng**†	GH	**finchingirichil; ehameteri; baochuch; etewas**	L	pound with **yaho, wich, nuhr, haisas**; massage with coconut oil	soothe pain; reduce swelling; promote circulation; clean/kill germs; connect bone and tissue	x				**forest path**	R
0	APOCYNACEAE *Plumeria rubra* [H] **bung sapan**† [P] **elilai ra ngebard**	AL	**mehitariga meta**	E	apply directly to wound†	stop bleeding			x		**home garden/ cultivar**	R

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	ID	**Illnesses** [P]Palauan Term	Part(s) Used	**Preparation and Administration**	**Healing properties of medicines**	Food	Recreational/Social	Cosmetic/Ornamental	Utilitarian	**Habitat**	Reported Availability
0	ARACEAE *Cyrtosperma chamissonis* [H] **buroh** [P] **brak**	AD	**mehitariga meta**	L	place pulverized **chaowor** leaves inside **buroh** leaf; cook on hot coals; apply hot poultice	cleanse/kill germs; close wound; stop bleeding; remove waste and pus	x			x	**home garden/ cultivar;** market	C
0	ARACEAE *Cyrtosperma chamissonis* [H] **buroh** [P] **brak**	AD	**mehitariga meta;** **yeturong tafaief**	L	place crushed **fariap** leaves inside **buroh** leaf; cover medicine pouch with coconut shell; barbecue on coals; apply coconut oil to wound; apply hot poultice; repeat until skin closes	cleanse/kill germs; close wound; stop bleeding; remove waste and pus; connect tissue	x			x	**home garden/ cultivar;** market	C
0	ARACEAE *Colocasia esculenta* [H] **wot** [P] **kukao**	AD	**mut**	R	wrap in **wich** leaf; bake in earth oven; pound until soft; eat before taking bitter medicine	prevent vomiting; use when taking bitter medicines	x			x	**home garden/ cultivar;** market	C
0	ARECACEAE *Areca catechu* [H] **buu** [P] **buuch**	AL	**hamete;** childbirth	F	chew in quid with slaked lime (**aus**) and **kebui** leaf	soothe pain; increases circulation; creates heat		x	x		**home garden/ cultivar;** market	A

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	ARECACEAE *Areca catechu* [H] **buu** [P] **buuch**	AL	**ameba; ekeri, pahecha;** worms	F	chew and swallow juice	causes vomiting; expels worms		x	x		**home garden/ cultivar;** market	A
0	ARECACEAE *Cocos nucifera* [H] **ruh; ruh melai** [P] **lius**	AL	illness that require **tafeieri chouchou** and **warurani tafei**	L	weave into mats for use in massage and sleeping in the medicine	facilitate and prolong exposure to medicine	x	x	x	x	**home garden/ cultivar;** market	A
0	ARECACEAE *Cocos nucifera* [H] **ruh; ruh melai** [P] **lius**	AL	**yungut baut; taringungut meta ngurut**	S	massage oil over chest and back and forehead	open breathing pathways; create heat; dislodge phlegm; relax coughing muscles	x	x	x	x	**home garden/ cultivar;** market	A
0	ARECACEAE *Cocos nucifera* [H] **ruh, ruh melai** [P] **lius**	AL	**hamete taring**	S	squeeze small drops of oil into both ears	soothe pain; dislodge waste from ear; also prevent infection	x	x	x	x	**home garden/ cultivar;** market	A

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	ARECACEAE *Cocos nucifera* [H] **ruh, ruh melai** [P] **lius**	AL	**suka;** **ebueihei**	E	cook tree sap (**haichi**) until it is the syrup (**richo**); lick it when dizzy	reduce dizziness	x	x	x	x	**home garden/ cultivar**	A
0	ARECACEAE *Cocos nucifera* [H] **ruh, ruh melai** [P] **lius**	AL	**mehitariga meta**	S	apply freshly shaved copra directly to cut/abrasion	stop bleeding; clean/kill germs	x	x	x	x	**home garden/ cultivar,** market	A
0	ARECACEAE *Cocos nucifera* [H]**ruh,ruh melai** [P] **lius**	AL	**matamat;** [P] bikodel; skin allergy	S	drink juice of young coconut	calms skin	x	x	x	x	**home garden/ cultivar,** market	A
0	ARECACEAE *Cocos nucifera* [H]**ruh,ruh melai** [P] **lius**	AL	**matamat;** [P] bikodel; skin allergy	S	mix **richo** with water, drink	calms skin	x	x	x	x	**home garden/ cultivar,** market	A
0	ARECACEAE *Cocos nucifera* [H]**ruh,ruh melai** [P] **lius**	AL	**hameteri siei;** male genital pain, especially testicles	L	husk green coconut and heat over fire; put close enough to the testicles to feel the heat but not on the skin	draws heat to pained area; stimulate blood flow and circulation	x	x	x	x	**home garden/ cultivar,** market	A

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	ARECACEAE *Cocos nucifera* [H]**ruh,ruh melai** [P] **lius**	AL	**hametarisi; ieieou yangisiei**	S	scrape soft meat from young coconut (**ub**); mix with coconut syrup (**richo**) and coconut oil; drink†	causes diarrhea; soothe stomach; expel heat	x	x	x	x	**home garden/ cultivar,** market	A
31	ASTERACEAE *Eclipta alba* [H] **taferi bech**	GH	**ifou; bechriruh; moh**	L	pound, squeeze juice all over the body	lowers fever					Tobi	R
0	BORAGINACEAE *Tournefortia argentea* [H] **cher** [P] **rirs**	AL	**ameba; ekeri, pahecha;** worms	L	select young leaves and one mature leaf; pound green coconut husk; squeeze out juice; pound juice with leaves; mix with young coconut juice; heat, drink	expels worms	x				Tobi; Babeldaub	R
0	CAPPARACEAE *Craeteva speciosa* [H] **tafach†**	AL	**pahecha†**	L	pound with **yaho, haohuh, nuhr**; put into cloth; dip into young coconut juice; squeeze out juice; add coconut oil; drink 2x/day for three days†	stops diarrhea					Tobi	R

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	CAPPARACEAE *Craeteva speciosa* [H] **tafach†**	AL	gonorrhea†; **hameteri siei**	L	pound with **yaho** and **haohuh**; place leaves in cloth; dip into young coconut juice; squeeze out juice; add coconut oil; drink; follow with one glass hot water; repeat 2x day†	expel heat; remove waste; bitter; cleanse system; move water out					Tobi	R
0	CARICACEAE *Carica papaya* [H] **babai** [P] **bobai**	AL	**hameteri chimei**	R	pound with **kingkang**; mix with coconut oil; inhale the vapors	open breathing pathways; improve circulation in head	x				**home garden/ cultivar;** market	C
0	CARICACEAE *Carica papaya* [H] **babai** [P] **bobai**	AL	**yefeter chanbout; yehochohoch mataiei; yehangahang mataiei**	St	hollow of stem used to apply medicine to injured eyes and ears and into nostrils		x				**home garden/ cultivar;** market	C
34	CASUARINACEAE *Casuarina equisetifolia* [H] **ngach** [P] **ngas**	GH	**herisabou**	B	pound with **fariap, haisas, safang**; bathe in decoction 3x/day	reduce swelling dry the skin; make skin come off; cleanse/kill germs					**forest/ littoral borders**	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
34	CASUARINACEAE *Casuarina equisetifolia* [H] **ngach** [P] **ngas**	GH	**matamat**	B	pound with **fariap**; mix with coconut oil; apply to skin	reduce swelling; make skin come off; dry the skin; cleanse/kill germs					**forest/ littoral borders**	C
0	CLUSIACEAE *Calophyllum inophyllum* [H] **safang** [P] **batches**	AL	**taferi homoho tetipach**	L	pound with **fariap, haohuh, hirifou, safairing**; drink cold water infusion	strengthen body; prevent sickness; contains vitamins; improve circulation; bitter/cleanse inside	x			x	Tobi; Rock Islands	R
0	CLUSIACEAE *Calophyllum inophyllum* [H] **safang** [P] **batches**	AL	**herisabou**	B	pound with **fariap, haisas, ngach**; bathe in decoction 3x/day	reduce swelling dry the skin; make skin come off; cleanse/kill germs	x			x	Tobi; Rock Islands	R

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
13	COMBRETACEAE *Terminalia catappa* [H] **haisas** [P] **niich**	GH	**herisabou**	B	pound with **safang, fariap, ngach**; bathe in decoction 3x/day	dry the skin; make skin come off; cleanse/kill germs	x				**foothpath** roadside; littoral borders	C
13	COMBRETACEAE *Terminalia catappa* [H] **haisas** [P] **niich**	GH	**mut**	L	chew and swallow the juice; or pound and squeeze juice into water or coconut juice and drink	prevent vomiting; use before taking bitter medicine; prevent seasickness	x				**foothpath** roadside; littoral borders	C
13	COMBRETACEAE *Terminalia catappa* [H] **haisas** [P] **niich**	GH	**TB†**	B	pound gently with **fariap, hirifou, hamahi;** mix with gallon of fresh water and small amount of sea water; drink decoction or cold water infusion; add sugar water if needed; repeat	strengthens; bitter/cleanse inside	x				**foothpath** roadside; littoral borders	C
13	COMBRETACEAE *Terminalia catappa* [H] **haisas** [P] **niich**	GH	**taferi homoho tetipach;** **TB;** high blood	B	pound with **fariap, hirifou, hirio,** and **hochari;** fill bucket with rain water, drink cold water infusion Note: do not use with coconut juice; bitter	improve circulation	x				**foothpath** roadside; littoral borders	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
13	COMBRETACEAE *Terminalia catappa* [H] **haisas** [P] **niich**	GH	**hametarisi; hachouess; hameteri retip**	L	pound with **yaho, wich, nuhr,** and **hachereng**; strain juice through **uhr**; drink the extract	stop bleeding; heals internal injury	x				**foothpath** roadside; littoral borders	C
13	COMBRETACEAE *Terminalia catappa* [H] **haisas** [P] **niich**	GH	**finchingirichil; ehameteri; baochuch; etewas**	L	pound with **yaho, wich, nuhr, hachereng**; massage with coconut oil	connect bone and tissue; remove waste and pus inside; soothe pain	x				**foothpath** roadside; littoral borders	C
24	CONVOLUVULACEAE *Ipomoea triloba* [H] **chaowor** [P] **torech**	JM	**finchingerichil; hameteri retip; hamete; baochuch; etewas**	L	pound with **yaho, nuhr, ngou, mai, hamahi, huh;** mix with coconut oil; use in **tafeieri chouchou** and **warurani tafei**	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue	x				farm borders; **forest borders;** roadside	C
24	CONVOLUVULACEAE *Ipomoea triloba* [H] **chaowor** [P] **torech**	JM	**hameteri retip**	L	pound with **yaho, ngou, chichi, yohoma, yerao**; mix with coconut juice; drink	heal internal injury	x				farm borders; **forest borders;** roadside	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	ID	**Illnesses** [P]Palauan Term	Part(s) Used	**Preparation and Administration**	**Healing properties of medicines**	Food	Recreational/Social	Cosmetic/Ornamental	Utilitarian	**Habitat**	Reported Availability
24	CONVOLUVULACEAE *Ipomoea triloba* [H] **chaowor** [P] **torech**	JM	**mehitariga meta**	L	pound leaves; place inside **buroh** leaf and make a pouch; cook over smoldering coals; carefully apply hot poultice directly to wound	cleanse/kill germs; draw out pus; stop bleeding	x				farm borders; **forest borders;** roadside	C
11	CONVOLUVULACEAE *Merremia peltata* [H] **marumeug** [P] **kebeas**	GH	**finchingerichil**	L	pound with **woripacheche** and **fariap**, apply either as poultice or sleep on medicine; follow with a tonic/massage	soothe pain; connect bone and tissue; remove waste					**taro patch;** forest, roadside	C
0	CONVOLUVULACEAE *Ipomoea batatas* [H] **tumucho**	AD	**taferi homoho tetipach** during pregnancy; **etai inou harai; yaoch sewa;**	L	boil with water and juice from **huruhu** fruit	makes mother's milk come in; stimulate appetite; strengthen fetus	x				**home garden/ cultivar**	C
11	CONVOLUVULACEAE *Merremia peltata* [H] **marumeug** [P] **kebeas**	GH	**moh**	L	chew with young coconut leaf, spit medicine into child's mouth	close the sores; clean/kill germs					**taro patch;** forest, roadside	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
9	CONVULUVULACEAE *Ipomoea violaceae* [H] **woripacheche**	GH	**finchingerichil; ehameteri; baochuch; etewas; tobotoborchil**	L	pound with **siviriyarus** and **ngou**, massage with coconut oil; spread leaves on mat; sleep in medicine	connect bone and muscle; remove waste; soothe pain					forest; **farm borders;** roadside	C
9	CONVULUVULACEAE *Ipomoea violaceae* [H] **woripacheche**	GH	**hamete; baochuch; etewas**	W	pound, place inside leaf pouch and barbecue over coals; massage hot medicine into swollen and sore muscles Note: do not add coconut oil or water	create heat; relax muscles; soothe pain; improves circulation					forest; **farm borders;** roadside	C
9	CONVULUVULACEAE *Ipomoea violaceae* [H] **woripacheche**	GH	**finchingerichil**	L	pound with **marmeug** and **fariap** leaves, apply as poultice or sleep on medicine; follow with a tonic and massage	connects bone and muscle; removes waste; soothe pain					forest; **farm borders;** roadside	C
30	CYPERACEAE *Cyperus brevifolius* [H] **ngus** [P] **dues; esechesiding**	GH	**taferi homoho tetipach**	W	pound with ginger root, leaf, flower; mix with toasted copra; add fresh water; heat a rock and place rock in bowl; drink while warm; Drink when you eat **belsiya** (pounded taro)	stimulate circulation prevent illness; supplement diet	x				foot path, yard borders; **house borders**	R

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	ID	**Illnesses** [P]Palauan Term	Part(s) Used	**Preparation and Administration**	**Healing properties of medicines**	Food	Recreational/Social	Cosmetic/Ornamental	Utilitarian	**Habitat**	Reported Availability
40	DAVALLIACEAE *Nephrolepis saligna* [H] **hamahuh**	GH	**matamat**	L	pound, mix with coconut oil, apply to cuts and abrasions	tighten skin; stop bleeding					home garden/ cultivar; footpaths; **roadside**; forest pathways;	A
40	DAVALLIACEAE *Nephrolepis saligna* [H] **hamahuh**	GH	**moh**	L	pound with **yaho** and **taferi moh**; mix with coconut milk; apply coconut residue to sores; squeeze medicine on sores; fish partners: **horech, hathi**	soothe pain; close the sores; draw out heat; clean/kill germs; blood from the fish heals the open sores					home garden/ cultivar; footpaths; **roadside**; forest pathways;	A
10	EUPHORIBACEAE *Macaranga carolinensis* [P] **bdel**	GH	**matamat**	L	pound, apply to skin	tighten skin; stop bleeding					roadside; **forest border**	A
7	FABACEAE *Canavalia cathartica* [H] **hahariborot, riborot†**	GH	medicine for baby after it is born	L	pound; soak coconut juice, strain; feed juice to baby	strengthen; prevent sickness	x				**footpaths** ; roadside; forest pathway	

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No.	FAMILY Genus and species [H] Tobi Term [P] Palauan Term	ID	Illnesses [P]Palauan Term	Part(s) Used	Preparation and Administration	Healing properties of medicines	Food	Recreational/Social	Cosmetic/Ornamental	Utilitarian	Habitat	Reported Availability
7	FABACEAE *Canavalia cathartica* [H] **hahariborot, riborot†**	GH	**taferi homoho tetipach** for pregnant woman	L	pound, cook with coconut juice; add coconut milk to decoction; drink	improve circulation; prevent sickness; provide vitamins to baby	x				**footpaths**; roadside; forest pathway	C
41	FABACEAE *Erythrina variegata* [H] **haohuh, hawhow†** [P] **rorou**	GH	**finchingerichil**; **hameteri retip**; **ehameteri**; **baochuch**; **etewas**	L	pound with **hariwa, yaho, nuhr,** and **siviriyarus;** mix with water or coconut juice; use same leaves to make drink; exclude **haohuh** to prepare **warurani tafei;** sleep in medicine every day	bitter/cleanse inside; move water out; heal internal injuries; connect bone tissue; soothe pain Note: do not use **haohuh** externally	x				**Meyuns**	R
41	FABACEAE *Erythrina variegata* [H] **haohuh, hawhow†** [P] **rorou**	GH	**taferi homoho tetipach**	L	pound with **safang, fariap, hirifou, safairing**; soak in fresh water until red; drink	prevent sickness	x				**Meyuns**	C

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No.	FAMILY **Genus and species** **[H] Tobi Term** [P] Palauan Term	ID	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
41	FABACEAE *Erythrina variegata* [H] **haohuh, hawhow†** [P] **rorou**	GH	**taferi homoho tetipach**	L	pound with **yaho** and **ngou,** mix with coconut milk, drink	prevent sickness	x				**Meyuns**	C
41	FABACEAE *Erythrina variegata* [H] **haohuh, hawhow†** [P] **rorou**	GH	**pahecha†**	L	pound with **yaho, tafach, nuhr**; squeeze medicine mixed with coconut juice through **uhr;** add coconut oil; drink 2x/day for three days†	stop diarrhea	x				**Meyuns**	C
41	FABACEAE *Erythrina variegata* [H] **haohuh, hawhow†** [P] **rorou**	GH	gonorrhea†; **hameteri siei**	L	pound with **tafach** and **yaho**; place leaves in cloth; squeeze medicine and coconut juice through **uhr**; add coconut oil drink; drink one glass hot water; repeat 2x day †	expel heat; remove waste; bitter/cleanse inside; move water out;	x				**Meyuns**	C
27	FABACEAE *Derris elliptica* [H] **deris** [P] **dub, derris**	GH	all types of **matamat;** [P] makngitelrakd	R	use outer layer of rhizome; pound with **titimel** and **olmalel a rubak**; soak in coconut oil one day before first application; oil is yellow	clean/kill germs; reduce redness; stimulate exfoliation of dead skin				x	**foot path;** yard border; farm borders	C

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27	FABACEAE *Derris elliptica* [H] **deris** [P] **dub, derris**	GH	all types of **matamat** except for cuts and open wounds	L R	pound young leaves and root with **hachio**; soak in coconut oil for two days; apply to skin	reduce itching/ swelling; soothe pain; clean/kill germs				x	**foot path;** yard border; farm borders	C
27	FABACEAE *Derris elliptica* [H] **deris** [P] **dub, derris**	GH	**matamat masusuhr matamat merifirif;** [P] bikodel; [P] makngitelrakd	B	use peel of bark; pound; soak in coconut oil one day before first application	clean/kill germs; reduce itching; stimulate exfoliation of skin				x	**foot path;** yard border; farm borders	C
38	FABACEAE *Derris trifoliata* [P] **komokom**	GH	poison fish sting	R	pound and mix with coconut oil or water and apply to point of entry	draw out poison					**forest littoral borders**	C
0	GOODENIACEAE *Scaevola taccada* [H] **hamahi** [P] **korari, kirrai, railechol**	AL	**finchingeri-chil; hameteri retip; ehameteri; baochuch; etewas**	L	pound with **yaho, nuhr, ngou, chaowor, mai, huh;** mix with coconut oil; use in **tafeieri chouchou** and **warurani tafei**	remove waste; heal internal injuries; connect bone and muscle; soothe pain					Tobi; Rock Islands; Helen Reef	R

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0	GOODENIACEAE *Scaevola taccada* [H] **hamahi** [P] **korari, kirrai, railechol**	AL	**TB†**	B	pound gently with **fariap, hirifou, haisas;** mix with gallon of fresh water; add small amount of sea water; drink decoction or cold water infusion; add sugar water if needed; repeat	improve circulation; strengthen; prevent sickness					Tobi; Rock Islands; Helen Reef	R
39	HERNANDIACEAE *Hernandia sonora* [H]**hochari†** [P] **doko**	GH	**taferi homoho tetipach;** **TB†;** high blood	B	pound with **fariap, haisas, hirifou, hirio.** Note: do not use with coconut juice; very bitter	stimulate circulation; prevent sickness	x				**taro patch**	R
19	LAMIACEAE *Orthosiphon aristatus* [H] **Chinese kidney plant**	GH	**hameteri retip**	L,F	drink infusion several times a day	bitter/cleanse inside; move water out; weight loss aid	x		x		**home garden/ cultivar**	C
18	LAMIACEAE *Ocimum sanctum* [H] **worung** [P] **mach**	GH	**moh**	L	pound; squeeze juice, add water; drink; apply coconut oil residue to sores; 2x/day; eat **hiri** or **horech** sashimi after the first day	stop bleeding	x		x		**footpath; home garden/ cultivar**	R

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18	LAMIACEAE *Ocimum sanctum* [H] **worung** [P] **mach**	GH	**mehitariga meta**	L	pound, squeeze the juice onto skin	stop bleeding	x		x		**footpath; home garden/ cultivar**	R
16	LECYTHIDACEAE *Barringtonia racemosa* [P] **koranges**	GH	**moh** [P] bao	L	chew leaves, spit juice into patient's mouth	reduce swelling; cleanse/kill germs; reduce fever			x		**forest littoral borders**	R
23	LILIACEAE *Dianella caroliensis* [P] **bakelild; kobesos**	GH	**taferi homoho tetipach**	R	pound with **huruhu**; mix with water; drink before working in sun	cleanse; stimulate circulation; prevent sickness	x				**roadside;** farm borders; forest borders	A
0	MALVACEAE *Hibiscus rosa sinensis* [P] **bussonge**	AL	**mehitariga meta**	Fl	pound; squeeze juice onto cut; repeat	stop bleeding			x		**roadside;** home garden/ cultivar	A
0	MALVACEAE *Hibiscus tiliaceus* [H] **hirifou†** [P] **chermall**	GH	**taferi homoho tetipach**	L	pound with **safang, fariap, haohuh, safairing**; drink cold water infusion	stimulate circulation; cleanse; prevent sickness	x				**forest littoral borders**	C

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0	MALVACEAE *Hibiscus tiliaceus* [H] **hirifou†** [P] **chermall**	GH	**taferi homoho tetipach;** **TB;** high blood	B	pound with **haisas, fariap, hirio, hochari;** fill bucket with rain water, soak until red; drink. Note: do not use with coconut juice; bitter	stimulate circulation; prevent sickness	x				**forest littoral borders**	C
0	MALVACEAE *Hibiscus tiliaceus* [H] **hirifou†** [P] **chermall**	AL	**TB†**	B	pound gently with **fariap, haisas, hamahi;** mix with a gallon of fresh water add small amount of sea water; boil or soak until red; drink with sugar water if needed; repeat†	strengthen; cleanse inside	x				**forest littoral borders**	C
0	MALVACEAE *Hibiscus tiliaceus* [H] **hirifou†** [P] **chermall**	AL	**ifou; bechriruh**	L	pound, mix with water; squeeze on body or bathe in medicine; repeat	reduce fever	x				**forest littoral borders**	C
0	MELASTOMACEAE *Melastoma malabathricum* [P] **matakui**	AL	[P] belebel	L	boil in water; massage leaves with hands to make supple; place leaves on skin; repeat	dry blisters; draw out heat; prevent spread of blisters			x		**Malakal;** Koror; Babeldaub	C

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0	MORACEAE *Artocarpus atilis* [H] **bukeriao** [P] **arandu, meduu**	AL	-	F	same as in any recipe that uses **mai**	same as mai	x				**home garden-cultivar**	C
0	MORACEAE *Artocarpus mariannensis* [H] **mai** [P] **ebiei, meduuliou**	AL	**hamete ngi**	Fl	pound the end of the bud; mix with coconut milk; chew	soothe pain	x			x	**home garden-cultivar**	C
0	MORACEAE *Artocarpus mariannensis* [H] **mai** [P] **ebiei, meduuliou**	AL	**finchingeri-chil; hameteri retip; ehameteri; baochuch; etewas**	L	select young leaves; pound with **yaho, nuhr, ngou, chaowor, hamahi, huh;** mix with coconut oil; use in **tafeieri chouchou** and **warurani tafei**	connect bone and tissue; soothe pain	x			x	**home garden-cultivar**	C
12 25	MORACEAE *Ficus prolixa* [H] **hirio** [P] **lulk**	GH	**taferi homoho tetipach;** **TB;** high blood	B	pound with **haisas, fariap, hirifou, hochari;** fill bucket with rain water, soak until red; drink Note: do not use with coconut juice; very bitter	stimulate circulation; prevent sickness	x				**roadside;** footpath border	C

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No.	FAMILY Genus and species [H] Tobi Term [P] Palauan Term	ID	Illnesses [P]Palauan Term	Part(s) Used	Preparation and Administration	Healing properties of medicines	Food	Recreational/Social	Cosmetic/Ornamental	Utilitarian	Habitat	Reported Availability
12 25	MORACEAE *Ficus prolixa* [H] **hirio** [P] **lulk**	GH	**hamete ngi; ehamete hapiriwohangehi**	R	pound small white roots; boil in saltwater; gargle; repeat several times per day	soothe pain	x			x	**roadside**; footpath	C
12 25	MORACEAE *Ficus prolixa* [H] **hirio** [P] **lulk**	GH	**etafaiei; mehitariga meta**	R,B	pound together, mix with coconut oil; massage	soothe pain; promote circulation	x			x	**roadside**; footpath	
12 25	MORACEAE *Ficus prolixa* [H] **hirio** [P] **lulk**	GH	**etafaiei;** [P] belebel	F	pound with old dry coconut leaves; apply to scars	fade scars	x			x	**roadside**; footpath	
0	MUSACEAE *Musa sp.* [H] **wich** [P] **ilias**	AL	**mehitariga meta**	L	scrape off the **chapunung** (brown fiber); apply to the cut	stop bleeding	x			x	**home garden-cultivar;** market	C
0	MUSACEAE *Musa sp.* [H] **wich** [P] **ilias**	AL	**hametarisi; hachouess; hameteri retip**	L	pound with **yaho, nuhr, hachereng, haisas**; squeeze with water through **uhr**; drink	heal internal injury; promote circulation; open breathing pathway	x			x	**home garden-cultivar,** market	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	MUSACEAE *Musa sp.* [H] **wich** [P] **ilias**	GH	**finchingirichil; ehameteri; baochuch; etewas**	L	pound with **yaho, haisas, nuhr, hachereng**; massage with coconut oil	connect bone and tissue; soothe pain	x			x	**home garden-cultivar;** market	C
0	MUSACEAE *Musa sp.* [H] **wich** [P] **ilias**	AD	**mut**	L	wrap around **wot;** place in earth oven overnight; pound until soft; sit for 1-3 days; eat before taking bitter medicine	prevent vomiting	x			x	**home garden-cultivar;** market	C
1	MYRTACEAE *Psidium guajava* [H] **guava** [P] **kuabang**	AL	**hameteri retip hametarisi**	L	drink infusion;	cleanse stomach	x				**home garden/ cultivar**	C
1	MYRTACEAE *Psidium guajava* [H] **guava** [P] **kuabang**	AL	**hametarisi buchita hametarisi**	L	chew leaves, swallow juice	stop diarrhea	x				**home garden/ cultivar**	C
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	postpartum bathing ritual	L	bathe in decoction 2x/ day for seven days post partum	cleanse/kill germs; prevent illness; cause sweating	x		x	x	yard borders; farm borders; **footpath**	C

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**mehitariga meta; yeturong tafaief**	L	place pulverized leaves inside **buroh** leaf and make a pouch; cover with half coconut shell; cook on coals; apply coconut oil to wound; apply hot poultice; repeat	cleanse/kill germs; dry out wound; stop bleeding;	x		x	x	yard borders; farm borders; **footpath**	C
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**taferi homoho tetipach; etai inou harai; hameterisi; pahecha**	F	remove seeds; boil; mix with young coconut juice; drink	stimulate circulation; increase appetite; remove waste	x		x	x	yard borders; farm borders; **footpath**	C
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**taferi homoho tetipach**	L	pound with **safang, haohuh, hirifou, safairing**; soak in freshwater until red; drink	stimulate circulation; prevent sickness add vitamins to diet	x		x	x	yard borders; farm borders; **footpath**	C
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**herisabou**	F	pound with **safang, haisas, ngach**; boil in fresh water until brown; bathe in decoction 3x/day	dry out skin; cause skin to come off	x		x	x	yard borders; farm borders; **footpath**	C

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No.	FAMILY **Genus and species** **[H] Tobi Term** [P] Palauan Term	ID	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**hamete taring**	L	pound with **warimoh** and **yaho**; combine with salt water or coconut oil; drop into both ears, ending with infected one	dislodge waste; soothe pain; prevent sickness	x		x	x	yard borders; farm borders; **footpath**	C
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**TB†**	B	pound gently with **haisas, hirifou, hamahi;** mix with a gallon of fresh water and small amount of sea water; boil or soak until red; drink with sugar water if needed†	strengthen; bitter/ cleanse inside	x		x	x	yard borders; farm borders; **footpath**	C
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**taferi homoho tetipach;** **TB;** High blood	B Br	pound with **haisas, hirifou, hirio, hochari;** soak in rain water until red Note: do not use with coconut juice; bitter	improve circulation; strengthen; prevent sickness	x		x	x	yard borders; farm borders; **footpath**	C
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**finchingerichil**	L	pound with **marmeug** and **woripacheche**, apply poultice or **warurani tafei**; end with tonic or massage	connect bone and tissue; remove waste; soothe pain	x		x	x	yard borders; farm borders; **footpath**	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**matamat**	B	pound with **ngach** and coconut oil; apply to skin	dry the skin; cause skin to come off	x		x	x	yard borders; farm borders; **footpath**	C
15	MYRTACEAE *Syzgium malaccense* [H] **fariap†** [P] **kidel**	GH	**yungut baut; taringungut meta ngurut; hameteri chimei; matsirip, fahafah**	L	pound leaves; make steam bath; follow with cold shower	dislodge phlegm; clear circulatory pathways	x		x	x	yard borders; farm borders; **footpath**	C
28	NEPENTHACEAE *Nepenthes mirabilis* [P] **meliik, olmalel a rubak**	GH	all types of **matamat;** [P] makngitelrakd	R	pound with **titimel** and **deris**; soak in oil 1 day before first application	soothe pain; cleanse/kill germs; cause skin to come off				x	**farm borders**	R
0	PANDANACEAE *Pandanus sp.* [H] **fach** [P] **ongor**	AL	illnesses that require use of **warurani tafei / tafeieri chouchou**	L	weave into mats for **warurani tafei, tafeieri chouchou**	facilitate and prolong exposure to medicine	x		x	x	**roadside;** yard borders	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	PIPERACEAE *Piper betle* [P] **kebui**	AL	**mehitariga meta; matamat**	L	pound, mix with water or coconut oil; apply to skin	stop bleeding		x			**home garden/ cultivar;** forest pathways; market	A
0	PIPERACEAE *Piper betle* [P] **kebui**	AL	**ehameteri;** childbirth	L	chew in a quid with **aus** (slaked lime) and **bucch**	soothe pain; increases circulation; creates heat		x			**home garden/ cultivar;** forest pathways; market	A
0	POACEAE *Saccharum officinarum* [H] **suka cane** [P] **deb**	AL	**matamat;** [P] bikodel; skin allergies	L	pound stem, mix with water, drink	soothe skin	x				**home garden/ cultivar;** market	C
3	POLYPODIACEA *Polypodium scolopendria* [H] **chichi†** [P] **ebechab**	GH	**finchingerichil**	L	pound new leaves with coconut oil or water; massage; sleep on medicine	draw out heat; connect bone and tissue	x		x		home garden/ cultivar; footpaths, **roadside;** yard borders;	A

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
3	POLYPODIACEA *Polypodium scolopendria* [H] **chichi†** [P] **ebechab**	GH	**hameteri retip**	L	pound with **yaho, ngou, chaower, yohoma, yerao**; mix with coconut juice; drink	heal internal injury	x		x		home garden/ cultivar footpaths, **roadside**; yard borders;	A
20	POLYPODIACEAE *Pteris tripartite* [H] **siviriyarus** [P] **liker bedaoch**	GH	**hametarisi**	L	pound with **yaho** and **ngou**, mix with coconut oil, eat; very bitter	cause vomiting					**footpath**, yard borders; between rocks	C
20	POLYPODIACEAE *Pteris tripartite* [H] **siviriyarus** [P] **liker bedaoch**	GH	**finchingeri-chil; hameteri retip; ehameteri; baochuch; etewas**	L	pound with **hariwa, yaho, nuhr, haohuh;** mix with water or coconut juice; drink; can use same leaves except **haohuh** for **warurani tafei;** sleep in this medicine daily; drink after using emetic	remove waste; heal internal injury; connect bone and tissue; stimulate circulation					**footpath**, yard borders; between rocks	C
20	POLYPODIACEAE *Pteris tripartite* [H] **siviriyarus** [P] **liker bedaoch**	GH	**finchingeri-chil; ehameteri; baochuch; etewas; tobotoborchi**	L	pound with **ngou** and **woripacheche**, massage with coconut oil; sleep in medicine	remove waste; heal internal injury; connect bone and tissue; help circulation					**footpath**, yard borders; between rocks	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
21	RHAMNACEAE *Colubria asiatica* [H]**hanoh†** **[P] drikel; ongaitong**	GH	**metai; yehangahang mataiei; matari wor**	L	chew with **ngou**; spit through papaya stem into both eyes, ending with injured eye	remove waste; stimulate circulation	x		x		**forest**	C
8	RUBIACEAE *Aidia racemosa* **[P] kerumes**	GH	**hametarisi**	F	drink cold infusion	bitter/cleanse inside; move water out			x		**forest pathway**	R
6	RUBIACEAE *Ixora casei* **[H] hachio** **[P] kerdeu**	GH	all types of **matamat** except cuts and open wounds	L,R	pound with **deris**; soak in coconut oil for 2 days; apply oil to the skin	soothe pain; cause skin to come off					**forest borders**; roadside; yard borders	C
2	RUBIACEAE *Morinda citrifolia* **[H] nuhr, noar†** **[P] ngel**	GH	**hametarisi; buchita; yarorupu sewa**	F	mix with gallon of fresh water; drink several times daily; keep refrigerated	bitter/cleanse inside; move water out; weight loss aid	x				**yard borders**; roadside; forest borders; footpaths	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**hametarisi**	F	eat raw	bitter/cleanse inside; move water out; prevent sickness	x				**yard borders**; roadside; forest borders; footpaths	C
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**hametarisi; hachouess; hameteri retip**	L	pound with **yaho, wich, hachereng, haisas**; strain through **uhr** drink extract	stop bleeding; heal internal injury; stimulate circulation	x				**yard borders**; roadside; forest borders; footpaths	C
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**ehameteri; baochuch; etewas**	L	pound; massage with warm coconut oil	create heat; relax muscles; soothe pain	x				**yard borders**; roadside; forest borders; footpaths	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**finchingerichil hameteri retip; ehameteri; baochuch; etewas**	L	pound with **hariwa, yaho, siviriyarus, haohuh;** mix with water or coconut juice; drink; use same leaves, except for **haohuh** for **warurani tafei;** sleep in this medicine every day. Note: drink after taking an emetic	bitter/cleanse inside; move water out;; soothe pain; connect bone and tissue; heal internal injuries Note: do not use **haohuh** externally	x				**yard borders;** roadside; forest borders; footpaths	C
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**finchingirichil; ehameteri; baochuch; etewas**	L	pound with **yaho, haisas, wich, hachereng;** massage with coconut oil	connect bone and muscle; soothe pain	x				**yard borders;** roadside; forest borders; footpaths	A
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**yehangahang mataiei; yehochohoch mataiei; matari wor**	F	pound with **yaho;** squeeze juice into eyes, ending with injured eye; repeat several times a day for 5 days	soothe pain; prevent sickness; stimulate circulation	x				**yard borders;** roadside; forest borders; footpaths	A

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**finchingerichil; hameteri retip; ehameteri; baochuch; etewas**	L	pound male and female leaves with **yaho, ngou, mai, chaowor, hamahi, huh;** mix with coconut oil; use in **tafeieri chouchou** and **warurani tafei**	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue	x				**yard borders;** roadside; forest borders; footpaths	A
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**ehameteri; baochuch; etewas**	L	pound female leaves with **ngou**; mix with coconut oil; use for **tafeieri chouchou** and **warurani tafei**	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue	x				**yard borders;** roadside; forest borders; footpaths	A
2	RUBIACEAE *Morinda citrifolia* [H] **nuhr, noar†** [P] **ngel**	GH	**pahecha†**	L	pound with **yaho, tafach, haohuh**; squeeze with coconut juice through **uhr** add coconut oil; drink 2x/day for 3 days†	stop diarrhea	x				**yard borders;** roadside; forest borders; footpaths	A
26	RUBIACEAE *Mussaenda frondosa* [H] **eroi** [P] **cherechroi**	GH	**mehitariga meta; yeturong tafaief; suka**	L	pound with small amount of fresh water; apply to skin	stop bleeding; connect skin			x		**roadside**	A

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
26	RUBIACEAE *Mussaenda frondosa* [H] **eroi** [P] **cherechroi**	GH	**hametarisi**	L	boil in water, drink infusion	bitter/cleanse inside; move water out;			x		**roadside**	A
29	RUTACEAE *Citrus hystrix* [H] **huruhu** [P] **debechel**	GH	**taferi homoho tetipach** during pregnancy; **etai inou harai;** **yaoch sewa;**	F	mix juice, water, and **tumucho** leaves; drink decoction	help make mother's milk; stimulate appetite; strengthen fetus	x				**home garden/ cultivar;** market	C
29	RUTACEAE *Citrus hystrix* [H] **huruhu** [P] **debechel**	GH	**mehitariga meta**	F	squeeze juice onto cut/abrasion	close the skin; cleanse/kill germs; stop bleeding	x				**home garden/ cultivar;** market	C
29	RUTACEAE *Citrus hystrix* [H] **huruhu** [P] **debechel**	GH	**taferi homoho tetipach; yehuh fario**	L	pound with **bakelild (kobesos)**; mix with water; drink before working in sun	prevent fainting; strengthen	x				**home garden/ cultivar;** market	C
0	RUTACEAE *Citrus microcarpa* [P] **kingkang**	AL	**hametarisi;** **buchita**	F	eat fruit and rind	gets rid of air in the stomach	x				**home garden/ cultivar;** market	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	RUTACEAE *Citrus microcarpa* [P] **kingkang**	AL	**hametarisi; buchita**	F	boil rind in water; drink decoction	bitter/cleanse inside; move water out; cleansing	x				**home garden/ cultivar;** market	C
0	RUTACEAE *Citrus microcarpa* [P] **kingkang**	AL	**hameteri chimei**	R	pound with **babai;** mix with coconut oil; inhale vapors	clear air pathways; stimulate circulation	x				**home garden/ cultivar;** market	C
35 36	SAPINDACEAE *Allophylus timoriensis* [H] **ngou** [P] **ebeludes**	GH	**hametarisi**	L	pound with **yaho** and **siviriyarus**, mix with coconut oil, eat; bitter	causes vomiting; gets rid of air in stomach	x				**footpaths;** forest pathway	A
35 36	SAPINDACEAE *Allophylus timoriensis* [H] **ngou** [P] **ebeludes**	GH	**taferi homoho tetipach**	L	pound with **yaho** and **haohuh,** mix with coconut milk, drink	strengthen; prevent sickness; stimulate circulation	x				**footpaths;** forest pathway	A
35 36	SAPINDACEAE *Allophylus timoriensis* [H] **ngou** [P] **ebeludes**	GH	**hameteri retip**	L	pound with **yaho, chaower, chichi, yohoma, yerao**; mix with coconut juice, drink	remove waste; bitter/cleanse inside; move water out; heal internal injury	x				**footpaths;** forest pathway	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
35 36	SAPINDACEAE *Allophylus timoriensis* [H] **ngou** [P] **ebeludes**	GH	**yehochohoch mataiei; yehangahang mataiei; matari wor**	L	chew with **hanoh**; spit through **bobai** stem into eyes; injured last	soothe pain; promote circulation; prevent sickness	x				**footpaths**; forest pathway	C
35 36	SAPINDACEAE *Allophylus timoriensis* [H] **ngou** [P] **ebeludes**	GH	**finchingerichil**; **hameteri retip**; **ehameteri**; **baochuch**; **etewas**	L	pound with **yaho, nuhr, mai, chaowor, hamahi, huh**; mix with coconut oil; use in **tafeieri chouchou** and **warurani tafei**	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue	x				**footpaths**; forest pathway	C
35 36	SAPINDACEAE *Allophylus timoriensis* [H] **ngou** [P] **ebeludes**	GH	**ehameteri**; **baochuch**; **etewas**	L	pound with **nuhr**; mix with coconut oil; use for **tafeieri chouchou** and **warurani tafei**	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue					**footpaths**; forest pathway	C
35 36	SAPINDACEAE *Allophylus timoriensis* [H] **ngou** [P] **ebeludes**	GH	**finchingerichil**; **ehameteri**; **baochuch**; **etewas**; **tobotoborchi**	L	pound with **siviriyarus** and **woripacheche**, mix with coconut oil; use for **tafeieri chouchou** and **warurani tafei**	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue					**footpaths**; forest pathway	C

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
32	SCROPHULARIACEAE *Limnophila spp.* **[P] kare, ukelakel, ilemelakel**	GH	post partum medicine for mother	W	pound, mix with water or coconut juice, strain and drink; boil in water and expose womb to steam	clean/kill germs; shrink womb					**Koror;** Babeldaub	R
0	SOLANACEAE *Capsicum frutescens* [P] **meringel**	AL	**matamat** [P] makngitelrakd	F	pound, mix with coconut oil; apply to skin	clean/kill germs	x				**home garden/ cultivar;** market	C
14	VERBENACEAE *Clerodendrum paniculatum* [P] **butecherechar**	GH	**matamat; mehitariga meta; etafaiei**	L	pound; mix with coconut oil; cook; add more coconut oil; apply to skin	dry the skin; stop bleeding; repel insects; fade scars	x				**forest pathways**	U
17	VERBENACEAE *Vitex negundo* [H] **ihaweri†** [P] **kelsechedui**	GH	**taferi homoho tetipach**	L	pound, drink decoction or cold water infusion	prevent sickness; dietary supplement	x			x	**forest littoral/ borders**	U

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**moh**	L	pound with **taferi moh** and **hamahuh**; mix with coconut milk; apply coconut residue to sores; squeeze medicine on sores; eat **horech** or **hathi**	clean/kill germs; soothe pain; close the sores; draw out heat	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**hametarisi; hachouess; hameteri retip**	L	pound with **nuhr, wich, hachereng, haisas**; squeeze with water through **uhr**; drink	open breathing pathways, improve circulation; stop bleeding repairs internal injuries	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**hametarisi**	L	pound with **siviriyarus** and **ngou**, mix with coconut oil, eat	cause vomiting	x				**forest pathways** footpaths; garden borders; yard borders	A

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**taferi homoho tetipach**	L	pound with **ngou** and **haohuh,** mix with coconut milk, drink	strengthen; prevent sickness; stimulate circulation	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**hameteri retip**	L	pound with **ngou, chaower, chichi, yohoma, yerao**; mix with coconut juice, drink	bitter/cleanse inside; move water out; heal internal illness	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**hamete taring**	L	pound with **warimoh** and **fariap**; combine with salt water or coconut oil; drop both ears, ending with infected ear	dislodge waste; soothe pain; prevent infection	x				**forest pathways** footpaths; garden borders; yard borders	A

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**finchingerichil; hameteri retip; baochuch; etewas**	L	pound with **hariwa, nuhr, siviriyarus, haohuh;** mix with water or coconut juice; drink; use same leaves, except for **haohuh** for **warurani tafei;** Note:drink after an emetic	soothe pain; stimulate circulation; remove waste; cleanse/kill germs; connect bone and tissue	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**finchingirichil; ehameteri; baochuch; etewas**	L	pound with **nuhr, haisas, wich, hachereng;** massage with coconut oil	soothe pain; stimulate circulation; remove waste; cleanse/kill germs; connect bone and tissue	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**hameteri chimei**	L	steam bath	improve circulation	x				**forest pathways** footpaths; garden borders; yard borders	A

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**ehameteri; baochuch; etewas**	L	pound; massage with warm coconut oil	soothe pain; stimulate circulation	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**yehangahang mataiei; yehochohoch mataiei; matari wor**	L	pound with **nuhr**; squeeze juice into eyes, ending with injured eye; repeat several times a day for 5 days	remove waste; stimulate circulation	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**finchingerichil hameteri retip; ehameteri; baochuch; etewas**	L	pound with **nuhr, ngou, mai, chaowor, hamahi, huh;** mix with coconut oil; use in **tafeieri chouchou** and **warurani tafei**	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue	x				**forest pathways** footpaths; garden borders; yard borders	A

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	**pahecha†**	L	pound with **haohuh, tafach, nuhr**; strain medicine and coconut juice; through **uhr;** add coconut oil; drink 2x/day for three days	stop diarrhea	x				**forest pathways** footpaths; garden borders; yard borders	A
4	VERBENACEAE *Premna obtusifolia* [H] **yaho†** [P] **osm**	GH	gonorrhea†; **hameteri siei**	L	pound with **tafach** and **haohuh**; strain medicine and coconut juice; through **uhr**; add coconut oil; drink; drink one glass hot water; repeat 2x day as needed†	cleanse/kill germs; move waste; move water out	x				**forest pathways** footpaths; garden borders; yard borders	A
17	VERBENACEAE *Vitex negundo* [H] **ihaweri†** [P] **kelsechedui**	GH	**mehitariga meta;** **yeturong tafaief**	L	pound leaves; apply to skin	stop bleeding; connect tissue	x			x	**forest/ littoral borders**	U
17	VERBENACEAE *Vitex negundo* [H] **ihaweri†** [P] **kelsechedui**	GH	**hameteri retip**	L	pound, mix with water, strain juice through **uhr**, drink	heal internal injury	x			x	**forest/ littoral borders**	U

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
37	VITTARIACEAE *Vittaria incurvata* [P] **albeluu**	GH	**mehitariga meta**	W	pound; mix with water or coconut oil, apply to skin	stop bleeding; cleanse/kill germs					**yard borders;** footpaths	A
0	ZINGIBERACEAE *Curcuma longa* [H] **haeng, chaoriang** [P] **kesol; telab‡**	AL	**tobotorich;** arthritis	R	boil; pound while warm; apply to body where needed; cover with cloth and wrap	reduce swelling; soothe pain	x		x		**home garden/ cultivar;** market	C
0	ZINGIBERACEAE *Curcuma longa* [H] **haeng, chaoriang** [P] **kesol; telab‡**	AL	**taferi homoho tetipach**	L	pound with **yerao** and **rab;** drink decoction while warm	prevent sickness	x		x		**home garden/ cultivar;** market	C
0	ZINGIBERACEAE *Hedychium coronarium* [H] **white ginger**	AL	pregnancy and postpartum birthing ritual	R	pound; soak in coconut oil for 2 days; take steam bath; also inhale vapors; massage with oil	clean/kill germs; prevent illness; cause sweating	x		x		**yard borders;** home garden/ cultivar	C
0	ZINGIBERACEAE *Zingiber officinale* [H] **ginger** [P] **sionga**	AL	**hametarisi; buchita**	R	drink decoction	get rid of air in stomach	x		x		**home garden/ cultivar;** market	C

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	ZINGIBERACEAE *Zingiber officinale* [H] **ginger** [P] **sionga**	AL	**taferi homoho tetipach**	R L Fl	pound with **ngus**, mix with toasted copra; add fresh water; heat rock and place in bowl with drink; drink warm; drink with **belsiya** (pounded taro)	stimulate circulation; prevent illness; supplement diet	x		x		**home garden/ cultivar;** market	C
0	- [H] **hariwa**	-	**finchingerichil; hameteri retip; ehameteri; baochuch; etewas**	L	pound with **yaho, nuhr, siviriyarus,** and **haohuh;** mix with water or coconut juice; drink; use same leaves, except for **haohuh** for **warurani tafei;** sleep in this every day; Note:drink after an emetic	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue					Tobi	R
0	- [H] **hiyobu**†	-	**hameteri retip** induce vomiting†	B	pound; drink juice; repeat	cause vomiting	x			x	Tobi	R
0	- [H] **huh**	-	**hameteri taringei**	Fl	place flowers in cloth and pound; squeeze 3 drops of into both ears, ending with the infected one; use 1x/ day	soothe pain; dislodge waste from ear; also prevent infection					Rock Islands, Tobi	R

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	- [H] **huh**	-	**finchingerichil; hameteri retip; ehameteri; baochuch; etewas**	Fl L	pound with **yaho, nuhr, ngou, chaowor, mai, hamahi;** mix with coconut oil; use in **tafeieri chouchou** and **warurani tafei**	soothe pain; stimulate circulation; remove waste; clean/kill germs; connect bone and tissue					Rock Islands, Tobi	R
0	- [H] **igata**	-	**matamat**	B	pound, soak in coconut oil, apply to skin	reduce redness; soothe pain; stop itching; clean/kill germs					Tobi	R
0	- [H] **rap**	-	**taferi homoho tetipach**	L	pound with **yerao** and **chaoriang;** drink decoction while warm	prevent sickness	x				Tobi	R
0	- [H] **safairing**	-	**taferi homoho tetipach**	L	pound with **safang, fariap, hirifou, haohuh;** drink cold water infusion	prevent sickness; has vitamins	x				Tobi Rock Islands	R

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	- [H] **taferi tahuh mar**	-	**tahuh mar**	L	pound; cook; apply coconut oil onto body, then massage hot medicine; for men only;	soothe pain; improves circulation; removes waste					Tobi	R
0	- [H] **wahahariruhu**	-	induce menstruation	R	pound with green coconut husk to a pulp; mix with coconut juice; drink small amount every day leading up to next period	induce menstruation	x				Tobi	R
0	- [H] **wahahariruhu**	-	**taferi homoho tetipach**	R L	pound, mix with coconut milk; young boys drink for strength	prevent sickness	x				Tobi	R
0	- [H] **wahahariruhu**	-	**hamete ngi; ehamete hapiriwohangehi**	R	pound; mix with saltwater; gargle several times a day	soothe pain	x				Tobi	R
0	- [H] **warimoh**	-	**ifou, bechriruh**	L	pound; mix with fresh water, bathe or squeeze on body; repeat	reduce fever					Tobi	R

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No.	**FAMILY** **Genus and species** **[H] Tobi Term** [P] Palauan Term	**ID**	**Illnesses** [P]Palauan Term	**Part(s) Used**	**Preparation and Administration**	**Healing properties of medicines**	**Food**	**Recreational/Social**	**Cosmetic/Ornamental**	**Utilitarian**	**Habitat**	**Reported Availability**
0	- [H] **warimoh**	-	**hameteri taringei**	L	pound with **yaho** and **fariap**; add salt water or coconut oil; drop both ears ending with infected one	soothe pain; dislodge waste from ear; also prevent infection					Tobi	R
0	- [H] **yerao**	-	**hameteri retip**	L	pound with **yaho, ngou, chaower, chichi, yohoma**; mix with coconut juice; drink	heal internal injury					Tobi	R
0	- [H] **yerao**	-	**taferi homoho tetipach**	L	pound with **rap** and **chaoriang;** drink decoction	prevent sickness	x				Tobi	R
0	- [H] **yohoma**	-	**hameteri retip**	L	pound with **yaho, ngou, chaower, chichi, yerao**; drink with coconut juice	heal internal injury					Tobi	R

Notes: † = indicates that the taxon, term, illness, and/or medical preparation are also reported in Black (1968).
No.: Voucher collection number, "0" indicates that author did not collect a voucher specimen.
ID: GH = Guam Herbarium; JM = Joel Miles; AR = Aurora Del Rosario; AL = Aunchalee Loscalzo, identified by the author based on linguistic comparison and botanical references (Black 1968; Del Rosario 2001; Del Rosario and Esguerra 2003; Fosberg 1979; Fosberg, et al. 1980; Keppler 1992; Space, et al. 2003).
Part: B (bark); Br (branch); E (exudate); F (fruit); L (leaf); R (rhizome/root/tuber); S (seed); St (stem); (W) whole plant

Appendix B. Botanical Pharmacopoeia of Echang Hamlet

Illnesses: Refer to Appendix A. Tobi term is emboldened. English description and Palauan terms [P] are not. Spellings based on interviews.
Collection notes: Voucher collection habitat is in bold; other sites where taxon is found are also included. This list is not exhaustive.
Other categories of use: The information reflects incidental information provided during interviews on ethnomedicines. It is not an exhaustive survey.
Reported availability: Assessment is based on informant responses to interviews.

APPENDIX C. Sense of Coherence Questionnaire for Echang

1. What is your name?
2. Age
3. Birthplace
4. Highest level of education completed.
5. Number of people in household (ages; education; employment)
6. How long have you lived in Echang?
7. Where else have you lived?
8. How often do you travel back and forth from Echang to (Tobi, Sonsorol, etc.)?
9. What place do you consider your home? Why do you consider this place your home?
10. Please describe the place where you currently live
11. Please describe your community
12. How would you describe your position in your community?
13. What kinds of things are necessary to have to support your family in Echang?
14. Do you have access to any farmland, canoe, home garden, or livestock in Echang?
15. On a daily basis, are you confident that you are able to provide for your family's needs?
16. Do you think that people in your community are concerned about being able to provide for their family's needs?
17. Do you feel like people in Echang share the same ideas and beliefs that you do?
18. Do you feel safe and secure living in Echang?
19. Are you concerned about the conditions of the environment in Echang? Please describe your concerns.
20. What are some of the health concerns that you have for yourself and your family?
21. How do you and your family deal with health problems? Do you/they use local medicine?
22. What do you think are the major health concerns for the people living in your community?
23. How do you think that people in your community manage their health concerns?
24. Are you satisfied with the health care that is available to you in Koror?
25. Would you make any changes or wish it were different?
26. Do you feel comfortable seeking health care at the hospital/doctor's office?
27. How frequently do you feel unhappy, upset, or dissatisfied with the conditions of your life in Echang? Please describe these occasions and the feelings that you were having.
28. Do you notice that you ever feel so tired (or run down, physically ill) that you cannot perform work or daily activities? If so how often? Please describe situations where you felt like this.
29. Has use of alcohol ever interfered with your job, work, or ability to accomplish daily activities?
30. Do you observe that alcohol use interferes with people's ability to complete school, work, or daily responsibilities? Please explain.
31. Are there people who you can talk to or rely on when you are having problems or concerns?
32. If you had a problem (with health, money, or family) are you confident that you have the resources to solve that problem?
33. What are your biggest concerns for your community?
34. What do you hope for your personal future? The future of your family?
35. What would you like to see improve within your community?

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