A SELECTION OF TRADITIONAL MEDICINAL REMEDIES IMPORTANT TO CONTEMPORARY CARRIER PEOPLE IN THEIR TREATMENT OF DISEASE

By

ELIZABETH MAUD RITCH-KRC

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Department of Botany

The University of British Columbia
Vancouver, Canada

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ABSTRACT

This project focuses on the documentation and analysis of folk medicines used by the Carrier people in northcentral British Columbia. It includes the traditional and contemporary plant knowledge of the medicinal properties of the plants, as well as methods used to prepare and administer herbal remedies. A collection of voucher specimens of the prepared medicinal plants and the plants from which they were derived accompanies this project. Important Carrier medicinal plants include: Abies lasiocarpa, Alnus incana, Arctostaphylos uva-ursi, Artemisia frigida, Fragaria virginiana, Juniperus communis, Picea glauca, Pinus contorta, Populus tremuloides, Rubus idaeus, Salix sp. and Shepherdia canadensis.

The antimicrobial properties of some of the medicines were evaluated to determine the therapeutic properties of traditional herbal preparations. Using the disk diffusion method aqueous medicinal preparations, pitch preparations and methanolic extracts were screened against five known human pathogens: Escherichia coli, Staphlyococcus aureus, Pseudomonas aeruginosa, Candida albicans

and Aspergillus fumigatus. The results indicated definite anti-microbial activity in the pitch preparations of Picea glauca and Pinus contorta and provide a starting point for the pharmacognostic evaluation of these plants.

In addition, a cytoxicity assay - colorimetric method - was used to test the anticancer activity of the methanolic extracts of Alnus incana and Shepherdia canadensis against mouse mastocytoma cells. Preliminary results indicated that A. incana possessed definite anticancer properties. S. canadensis also produced some cytotoxic activity, although not as great as that produced by A. incana.

The study provides further evidence to support the pharmacological validity of Native herbal medicines.

CONTENTS

CONTENTS

LIST OF TABLES

Acknowledgements

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FOREWORD

The Native peoples in northwestern North America have been using herbal medicines for several hundreds, probably thousands, of years in much the same manner as Indigenous peoples in other parts of North America, South America and Asia. One significant difference among these peoples is that those living in Asia (i.e. China and India) have had a written record of their herbal remedies extending back for several thousand years. In the Americas however, there was no written record but rather, an oral tradition of passing the knowledge from one generation to the next.

The existence of written records, Pent'ts'ao (China) and Atharvaveda (India), allowed the traditional herbal medicines from each region in these countries, to be compared, perfected and accepted nationwide; such that today, they are not only accepted but preferred by the population at large to other forms of medicine.

From the first early documents and reports of explorers and missionaries in the Americas it was evident that an extensive body of knowledge concerning the use of indigenous plant species existed among the Native peoples. Similarities, for example, can be seen in

the use of certain species, notably the conifers, between Native peoples living on opposite sides of the North American continent. Unfortunately, as the Indigenous peoples of North America had no written language, some of these remedies were lost as the knowledge was passed from one generation to the next. The lack of a written record confined the use of these herbal medicines to a limited area and a select audience; thus, until recently, they were virtually unknown to the world beyond the tribal boundaries.

This is particularly true of the Native people in northcentral British Columbia. In the late 1800's and early 1900's, missionaries and explorers in the region (Morice,1893; Smith,1929; Jenness,1943) recorded Carrier culture, folklore and some medicinal practices, but since then research done to record and evaluate the medicinal practices of northern interior peoples has been limited.

The purpose of undertaking this particular project, documenting the plant medicines of the Carrier people of northcentral British Columbia, was not only to further scientific knowledge and contribute to the understanding of North American Native medicines, but also to provide for the Carrier people of the Stoney Creek Band a

first written record of some of their herbal remedies.

It is hoped that this study will provide other researchers with an opportunity to consider an overall pharmacological evaluation of Native herbal medicines, as well as providing an opportunity for non-Natives, in general, to appreciate an alternative approach to Western health care.

In order to allow access to both a Native and/or early college-level readership the botanical information and medicinal descriptions of the herbal medicines have purposefully been kept as non-technical as possible.

1.0 Introduction

1.1 Scope of Project and Definition of Terms

The Carrier people of northcentral British Columbia have been, traditionally, a hunting, fishing and gathering society who relied primarily on the forest for subsistence. From the forest they obtained animals for food and clothing, trees for construction and fuel, and shrubs and herbaceous plants which provided food and medicines. Today, although the Carrier do not rely as heavily on the forest as formerly, they still see it as an integral part of their history and heritage. Part of that heritage is being severely threatened today by large pulp mill companies which have applied to the government for permits to clear "aspen, cottonwood, birch and stunted conifers" (Bernsohn, 1990) from the Prince George Timber Supply Area - an area only slightly smaller than England. In clearing the trees the forest companies destroy the delicate and fragile ecology of the forest floor, resulting in the loss of many shrubs and herbs presently harvested by the Carrier people for medicinal purposes.

> ... I told them (the officials) about it at that pulp hearing (Sept. 17, 1990); you've got to share - you can't say all the trees are my trees -

you've got to share, but they never catch on. It's sad when they don't understand what our ways are. ... Now they are tearing it up. (Sophie Thomas, personal communication, 1990) (cf. Prance, 1991 and Appendix E - Story about Sharing).

It is this aspect, the use of plants for medicinal purposes, that the study will focus on, examining Carrier plant knowledge, both traditional and contemporary, with respect to the vegetation of the Sub-Boreal Spruce forest, the major environment of the Carrier homeland.

The study involves two significant fields affiliated with the discipline of botany, namely ethnobotany and ethnopharmacology. The latter is sometimes alternately referred to as ethnopharmacognosy (De Smet, 1989).

Ethnobotany is the study of human/plant relationships with a particular emphasis on a given culture. As an area of study it bridges two major disciplines, anthropology and botany, and may often incorporate other disciplines such as ecology, history, linguistics, cognitive psychology, pharmacognosy, and nutrition.

There are likely as many definitions of ethnobotany as there are ethnobotanists, but two I have found to be most useful are as follows:

> .. Ethnobotany is the study of the direct interrelationships between human populations and their botanical environment. Through its culture a human population classifies the plant world, develops attitudes and beliefs about plants and learns the uses of plants in its environment. As a consequence of culturally determined behaviour human actions have a direct impact on plant taxa and communities. At the same time the biology of plants imposes constraints on human actions and underlies aspects of belief. The genetics, phenology, anatomy and productivity of specific taxa and populations are but a few of the biological restrictions affecting these interactions.
>
> Richard Ford [(1981)1]

> ... Ethnobotany is the science of people's interactions with plants.
>
> Nancy J. Turner [(n.d.) in press 2]

Ethnobotany itself is a multidisciplinary field. As in medicine, where one is able to focus on one or a number of specialties within the field, such as anaesthesia, obstetrics, opthalmology, or pediatrics, so too can the ethnobotanist focus on a particular specialty, since ethnobotany is equally as diverse a field as medicine. Some areas of specialty within ethnobotany include:

a) linguistics - the study of plant names and classification categories and their meanings,

b) nutrition - the study of the nutritive value of traditional plant

foods and the cultural implications of plants as foods;

c) technology - the use of plants as materials for clothing, tools construction, dyes, glues, fuels, tanning agents and other cultural substances;

d) medicine - the use of plants in healing and the maintenance of health;

e) ethnopharmacology - the determination of the active principles in traditional medicine and their potential for broader application;

f) social culture - the study of the role of plants in mythology, religion and traditional beliefs.

Of particular interest in this project is ethnopharmacology, one of the specialty areas related to ethnobotany. Since 1979, with the inception of the Journal of Ethnopharmacology, this particular specialty has received world recognition; the Journal publishes many and varied articles concerning traditional medicine from all regions of the globe. However, the use of plants for the drugs they contain goes back long before ethnopharmacology was a recognized field, back to time immemorial when primitive people used plants to

cure illness and allieviate pain.

In 1981 Bruhn and Holmstedt (3) provided the following description and definition for ethnopharmacology:

> .... the interdisciplinary scientific exploration of biologically active agents traditionally employed or observed by man.

In 1989, this definition was expanded by De Smet and Rivier (4) who stated that the aim of ethnopharmacology was to:

> .... obtain and maintain a broad multidisciplinary perspective on the human use of crude drugs and poisons in a traditional context by correlating and integrating scientific data offered by a variety of widely differing disciplines and subdisciplines, such as cultural anthropology, archaeology, linquistics, history, zoology, botany, chemistry, pharmacology, toxicology and medicine.

Pharmacognosy, the precursor of medical science, is in many respects similar to ethnopharmacology, but differs in that "pharmacognosy is the science of drugs that originate from living beings and are studied to help other living things" [De Pasquale, (1984) 5]. Ethnopharmacology, on the other hand, restricts itself to the study of agents that have been employed in a traditional context (Sevenet,1991). This implies that ethnopharmacology expands into

the anthropological area creating an interdisciplinary approach involving both "naturalistic field observation and controlled laboratory evaluation" [(De Smet & Rivier) 6].

1.2 Methods - Two Different Angles

In doing anthropological work the challenge lies in being able to combine observation and participation so as to understand the experience as insiders (Indigenous people) and yet describe the experience for outsiders (non-Indigenous people) (Spradley,1979). Ethnobotany's diverse nature and its position in both the biological and social sciences necessitates an effort, when conducting research, to balance the generally quantitative approach of botany on the one hand, with the generally qualitative approach of anthropology on the other hand.

The quantitative approach of botany requires the use of an experimental design, a stated hypothesis and quantitative data which, when followed by deductive analysis, leads to a conclusion. On the other hand, the qualitative approach of anthropology requires the use of a naturalistic design, no stated hypothesis and qualitative

data followed by inductive analysis from which generalizations can be determined (see Appendix A - Two Scientific Approaches).

Both these approaches are valid means of doing research although they differ greatly in the methods used to collect the data, in the type of data collected, and in the analyses of the data. Each method, however, ends up with either conclusions or generalizations which must face the academic community and stand the test of time.

It is thus evident that ethnobotanists must be both anthropologists and botanists since, "field work in ethnopharmacology necessitates the use of botanical, ethnographic and pharmacological methods" (Lipp 1989).

1.3 The Region and Climate

This project focuses on the Carrier people of northcentral British Columbia. The actual geographic area involved lies on the northern edge of the Interior Plateau, which is itself bordered by the Cascade and Coast mountain ranges to the west and by the Rocky Mountains to the north and east (Appendix B - British Columbia).

At its northern edge, near the 54th parallel, the Interior

Plateau extends to a width of approximately 320 km. From this northern edge it extends southward about 800 km to the Okanagan River near the border with the United States (Turner,1978). The countryside consists mainly of rolling hills, abundant wetlands and river valleys drained by the Fraser River system and its tributaries.

The climate is generally more variable and extreme in the interior than on the coast, although mild Pacific winds sometimes temper the exceedingly severe winter temperatures which can reach from -35 °C to -30 °C for several weeks at a time in December and/ or January.

Within the province there are 14 major vegetation zones known technically as "biogeoclimatic zones" (Krajina,1969; Ministry of Forests,1988). These zones are distinguished primarily on the basis of climate and vegetation. In northcentral British Columbia the most prominent zone is the Sub-Boreal Spruce Zone. This is an intermediate forest type between the Interior Douglas-fir Zone forests to the south and the Boreal forest to the north. At higher elevations, within the Sub-Boreal Spruce Zone, a second zone is often present. This zone is referred to as the Engelmann Spruce -

Subalpine Fir Zone (Ministry of Forests, 1988).

Although the Sub-Boreal Spruce forest has a short growing season and severe climatic conditions, it has moderately good plant growth (Ministry of Forests,1988). The forest in this region consists predominantly of hybrid Engelmann-white spruce, [Picea engelmannii Parry X Picea glauca (Moench) Voss] along with subalpine fir, [Abies lasiocarpa (Hook.) Nutt.]. There are also some Douglas-fir [Pseudotsuga menziesii (Mirb.) Franco.] as well as extensive stands of lodgepole pine [Pinus contorta ssp. latifolia Engelm.] in the drier regions (Ministry of Forests,1988).

Due to the climatic conditions of the interior, the variety of wild plants available to the Carrier people has consistently been less than that encountered by Native peoples in more southerly regions of the province (cf. Turner et al.,1990). Although the Carrier gathered many available wild plants as foods or as materials for procuring food, they have tended, for the most part, to be a hunting and fishing people relying on the animals of the plateau to sustain them (Turner,1978; Walker, 1984).

1.4 Ethnographic Background of the Carrier People

The Carrier, primarily a hunting and fishing group, had fairly permanent winter villages and traded with the Tsimshian and Tlingit peoples of the coast on a regular basis (Berry,1976; Walker, 1984). The more southerly Carrier, including the Ulkatcho, traded with the Nuxalk of Bella Coola and the Haisla and Heiltsuk Wakashan peoples (Turner, personal communication,1991). As a result of this economic relationship the culture of the Northwest Coast Native peoples diffused into the Interior and was adopted to some extent by the Carrier people (Walker,1984).

The Carrier language is classed in the Athapaskan family (Berry, 1976; Krauss & Golla 1981), and as such is related to Chilcotin, Sekani, Slave, Tahlan and Beaver in British Columbia, as well as to the Chipewyan and Navajo (Turner, personal communication,1991).

As a group, the Carrier peoples practised mother-right or matriarchate as the law governing succession to titles and property (Jenness,1943; Christensen,1991). Generally five phratries were recognized, although in some villages (eg., Stoney Creek) there were only two. Every clan within the phratry had the exclusive ownership

of a number of titles which carried with them a more or less definite rank. It was these titles that in turn conferred on their owners, be they male or female, the authenticity of nobility (Jenness,1943; Christensen,1991). This system of ownership extended not only to titles, but also to the ownership of recipes for ritual or medicinal purposes.

Accession to a title depended in part upon heredity and in part upon the ability to provide the potlatch necessary to make the accession valid. The boundary between nobility and commoner was fluid, for although, the son of a chief would never become a commoner, it was possible for a commoner to achieve the status of nobleman (Jenness,1943).

Children, like adults, were respected individuals who were expected to exercise independent responsibilities (Morice,1898). These they learned through the folklore which depicted ritual and rules of etiquette and stressed the following values (Jenness,1943):

a) to be respectful of elders and those less fortunate;

b) not to mock misfortune or sorrow;

c) never to ridicule animals or gloat over hunting success; and

d) to play quietly with dignity and moderation.

Discipline was rarely corporal. Humiliation and shame were evoked by the elders who publicly revealed a misdemeanor to the community at large (Fiske,1981; Celina John, personal communication,1990).

As colonization moved west across Canada, a strong European influence began to be felt in the traditional areas of the Carrier people (Moran,1988). At the beginning and through to the middle of the nineteenth century the fur traders relied on the Carrier for food and fur supplies. In 1863, new transportation routes were opened allowing the area access to European goods and foods (Fiske,1981). Additional contact between whites and natives occurred with the gold rushes of the 1850's and 1870's (Morice, 1898). This contact, however, destroyed the balance of relations developed during the fur trade and placed the Carrier in a position of dependency and social disruption (Fiske, 1981).

At the turn of the century the Grand Trunk Pacific Railway was pushed through Carrier country to its terminus in Prince Rupert. Once again the Carrier were exposed to the influences of a foreign

culture but this time it was the influence of Christianity, the Catholic Church and a law requiring Native children to attend residential schools that changed their lives completely (Moran, 1988). The growth of European settlements and the greater ease of communication through roads and railway, in addition to epidemics of disease introduced by Europeans, all contributed to the disruption of the traditional culture (Fiske,1981; Moran,1988). Many Carrier families were displaced and their land taken by immigrant families from other districts, thus eroding many of the traditional ways of life, the values and the culture (Jenness,1943). Despite these many hardships the Carrier people still thrive, although much of their traditional folklore, their remedies and rituals may disappear forever with the passing of the present generation of elders, many of whom are now in their late seventies and eighties.

1.5 Theoretical Significance and Practical Importance of the Project

There are many reasons, both academic and practical, to conduct an ethnobotanical survey of a particular group of Indigenous people focusing on their use of traditional herbal remedies.

From a purely academic standpoint, ethnobotany is important to the advancement of knowledge in both botany and anthropology. For anthropology there are two major benefits. First, with respect to the study of culture, the documentation of folk medicines not only increases the documentation of culture but, for the people themselves, represents a cultural rediscovery of local traditions. Likewise, a knowledge of traditional plant names and their meanings helps in the preservation of the language and increases the overall linguistic knowledge of the culture. It may also assist in explaining the diffusion and proliferation of native languages in the region (Turner, n.d. in press).

For botany, the study of ethnobotany and in particular, ethnomedicine, is important because, not only will it provide qualitative data regarding the effectiveness of plant medicines against known microorganisms, but it will add to the understanding and appreciation of folk medicines and remedies throughout the academic community.

From a practical outlook, on the other hand, one reason for conducting this research is to document what, up until very

recently, had been primarily an oral tradition passed from generation to generation. The elders who have this knowledge are now in their late seventies or early eighties and with the advent of easily accessible modern medical care the younger generations no longer rely exclusively on this knowledge for their well-being. As a result, much of this very important knowledge is on the verge of being lost. Thus, collecting and documenting the traditional knowledge of local plants and herbal remedies may allow the preservation of a small but important portion of the cultural heritage of the Carrier people.

Footnotes

1. Ethnobotany in North America - an historical phytogeographical perspective. Canadian Journal of Botany, 1981, 59: 2178-2188.

2. Ethnobotany Today in Northwestern North America. n.d. in press, (Unpub. manuscript).

3. Ethnopharmacology, Objectives, Principles and Perspectives. In: J.L. Beal and E. Reinhart (Eds.) Natural Products as Medicinal Agents. 1981, Hippokrates Verlag, Stuttgard p.405-430.

4. A General Outlook on Ethnopharmacology. Journal of Ethnopharmacology, 1989 (April) 25: 127-138.

5. Pharmacognosy: The oldest modern science. Journal of Ethnopharmacology, 1984 (June) 11: 1-16.

6. Same as #4 above

2.0 Historical Use of Medicinal Plants

2.1 History of Herbalism - Literature Review

Humanity's relationship with the botanical world has been constant through numerous ages and civilizations. Recently, the study of herbs and the related field of pharmacognosy has experienced a revival. It is interesting to note that over the past three decades research done both in botany and organic chemistry has revitalized the field of pharmacognosy. This has been due, in part, to an overwhelming concern with all aspects of ecology. As a result, there has been a renewed interest in so called "natural" products and drugs (Tyler et al.,1981; Trease & Evans, 1983). Many drugs such as opium, henbane and ginseng have been known and used by people for well over six thousand years. Today, in many parts of the world (Asia, Africa and Europe) the use of crude natural products in medicines and for healing is still a common occurrence (Der Marderosian & Liberti, 1988).

However, the relationship that developed between humanity and the plant world has varied greatly depending on the cultural development of each particular group, as well as the environment in

which it lives. At various times in our history the use of botanical knowledge has been inextricably linked to religion, economics or science. This is evident, when one follows the evolution of knowledge (both biological and botanical) from the ancient, nomadic hunting and gathering societies through to modern peoples in the present-day technological societies.

During the early hunter-gatherer period ~20,000 years ago descendants of the Cro-Magnons in Africa, Europe, Asia and the Americas hunted, fished, gathered wild fruits and dug for edible roots. They discovered, mostly by trial and error, that some plants would nourish them, some could relieve pain and others proved to be fatal under some circumstances. The early people also developed methods to render palatable certain parts of the plants that they found to be of value (Tyler et al. 1981; Stuart,1987; Johns,1990). This early hunter-gatherer period, lasting ~12,000 years, was perhaps the longest clinical-trial period in our history and eventually produced a valuable body of knowledge with respect to the qualities of the different herbs. Primitive peoples determined which herbs produced the best foods, the best poisons, the best

medicines, and the finest fuels and weapons, as well as which produced the best dyes for body or cave paintings (Stuart,1987). In addition, they also discovered "magic" plants - those having a strange effect on the mind and body and able to transport one to another dimension away from the reality and severity of the environment. Gradually, through trial and error, early people developed a knowledge of naturally occurring drugs that was at first handed down orally, from one generation to the next, and then later in written form as papyri, baked clay tablets, parchments, manuscript herbals and eventually as pharmacopoeias (Trease & Evans, 1983).

As De Pasquale points out in a paper presented at the meeting on "Prospectives of interdiciplinary research in the plant kingdom" (Siena, 13 -15 May 1983):

> ... In the archaeological findings of Shanidar in Iraq, there have been identified, from pollen, plants that are still used nowadays in the traditional medicine of those parts of Asia (yarrow, holly-hock, groundsel, grape hyacinth, St. Barnaby's thistle, joint pine): it may thus seem that, sixty thousand years ago, Neanderthal man possessed a rudimentary Pharmacopoeia. (1)

In the many great civilizations that followed (Ancient Egypt, Greece, India, China, Peru and Mexico) one can relatively easily trace

the therapeutic use of naturally occurring drugs in written accounts or archaeological findings. Unfortunately, as long as the commoners in these early civilizations remained ignorant of plant chemistry, they were easily enslaved to superstition and the idea of "magical" plants. This led to the creation of a caste of herbalists, priests or shamans who, in many of the early civilizations, attempted to safeguard the secrets of their remedies by combining them with mystery and magic. In most instances the remedies were rational ones. However, because many of these early herbalists enjoyed an elevated position in society (due primarily to their botanical knowledge concerning the herbs and healing), they often resorted to a "supersitious contamination" of the remedies in order to maintain these positions (De Pasquale 1984; Stuart,1987).

The ancient civilizations of Egypt and Mesopotamia seem to have developed an original body of medical knowledge that later spread to the Eastern Mediterranean, Persia, Armenia, ancient Greece and eventually throughout Europe. The most important known document on the medical knowledge in ancient Egypt and the Eastern Mediterranean is the Ebers Papyrus. This document was purchased in

1873 by the German archaeologist Georg Ebers and is now preserved at the University of Leipzig. It was written in 1550 B.C. and later discovered in a tomb outside Thebes (Tyler et al.,1981). The Papyrus makes reference to over 700 drugs and approximately 800 prescriptions dating back to the first dynasties of Egypt (i.e., from 3300 to 2600 B.C.). Some of the vegetable drugs known to the ancient Egyptians were: aloe, henbane, myrrh, castor-oil, thyme, peppermint, turpentine, acacia gum, linseed, mandrake and hemp (De Pasquale, 1984).

It is thought by some that the Egyptians were the first to begin the process of rejecting magic in medicine. There is some evidence that by 1550 B.C. Egyptian physicians were attempting to introduce logic and experimentation into their medical practices (Stuart,1987). An example of this is during the construction of the great pyramids when the slaves of the day were given large quantities of radishes, onions and garlic. In 1948 when the active ingredients of these vegetables were isolated - raphanin, allicin and allistatin respectively - they were found to exhibit definite anti-biotic properties (De Pasquale,1984).

Two ancient civilizations whose Materia Medicae appear to have been closely linked with that of the Egyptians, are those of Mesopotamia and ancient Israel.

In Mesopotamia the earliest Sumerian herbal is dated to about 2000 B.C. This document was found in the form of cuneiform tablets inscribed at a slightly later date, during the seventh century B.C., by the scribes of King Ashurbanipal, as the King wished the knowledge to be passed on to future Babylonians. The clay tablets refer to 250 vegetable drugs, many of which were also prescribed in Egyptian remedies, thus making it unclear as to whether the Egyptians were influenced by the Sumerians or vice versa (Stuart,1987).

Also dating back to the same period (1990 B.C.) and having striking similarities with Egyptian medicine is that of the ancient Hebrews. Although it appears that many of the remedies were learnt from the Egyptians, a significant difference made by the Hebrews was their insistence on an extremely high level of personal and public hygiene. This high standard of hygiene was stressed in the Sacred Scriptures, which are replete with references to the use of suffumigations of scented herbs and disinfectant oils to guard

against impurities (De Pasquale,1984).

The ancient civilizations of the Middle East, however, were not alone in recording the healing powers of plants. In China, about 2700 B.C., the earliest known Chinese pharmacopoeia, Pent'ts'ao appeared. The Pent'ts'ao and several documents which followed it recorded the traditional medicinal practices and attempted to give an authoritative up-to-date survey of medicinal preparations at the time. One of the ancient treatments for asthma and pulmonary disease was the use of the desert shrub Ephedra sinica Stapf. A tea was brewed from the stems of this plant (which the Chinese called Ma huang) to relieve asthma, colds and coughs. Its active ingredient, ephedrine, is the key ingredient in many modern pharmaceuticals used to relieve breathing difficulties (Dwyer et al.,1986; Holmsteadt, 1991).

About the same time in India (2000 B.C.), many generations of Hindu medical traditions were written down in the Atharvaveda, one of four Hindu books of knowledge originally written in Sanskrit. The Atharvevada, in particular, contains many references to healing plants as well as descriptions of several drugs such as opium,

rauwolfia, nux vomica and aconite (De Pasquale, 1984; Kline 1987).

Classical Greece obtained much of its medicinal knowledge from the civilizations of Egypt and Mesopotamia and, like many of its contemporaries, shrouded its knowledge of healing and medicine in mystery and religion. During the fourth century B.C. Hippocrates took a major step toward the establishment of a scientific basis for medicine by moving the healing profession away from the realm of mysticism and religion (Dwyer et al.,1986). Interestingly, Hippocrates never wrote a herbal, although his writings refer to the use of over 400 different drugs as well as the utilization of narcotics such as opium, henbane and mandrake. Dioscorides, on the other hand, was the author of an authoritative herbal which, for over 1500 years, was the "Bible" for doctors and pharmacists (De Pasquale, 1984) .

Dioscorides' work, known as "De Materia Medica", is perhaps the forerunner of all modern pharmacopoeias. It deals effectively with 600 of the best known plants used traditionally during the first century A.D. For each entry Dioscorides gave the name of the plant, a description, its habitat, how it should be prepared for medicinal use

and its effect. In fact, Dioscorides was probably the first widely recognized medical botanist. His success in this regard stems from his position as doctor with the Roman army. Much of his knowledge came from first hand experience gained in his travels to the Near East, France, Spain, Germany and Italy, as well as plant knowledge known at an earlier time by Hippocrates. Some drugs of vegetable origin described by Dioscorides include castor-oil, poplar, poppy, myrrh and squill (Kline, 1987; Dwyer et al., 1986).

Following the collapse of the Roman Empire, scientific research and writing virtually ceased. This allowed the Christian Church to assume control over all medical knowledge from approximately 400 to 1500 A.D. and thus, thrust most of western civilization into the Dark Ages. Although scientific thought had been temporarily snuffed out in Europe, it was experiencing renewed interest in the Arab world, where the culture of Islam was rediscovering the medical works of the Greeks. By merging the Greek-Roman culture with that of India and their own culture, the Arabs (~900 A.D.) developed Arabic medicine which spread with the movement of their armies across Northern Africa, into Spain and

eventually all across Europe. Some of the plants added to the classical pharmacopoeias by the Arabs were camphor, lemon, manna, areca nut, cinnamon, nutmeg, senna, saffron and spinach (De Pasquale,1984).

An end to the Dark Ages in Europe occurred in the 16th century when, with the opening of sea-routes to India and America, there came the discovery of new plant substances such as cocoa, tea and coffee, as well as the revival of scientific knowledge. A prominent figure at this time was Paracelsus, a Swiss physician, who understood that the importance of medicinal plants came from their chemical make-up. He was one of the first to pioneer and perform extractions of plant oils in a systematic way for medicinal use (Dwyer et al.,1986; Phillipson et al.,1989).

The revival of scientific thought in western Europe brought with it a proliferation of knowledge plus many new drugs that needed to be tested and added to the pharmacopoeias. The rapid spread of this knowledge and that of the new drugs, was significantly enhanced by the influence of the major maritime cities (Genoa, Venice and Marseilles) whose travellers and merchants were

responsible for disseminating much of this knowledge throughout central and northern Europe via the existing waterways and their tributaries (De Pasquale,1984; Kline,1987; Holmstedt, 1991).

The 16th and 17th centuries brought exotic plants and many new scientific discoveries to Europe, but it was not until the 18th century that a more precise knowledge of the plant world was developed. The first step taken toward this new understanding was by Scheele, who separated oxalic, malic and tartaric acids - the first organic acids. Not long after this, at the beginning of the 19th century, the first active ingredients in plants were isolated. Some of these ingredients were: narceine and morphine from poppy (Derosne, 1832); strychnine from nux vomica and quinine from cinchona (Pelletier & Caventoux,1820); caffeine from coffee and amygdalin from bitter almonds (Robiquet,1830); salicin from willows (Leroux, 1830); and digitalin from fox-gloves (Nativelle,1868) (De Pasquale, 1984; Holmstedt, 1991).

Gradually, as progress in chemistry and an understanding of plants grew, more and more plant chemicals were successfully isolated. The idea of active principles in plants was accepted and

eventually chemists were able to synthesize and to use many of these refined chemicals in place of crude drug therapy.

The reliance of orthodox medicine on plant-derived drugs is vividly illustrated by the recent history of pharmaceutical botany (Elizabetsky,1991; Reuter,1991). Presently, in several developing countries of the Third World where western medicines are prohibitively expensive, many local governments are being advised to cultivate their own indiginous medicinal plants and to investigate traditional herbal medicines known to be effective, as an alternative to using western drugs (Evans,1989; De Smet,1980). The tropical forests of South America, for example, are known to be a vast storehouse for potential new drugs and, as yet, only one percent of the flora has been investigated for new medicinal ingredients. Thus it is safe to assume that in the future, plants and plant-derived medicines will continue to have as great an importance as they do today.

2.2 The Use of Medicinal Plants in North America

The aboriginal peoples of North America are thought to have

arrived from Asia about 20,000 to 30,000 years ago in a series of migrations or "waves". These early people were primarily hunters who followed the big game animals across the steppe-tundra biome that stretched from central Asia across the Bering Land Bridge to North America. They originated some 40,000 years ago in central Asia from a generalized Mongolian stock which was mixed to some extent with the early Caucasoids. In their quest for game, they moved with the animals north to Siberia, east to Alaska and the Yukon, and eventually south throughout the Americas bringing with them their families and their cultural and linguistic heritage (Johnston, 1987).

By the time the first European explorers reached the Americas (~1490 A.D.), the aboriginal people formed numerous tribes and cultural groups (i.e. the Aztecs in Mexico, the Incas in Peru, or the nomadic hunting societies of the Prairies and Arctic). Each cultural group was defined by the local geography, climate, and natural resources and thus exhibited a level of cultural sophistication relevant to its environment.

The Spaniards who first arrived in Mexico were amazed to

find among the Aztecs elaborate medicinal plant gardens and a knowledge of herbal medicine that appeared to rival or surpass that of the Europeans (Erichsen-Brown,1979; Bisset, 1991).

The first conquest of the Americas from outsiders however, appears to have been the occupation of Greenland by the Vikings from 985-1400 A.D. During the 400 years of occupation, the Norse culture, ideas and medicinal practices may have had an influence on the region (Erichsen-Brown,1979). Some medicinal plants may have been introduced to northeastern Canada via trade routes coming to the area from the north, west and south. Trade routes from the St. Lawrence and Lake Ontario to Lake Superior and further north were used by the Algonquin, who traded furs for plant materials such as corn and tobacco (Erichsen-Brown,1979).

The Native people of central and eastern North America had developed a sophisticated agriculture and trade network when Jacques Cartier arrived in North America in 1535 A.D. In addition to cultivating beans, pumpkins and tobacco the Native people had successfully expanded their agriculture by carrying to their northern limits plants such as maize, native apples and edible nut trees.

Through a process requiring the careful selection of seeds they took only those from the most hardy or late budding plants (Erichsen-Brown 1979). In this, and many other instances, it is evident that the Native cultures of North America were in harmony and partnership with their environment and the elements of the natural world (cf. Lewis & Elvin-Lewis,1977; Chandler et al.,1979; Arnason et al.,1981; Moerman, 1991).

Throughout North America the practice of herbal medicine was a theological-medical dualism in which traditional spiritual and mythical roles encompassed the knowledge of healing. This duality was common among many tribes (eg., Zuni, Navajo, Blackfoot, Cree and Algonquin), who combined magic rites with a solid botanical knowledge of plants and their properties (Lewis & Elvin-Lewis,1977; Erichsen-Brown,1979; De Pasquale,1984; Camazine,1986; Johnston, 1987; Young,1989).

In many North American tribes, therefore, there were both medicine-men or shamans as well as herbalists. The shamans were usually, but not always, male and were responsible for the treatment of ailments requiring the need for a ceremony, ritual or the help of

the spiritual world to cure either physical or mental afflictions. Other remedies for common ailments such as bruises, insect bites, colds, sore throats or fractures were dealt with by other knowledgeable members of a tribe. These were usually women elders, who employed herbal folk remedies when supernatural help was not required although, on occasion, ritual and spiritual healing were combined with herbal healing (Lewis & Elvin-Lewis,1977; Chandler et al., 1979; Erichsen-Brown, 1979; Leighton, 1985; Camazine,1986; Johnston, 1987).

One thing, above all, that was recognized as an important guiding principle among Native cultures in North America, was the dream or vision. If one was to do anything of consequence one must have the right dream. The power of healing, for example, could be obtained if the vision were strong enough (Erichsen-Brown,1979; Johnston,1987; Young,1989; Celina Thomas, personal communication, 1990). This concept of having the right dream also assisted the shaman or herbalist in choosing which plants to use and how to cure the ailment.

It is important to note here that the Native shamans and

herbalists possessed a substantial and solid botanical knowledge. This knowledge included which plants should be incorporated into a particular medicinal preparation, what parts of the plant to pick, how best to preserve the plant, how to prepare the plant and what dosages to give (Lewis & Elvin-Lewis,1977; Erichsen-Brown,1979; Johnston,1987; Young,1989).

The Native peoples in North America and in particular the healers had a very strong respect and love for the natural world. When they went out to the tundra, forest, prairie or meadow to collect herbs they did so carefully and with discretion. For example, care was taken so that not all the herbs of one species in a certain area would be harvested. They collected with a sense of conservation and respect for the environment as well as with a reverence for the spiritual world. In many tribes offerings such as tobacco or seeds and recently, small gifts such as matches, thread or candy were left, along with prayers which were dedicated to the plants as they were collected. The herbalist would very often fast before going to harvest medicinal herbs (Arnason et al.,1981; Leighton,1985; Johnston,1987; Kari,1987; Young,1989; Sophie Thomas and Catherine

Bird, personal communication, 1989).

The practice of native medicine, like western medicine, is culture specific and as such, has both a meaningful cultural content and biochemical effect. For a positive result to ensue, the patient must have faith not only in the practitioner but also in the medicine and the treatment (Vogel,1970; Chandler et al.,1979; Arnason et al.,1981; Moerman,1982; Camazine,1986; Johnston,1989; Young,1989)

When the first European explorers arrived in North America (~1490 A.D.), they gratefully accepted Native hospitality and medical treatment for their sailors, many of whom were dying of scurvy. Written accounts by Jacques Cartier (1535) attest to the superiority of Native medicine in curing scurvy and documentation by Boucher (1663) commends the methods employed by Natives to treat and heal wounds (Chandler et al.,1979; Erichsen-Brown,1979; Arnason et al.,1981).

The early years of contact saw the exchange of considerable cultural and medicinal information, not the least of which was the exchange of Native representatives, who returned to France with Jacques Cartier and Samuel de Champlain. A year or two later when

the Natives were returned to North America and their tribes, they were often able to report not only on European culture, but also on the use of drugs and medical practices in France (Erichsen-Brown,1979).

The settlers who arrived in the 1600's, however, preferred their own medicine and were reluctant to try Native medicine. Members of the clergy attempted to discredit the shamans and undermine their position in Native society, even though Native medicine at the time was much farther ahead in the area of medications to ease childbirth or to control menorrhagia, as well as in the use and knowledge of the poisonous properties of plants (Erichsen-Brown,1979; Moran,1989; Young,1989). When the settlers began to move west after the American Civil War, their reluctance to try Native medicines partially disappeared, and many began to use and acquire a knowledge of Native medicines (Kline,1987).

Historically, the pharmacognosy of the North American Indians has been recorded in numerous documents as being rich in the use of roots, leaves, bark and twigs (Steedman,1930; Chandler et al.,1979; Arnason et al.,1981; Moerman,1986; Turner & Hebda, 1990). Some

examples of the hundreds of medications used by Native peoples at the time of the European arrival in North America were as follows:

TABLE 1

SOME MEDICATIONS USED BY NATIVE PEOPLE AT THE TIME OF THE EUROPEAN ARRIVAL IN NORTH AMERICA

Native groups, listed alphabetically, are followed by species, use and reference

Native Group/ Species/ Use and Reference

A) Aleut - Achillea millefolium L. var. californica (Pollard) Jeps. (yarrow): leaves infused to relieve colds, sore throats or stomach pains;

- Artemisia tilesii Ledeb. (wormwood): leaves and Heracleum lanatum Michx. (cow-parsnip) leaves heated and placed over sore muscles;

- Geranium erianthum DC (wild geranium): leaves boiled and the solution used as a gargle (Smith, 1973).

B) Algonquin - Abies balsamea (L.) Mill. (Canada balsam) and Pinus resinosa Ait. (pine): resin used to heal wounds;

- Asarum caudatum Lindl. (wild ginger): root used to dress wounds (Erichsen-Brown, 1979; Arnason et al., 1981).

C) Blackfoot - Abies lasiocarpa (Hook.) Nutt. (subalpine fir): liquid resin from bark blisters applied to wounds; tea from the needles used as a remedy for colds;

TABLE 1 (cont'd)

Native Group/ Species/ Use and Reference

C) Blackfoot- Achillea millefolium L. (yarrow): tea made from the whole plant used as a laxative; tea from the flowers and leaves used as a tonic for stomach trouble or headache;

- Heracleum lanatum Michx. (cow-parsnip): a decoction made from the roots used for rheumatism; poultice of boiled, crushed roots applied to boils (Johnston, 1987).

D) Eskimo - Artemisia tilesii Ledeb. (wormwood): leaves used as a poultice for injuries and swelling; a tea from the leaves was used to relieve colds;

- Picea glauca (Moench) Voss (white spruce): resin applied to wounds or used as an all purpose medicine (Smith, 1979).

E) Iroquois - Caulophyllum thalictroides (L.) Michx. (blue cohosh): root boiled and the tea used to ease delivery or to control menorraghia;

- Geranium maculatum L. (wild geranium): root boiled and tea used for mouth sores;

- Picea rubens Sarg. (spruce) and Tsuga canadensis (L.) Carr. (hemlock): needles used in tea to cure scurvy (Erichsen-Brown,1979; Arnason et al.,1981; Moerman,1982).

F) Zuni - Artemisia tridentata Nutt. (big sagebrush): leaves used to prevent athlete's foot; a tea made from the leaves used to relieve congestion;

- Oenothera coronopifolia (evening-primrose): used as a remedy for swelling;

TABLE 1 (cont'd)
Native Group/ Species/ Use and Reference

F) Zuni - Pinus edulis Engelm. (pinyon pine): sap used to heal abscesses (Camazine,1986; Moerman,1986).

The pervasive influence of European culture on the Indian tribes of North America over the past 250 to 300 years significantly altered Native medical practices and treatments. During this time there was a blending of medical knowledge, particularly in northeastern North America which eventually evolved to become the present and popular folk medicine of Quebec (Erichsen-Brown,1979). Similarily, in other regions of North America, the herbal knowledge of the Native people was mixed with the folk medicine of the settlers as they moved west across the continent (Marles,1984; Kline,1987; Young,1989).

However, despite the changes in Native medicine brought about by the influence of the European settlers, it is safe to assume that Native medicine would not have remained static over the past 250 years as it was empiric. The Native healers would have experimented and undoubtedly discovered new plants or new uses for the plants they already possessed (cf. Ch. 3, p.93 - Raspberry/choke-

cherry medicine).

2.3 The Use of Medicinal Plants in Northwestern North America

In the Pacific Northwest - an area encompassing Washington State, British Columbia, southern Alaska and southwestern Yukon - traditional Native life went on reasonably undisturbed by outsiders (explorers, gold seekers and colonists) until the 1800's, almost 300 years later than experienced by the Native peoples of Eastern North America.

Along the coast and in the southern interior, the climate and vegetation differ significantly from the northcentral regions of the province, resulting in the development and use of several, quite different medicinal treatments among Native peoples in these areas. The ethnobotany of these regions has been carefully and thoroughly documented (Turner, 1973, 1974, 1975, 1979, 1981, 1982 and 1988; Turner & Hebda, 1990; Turner et al., 1983, 1990; Steedman, 1930; Palmer, 1975; Kari, 1981; Gottesfeld & Anderson, 1988).

Across the northern portion of the continent, just south of the Arctic tundra, lies the Boreal forest which stretches from the

Pacific Coast to the Atlantic Coast. The people in the Northwest, like their counterparts in the central and northeastern regions of the continent, possessed a knowledge of herbal medicine rich in the use of roots, bark, twigs and leaves (Turner & Hebda,1990).

In the northcentral and more northerly regions of British Columbia the Sub-Boreal Spruce Zone, comprised mostly of spruce (Picea), pine (Pinus), and fir (Abies), is shared directly or indirectly, through trade routes, by several Native groups. Thus, it is possible to compare the herbal remedies of different cultural groups of the Interior Plateau (Carrier, Gitksan, and Thompson) who live close to or within this common vegetative zone. The more northerly of these tribes were nomadic, hunting and fishing societies whose traditional way of life was shaped by the northern forest. Traversing the forest required mobility and thus the Native peoples carried few material possessions with them between their summer and winter camps. What they did carry from place to place was a knowledge and profound understanding of the land and how to survive in the harsh climate (Moran,1989; Catherine Bird, personal communication,1989).

The Carrier, Gitksan and Thompson inhabit different regions of

the Interior Plateau. At the northwestern edge of the plateau and the Sub-Boreal Spruce Zone live the Gitksan whose traditional territory also includes the Interior Cedar-Hemlock Zone; the Carrier, whose traditional territory lies primarily within the Sub-Boreal Spruce Zone reside in the central region of the province; and at the southeastern edge, also on the plateau, live the Thompson whose traditional territory is primarily within the Interior Douglas-Fir Zone (Ministry of Forests,1988).

The similarity of their environments, in addition to the wants and needs of the people led to similar medicinal uses of the indigenous plants. This can be illustrated by comparing the use and preparation of the conifers. The following list (TABLE 2) summarizes common uses of some coniferous species among these northwestern North American Groups.

TABLE 2

TRADITIONAL MEDICINAL USE OF SOME COMMON CONIFERS BY NORTHERN NATIVE PEOPLE OF NORTHWESTERN NORTH AMERICA

Abbreviations used are as follows: dec, decoction (made by boiling the plant material in water); inf, infusion (made by steeping the material in water which has just been boiling, as making tea); rt, root(s); lvs, leaves; br, branch(es); st, stem(s); bk, bark.

TABLE 2 (cont'd)

Plant name	Group/Native name	Use	Reference
Abies lasiocarpa (Hook.) Nutt. (subalpine fir)	Thompson/"tlesa'lhp"	-dec of bk & shoots for tonic or eye wash	Teit, 1930.
		-pitch applied to sores as poultice or dec of bk drunk for bad cough.	Turner et al.,1990.
	Carrier/ts'ootsun	-pitch used for eyes, wounds or sores, dec of bk drunk for coughs.	C.L.C., 1973.
	Gitksan/ stu'uhl hoo'owxs	-liq. pitch used for wounds,sores & respiratory probs.	Gottes-feld, 1988.
Picea glauca (Moench.) Voss or P. engelmannii Parry (white spruce & Engelmann spruce	Thompson/ ".tsxaza'lp"	-ashes of young shoots mixed with fat as gen. salve or ointment for sores.	Teit, 1930.
		-dec of pitch taken for bad coughs.	Turner et al.,1990.
	Carrier/ts'oo	-dec of inner bk for coughs, colds; pitch for wounds & sores.	C.L.C., 1973.
	Gitksan/'ootx	-ashes of bark sprinkled on burn or dec of bk drunk as tonic for TB.	Gottes-feld, 1988.

TABLE 2 (cont'd)

Plant name	Group/Native name	Use	Reference
Pinus contorta Dougl. (lodgepole pine)	Thompson/"kwe'it"	-pitch mixed with fat & applied to sores or taken for coughs & colds.	Teit, 1930.
		-inf of twigs & needles for flu.	Turner et al.,1990.
	Carrier/chundoo	-pitch mixed with fat to heal sores or sore throats.	C.L.C., 1973.
	Gitksan/skyen	-pitch used to dress open boils and wounds.	Gottes-feld, 1988.
Juniperus communis L. (common juniper)	Thompson/ "tsitsextsaxt"	-dec of twigs to wash eyes, or as a stomach tonic;	Teit, 1930.
		-dec of brs taken for colds or for kidney infections.	Turner et al.,1990.
	Carrier/ datsan'angut	-dec of "berries" for TB; with twigs for high blood pressure.	C.L.C., 1973; Smith 1926.
	Gitksan/ laxsa laxnok	-dec of br used as a tonic.	Gottes-feld, 1988.

The conifers as a group of plants were the most culturally

significant to Native peoples because they were not only the most prominent form of vegetation, but they were also the most extensively used in nearly every aspect of traditional daily life (Turner,1988). As shown by the above comparison of medicinal uses, the conifers were commonly used to dress wounds, sores and boils or to treat coughs, colds and sore throats by several different groups of people, indicating that the conifers were effective therapeutic agents against infections.

The roots, leaves, bark and twigs of shrubs and herbaceous plants were also important to Native medicine in the Northwest and the medicinal preparations of these plants were primarily in the form of decoctions, infusions, poultices and ointments (Steedman, 1930; Turner & Hebda,1990). For some peoples the underground part of the plant was thought to be the most powerful medicinally (Kari,1987).

In northwestern North America several herbaceous plants and shrubs were used to treat a vast array of maladies from lung infections to minor cuts and bruises. A few of these treatments can be examined by describing the treatments of various groups

throughout the region. The following list is neither comprehensive nor complete as there are many more known uses for all the herbs listed below (cf. Turner,1981; Turner et al.,1990). The following table is a survey of some medicinal uses of herbs by Native peoples in northwestern North America.

TABLE 3

TRADITIONAL MEDICINAL USES OF SOME HERBACEOUS PLANTS AND SHRUBS BY NATIVE PEOPLE IN NORTHWESTERN NORTH AMERICA

Plant species, and under them, native groups, are listed in alphabetical order. Abbreviations used are as follows: dec, decoction; inf, infusion; rt, root(s); lvs, leaves; br, branch(es); st, stem(s); bk, bark; fr, fruit.

Species / Native Group / Use and Reference

Achillea millefolium L. (Yarrow)

Gitksan - young plant except rts boiled and dec gargled for sore throat (Smith, 1928).

Lillooet - tea made from plant good for diabetes and colds, tea from lvs for mumps; eat rts for chest problems (Melgrave, 1973).

Nuxalk (Bella Coola) - lvs chewed and applied to wounds (Smith, 1928).

Shuswap - dec of flower and rt used as blood purifier (Palmer, 1975).

Tanaina - dry lvs powdered and placed on sores, cuts, blisters and burns (Kari,1987).

Thompson - dec of whole plant used as general tonic or as eye wash (Teit, in Steedman, 1930); rts pounded and used on the skin for sciatica (Turner et al.,1990).

Species / Native Group / Use and Reference

Alnus incana (L.) Moench (Mountain Alder)

Gitksan - crushed pistillate catkins and ate these raw as a laxative (Smith, 1928).

Shuswap - bk used as a wash for sores (Palmer, 1975).

Thompson - used as general remedy for burns, wounds and inflammations (Turner et al., 1990).

Amelanchier alnifolia (Nutt.) Nutt. (Saskatoon)

Lillooet - dec of rts, sts and lvs for arthritis (Melgrave, 1973).

Thompson - dec of st drunk to hasten afterbirth (Teit,in Steedman, 1930); dec of saskatoon and bitter cherry (Prunus emarginata) taken for birth control (Turner et al., 1990).

Arctostaphylos uva-ursi L. (Kinnikinnick)

Chilcotin - dec of entire plant used for bleeding ulcers or as a tonic following childbirth (Jenkins, 1976).

Lillooet - bathe in dec of lvs as prevention of arthritis or smoke lvs to prevent colds (Melgrave, 1973).

Thompson - dec of lvs and sts used as eye wash or taken as diuretic (Teit, in Steedman,1930); dec of lvs taken for disorders of urinary passages, bladder and kidneys (Turner et al., 1990).

Artemisia frigida Willd. (Pasture Wormwood, Sage)

Shuswap - plant used to smoke out mosquitos (Palmer, 1975) or for rheumatism and arthritis (Jenkins, 1976)

Thompson - taken as medicine for venereal disease (Turner et al., 1990) or as a general medicine (Teit, in Steedman 1930).

Species / Native Group / Use and Reference

Berberis aquifolium Pursh (Oregon-grape or Mahonia)
Lillooet - dec of lvs and whole plant drunk for arthritis (Melgrave, 1973).
Shuswap - dec of lvs and sts drunk as a blood tonic (Palmer 1975)

Clematis occidendalis (Hornem.) DC. [syn. C. Columbiana T. & G.] (Western Blue Clematis)
Lillooet - piece of vine placed in cavity of tooth for toothache to rot out tooth (Melgrave, 1973).
Okanagan - lvs and br mashed and steeped or boiled in water to make a hair wash (Turner et al., 1980)
Thompson - dec. of plant used as wash for head and neck scabs (Teit, in Steedman,1930)

Cornus stolonifera Michx. (Red-Osier Dogwood)
Lillooet - dec of branches for rundown feeling, or as a wash for skin infections and rashes (Melgrave, 1973).
Shuswap - berries good for weak kidneys, bk scraped and used in tobacco (Palmer, 1975).
Thompson - dec of sts drunk after childbirth (Teit in Steedman, 1930). A dec of brs taken for colds (Turner et al., 1990).

Fragaria virginiana Duchesne (Wild Strawberry)
Chilcotin - dec of rts or lvs taken for colds or mixed with raspberry and yarrow for diarrhoea (Jenkins, 1976).
Chinook - boil the whole plant as a tea for diarrhoea (Gunther,1945).
Lillooet - dec of rts drunk for diarrhoea or dry lvs made into powder and sprinkled on sores (Melgrave, 1973).
Thompson - dec of lvs drunk for diarrhoea (Turner et al., 1990).

Species / Native Group / Use and Reference

Heracleum lanatum Michx. (Cow-parsnip)

Gitksan - rt poultice used for rheumatism (Gottesfeld, 1988).

Nuxalk (Bella Coola) - rts crushed, boiled and poultice applied to boils (Smith,1928).

Quinault - lvs warmed and placed on sore limbs (Gunther, 1945).

Sekani - rts mashed and applied to boils or swellings (Smith, 1928).

Thompson - dec of sts used as purgative or general tonic (Teit, in Steedman,1930; Turner et al., 1990).

Ledum groenlandicum Oeder (Labrador-tea)

Gitksan - dec of lvs used as a diuretic or beverage (Smith, 1928).

Nitinaht - tea drunk as a tonic by people who were "run-down" (Turner et al., 1983).

Nuxalk (Bella Coola) - dec of lvs used as beverage or for pain in the stomach (Smith, 1928).

Shuswap - dec of lvs used for blindness, sore eyes and poison ivy (Palmer, 1975).

Tanaina - dec of lvs drunk for weak blood , colds and tuberculosis (Kari, 1987).

Thompson - used as a substitute for tea (Turner et al., 1990).

Lonicera involucrata (Rich.) Banks ex Spreng. (Black Twinberry)

Gitksan - fresh juice of berries used as eye wash (Smith, 1928).

Nitinaht - buds eaten or bk rubbed on body as a general tonic (Turner et al., 1983).

Nuxalk (Bella Coola) - lvs chewed and applied to stop itch, or dec of bk taken for cough (Smith,1928).

Thompson - lvs boiled and applied to swellings (Teit, in Steedman, 1930); dec of brs and lvs used as a wash for broken bones, scabs and sores, or drunk for sore throats and bladder troubles (Turner et al.,1990).

Species / Native Group / Use and Reference

Oplopanax horridum (Smith) Mig. (Devil's-club)

Gitksan - dec of inner bk used as general tonic or for respiratory ailments and stomach ulcers or as a poultice of bk on wounds (Gottesfeld, 1988).

Halkamelum/Coast Salish- dec of bk mixed with Acer glabrum Torr. and drunk for diabetes (Turner & Hebda, 1990).

Nitinaht - inf of bk drunk for relief of arthritis and rheumatism (Turner et al., 1983).

Nuxalk (Bella Coola) - bk of rts chewed and taken with water as a purgative (Smith,1928).

Thompson - dec of crushed fresh sts for indigestion and stomach trouble or as a tonic and blood purifier; ashes of sts mixed with grease and rubbed on swollen areas (Teit, in Steedman, 1930); inf of stalks used to replace milk and other beverages if one is losing weight, or for flu and other illnesses (Turner et al.,1990).

Populus tremuloides A. Michx. (Trembling Aspen)

Gitksan - bk of rts chewed or mashed and put on cuts; dec of bk taken as purgative (Smith, 1928).

Halkamelem/Coast Salish - inf of bk drunk for any internal ailment and as contraceptive (Turner et al.,1990a).

Lillooet - dec of bk used to soak sore eyes; dec of bk and lvs to give quick delivery (Melgrave, 1973).

Nuxalk (Bella Coola) - dec of bk from rt used to stop hemmorhage from gonorrhea (Smith,1928).

Sekani - poultice of bk applied to wounds; dec of scraped bk taken for worms (Smith,1928).

Thompson - ashes of the wood mixed with water and rubbed on swelling (Teit, in Steedman,1930); dec drunk by people suffering from insanity through excessive drinking (Turner et al.,1990).

Species / Native Group / Use and Reference

Prunus virginiana L. (Western Choke Cherry)

Lillooet - dec of sts and rts good for diarrhea with blood; dec of twigs as general tonic (Melgrave, 1973).

Shuswap - rts to make beer; pregnant women avoided choke cherry for the welfare of the child (Palmer,1975).

Thompson - dec of "sticks" drunk for cold or a sick feeling or for coughs and colds (Turner et al., 1990).

Sambucus racemosa L. (Red Elderberry)

Gitksan - dec of rt bark used as an emic & purgative (Smith, 1928; Gottesfeld, 1988).

Halkomelem/Coast Salish- dec of bk drunk during labor to bring on birth (Turner & Hebda, 1990).

Makah - pounded fresh lvs and applied to an abscess or boil (Gunther, 1945).

Nitinaht - the bk and rts were made into a strong purgative taken at puberty by young people (Turner et al., 1983).

Nuxalk (Bella Coola) - dec of rt bark used as an emic & purgative for pains in the stomach (Smith, 1928).

Squaxin - mashed lvs and after dipping in water applied to area infected with blood poisoning (Gunther, 1945).

Shepherdia canadensis (L.) Nutt. (Soapberry)

Gitksan - dec of rts and sts used as wash for gonorrhoea; inf of lvs used as diruetic or for bladder and uterine infections; berries used to hasten childbirth (Smith, 1928; Gottesfeld, 1988)

Lillooet - dec of branches taken to slow heart or to heal the insides (Melgrave,1973).

Thompson - dec of branches and berries taken for "cancer of the stomach" and high blood pressure (Turner, 1981); dec of roots was drunk as a physic or purgative (Turner et al., 1990).

The Native peoples of northwestern North America aptly used the shrubs and herbaceous plants available to them in treating a myriad of ailments. Interestingly, several of the shrubs and herbs listed in Table 3 (yarrow, clematis, cow-parsnip, wild strawberry, devil's-club, red elderberry, soapberry and trembling aspen) were used for similar treatments by other groups of the Northwest. In particular, the Carrier used many of these same species of herbaceous plants and shrubs in the preparation of their herbal medicines.

The similarity of use among different groups of indigenous peoples within a common area suggests that these herbal remedies were indeed effective therapeutic treatments. In a paper presented in Rome in 1979, Bernardo Bernardi aptly sums up the cognitive reality of this cultural knowledge:

> ... At the empirical level we have to recognize the validity of traditional information on natural phenomena and particularly on the effects of plants in the treatment of illness and disease. (2)

The following chapter will examine some of the herbal remedies and the traditional cultural knowledge of a Carrier herbalist on the effects of these species in healing and the maintenance of health.

Footnotes

1. Pharmacognosy : The oldest modern science. Journal of Ethnopharmacology, 1984 (June) 11: 1-16.

2. An Anthropological Approach: The Problem of Plants in Traditional Medicine. J. of Ethnopharmacology, 1980 (June) 2: 95-98.

3.0 Carrier use of Medicinal Plants

3.1 Role of Plants in Carrier Medicine

The Carrier people of northcentral British Columbia are very much like other Native peoples across Canada in the way they gather and harvest medicinal plants and in their concept of medicine (cf. Arnason et al.,1981; Chandler et al.,1979; Moerman,1982; Gottesfeld & Anderson,1988; Turner et al.,1990).

> By a little creek up on the mountain I make medicine. Anytime you make medicine you have to be close to water, where nobody goes. It is very important to be close to water.
> The mountain is very sacred. You don't know when you go up in the mountain - maybe it will kill you, maybe it will freeze you, maybe you will fall down a cliff, it will kill you because you never prepare yourself. They (the elders) told us if you are going to a mountain that you don't know always have tobacco or something in your pocket. Then mark your face with charcoal and greet the mountain. It will respect you. ....
> Because the land is sacred the mountain water will heal. Go to a mountain spring it is sacred. The land is like a mother to us, it watches us .... and when we're sick we go back to the mountain, it gives us something to get healed. Everything is there we just have to respect it.

> When you go to gather plants always have tobacco with you. You give it back when you take medicine, you give back a little bit (to the land) when you take the plant. The medicine will have strength when you give back something. You don't take anything for nothing; sometimes when you have nothing to give (you forget your tobacco or something)

then you fast

Sophie Thomas (personal communication, 1991).

The Carrier people used the plants around them for medicinal purposes as well as for food, fuel, building materials and artifacts (Carrier Linquistic Committee, 1979; Jenness, 1943; Morice, 1893). However, grouping the plants according to a particular use or role is not always a satisfactory means of analysis as these categories often overlap. For example some "medicinal plants" particularly those with fruits (strawberry, raspberry, currants, soapberry and cranberry) were also used by the Carrier people as a food source whose edible parts were used either fresh or dried. A more realistic approach perhaps, might be to consider the overall effect of food on the maintenance of health (i.e. the possiblity that a traditional diet might have had an additive influence on the effect of many herbal medicines) (cf. Arnason et al.,1981; Turner et al.,1990; Etkin & Ross, 1991).

The research done to date indicates that at a minimum, 30 species of plants were or are presently used in some way by the Central Carrier for medicinal purposes (see Table 4) - These species were often used for more than one purpose and are categorized as follows:

	No. of species
A. Tonics and General Medicines	7
B. Poultices, Salves or Washes for Wounds, Burns, Infections or Sores	9
C. Medicines for Colds, Coughs, Tuberculosis, Influenza and Other Respiratory Ailments	7
D. Medicines for Arthritis and/or Rheumatism and/or Muscular Aches and Pains	8
E. Purgatives, Laxitives, Emetics	4
F. Medicines for Stomach and/or Digestive Tract	4
G. Medicines for Kidney and Urinary Ailments	3
H. Eye Medicines	2
I. Medicines for Circulatory System	3
J. Medicines for Cancer	5
K. Medicines for Diabetes	2
L. Medicines specifically for Women	2
M. Medicines for Purification	2
N. Emergency Foods	2

TABLE 4

CARRIER PLANT MEDICINES ENCOUNTERED IN THIS STUDY

Species are listed in alphabetical order of scientific name, within each category. Abbreviations used are as follows: dec, decoction; inf, infusion; rt, root; br, branches; st, stems; bk, bark; lvs, leaves; pl, whole plant.

A. TONICS and GENERAL MEDICINES

Achillea millefolium (yarrow) - crushed fresh lvs and flowers used as insect repellent

Clematis occidentalis (blue clematis) - lvs mixed with bear grease used to make hair grow

Cornus sericea (red-osier dogwood) - smoked br pith for general contentment and well-being

Picea glauca /engelmannii (spruce) - smoke from burning br used to cleanse the air

Pinus contorta (lodgepole pine) - tips of young needles chewed as tonic for general health

Prunus virginiana (choke cherry) - dec of st drunk for weak blood (with Rubus idaeus)

B. POULTICES, SALVES or WASHES for WOUNDS, BURNS, INFECTIONS and SORES

Abies lasiocarpa (subalpine fir) - pitch with fat as ointment for sores, wounds or blood poisoning

Achillea millefolium (yarrow) - crushed rt applied to sore tooth

Alnus incana (mountain alder) - shavings of bk as poultice for sores; dec of br as a wash for burns or sore mouth

Arctostaphylos uva-ursi (kinnikinnick) - dried lvs used as a poultice for wounds

Cornus sericea (red-osier dogwood) - shavings of bk as poultice for swellings; dec of br drunk for internal swelling

Picea glauca / engelmannii (spruce) - pitch with fat as ointment for wounds or sores; dec of inner bk as a wash for sore mouth

Pinus contorta (lodgepole pine) - pitch with fat as ointment for sores, wounds, mosquito bites or acne

TABLE 4 (cont'd)

Plantago major (plantain) - lvs used as poultice for boils or sores

Populus tremuloides (trembling aspen) - chew bk and use as poultice on bleeding wound

Sambucus racemosa (red elderberry) - dried lvs used as poultice for boils or swellings

C. MEDICINES for COLDS, COUGHS, TUBERCULOSIS, INFLUENZA and OTHER RESPIRATORY AILMENTS

Abies lasiocarpa (subalpine fir) - dec of inner bk drunk for tuberculosis; dec of br drunk for coughs; br steamed to provide vapours for chest colds (with Juniperus communis & Artemisia frigida or Picea sp)

Artemisia frigida (wild sage) - dec of lvs and st drunk for coughs

Picea glauca / engelmannii (spruce) - inner bk or young buds chewed for strep throat; dec of inner bk drunk when coughing blood; pitch with fat swollowed for sore throat, or dab put in nostril for sinusitis; br steamed to provide vapours for colds or flu (with Juniperus communis)

Pinus contorta (lodgepole pine) - inner bk chewed fresh or dec drunk for colds; pitch swallowed for sore throat

Populus tremuloides (trembling aspen) - dec of bk drunk for cough (with Salix sp)

D. MEDICINES for ARTHRITIS and/or RHEUMATISM and/or MUSCULAR ACHES and PAINS

Abies lasiocarpa (subalpine fir) - br steamed in sweat bed for sore backs (with Juniperus communis and Picea sp)

Achillea millefolium (yarrow)- boiled lvs and st used as poultice for rheumatism

Cicuta douglasii (water hemlock) - use rt as "mustard plaster" for rheumatism or arthritis

Cornus sericea (red-osier dogwood) - dec of bk shavings used as hot compress for pain; hot bk shavings used as poultice for pain

Heracleum lanatum (cow-parsnip) - use rt in wrap placed around throat for severe tonsilitis

Populus tremuloides (trembling aspen) - use warm ashes as a hot compress for arthritic pain

TABLE 4 (cont'd)

E. PURGATIVES, LAXITIVES, EMETICS

Calypso bulbosa (false ladyslipper) - rt boiled and eaten in spring to help body adjust to fresh foods

Ledum groenlandicum (Labrador tea) - dec of lvs drunk to clean out the system

Ribes hudsonianum (black currants)- dec of st drunk to soften stool

Shepherdia canadensis (soopolallie) - dec of st drunk for constipation; use berries "Indian ice cream" for constipation in children

F. MEDICINES for STOMACH and/or DIGESTIVE TRACT

Alnus incana (mountain alder) - dec of st drunk for ulcers or bleeding ulcers (with Salix sp)

Berberis aquifolium (Oregon-grape) - dec of lvs drunk for stomach problems

Fragaria virginiana (wild strawberry) - dec of rt or runners drunk for diarrhea

G. MEDICINES for KIDNEY and URINARY AILMENTS

Arctostaphylos uva-ursi (kinnikinnick) - dec of pl drunk for bladder infections; dec of pl drunk for kidney and bladder problems (with Juniperus communis)

Equisetum hyemale (scouring rush) - dec of sts drunk to relieve inability to urinate

Juniperus communis (common juniper) - dec of br with berries drunk for kidney infections

H. EYE MEDICINES

Abies lasiocarpa (subalpine fir) - pitch used for eye injuries or to heal a sore eye

Lonicera involucrata (black twinberry) - juice of berries used as drops to see more clearly or make cataracts disappear; dec of st used as drops in the same way as berries

I. MEDICINES FOR CIRCULATORY SYSTEM

Arctosaphylos uva-ursi (kinnikinnick) - dec of pl drunk for high blood pressure (with Rubus idaeus)

TABLE 4 (cont'd)

Fragaria virginiana (wild strawberry) - dec of rt or runner drunk for heart condition or those who have had heart attacks

J. MEDICINE FOR "CANCER" (or what is perceived as cancer)

Alnus incana (mountain alder) - dec of bk shavings used as wash for "skin cancer"; dec of bk shavings drunk for "leukemia" (with Salix sp., Prunus virginiana & Rubus idaeus)

Shepherdia canadensis (soopolallie) - dec of st drunk for "stomach or any internal cancer"

K. MEDICINE FOR DIABETES (or what is perceived as diabetes)

Arctostaphylos uva-ursi (kinnikinnick) - dec of pl drunk for "sugar diabetes" (with Juniperus communis)

Artemisia frigida (wild sage) - dec of lvs and st drunk for "sugar diabetes"

L. MEDICINES SPECIFICALLY FOR WOMEN

Arctostaphylos uva-ursi (kinnikinnick) - dec of pl drunk by young girls to ease menstrual cramps; by mothers during home births to ease cramps or by older women during menopause to ease tension or edginess

Berberis aquifolium (Oregon-grape) - dec of st and rt used to be drunk for sore womb following childbirth and/or menstruation.

M. MEDICINES FOR PURIFICATION

Artemisia frigida (wild sage) - smoke of pl used to purify the body before hunting (with Juniperus communis)

N. EMERGENCY FOODS

Bryoria lanestris (black tree lichen) - baked on coals and eaten when other food was unavailable

Epilobium angustifolium (fireweed) - inner pith of young shoots eaten when other foods are unavailable.

Carrier remedies generally consist of a single species and are

in most instances, administered singly. A notable exception, however, is the remedy for leukemia in which four different species are administered simultaneously. In preparing herbal medicines all parts of plants are used. Like many other Native groups in Canada the Carrier use bark, branches, roots and rhizomes as major sources of medicine (cf. Chandler et al., 1979; Arnason et al., 1981; Turner & Hebda, 1990; Turner et al., 1990). In this study on Carrier medicines the percentage of various plant parts used in relation to the total number of medicines prepared is as follows:

	Percentage used from total of 73 preparations
Bark or inner bark	20%
Branches /stems	19%
Roots or rhizomes	14%
Sap/pitch	11%
Whole plants	11%
Leaves	9%
Branches & leaves	6%
Berries	4%
Flowers	2%
Other	4%

Herbal medicines can be administered in a variety of ways depending on the ailment and the plant material to be used. In Carrier medicine decoctions, prepared by boiling plants, are the

preferred method of medicinal preparation and are used routinely for medicines which are to be ingested. Many of these medicines use woody plant parts which need to be "cooked" sufficiently to release their medicinal ingredients. The decoctions are usually taken in small quantities (about 125 ml) several times a day for one to two weeks. Once made, the decoction is kept in the refrigerator but never for longer than two weeks. If more is required, a fresh batch is made (Sophie Thomas, personal communication,1991). Infusions, prepared by letting the plants steep in hot water, are seldom used in Carrier medicine except to soften woody material prior to making a compress or poultice to treat swellings, boils or aches and pains. Some other commonly applied external treatments include salves and ointments (mixtures of pitch and fat), or washes - decoctions used to treat burns, wounds, sores and other dermatological disorders. Steambaths using aromatic plants are used to treat rheumatism, arthritis and general muscular pains while the inhalation of hot vapours from aromatic plants is prescribed for chest colds, flu and other respiratory disorders.

The proportions of these medicinal applications are as follows:

	Proportion of use (out of 73 medicinal applications)
Decoction drunk	42%
External application of salve/poultice	22%
Roots/leaves chewed or eaten	9%
External wash decoction/infusion	7%
Plant in hot compress	7%
Vapours leaves/branches inhaled	4%
Sap/pitch eaten	3%
Other applications	6%

Whenever possible the medicinal plants are gathered and used while still fresh. Some plants are always used fresh as they are usually easily available at all times (eg. trembling aspen, juniper, spruce, lodgepole pine and subalpine fir). Many others can be gathered in the fall and then dried and stored (bundled) for use during the winter months (eg. "pussy willow", raspberry, strawberry and kinnikinnick). The dried plants are never kept longer than one season. Each fall (usually in September) the supply of dried plants is replenished (Sophie Thomas, personnal communication,1991).

3.2 Traditional and Contemporary Knowledge of Herbs

In the past, knowledge of a few herbal remedies for minor ailments was widespread throughout the community while

knowledge of other herbal remedies or specialized treatments, was a closely guarded secret and considered the property of a particular individual or family (Catherine Bird, personal communication, 1989; Sophie Thomas personal communication 1989). Recently this has begun to change due to a renewed interest in Carrier culture, particularily among the young people. As there are very few Carrier elders in northcentral British Columbia who are knowledgeable about traditional medicines, it has been necessary to set up information sharing sessions throughout the region. As part of this process Sophie Thomas, an elder of the Stoney Creek Band in Vanderhoof, travels throughout the Carrier region (Yinke Dene Territory - see Appendix C) to share her knowledge concerning traditional medicines with other bands [eg. Fort Fraser; Fort George; Nazko, and Ulkatcho]. She also visits and teaches in the local elementary schools, in addition to assisting at the Yinke Dene Lanquage Institute in Vanderhoof along with several other prominent elders from the immediate area (i.e. Mary John, Celina Thomas and Catherine Bird) (Sophie Thomas, personal communication, 1990). Sophie and the other elders also travel to conferences where they

share their knowledge about Native culture with other interested people both Native and non-Native (eg. Native American Languages Institute Conference, held in Prince George, September 1991, which attracted over 900 delegates from North America and other continents). Many local elders attended and shared their knowledge about traditional Carrier life, folklore and ways with those present.

3.3. Traditional Medicinal Remedies

The following documentation of traditional Carrier medicine is based on information collected through taped and personal conversations with Sophie Thomas. A herbalist, and elder of the Stoney Creek Band in Vanderhoof, B.C., Sophie was born into the Frog Clan in 1917. When she was a young child both her parents died in the influenza pandemic of 1918-19, and she was thereafter raised by her grandmother.

The herbal recipes outlined below are those Sophie currently uses in the preparation of traditional medicines. She has been using herbal medicines ever since she was a child; she was taught how to prepare these medicines by her grandmother and in some cases by

her great grandmother. As an adult, Sophie learned by experimenting with the various recipes, how to adjust the ingredients in order to achieve the desired results from the medicines. As a result of the many requests she gets every year to help friends or acquaintances, the medicines she has made have travelled to other provinces in Canada, as well as to the United States and Europe (Sophie Thomas, personal communication, 1991).

The traditional medicinal recipes which follow (Carrier Medicinal Use) are written for the most part, word for word, as they were related to me by Sophie Thomas in taped interviews during 1991. Also, whenever possible, the Carrier name for the plant is given along with the common name used locally by the Native people. In some instances where the local common name may not be familiar, a second common name will be given.

Some general terms for plant parts in the Carrier language are as follows: chun = wood of any kind; tan = leaf; mai = berry; ella = bark (conifer); ul = boughs (conifers) (Carrier Linguistic Committee, 1974).

3.3.1. CONIFERS (Evergreens)

1. SPRUCE [ts'oo] Picea glauca (Moench) Voss (White Spruce) and/or Picea engelmannii Parry ex Engelm. (Engelmann Spruce) "Evergreen"

Distribution and Description

P. glauca and P. engelmannii (Pinaceae) are common to the Interior Plateau or Sub-Boreal Spruce Zone (Ministry of Forests, 1988). In some cases they have cross pollinated to produce hybrids in areas where their territories overlap. Picea glauca (voucher #141) is usually found in the northern half of the province while Picea engelmannii tends to be more common in the south. In the Sub-Boreal Spruce Zone there is considerable overlap and the hybrids are very difficult to distinquish from the original parents.

The needles, which tend to spread in all directions around the twig, are four-sided, dull-pointed and about 0.5 cm in length. When they are bruised they emit a pungent, but pleasant aroma. The trees grow to a height of 30 to 40 meters and may be up to one meter in diameter. The branches slope upwards at the top of the tree, outwards in the middle and downwards at the bottom of the tree. These conifers have a thin, scaly, greyish bark with reddish tinges

SPRUCE (cont'd)

showing between and underneath the scales. Among the conifers, spruce has the highest frost resistance and grows well in areas where the ground may be frozen for periods of five to eight months at a time (Krajina et al., 1982; Hitchcock & Cronquist, 1973).

Carrier Medicinal Use (Sophie Thomas, personal communication, 1991)

The inner bark can be chewed for strep throat or when there is a cold. Chew the young, inner bark and swallow the juice or take the gum and swallow it - this gets rid of a sore throat. The inner bark can also be boiled to make a tea. It is good to drink the tea when coughing up blood (tuberculosis).

Strep throat can also be cured by chewing young spruce tips. When alder is not available make a tea of spruce inner bark for sore mouth.

The pitch is mixed with lard and cooked over a low flame. If there is not enough lard mixed with it, it gets tough. Because there is lard mixed in, the ointment will come off when you wash your hands. It can be used by

SPRUCE (cont'd)

bandaging the ointment onto wounds or sores or by placing some of it onto the gauze of a band-aid and applying it directly to the wound (medicine sample #1). This is very good medicine and it heals quickly. It is also good for infections, sores, or for sunburn when you get too dark.

When there is sinusitis put a little dab in each nostril. This will cause the sinuses to break up and the passage ways will clear. The pitch also helps sore throats when it is swallowed (medicine sample #2).

For chest colds mix together branches of spruce and juniper to make a sweat bath or to produce vapours. Cook the branches in a large enamel pot and when it is steaming put a sheet over your head and breathe in the fumes. This is good for colds or flu.

Long ago spruce boughs were placed around the home to chase away colds. Sickness is scared of this and it will go away pretty quick. Today, the branches are used in a similar way by placing them in a pail, lighting them (smudge) and scattering the smoke throughout the house.

SPRUCE (cont'd)

This gets the vapours about the house faster. Today, people still put evergreens around the house.

Similar uses for Picea spp. cited in the literature:
Steedman, E.V.,1930 (Teit-p475); Smith, G.W.,1973 (p325 &330); Carrier Linguistic Committee, 1973 (p69); Palmer, G., 1975 (p51); Jenkins, D., 1976 (9 &12); Erichsen-Brown, C., 1979 (p13); Arnason et al., 1981 (p2216 &2284); Walker, M., 1984 (p123); Gitksan, 1984 (7); Marles, R., 1984 (p66); Leighton, A.L., 1985 (p48-49); Johnson, A.,1987 (p18); Gottesfeld, L.M.J. & B. Anderson, 1988 (p16 &24); Turner, N.J., 1988 (p185); Turner, N.J. et al., 1990 (p47 &100); Holloway P.S. & G. Alexander,1990 (p219 &223).

2. JACK PINE [chundoo] Pinus contorta Dougl. ex Loud. var. latifolia Engelm. (Lodgepole Pine)

Distribution and Description

Lodgepole pine (Pinaceae) or "Jack Pine" (voucher #143) as this species is more commonly called, is found throughout British Columbia particularly in the drier parts of the interior. The trees, usually very slender (about 0.75 m in diameter), often reach a height of 30 meters, and have prominent vertical markings on the bark (Appendix D). The needles are pointed, about 3 - 5 cm in length and usually in bundles of two. The branches tend to be concentrated on

JACK PINE (Lodgepole pine cont'd)

the upper half of the tree. This species is well adapted to the dry interior and the frequent forest fires. Its cones, which mature in two years become large and woody and sometimes remain closed and attached to the branches for 15 to 20 years or more. Then suddenly, they might be opened by the heat of a fire sweeping through the forest (Krajina et al.,1982; Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

When the pitch (medicine sample #3) is swallowed, it is good for sore throats. The inner bark is good for colds; it can be chewed fresh or boiled to make a tea.

The tips of the needles of the young growth are scraped off and chewed. This is good against things that make a person sick.

The pitch is mixed with lard to make an ointment for wounds or sores. To make the ointment, heat the pitch over low heat and stir in pure lard. It will melt and turn to an ointment by itself. It tends to be slow healing and may keep deep wounds open or make a big scar.

JACK PINE (Lodgepole pine cont'd)

The pitch ointment is good when children have sores or mosquito bites. It can also be used to heal acne when it is used lightly each night like face cream.

Similar uses for P. contorta cited in the literature:
Smith, H.I., 1928 (p49 &50); Steedman, E.V., 1930 (Teit- p461); Gunther, E., 1945 (p17); Vogel,V., 1970 (p346); Melgrave, C., 1973 (p8 &37); Smith, G.W., 1973 (p331); Bird, B., n.d. (p7); Carrier Linguistic Committee, 1973 (p67); Palmer G., 1975 (p51); Jenkins, D., 1976 (p10); Erichsen-Brown, C.,1979 (p7); Jamieson, L., 1981 (p43); Gitksan, 1984 (p8); Walker, M., 1984 (p101); Camazine,S.,1986 (p29); Gottesfeld L.M.J. & B. Anderson, 1988 (p16 &24); Turner, N.J. 1978 (p57), 1988 (p185); Turner, N.J., et al.,1983 (p73), 1990 (p45,47 &102).

3. BALSAM FIR [ts'oo tsun] Abies lasiocarpa (Hook.) Nutt.

(Subalpine Fir)

Distribution and Description

Subalpine fir (Pinaceae) or "Balsam fir" (voucher #142) is found throughout mainland British Columbia and may reach a height of 30 meters. It is distinquished by its symmetrical spirelike form and its distinctive grey bark, which becomes thick, scaly and covered with noticeable resin blisters as the tree matures. The branches are in whorls and generally slope downward to withstand heavy loads of

BALSAM FIR (Subalpine fir cont'd)

snow. The needles, often twisted to lie in one plane, or turned upwards, are flat and blunt with a silver tinge on the underside giving the tree a blue-green appearance. When the branches are cut or the needles are crushed, a pungent aroma is released. The frost resistance of this species is very high. In winter the ground may freeze completely before the snow protects it, without causing damage to the roots (Krajina et al.,1982; MacKinnon et al., 1992).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

The inner bark can be boiled to make a tea which is good for lung problems (tuberculosis). Use only a small amount at a time as this is a very strong tea. Cough medicine can also be made by putting some small fir twigs with needles in an enamel cup and boiling to make tea.

The branches can be used with juniper and spruce to make a steam bath (as mentioned earlier), or they can be used to make vapours in a sweat bed for sore backs (eg. if you fall off a house and get a sore back). This is done by laying balsam boughs and yarrow in layers over hot rocks.

BALSAM FIR (Subalpine fir cont'd)

About five good-sized hot rocks are placed in a pit and covered with layers of branches, then a thin cloth is placed over top of the balsam boughs and yarrow to make a bed. Lie on the sweat bed until the rocks cool. A sweat bath is also good for colds or general aches and pains.

The pitch is mixed with pure lard to make an ointment for sores and wounds or for blood poisoning. To make the ointment, heat the pitch over a low flame. When it is soft, slowly stir in the lard. This is used sparingly as it is very strong. Do not use the pitch medicine on open sores as it is too strong. It will make the sores worst and they will not heal.

The pitch (medicine sample #4) is used for eye injuries. It can be placed in the eye with a feather tip in order to remove particles or to heal a sore eye. This procedure was also used to remove cataracts in the eye.

Similar uses for A. lasiocarpa cited in the literature:
Smith, H.I., 1928 (p50); Steedman, E.V., 1930 (Teit- p462); Gunther,

BALSAM FIR (Subalpine fir cont'd)

E., 1945 (p19); Bird, B., n.d. (p7); Carrier Linguistic Committee, 1973 (p70); Melgrave, C.,1973 (p7 &37); Palmer, G., 1975 (p50); Jenkins, D.,1976 (p10 &12); Erichsen-Brown, C.,1979 (p18); Gitksan, 1984 (p7); Marles, R., 1984 (p60); Gottesfeld, L.M.J. & B. Anderson, 1988 (p16 &24); Johnson,A., 1987 (p17); Turner, N.J. 1988 (p185); Turner, N.J., et al.,1983 (p44), and 1990 (p45,46 &97).

4. JUNIPER [datsan 'algut] Juniperus communis L. (Common Juniper)

Distribution and Description

Juniper (Cupressaceae) (vouchers #140 & #144) is abundant throughout British Columbia and often spreads out over sand or rock in patches about 10 to 12 meters across, or occasionally, grows upright to a height of about one meter. The strongly scented leaves are in whorls of three, with a white marking or streak on their underside. These plants are dioecious (sexes separate) and instead of cones, produce dark blue "berries" which take about two seasons to mature. The wood is durable and often used for fence posts or pencils (Hitchcock & Cronquist, 1973; MacKinnon et al., 1992).

Carrier Medicinal Use (SophieThomas, personal communication,1991)

Juniper should always be used when fresh and the

JUNIPER (cont'd)

branches should have lots of berries on them. In the winter mark the shrub with a branch or stick, then you can go and dig away the snow to gather it fresh.

When used alone, juniper branches are good for kidney infections. The tea when taken, works like water pills (diuretics). To make "instant tea" crush the dry berries.

When the juniper is mixed with kinnikinnick (leaves, stems and roots) this is good for kidney and bladder infections. To make the tea boil equal amounts together for about two hours.The juniper branches should have lots of berries on them (medicine sample #20).

Similar uses for J. communis cited in the literature:
Smith, H.I., 1928 (p49); Gunther, E., 1945 (21); Hutchens, 1969 (p220-222); Vogel, V., 1970 (p329); Bird, B. (nd); Carrier Linguistic Comm., 1973 (p71); Erichsen-Brown, C., 1979 (p33-35); Chandler, R.F., et al., 1979 (p57); Arnason, T., et al., 1981 (p2266); Leighton, A.L., 1981 (p41); Donson, A., 1982 (p81); Walker, M., 1984 (p82); Stuart,(Ed.) 1987 (p209); Gottesfeld, L.M., & B. Anderson,1988 (p16 &25); Turner, N.J., 1988 (p185); Turner, N.J., et al., 1990 (p48 &92).

3.3.2. DECIDUOUS TREES AND SHRUBS

1. ALDER [k'us] Alnus incana (L.) Moench var. occidentalis

(syn A. tenifolia Nutt.) (Mountain Alder)

Distribution and Description

Mountain Alder (Betulaceae) (voucher #104) is the most common alder of interior British Columbia and is generally found east of the Cascades. As a shrub or small tree it grows to a height of 2 - 5 m and thrives in wet ground, very often near creek edges from valley bottom to high mountain elevations. Its dark green leaves are double toothed and may vary from 4 to 10 cm in length. The bark is smooth and thin and when peeled off turns a bright orange colour on the underside. These plants are monoecious (producing male and female flowers on the same plant). The fruiting catkins are conelike and persistent (Hichcock & Cronquist,1973; Brayshaw, 1976).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

> Always gather alder in the fall for storing. In the spring when the sap is running, it is not good but in the fall it has everything in it. Gather bark from the shrubs that do not have cones.

MOUNTAIN ALDER (cont'd)

For use as medicine the bark is scraped and the shavings (medicine sample #5) are used either to make a tea, or they are softened and applied externally to swollen areas or sores. To soften the shavings soak them in hot water and then wrap them on the sores. This is also good for skin cancer. Make the alder medicine (tea) and use it to wash the skin. Alder is like iodine; it may sting but it is working.

This is very good medicine when children scald themselves - it takes the sting away. Wash the burn with the water from the alder shavings when it is cool, then wrap some gauze on the burn.

For babies who get sore mouths from nursing, or when they get a "coated tongue" (dry tongue), or when the milk was too hot and they have difficulty sucking, use the alder alone to make a tea. Apply this by dipping a cloth into the tea and wiping it around the baby's mouth - the baby will get better. If there is no alder, make a tea from the inner bark of the spruce and use this in the same way or add a little to the bottle.

MOUNTAIN ALDER (cont'd)

For ulcers or bleeding ulcers mix the alder shavings with "pussy willow" (Salix sp.) to make a tea. This is very strong medicine and should be taken only by the TABLESPOON or MOUTHFUL two or three times a day. It may make you sleepy. The ulcer often aches when you take this medicine but then you know it is working. Use two bundles of alder to three bundles of "pussy willow". If this does not work, then add soopollalie (Shepherdia canadensis) shavings to the alder and "pussy willow" medicine.

This medicine (alder & pussy willow) can also be used at the first signs of any internal cancer. If you start early it will kill the cancer.

Alder and "pussy willow" is also good for leukemia taken only by the MOUTHFUL or TABLESPOON twice a day along with raspberry and choke cherry medicine.

Similar uses for A. incana cited in the literature:
Smith, H.I., 1928 (p55); Gunther, E., 1945 (p27); Vogel, V.,1970 (p270); Bird, B., (nd); Carrier Linguistic Committee, 1973 (p72); Palmer, G., 1975 (p59); Lewis & Elvin-Lewis, 1977 (p344); Erichsen-Brown, C., 1979 (p182-183); Chandler, R.F., 1979 (p54); Stuart (Ed.),

MOUNTAIN ALDER (cont'd)

1987 (p149); Turner, N.J. et al., 1990 (p188); Moerman, D.E.,1991 (p15).

2. "POPLAR" [t'ughus 'yaz] Populus tremuloides Michx. (Trembling Aspen or Quaking Aspen) [t'ughus]

Distribution and Description

Aspens (Salicaceae) (vouchers #110 & #135) are abundant and found widespread throughout British Columbia east of the Cascades particularly in the central interior. They are tall, slender trees with distinctive black, triangular markings. Aspens grow to a height of 25 meters and tend to have a smooth, whitish bark covered with a chalk-like substance that can be rubbed off (Appendix D). The petioles, often 2/3 the length of the ovate leaves, are strongly flattened laterally, causing the blades to rustle or tremble in the faintest breeze. Aspens have a strong tendancy to multiply by means of suckers which extend from their extensive shallow root system (Hitchcock & Cronquist, 1973; Brayshaw,1976).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

To use as medicine the bark is peeled and made into

POPLAR (Aspen - cont'd)

shavings (medicine sample #6). It is usually always used when it is fresh. Put about five strips in a bundle.

If you get hurt or cut in the woods, take some bark and chew it and apply it directly to the bleeding wound and this will stop the bleeding. "Red willow" (red-osier dogwood) can also be used to stop the bleeding.

When children have pinworms, boil some bark (put a little sugar with it as it is quite bitter) and give them two tablespoons before breakfast for several mornings and pretty soon you will see dead worms in their stool.

Poplar (aspen) also makes good cough syrup when mixed with young "pussy willow" (Salix sp). For a bad cold and cough it stops the coughing. For this medicine use slightly more "pussy willow" than poplar (aspen); about one little bundle of "pussy willow" to three or four pieces of "poplar bark". This is quite strong and will work right away to put you to sleep. For good flu medicine add lemon and honey. Smaller doses of this medicine can be made in a large enamel cup; or it can be made into cough drops by

POPLAR (cont'd)

adding more honey. The medicine will solidify so that it can be carried and chewed whenever there is a sore throat.

When there is pain from arthritis, put some ashes of the poplar tree into a little cloth sack and place the bag in some warm water. Keep the water and when the ashes cool, put them back in the water and reheat. This might make a little sore but it will heal if left in the open air.

Similar uses for P. tremuloides cited in the literature:
Smith, H.I., 1928 (p54); Steedman, E.V., 1930 (Teit- p464); Hutchens, 1969 (p284); Bird, B., (nd); Carrier Linguistic Committee, 1973 (p68); Erichsen-Brown, C., 1979 (p101); Arnason, T. et al.,1981 (p2302 &2320); Leighton, A. L., 1985 (p53); Stuart (Ed.), 1987 (p244).

3. "PUSSY WILLOW" [k'e dlih yaz] Salix discolor Muhlenberg

Distribution and Description

Willows (Salicaceae) (voucher #150) are among the most familiar and widespread shrubs in British Columbia with about 42 species occurring in the province (Brayshaw, 1976). They are generally shade-intolerant and seek open areas along creeks or rivers. Leaf and twig

"PUSSY WILLOW" (cont'd)

characteristics vary greatly due either to the age of the plant or hybridization, which is common among willow species. S. discolor tends to be a small tree or coarse shrub with leaves ranging from 3-10 cm in length. The staminate (male) catkins are sessile, precocious (often developing before the leaves) and silky, hairy when young; staminate catkins are ~5 cm long and pistillate (female) ones ~12 cm in length (Brayshaw, 1976).

Carrier Medicinal Use (Sophie Thomas, personal communication, 1991)

To make medicine use the young shoots or scrape the bark (medicine sample #7). "Pussy willow" is used to treat ulcers when mixed with alder; it is also used for leukemia when mixed with alder and taken together with the raspberry/choke cherry medicine. "Pussy willow" is used as cough syrup or flu medicine when mixed with poplar (aspen). It is usually used when it is fresh but if it needs to be stored for winter collect it in the fall. Never keep stored plants longer than one season.

"PUSSY WILLOW" (cont'd)

Similar uses for Salix sp. cited in the literature:
Gunther, E., 1945 (p26); Vogel, V., 1970 (p392); Erichsen-Brown, C., 1979 (p90-95); Arnason, T. et al., 1981 (p2303 &2320); Jamieson, L., 1981 (p122); Walker, M., 1984 (p130); Johnson, A., 1987 (p28); Turner, N.J. & R.J. Hebda 1990 (p64).

4. "RED WILLOW" [k'endulk'un] Cornus sericea L. [syn. C. stolonifera Michx.] (Red-Osier Dogwood)

Distribution and Description

"Red willow" (Cornaceae) (voucher #113) grows from 2 to 6 m in height in shady creek beds or damp lowland areas throughout the interior of British Columbia as well as along the coast, west of the Cascades. It is recognized by its shiny, bright red bark, symmetrical opposite branches (containing a central white pith) and distinct "dogwood" leaves. The tiny white flowers (petals 2 - 4 mm in length) form conspicuous clusters or "heads". The fruit, a whitish drupe, ripens in late summer.

Carrier Medicinal Use (Sophie Thomas, personal communication, 1991)

To make medicine scrape the bark into shavings (medicine sample #8). If you get hurt in the bush and swelling occurs,

"RED WILLOW" (Red-osier dogwood cont'd)

soak the bark in hot water to soften it. While the shavings are still warm, use a towel to wrap them around the swollen area and keep them warm with a hot water bottle. This is good to bring down the swelling. Make little pillows with gauze and put in enough shavings to cover the area. When the gauze dries return it to the pot containing hot water. This will moisten and warm it; then re-apply it to the swollen area.

If there is internal swelling, take some of the liquid - about 1/2 a cup (125 ml) will help to bring the swelling down. The liquid can also be used as a hot compress to ease pain. Boil the shavings for a little while and when the water is slightly coloured (yellow), apply a cloth like a hot compress to the sore area. To re-apply the dressing, warm up the water a second time and soak the cloth before putting it on again.

The shavings can also be used as a pain killer by soaking them and applying them to the place that hurts.

"When we were children, my grandmother would send us

"RED WILLOW" (Red-osier dogwood cont'd)

to find red willow branches for her. She would take out the white powdery center (pith) and smoke it. This would make her very happy" (Catherine Bird, personal comm., 1989).

Similar uses for C. sericea cited in the literature:
Vogel, V., 1970 (p300); Bird, B., (nd); Carrier Linguistic Committee, 1973 (p71); Melgrave, C., 1973 (p32); Palmer, G., 1975 (p61); Erichsen-Brown, C., 1979 (p144-145); Arnason, T. et al., 1981 (p2265 &2312); Marles, R., 1984 (p59); Leighton, A.L., 1985 (p36); Johnson, A., 1987 (p49); Turner, N.J. 1978 (p137); Turner, N.J. et al., 1983 (p103), 1990 (p204).

5. "BEARBERRY" [sus mai'] Lonicera involucrata (Rich.) Banks. ex Spreng. (Black Twinberry, Fly Honeysuckle)

Distribution and Description

Black Twinberry (Caprifoliaceae), or "Bearberry" (voucher #099) inhabits damp, open areas throughout British Columbia growing abundantly along streams and the edges of lakes, marshes and marine shorelines. A shrub, with prominently veined leaves up to 5 cm long, it often grows to heights of ~2 m. The irregular, twin yellow flowers are surrounded by two pairs of green, papery bracts which become

increasingly more red as the season progresses. By mid-summer the flowers are replaced by shiny, black, twin berries held within a conspicuous red "cape" (Hichcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

The berries make very good eye medicine (medicine sample #9), but if there are no berries the stems can be scraped and used instead (medicine sample #10). The liquid from the berries will be blue-black, but the stem shavings will give a yellow coloured liquid.

This medicine helps you to see more clearly; it can be made by using fresh or dried berries. To dry the berries wash them and put them on a screen in the sun and keep moving the screen all around because the berries are very sticky. When the berries are dry, crush them and pour boiling water over them and leave them until they all "dissolve". Then strain the juice and keep it in the fridge. With fresh berries do not add water. Crush the berries and cook them in an enamel pot in their own juice. Then strain

"BEARBERRY" (Black Twinberry)

the juice into a container and keep it in the fridge. Use an eyedropper to apply the medicine.

This medicine is also good to make cataracts disappear.

Similar uses for L. involucrata cited in the literature:
Smith, H.I., 1928 (p63); Steedman, E.V. 1930 (Teit- p457); Carrier Linguistic Committee, 1973 (p77); Stuart (Ed.), 1987 (p216).

6. KINNIKINNICK [dunih 'tan] Arctostaphylos uva-ursi (L.) Spreng.

Distribution and Description

Kinnikinnick (Ericaceae) (voucher #003), a spreading evergreen shrub, is widely distributed throughout the province. It grows in a mat on exposed rocky or sandy soil and has small, alternating, thick, leathery leaves. It can be recognized easily by its tiny, pink, clustered bell-shaped flowers in spring, or by its bright red berries scattered among the leaves by summer's end and often remaining on the plants into the winter (Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

KINNIKINNICK (cont'd)

This is good medicine when used alone or with other plants. When making medicine use the whole plant, roots and all (medicine sample #11). It is very good medicine for bladder infections when used alone or for high blood pressure. When mixed with raspberry stems in equal amounts or slightly more raspberry, it is good for high blood pressure. The kinnikinnick is strong so you can use a little more raspberry. This will take down the edema due to high blood pressure. This is also good medicine to take as it keeps you calm - not tense or stressed.

For young girls with menstrual cramps (dysmenorrhoea), use kinnikinnick alone to make a tea. This will help the blood flow so that it doesn't thicken and cause cramps.

Long ago when there were home births, this tea was used when there were cramps (contractions).

For women going through "change of life" (menopause) it is good to drink this tea as it makes one feel less edgy and cranky.

KINNIKINNICK (cont'd)

When mixed with juniper this makes good medicine for the bladder and kidney or for sugar diabetes.

The leaves of the kinnikinnick can be dried and then crushed to make a paste by soaking them. They can then be applied to wounds.

Similar uses for A. uva-ursi cited in the literature:
Steedman, E.V., (Teit- p.458); Hutchens, 1969 (p62); Vogel, V.,1970 (p280); Carrier Linguistic Committee, 1973 (p74); Palmer, G., 1975 (p62); Jenkins, D., 1976 (p13); Erichsen-Brown, C., 1979 (p127-128); Jamieson, L., 1981 (p63); Arnason, T. et al., 1981 (p2268); Leighton, A.L., 1985 (p30); Stuart (Ed.), 1987 (p155); Turner, N.J. 1978 (p143); Turner, N.J. et al., 1990 (p211-213).

7. "WILD HOLLY" [tan wus 'wei] Berberis aquifolium (Pursh) [syn. Mahonia aquifolium (Pursh) Nutt.] (Oregon-grape)

Distribution and Description

Oregon-grape (Berberidaceae) (voucher #005 &#024), an evergreen shrub with alternate, pinnately compound holly-like leaves is widely distributed throughout the province and tends to grow in exposed areas or rocky clearings. It can be recognized readily by its bright yellow, honey-scented flower clusters in the spring or its waxy,

"WILD HOLLY" (Oregon-grape cont'd)

blue berries which appear by summer's end. It tends to be a low, sprawling plant growing from a creeping underground rhizome but it can grow upright to a height of about one meter (Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

The leaves are used to make tea when there are stomach problems.

The roots are used to make a tea for women following menstruation. This helps to "clean everything up".

Long ago the stems and roots were boiled and used to make a tea for women to take following childbirth for a sore womb (medicine sample #21).

Similar uses for B. aquifolium cited in the literature:
Gunther, E., 1945 (p30); Palmer, G., 1975 (p59); Donson, A., 1982 (p89); Johnson, A., 1987 (p35); Turner, N.J., 1978 (p124); Turner, N.J. et al., 1990 (p187).

8. SOOPOLALLIE [nuwus chun] Shepherdia canadensis (L.) Nutt.

(Soapberry)

SOOPOLALLIE (cont'd)

Distribution and Description

Soopolallie (Elaegnaceae) (voucher #094), or soapberry grows to a height of about one meter inhabiting semi-open forested areas and thickets, rocky bluffs and shorelines. It is common in the interior of the province but sporadic on Vancouver Island and the Lower Mainland (Turner,1981). The dark green, opposite leaves are short-petioled and have distinct rusty brown spots on their undersides. The plants are dioecious (sexes separate) and the flowers borne in the leaf axils appear with or before the leaves. The staminate (male) flowers are brownish. The pistillate (female) flowers produce bitter, orange-red translucent berries appearing in small clusters along the stems by mid-summer. When ripe the berries fall readily from the branches (Hitchcock & Cronquist,1973; Turner,1981).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

> The stems (medicine sample #12) are used to make a tea when the doctor suspects the first signs of cancer (stomach or any internal cancer). Use soopolallie for cancer if the "alder and pussy willow medicine" doesn't

SOOPOLALLIE (cont'd)

work. This tea (soopolallie) can be taken up to about 1/2 cup (125 ml) at a time.

In a medium sized pot put about three bundles of soopolallie stems and boil until the water is half way down. If the medicine makes you sick, this is a good sign. You may be able to feel the size of the sore and where it is. Take this medicine by the mouthful or one to two tablespoons at a time.

The stems can also be used to make a tea for constipation. For children use the berries (i.e whip them to make "Indian ice-cream"). When you make the berries for the children and give them some, they are usually better the next morning.

<u>Similar uses for S. canadensis cited in the literature</u>:
Smith, H.I., 1928 (p60); Melgrave, C., 1973 (p33 &39); Bird, B., n.d. (p6); Carrier Linguistic Committee, 1973 (p76); Palmer, G., 1975 (P61);Arnason, T., et al., 1981 (p2267); Walker, M., 1984 (p121); Marles, R., 1984 (p68); Gottesfeld L.M.J. & B. Anderson, 1988 (p16 &23); Turner, N.J., 1978 (p138), 1981 (p1-14); Turner, N.J. et al., 1990 (p50 &209).

9. LABRADOR TEA [yak'unulh'a] Ledum groenlandicum Oeder

Distribution and Description

Labrador tea (Ericaceae) (voucher #114), an evergreen shrub reaching a height of about one meter, is widespread across Canada. It generally grows on peaty soils, sunny cliffs and ledges, or moss and lichen wastelands. The linear or slightly elliptic shaped, leathery leaves (about 2 - 6 cm in length) are very distinctive having a dark green upperside with edges that roll over the underside (strongly revolute). The undersides of older leaves are covered with a thick brownish-red wool; when crushed the leaves are extremely aromatic. The tiny, white flowers form terminal racemes or corymbs (heads) (Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

The leaves (medicine sample #13) are dried and boiled to make a tea which is taken about twice a month to "clean out the system" (purge it). Use the leaves the same way as ordinary tea (about as much as would make two teabags). Labrador tea is very strong and needs to be boiled but don't

LABRADOR TEA (cont'd)

make the tea too strong.

This used to be used as a tea but it wasn't very good.

Similar uses for L. groenlandicum cited in the literature:
Smith, H.I., 1928 (p63); Palmer, G., 1975 (p62); Erichsen-Brown, C.,1979 (p194-196); Jamieson, L.,1981 (p66); Walker, M., 1984 (p85-86); Marles, R., 1984 (p54); Arnason T. et al., 1981 (p2269); Leighton A.L., 1985 (p7); Johnson, A., 1987 (p49); Kari, P.R., 1987 (p137); Turner, N.J., 1978 (p145); Turner, N.J. et al., 1983 (p44 &106), 1990 (p214).

10. "SAGE" [tse 'ul] Artemisia frigida Willd. (Pasture Wormwood or Wild Sage, "rock plant")

Distribution and Description

Wild sage (Asteraceae) (voucher #134) is generally found growing in dry open areas or on exposed slopes throughout the interior of the province. It is a small shrub forming a lacy-looking clump and reaching a height of 0.25 to 0.75 meters. It has tiny, dissected, alternating, dense silvery-grey-green leaves along the stem which make it easily recognizable. When the leaves are crushed they produce a very strong "sage" aroma. The plants produce small

"SAGE" (Pasture wormwood cont'd)

yellowish, discoid heads which bloom in late summer.

Carrier Medicinal Use (Sophie Thomas, personal communication, 1991)

The leaves and stems are boiled to make a tea for coughs. When this is mixed with juniper and balsam in a sweat bath and the vapours breathed in, it is good for colds.

The sage can also be used to make a Sage Bath. This is similar to the smoke baths Plains peoples made using sweet grass. The Carrier people used sage with juniper.

When people would go out hunting and they would have trouble to find game they would make a Sage Bath mixed with juniper. They would first each bathe themselves and then their hunting equipment in the smoke to purify both the body and equipment. Afterwards they would be able to find the animals. This would make them lucky.

The sage tea made from flowers and leaves is good for people with sugar diabetes (medicine sample #18).

Similar uses A. frigida cited in the literature:
Smith, G.W., 1973 (p325); Palmer, G., 1975 (p58); Erichsen-Brown, C.

"SAGE" (Pasture wormwood cont'd)

1979 (p409); Arnason, T. et al.,1981 (p2252 & 2310); Walker, M.,1984 (p110); Johnson, A., 1987 (p56); Holloway P.S. & G. Alexander,1990 (p217).

11. "WILD RHUBARB" [goos] Heracleum lanatum Michx. (Cow-parsnip)

Distribution and Description

Cow-parsnip (Apiaceae) or "Wild Rhubarb" (voucher #124) grows throughout British Columbia on moist rich soils in meadows, open areas and roadsides from sea level to mountain elevations. It may reach a height of two meters and has a stout, hollow, grooved stem and a thick fleshy taproot. Each huge compound leaf comprised of three leaflets (ternate), grows away from the stem through a large sheath. The large, compound, white flower heads (terminal umbels), often 10 to 30 cm across, produce flattened oval seeds and are easily recognized when the large stalks dry in the fall (Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

For people who have severe tonsilitis or "quinzi" warm the

"WILD RHUBARB" (Cow-parsnip)

root in a pot with a little water. When it is warm wrap (pieces of) the root in some flannel cloth and place this around the throat. This will make the infection break.

This is also good to use for rheumatism. It helps to take away the pain.

Similar uses for H. lanatum cited in the literature:
Smith, H.I., 1928 (p61); Gunther, E., 1945 (p42); Smith, G.W., 1973 (p327-329); Bird, B., (nd); Carrier Linguistic Committee, 1973 (p82); Palmer, G., 1975 (p56); Gilmore, M.R.,1977; Erichsen-Brown, C., 1979 (p260-261); Arnason, T., 1981 (p2245); Walker, M., 1984 (p56); Leighton, A.L., 1985 (p40); Johnson, A., 1987 (p48); Gottesfeld, L.M.J. & B. Anderson 1988 (p25).

3.3.3. BERRIES AND FLOWERS

1. RASPBERRY ['ut'ankalh chun] Rubus idaeus L. (Wild Raspberry)

and CHOKE CHERRY [dulgoos mai chun] Prunus virginiana L.

Distribution and Description

Wild raspberry (Rosaceae) (voucher #112) is widespread throughout the province. It grows well in dry areas and is often found along roadsides, clearings or rockslides particularly in the interior.

RASPBERRY / CHOKE CHERRY (cont'd)

Wild raspberry is a prickly little shrub similar to cultivated varieties, but usually it is much smaller than cultivated varieties.

Choke cherry (Rosaceae) (voucher #107) is also widespread throughout the interior of the province but tends to be more common in the southern regions and is found only occasionally in the north central interior. Choke cherry is a sprawling shrub or small tree with alternate, finely serrate leaves preferring damp conditions but growing equally well in open woodlands, grasslands or clearings. The bark is greyish to brown in colour giving off an acrid smell when cut or bruised. The white flowers at the ends of the branches form dense tassel-like clusters (racemes) which later turn to dark, purple-black berries (drupes) (Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

Use the stems of the raspberry once they have been cleaned to remove their thorns (medicine sample #14). This can be done by using a heavy cloth or leather gloves to rub along the stalks. This is often done in the fall.

For "low or weak blood" mix the raspberry stems with

RASPBERRY/CHOKECHERRY (cont'd)

choke cherry stems (medicine sample #15) to strengthen the blood. When people cut themselves and lose blood they use it. Use seven parts raspberry to four parts choke cherry and boil together for about two hours. Take about 1/2 cup (125 ml) at a time twice a day. This will make you feel very energetic. If there is no choke cherry, mix raspberry stems with kinnikinnick for poor blood.

This is also good medicine when the doctor suspects leukemia. It can be taken together with "pussy willow and alder" medicine. Cook the medicines in two separate batches and take the alder medicine only by the mouthful.

This medicine might also be good for people with AIDS since "something happens to their blood". For AIDS mix together choke cherry, raspberry and kinnikinnick stems.

For sore backs make tea by mixing raspberry with alder.

<u>Similar uses for R. idaeus and P. virginiana cited in the literature</u>
Smith, H.I., 1928 (p49); Steedman, E.V., 1930 (Teit- p466 &477); Hutchens, 1969 (p133); Vogel, V., 1970 (p389); Moerman, D.E.,1991 (p14).

2. WILD STRAWBERRY ['indzi] Fragaria virginiana Duchesne (Blue-leaved Wild Strawberry)

Distribution and Description

Wild strawberries (Rosaceae) (voucher #100) commonly occur in open woods, meadows or along streambanks and are particularly plentiful in northcentral British Columbia. The leaves are basal, compound and often with three equal-sized leaflets. These perennial plants are easily recognized by their conspicuous red "runners" (stolons) which branch out from the base of each plant. The five-petalled white flowers may occur singly or several to a stem and bloom throughout the summer months. These blossoms are quickly replaced by tiny, sweet, red berries (Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

> The stems and roots are boiled and made into a tea when there is heart trouble (angina). The roots are best but in the winter the runners (stolons) (medicine sample #16) can be used instead. Collect the runners in the fall and make these into little bundles.

WILD STRAWBERRY (cont'd)

For those with heart conditions or who have had heart attacks use the roots for stronger medicine.

This also makes good medicine for diarrhea; take as required.

Similar uses for F. virginiana cited in the literature
Gunther, E., 1945 (p36); Hutchens, 1969 (p324); Carrier Linguistic Committee, 1973 (p78); Melgrave, C., 1973 (p14 & 31); Palmer, G., 1975 (p66); Erichsen-Brown, C., 1979 (p466); Arnason, T. et al., 1981 (p2295); Johnson, A., 1987 (p38); Stuart (Ed.), 1987 (p192).

3. WILD CURRANTS [tsasdli mai] Ribes hudsonianum Richards.

(Northern Black Currant)

Distribution and Description

Wild currants (Grossulariaceae) (voucher #151) grow along shaded creeks and streams or in moist woods and thickets throughout the province. These currants lack thorns, have tiny white flowers in clusters (racemes) and three-lobed leaves, resembling maple leaves, which vary in size from 3.5 to 9.0 cm across. The smooth-skinned fruit forms tiny clusters of blue-black berries which branch from the main stem (Hitchcock & Cronquist, 1973).

NORTHERN BLACK CURRANT (cont'd)

Carrier Medicinal Use (Sophie Thomas, personal communication, 1991)

This makes good medicine when babies are constipated. They are called "frog berries" because they grow by the creeks. In the fall the black berries are good for making jam.

Use the stems (in little bundles) and make tea. This will help to soften the stool. Give it to the babies by mixing a little with the milk in their bottle. This is also good for babies when they get a cold or are sick.

Similar uses for R. hudsonianum cited in the literature
Steedman, E.V., 1930 (Teit- p471); Marles, R., 1984 (p49); Turner, N.J. et al., 1990 (p49 &228).

4. "BLUEBELLS" [dzulh tl'oolh] Clematis occidentalis (Hornem.) DC. [syn. C. columbiana T. & G.] (Western Blue Clematis, "Rope of the Woods")

WESTERN BLUE CLEMATIS ("Bluebells")

Distribution and Description

The western blue clematis (Ranunculaceae) (voucher #018) is found rarely throughout the northcentral portion of the province but often grows on steep rocky slopes in wooded or brushy mountain areas east of the Cascades. The blue clematis is a trailing vine clinging to surrounding shrubs such as willow, twinberry or highbush cranberry (S. Thomas, personal communication,1990). It would be invisible among these shrubs were it not for its beautiful blue, bell-shaped flowers which appear singly, early in the spring, at the end of a leafless stalk growing from a leaf axil. The opposite leaves each have three broadly lanceolate leaflets (ternate). The fruit, in the form of fluffy seed heads of silvery plumes, matures in late summer and resembles a feathery sphere (Hitchcock & Cronquist,1973; Spellenberg et al., 1979).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

> This makes good hair tonic when the green leaves are mixed with bear grease (collect the bear grease in the fall before the bears go to sleep). Put the ointment on and leave

WESTERN BLUE CLEMATIS ("Bluebells") cont'd

it for three days. Rub the ointment into the scalp three times (until it disappears) and then wash your hair. It makes the hair grow fast and thick.

When the tufts (seed heads) (medicine sample #17) are used to wash the hair, the hair will grow fast.

Similar uses for C. occidentalis cited in the literature
Steedman, E.V., 1930 (Teit - p459); Turner, N.J. et al., 1990 (p248), 1984 (p188).

5. WILD ROSE [whus wai] Rosa acicularis Lindl. (Prickly Wild Rose)

Distribution and Description

This species of wild rose (Rosaceae) (voucher #106) is found throughout the interior of the province east of the Cascades. It grows well along roadsides, riverbanks, in clearings or in wooded areas where the soil is moist and fairly rich. It is well armed with sturdy spines and produces showy, pink flowers, often five centimeters across, which bloom early in the summer. The flowers are usually single on the lateral branches of the season but occasionally can be

WILD ROSE (cont'd)

in groups of two. In the fall the blossoms are replaced by scarlet red fruit or "hips". The leaves are stipulate, toothed, alternate and pinnate each with 5 -7 leaflets (Hitchcock & Cronquist, 1973).

Carrier Medicinal Use (Sophie Thomas, personal communication, 1991)

> Use the roots to make a medicine that is good for the whole body. It is often mixed with ten different barks, including, raspberry, choke cherry, saskatoon, cranberry, and five others which I cannot remember. My grandmother used to make this when I was a child.

Similar uses for R. acicularis cited in the literature

No similar uses were found cited in the literature.

6. YARROW [latalba] Achillea millefolium L.

Distribution and Description

Yarrow (Asteraceae) (voucher #065) is widely dispersed through out the province and usually found growing on dry or wasteland soils.

YARROW (cont'd)

It is easily recognized by its feathery, finely divided, fern-like leaves which appear soft and lacy. When crushed the leaves emit a very pungent aroma. The flat-topped, white flower heads often 5 to 10 cm across are composed of several smaller clusters creating the appearance of a large head (i.e. pan-corymbiform inflorescence) (Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

The fresh flowers and stems can be crushed and applied to the skin as an insect repellent. This works well to keep the mosquitos away. Burning the plant also helps to keep mosquitos away.

The roots can be crushed and placed on a sore tooth to relieve toothache. For rheumatism the leaves and stems can be boiled and applied to the area that hurts.

Balsam boughs and yarrow are mixed together and used in a sweat bath.

Similar uses for A. millefolium cited in the literature

Smith, H.I. 1928 (p65); Steedman, E.V., 1930 (Teit- p460); Gunther, E., 1945 (p49); Hutchens, 1969 (p386); Bird,B., (nd); Carrier Linguistic

YARROW (cont'd)

Committee, 1973 (p85); Melgrave, C. 1973 (p 20,32,&33); Smith, G.W., 1973 (p327); Chandler, R.F. et al.,1979, (p53); Erichsen-Brown, C., 1979 (p401); Arnason, T. et al., 1981 (p2251 &2310); Jamieson, L., 1981 (p36); Chandler et al.,1982 (p205-208); Marles, R.,1984 (p60); Leighton, A.L.,1985 (p22); Johnson, A., 1987 (p56); Kari, P.R., 1987 (p142); Stuart (Ed). 1987 (p143); Turner, N.J. et al., 1990 (p47 &166).

7. RED ELDERBERRY [da chungoos' tan] Sambucus racemosa L.

(Common Red Elderberry)

Distribution and Description

Red elderberry (Caprifoliaceae) (voucher #125) is commonly found in the Coastal forest and east of the Cascades but is not a particularly common shrub in the northcentral interior. Red elderberry is a large bushy shrub with distinct pithy stems and large, opposite, pinnately compound leaves with serrate leaflets. It usually grows in moist clearings or shady forests producing white pyramidal flower clusters which turn to bright red berries by mid-summer (Hitchcock & Cronquist, 1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

This is good medicine when there are boils or infections.

RED ELDERBERRY (cont'd)

Put the leaves in hot water and then put the leaves on the boil. This will make the swelling burst.

Put boiling water on the leaves and then put the leaves on a gauze. Use as many leaves as needed to cover the area. Keep the leaves wet all the time. This will help to remove thorns, slivers or pieces of glass (medicine sample #19).

NEVER drink this medicine.

Similar uses for S. racemosa cited in the literature
Gunther, E., 1945 (p47); Erichsen-Brown, C., 1979 (p122); Gottesfeld, L.M.J. & B. Anderson, 1988 (p25).

3.3.4. OTHER PLANTS AND EMERGENCY FOODS

1.PLANTAIN ['ut'an chischo] Plantago major L. (Broad-leaved Plantain)

Distribution and Description

Plantain (Plantaginaceae) (voucher #079) a hardy, widespread weed is found throughout British Columbia most often in lawns, but it is also prevelant in fields, along roadsides and in wastelands.

PLANTAIN (cont'd)

Plantain can reach a height of 20 cm. Its flat, dark-green leaves are elliptical in shape and basal - all radiating out from the center of the plant in a close spiral. The flowers are long slender spikes which also grow out from the center of the plant (Hitchcock & Cronquist,1973).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

The leaves of plantain are used like elderberry leaves to heal boils or infections. Put boiling water on the leaves and place them on a gauze. Use as many leaves as needed to cover the area.

Similar uses for P. major cited in the literature
Carrier Linguistic Committee, 1973 (p86); Palmer, G. 1975 (p64); Gilmore, M.R.,1977; Arnason, T. et al., 1981 (p2287 & 2317); Jamieson, L., 1981 (p92); Walker, M., 1984 (p105); Turner, N.J. et al., 1983 (p44 &115), 1990 (p236).

2. DIAPER MOSS [ts'al] Sphagnum spp. (Sphagnum Moss)

Distribution and Description

Sphagnum mosses (Sphagnaceae) are found usually in peat bogs,

DIAPER MOSS (cont'd)

muskegs or wet mountain meadows throughout the world but are most abundant in the cooler temperate portion of the Northern Hemisphere. There are 150 recognizable species, although 300 have been described (Schofield,1985). They are tiny, water-saturated plants about 2 - 5 cm in height. The leafy gametophyte is usually erect with the stem leaves spirally arranged and widely spaced; the mature stem leaves contain little or no chlorophyll. The plants act like a "sponge" to fluids and when harvested can be squeezed to remove the water (Schofield,1985).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

The moss was collected and dried and then used as diapers for young children. When children were wrapped in diapers of moss they never had rashes or sores.

The moss was also used for menstrual padding and as a dressing for wounds.

Similar uses for Sphagnum spp. cited in the literature

Bird, B., n.d. (p5); Carrier Linguistic Committee, 1973 (p87); Arnason, T. et al., 1981 (p2308); Walker, M., 1984 (p149); Leighton, A.L., 1985 (p21); Turner, N.J. et al., 1983 (p59);

3. WATER HEMLOCK [hooghunaich'oh] Cicuta douglasii (DC.) Coult. & Rose ("cow-parsnip")

Distribution and Description

Water hemlock (Apiaceae) is known locally as "cow-parsnip" because a small piece of the rootstalk is enough to kill a cow. It grows throughout the province except on the Queen Charlotte Islands, in marshes, ditches and wet low places from sea level to mountain elevations and closely resembles the local "wild rhubarb" or cow-parsnip (Heracleum lanatum). Water hemlock is a sturdy herbaceous perennial about 5 - 20 dm in height with hollow stems and white, flat-topped "umbrella" flower clusters. Each compound leaf has three small, narrow leaflets which are sharply toothed and the leaf veins are directed to the bases of the teeth rather than forward to the points; an important feature to note when identifying water hemlock. The root is often tuberous and thickened resembling a small turnip - revealing horizontal chambers when cut open. Water hemlock is extremely poisonous and its genus has been described as the most poisonous in North America (Hitchcock & Cronquist,1973; Turner, 1975).

WATER HEMLOCK ("cow-parsnip" cont'd)

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

This is good medicine for rheumatism. The root is like a turnip. Cut it in half and heat it up in a pan with a little water (this is so it will not stick). When it is bearable - not too hot, apply it like a mustard plaster to the sore area but don't leave on the area for more than 10 minutes. The sore area will turn red and little red scabs will appear. Leave these scabs in the open air and they will heal by themselves. This is good for rheumatism or arthritis as a pain killer.

This plant is extremely poisonous NEVER drink the water or eat any part of this plant.

Similar uses for C. douglasii cited in the literature

Smith, H.I.,1928 (p61); Steedman, E.V., (Teit- p476); Palmer, G., 1975 (p.56); Turner, N.J., 1975 (p238); Erichsen-Brown, C., 1979 (p254); Edwards, G.T., 1980 (p9); Arnason, T. et al., 1981 (p2245); Turner, N.J. et al., 1983 (p94); Walker, M., 1984 (p152); Johnston, A., 1987 (p48); Turner, N.J., 1990 (p150).

4. SCOURING RUSH [kla'kwuzi] Equisetum hyemale L.

Distribution and Description

The Scouring rush (Equisetaceae) (voucher #133) grows in low, wet areas, swamps, or alongside streams throughout the province. The rush has tall, similar, unbranched evergreen stems which often reach a height of about one metre. The stems are hollow (except at the joints) have broad, round, roughened ridges running the length of the stem and are conspicuously jointed. The cell walls of the epidermal (outer layer) cells contain silicon, as do the ridges, making the plant "scratchy" to touch. The leaves are very small and scale-like growing in whorls at each node; at the top of the stems are spore-bearing "cones" (Turner,1979).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

> Gather the stems of the rush growing in sandy places. Do not pick the stems of plants growing in the water. The rush should be about 25-30 cm high.
>
> Make a tea from the stems in a large enamel cup for older men when they have colic (trouble urinating). This will help

SCOURING RUSH (cont'd)

them to pass water. At first the urine will appear milky but then it will clear and be normal.

Sophie used this medicine to cure an old man who had not urinated for three days.

Similar uses for E. hyemale cited in the literature
Steedman, E.V., 1930 (Teit- p462); Carrier Linguistic Committee, 1973; Bird, B. nd (p6); Turner, N.J., 1975 (p62); Erichsen-Brown, C., 1979 (p225); Johston, A., 1987 (p16); Turner, N.J. et al., 1990 (p86).

5 FALSE LADYSLIPPER [Maria kesgwut] Calypso bulbosa (L.) Oakes

Distribution and Description

Ladyslipper or Maria's moccasin (Orchidaceae) (voucher #001), is a beautiful little orchid, found throughout the province in shady coniferous forests. It grows up to 10 or 15 cm in height and has a single, shiny, green basal leaf which is oval, corrugated and over-wintering (Clarke, 1974). Its delicate red stem and pink-purple petals culminate in a pendent slipper-like lower petal about 10 mm across and streaked inside with purple lines (Hitchcock & Cronquist,1973).

FALSE LADYSLIPPER (cont'd)

Carrier Medicinal Use (Catherine Bird, personal communication 1989)

> When we had been out on the trapline all winter and eaten only dried foods, our bodies were sluggish. To adjust to fresh foods we would dig up calypso bulbs when we came out in the spring. We would boil the corms and eat these like vegetables.

Similar uses for C. bulbosa cited in the literature
Turner, N.J., 1975 (p99), 1978 (p208); Turner et al.,1990 (p135).

6. BLACK TREE LICHEN [dohghwa] Bryoria lanestris (Ach.) Brodo & Hawksw. (syn. Alectoria lanestris (Ach.) Gyel) (Indian Bannock or Indian Bread)

Distribution and Description

Black tree lichen (Lichenaceae) or "Indian Bannock" (voucher #127), as this pendent lichen is locally known, grows on conifers at all elevations throughout the interior of the province. It hangs from the upper branches in long, dark brown to black hair-like mats which

BLACK TREE LICHEN (cont'd)

may reach 6 dm in length. It is easily harvested throughout the year with the aid of a long stick. The taste of the lichen is affected by the type of tree on which it grows (Turner, 1978; MacKinnon et al., 1992).

Carrier Medicinal Use (Sophie Thomas, personal communication,1991)

Collect only the black mat that grows on the spruce (Picea glauca) or lodgepole pine (Pinus contorta). Wash it carefully to remove any dirt or twigs. (When it is dry the lichen's texture is similar to steel wool; when wet it is soft and limp). When the lichen is clean put it on the coals of a fire and sprinkle it with water. It will cook by itself and form a cake like "bannock".

When people were out in the woods and they could not find any food or had nothing with them they could always find "Indian bannock" to cook.

Similar uses for A. fremontii cited in the literature
Bird, B. nd (p5); Palmer, G., 1975 (p47); Turner, N.J., 1978 (p35), 1979 (p48); Walker, M., 1984 (p147); Johnston, A., 1987 (p15); Turner, N.J. et al., 1990 (p72).

7. FIREWEED [khas] Epilobium angustifolium L. (Willow Herb)

Distribution and Description

Fireweed (Onagraceae) (voucher #152) is found widespread throughout British Columbia growing in extensive patches by roadsides, in meadows, forests, on riverbars and in logged or burned areas. Fireweed, a tall, smooth-stemed, herbaceous perennial plant, grows to a height of 1-2 m. Its long, narrow, smooth-edged leaves are willow-like and arranged alternately along the stem, growing out and upwards from the main stalk. The flowers are very showy, four-petalled and red to purple in colour. They bloom throughout the summer months from the bottom to the top of the long terminal clusters. The seed capsules are long and narrow splitting longitudinally along all four sides to release tiny parachuted seeds which travel great distances. Fireweed's spreading roots (stolons and rhizomes) allow it to spread quickly over large areas (Hitchcock & Cronquist, 1973; Turner, 1978).

Carrier Medicinal Use (Sophie Thomas, personal communication, 1991)

When there is nothing else to eat, the central pith is good to

FIREWEED (cont'd)

eat. In the springtime gather the young shoots when they are tender and not higher than ~ 30 cm. The pith can be eaten raw or the stems can be boiled.

Similar uses for E. angustifolium cited in the literature
Carrier Linguistic Committee, 1973 (p84); Bird, B. nd (p8); Palmer, G., 1975 (p64); Erichsen-Brown, C., 1979 (p240); Turner, N.J., 1978 (p171), 1979 (p225); Walker, M.,1984 (p71); Holloway P.S. & G. Alexander, 1990 (p219); Turner, N.J. et al., 1990 (p235).

4.0 Ethnopharmacology

4.1 Introduction

Humanity's most valuable pharmacological assets worldwide are the higher plants. Not only do they provide 25% of the active ingredients dispensed in western prescriptions (Phillipson et al.,1989; Cordell et al.,1991), but they also account for the primary means of therapy among healers using traditional medicine (Schultes, 1972; Wassen, 1972; Marini- Bettolo,1980; Reuter,1991).

Medicinal plants are the oldest known source of drugs for curing human illnesses. Today 75% to 80% of the world's population relies on traditional medicines and the crude natural product molecules present in plants to improve their health and cure disease (Marini-Bettolo,1980; Phillipson et al.,1989). Throughout the world traditional medicine may vary in form, from one ethnic group to another because of historical or cultural background, but its practice in all cases, is one that addresses the patient as a whole. Treatment includes a concern for both the psycho-physical reality and the unity of each individual (Lewis & Elvin-Lewis,1977; Tempesta,1980; Gottesfeld & Anderson,1988; De Smet,1991).

Over the past decade, ethnopharmacological research has contributed significantly to our general knowledge concerning the medical practices of indigenous peoples (Sussman,1980; Wat et al., 1980; Cappeletti,1982; Chandler et al.,1982; Giberti,1983; Gill et al.,1986; Verzar et al., 1987; Linares et al.,1987; Moskalenko,1987; Lokar et al.,1988; Turner & Hebda,1990). It has provided new data to improve health care in all societies. An example of this is the identification and promotion of effective traditional treatments, which are available and can be used in developing countries (eg. "oje" sap used in Peru against internal parasites). This herbal preparation is administered once every three months and is an effective, inexpensive alternative to western medicines.

Ethnopharmacology has also deepened respect for the empirical rationality of certain cultural practices through the scientific evaluation of native drug use (De Smet et al.,1989; Phillipson et al.,1989). Some researchers, however, have argued that it is possible to replace the ethnopharmacology-based search for biologically active compounds, by the study of chemosystematics (Gottlieb,1982). Although we should not be shy about using comparative phyto-

chemistry (chemosystematics) in the search for new drugs (Sevenet,1991), it appears that our present body of knowledge has predictive value in some but not in all instances (Swain,1972). It is possible to predict the presence of particular compounds in certain families (eg., indole alkaloids in Apocynaceae), but it is not always possible to predict the exact quantity or structural type present in a species. The British Navy discovered this when it switched lime varieties in the 1850's (Swain,1972). A recurrence of scurvy led to the discovery that the substituted West Indian lime (Citrus medica var. acida) contained only one fourth the amount of ascorbic acid as the sweet lime (C. medica var. limetta). This example illustrates that the use of chemosystematics in predicting a source for new drugs is not always consistent even within the same species.

Recent studies using alder have shown that one species, Alnus rubra growing along the coast of B.C. west of the Cascades has definite antimicrobial properties while another species, A. incana, growing in the interior of the province shows no antimicrobial activity (G.H.N. Towers, personal communication,1991). A few articles in the literature support the chemosystematics perspective,

but the vast majority tend to support an ethnopharmacological approach in the search for biologically active compounds. The investigation of traditional methods or substances, used in the treatment of common human ailments is viewed as the best means to identify new drugs (Lewis & Elvin-Lewis,1977; Marini-Bettolo, 1980; Bernardi,1980; Bonati,1980; Galeffi,1980; De Smet et al.,1989; Phillipson et al.,1989; Cordell et al.,1991; Reuter,1991).

Today, approximately 100 natural products are available within many modern, clinically used pharmaceuticals (Phillipson et al., 1989). The majority of these natural product molecules are the result of secondary plant metabolism, which accounts for the production of alkaloids, anthraquinones, flavonoids, lignans, terpenoids, oils and many other compounds found in plants. Several of these secondary plant products play an important role in both traditional and modern medicine (Phillipson et al.,1989; Verpoorte, 1989).

4.2 Secondary Plant Metabolites

Secondary plant metabolites are compounds synthesized by plants using the primary products manufactured during photo-synthesis (eg. glucose, acetyl CoA, or amino acids). In the literature

the secondary metabolites are often referred to as substances which have "no known role in the economy of the producing organism" (Swain,1972; Evans,1989; Williams et al.,1989). Yet,it is known that vast amounts of energy are required to produce natural product molecules such as the phenolics, terpenoids, alkaloids and polyacetylenes. Many baffled researchers are thus inquiring, "Why are the secondary metabolites biosynthesized?" In an article addressing this very topic Williams (1989) and his co-workers reviewed six different hypotheses. Each hypothesis suggested reasons why the secondary metabolites were manufactured. After examining each one carefully, Williams and his team concluded that the secondary metabolites improve the producer's survival fitness by acting at specific receptors in competing organisms. They further proposed that all secondary metabolites have evolved under the pressure of natural selection to bind to specific receptors. Their conclusions were in agreement with the test hypothesis that stated:

> "The secondary metabolites are a measure of the fitness of the organism to survive. The ability to synthesize an array of secondary metabolites which may repel or attract other organisms has evolved as one facet of the organism's strategy for survival." (1)

The conclusions reached by Williams and his team are shared by other prominent researchers in the field (Harborne,1988; Verpoorte,1989), who also agree that secondary metabolites have an ecological significance to plant survival.

Secondary metabolites in plants are biosynthesized by two main pathways: the acetate-malonate pathway and the shikimic acid pathway. These two pathways give rise to a vast array of compounds which provide the characteristic odour, colour or trait of a plant, i.e. its culinary, medicinal or poisonous property (Vickery & Vickery, 1981; Evans,1989).

The acetate-malonate pathway is primarily responsible for the production of fatty acids but also makes an important contribution to plant aliphatic and aromatic compounds which are biosynthesized through the formation of polyketides. Some examples of compounds produced by the acetate-malonate pathway are polyacetylenes, thiophenes, terpenes, steroids and cardenolides (Vickery & Vickery, 1981). The shikimic pathway is responsible for the production of a large number of aromatic compounds derived from its end products; (phenylalanine, tyrosine and tryptophan).

Examples of compounds produced via the shikimic pathway are the cinnamic acid derivatives, benzoic acid derivatives, lignins, coumarins and tannins (Vickery & Vickery,1981; Evans,1989).

Not all secondary metabolites, however, are biosynthesized by one of the two major pathways. A significant number of the aromatic compounds have a mixed biogenesis. These compounds are derived from products of two or more of the major pathways and include compounds such as the flavonoids, xanthones and stilbenes (Vickery & Vickery,1981).

Although it has been stated that the prime function of secondary metabolites may be to enhance the producer's overall survival fitness, investigations have shown that many of the secondary compounds are also pharmaceutically important. One group in particular, the stress compounds, accumulates in plants as a result of injury, metabolic disturbances or microbial infections. Stress compounds, such as the gums and oleoresins, are pharmaceutically important because they may be involved in the pathological formation of various crude drugs (Anton,1988; Evans,1989). Some other secondary plant metabolites also having pharmaceutical importance

are the alkaloids, tannins, terpenoids and flavonoids (Tyler et al., 1981; Anton,1988; Wollenweber,1988; Evans,1989). Many of these secondary compounds account for the crude drugs or active principles present in plants. Crude drugs are defined, at this point, as "natural substances that have undergone only the process of collection and drying" (Tyler et al.,1981, p.4). It is these secondary compounds or crude drugs that are used therapeutically by traditional healers.

4.3 Factors Affecting the Quality and Content of Medicinal Plants

The quality and quantity of crude drug compounds in medicinal plants are dependent on a number of factors, the most important of which include variations in climate, the soil conditions and also the collection procedures used to harvest the plants (Bonati,1980; Galeffi,1980; Tyler et.al.,1981; Evans,1989; Lipp, 1989).

The nature and quantity of secondary metabolites (i.e. crude drugs or active principles) in medicinal plants are affected by variations in temperature, rainfall, altitude, length of day and growing season. Studies have shown that temperature is a major factor in controlling the metabolic processes of plants. It has been

found that volatile oils, for example, appear to be enhanced by higher temperatures (Evans,1989). Continuous rain may lead to the loss of water-soluble substances from leaves and roots by leaching. Low yields of certain compounds (i.e. alkaloids, glycosides and volatile oils) have also been attributed to excessive rain. However, the low yields frequently experienced during wet seasons may also be due to a lack of light. Some researchers have shown that light is a factor that helps to determine the amount of glycosides or alkaloids produced by plants (Evans,1989).

Soil conditions are also important to plant species, many of which vary considerably with respect to their nutritive and soil requirements. Worldwide, soils vary in their physical, chemical and microbiological composition. These variations affect plant growth and distribution in different regions around the globe.

The timing of plant collection is also a major factor in the harvesting of crude drug compounds. Depending on the season and/or the maturity of the plant the amount and nature of the active principles may vary substantially. Similarily, the time of day may also affect the harvest. Increasing evidence indicates that the

quantity of certain secondary metabolites varies significantly between the night and the day (Bonati,1980; Galeffi,1980; Evans, 1989; Verpoorte,1989).

Collection methods are also important in determining the overall yield of active principles. Leaves, for example, are usually collected when the plant is in flower or as the flowers are beginning to open. Flowers are usually collected immediately upon opening, and seeds as soon as they have ripened. Roots and rhizomes are collected along with a certain amount of aerial stem when the leaves of the plant are falling (Evans,1989; Lipp,1989).

Once the plant specimens have been collected they must be carefully dried as soon as possible to preserve the active principles. Drying not only fixes the constituents, but also converts the specimens into a more convenient form for storage. Leaves, herbs and flowers dry best between 20° and 40°C while bark and roots need slightly higher temperatures, between 30° and 65°C (Evans,1989).

4.4 Some Active Principles Present in Traditional Medicines.

For centuries, plant-based medications have been humanity's

prime means of defense, often taking the form of decoctions or infusions. Such solutions of medicinal plants allow many active principles to be released in a form readily utilized by traditional healers. The efficacy of these extracts is often due to the presence of one or more biologically active principles (Bonati,1980; Galeffi,1980). The extracts can be taken orally either by the cupful or spoonful; or they can be used externally to bathe or wash a particular area. The ensuing result (the biological activity of the secondary metabolites) is recognized as a treatment or cure. Insight into, or knowledge of, the physiochemical and pharmacological properties of the active principles, will assist in the eventual utility and acceptance of many traditionally used medicinal plants in modern western medicine (De Smet et al.,1989).

The therapeutically active principles produced by plants can be classified according to their biochemical properties (eg. phenolic glycosides, tannins, alkaloids, terpenoids, oils, or resins) or on the basis of their biological activity, such as, their antimicrobial, astringent, antifungal, analgesic, diuretic or emetic properties. Since chemically related compounds may frequently exert similar

pharmacological effects there is often some correlation between the pharmacological and chemical classifications of these active principles (Ross & Brain 1977). Many of the plant organic molecules, possessing pharmacological properties, have long been known to humanity but only in the past century have they been identified and isolated by biochemists and phytochemists.

Compounds containing a saccharide attached to an aglycone are generally refered to as glycosides. The term "glycoside" was previously favoured as a category for classifying pharmaceutical compounds. However, it is a very general grouping and currently not often used as it includes many different aglycones which vary greatly in their physical and chemical properties as well as in their pharmacological actions (Evans,1989; G.H.N. Towers, personal communication, 1992). The sugar unit renders these compounds more soluble in the cell sap, allowing them to be stored in cell vacuoles. A large number of the aglycones are phytotoxic in high concentrations thus their conversion to a glycoside limits their toxicity. In nature the most commonly occurring aglycone groups are phenolics but tannins triterpenes, cardenolides and cyanogens are also prominent

forms (Hansel,1972; Ross & Brain,1977; Tyler et al.,1981).

In traditional medicines some of the important pharmaceutical groups represented are as follows:

ALKALOIDS

This group of compounds, perhaps more than any other, is of particular interest because most alkaloids manifest some form of physiological activity (Phillipson et al.,1989; Ross & Brain, 1977). A working definition of alkaloids, according to Ross & Brain, (1977 p.22) is that they " ... are white crystalline solids which contain nitrogen, are basic in reaction and possess physiological activity."

Due to the wide variety of compounds that fit the above definition, the alkaloids are further classified by ring shape, number of rings, the position of nitrogen atoms in the ring and also, by the number of nitrogens in the compound. Alkaloids may be further classified on the basis of the forming ring (i.e. amino acid, steroid or terpenoid) (Ross & Brain,1977).

Alkaloids tend to be rare in the lower plants and gymnosperms and unevenly distributed among the angiosperms (Swain,1972). Those alkaloids isolated from the angiosperms, of which there are now over

3000 (Schultes,1972), reveal a wide variety of pharmacological activity. One family, Papaveraceae, is 100 percent alkaloidal while the families Rosaceae and Laminaceae are almost lacking in alkaloids (Schultes,1972). Alkaloid activity produces analgesic, cardiovascular and anaesthetic effects, and may also affect the functioning of the central and autonomic nervous systems (Phillipson et al.,1989). Berberine, an alkaloid found in some species native to British Columbia (eg. Berberis), is a complex aromatic alkaloid isolated from the family Berberidaceae. A decoction of the stems of B. aquifolium Pursh (Oregon-grape) used to be administered following childbirth in some aboriginal groups of British Columbia (S. Thomas, personal communication, 1991).

PHENOLIC COMPOUNDS

Some important groups of phenolic compounds are the phenolic glycosides, anthraquinones, flavonoids, tannins, and some cyanogens.

The phenolic glycosides incorporate many different compounds and are responsible for a wide range of effects, both physiological and pharmacological (Ross & Brain, 1977; Tyler et al., 1981; Evans, 1989). Simple phenolics such as arbutin have a mild diuretic action,

while the salicylates, also simple phenolics, have sedative and analgesic properties. The anthraquinones are used mostly as vegetable laxatives (eg. rhubarb and senna) (Ross & Brain,1977).

Flavonoids, the largest group of glycosides, are present in all aerial parts of the plant. They contribute to the colouring of plant parts as well as the browning of leaves in the autumn (Ross & Brain,1977; Anton 1988). The literature tends to link their presence to the adaptation and survival mechanisms common to most plants, (Kapulnik et al.,1987; Harborne,1988) but, the flavonoids are also recognized as one of the active ingredients of traditional medicines (Schultes,1972; Anton,1988; Wollenweber,1988; Vlietinck, 1988).

Some flavonoid aglycones are present on plant surfaces and their secretion is correlated with essential oil production. The families Asteraceae and Lamiaceae appear to have the greatest number of these flavonoid aglycones (Wollenweber,1988). Both the genera Achillea and Artemisia have glandular trichomes and accumulate flavonoids externally. Traditionally, Achillea millefolium (yarrow) has been used to treat purulent wounds (i.e. those full of pus), or to prevent haemorrhages. Its pharmaceutical properties are thought to

be due to the accumulation of external flavonoid aglycones (Wollenweber,1988).

The tannins, a group of compounds having phenolic properties, are water soluble and often found as glycosides. They are usually concentrated in the leaves, fruit, bark and stems and exist as a mixture of polyphenols. Tannins can be divided into two major groups: hydrolysable tannins found, for example, in rose petals and kinnikinnick leaves and condensed tannins, found in barks, roots and rhizomes, for example, in willow and wild cherry barks. Tannins have the ability to precipitate proteins, as well as having an inhibitary effect on enzymes. This inhibitary property is thought to contribute to the protective function of bark (Ross & Brain,1977; Tyler et al.,1981). The "astringent" property of tannins, utilized in herbal medicine, is due to a combination reaction between proteins in living tissues and the tannins present in bark or leaves. Similarily, in the treatment of burns, tannins precipitate the proteins of the exposed tissue and form a slightly antiseptic coat under which new skin can regenerate (Ross & Brain,1977; Trease et al.,1981; Evans,1989). Folk medicine also uses the astringent effects of some plants to control

diarrhoea, haemorrhages, sore throats and haemorrhoids (Phillipson et al.,1989). The most common of the hydrolysable tannins are derived from esters of gallic acid and ellagic acid whereas, the condensed tannins are produced from flavonoid derivatives (Vickery & Vickery, 1981).

Cyanogenic glycosides produce hydrogen cyanide when they are separated from the saccharide unit. Prunasin, a phenolic cyanogen found in choke cherry bark (Prunus virginiana L), has a mild sedative effect. It was used by the Mohican Indians, Native peoples of the Pacific Northwest (eg. Bella Coola, Thompson and Okanagan) as well as by the early settlers as a cough medication or sedative (Ross & Brain,1977; Lewis & Elvin Lewis,1977; Tyler et al.,1981; Turner et al., 1990). The cyanogenic glycosides can be highly toxic, and must be used with extreme care (Turner, personal communication,1991).

ISOPRENOIDS

The third major group of pharmaceutically active principles present in traditional medicines are the isoprenoids or terpenoids. The isoprenoids are molecules built from isoprene units (five-carbon

molecules) and include compounds such as the essential oils, steroids, saponins, cardiac glycosides, hormones and vitamins. The isoprenoids are classified according to the number of carbons in the compound, eg. monoterpenes (C10); sesquiterpenes (C15); diterpenes (C20); and triterpenes (C30). Many of the terpene molecules have antibiotic properties (Ross & Brain,1977; Tyler et al.,1981).

The monoterpenes are produced primarily by higher plants and are present in the essential oils and oleoresins (eg. pinenes). Their structures can be acyclic, monocyclic or bicyclic. Monoterpenes tend to be volatile and are responsible for the characteristic odors produced by the essential oils of plants. Pharmaceutically the essential oils are used as carminatives and expectorants to treat digestive upsets and respiratory ailments (Vickery & Vickery,1981).

The diterpenes are non-volatile and usually found in the resins of higher plants. Most are polycyclic and occur as a result of injury to the plant. Abietic acid, a diterpene produced by conifers, particularly Abies (fir), is excreted from injured trees and is also the major component of commercial colophony (a dark-coloured resin obtained from the distillation of turpentine with water) (Vickery & Vickery,

1981; Tyler et al., 1981).

The saponins composed of either a triterpene or steroidal aglycone are unique in producing a lasting froth when shaken with water. All have haemolytic properties if injected directly into the blood stream. The triterpene saponins tend to be universal in plants and generally are not toxic to warm-blooded animals if injested (Vickery & Vickery 1981). Steroidal saponins have been valued as arrow poisons throughout the ages and have been identified predominantly in the genera Agave, Yucca, and Dioscorea (Schultes, 1972). Shepherdia canadensis, a species native to B.C., contains saponins derived from triterpenes which produce the frothy effect or "Indian ice-cream" when the berries are whipped (Turner,1981).

The cardiac glycosides are distinquished by either a five or six-membered lactone ring attached to the C-17 of the tetracyclic ring structure. The cardiac glycosides act to increase the heart rate and thereby increase blood pressure to improve the flow of blood through the kidneys' (Ross & Brain,1977). Some South American peoples used the cardenolides found in the families Apocyanaceae, Liliaceae and Ranunculaceae as arrow and ordeal poisons (Schultes,1972).

4.5 Field Methods in Ethnopharmacology

The interdisciplinary nature of ethnopharmacology is nowhere more apparent than in the field. Successful field research demands a basic understanding of the skills, field methods and procedures required in anthropological, botanical, and pharmacological fieldwork. This includes a knowledge of ethnographic skills, plant collection and pressing techniques, as well as an awareness of the biodynamic properties of plants. To maintain ethnopharmacology and its inter-disciplinary approach, it is essential that the highest methodological standards be achieved during the collection of field data from each of the contributing disciplines (De Smet et al.,1989; Lipp, 1989).

The anthropological approach requires that any investigation of traditional medicine (among indigenous peoples) be conducted with an awareness of the cultural reality. Any analysis of the plants as medicines should not be detached from the people's own cultural system (Bernardi, 1980).

The first step in the collection of ethnographic data is the ability of the researcher to gain entrée to members of a community and to establish rapport. This is essential and often, the most

difficult task (Spradley,1979; Lipp,1989). After rapport has been established with the community one must then identify the key-informants. Although anyone can be an informant, not everyone is a good consultant, or possesses the appropriate knowledge. In many communities where herbal medicine is used as an alternative to, or in conjunction with western medicine, the key-informants are usually women elders (Cappelletti et al., 1982; Moskalenko;1987; Turner et al.,1990). Good consultants are usually individuals who are thoroughly enculturated, currently involved, not analytical and who have adequate time (Spradley,1979).

When there is more than one key-informant available within a community, it is possible to validate the information that has been collected. In some communities, however, there may be only one key-informant available, due to the specialized nature of the information and the age of the consultants. In such cases library studies will often substantiate the information collected.

The two most common methods for gathering information are the use of interview techniques and/or participant observation (Bernardi,1980; Sussman,1980; Cappelletti et al.,1982; Marles,1984;

Gill et al.,1986; Moskalenko,1987; Turner, 1988). Although most interviews tend to be unstructured and open-ended, it is important that the researcher has a plan or notes to keep the conversation on track (Lipp, 1989).

In ethnopharmacological research, as in any form of research involving human consultants, one's ethical judgement is critical. Consultants must always be considered first, to ensure that their rights, interests and sensitivities are safeguarded at all times. This naturally includes protecting their privacy should they so desire, explaining the objectives of the research and making copies of all reports available to the participants (Rynkiewich et al.,1976; Spradley,1980). Consultants become teachers for the researcher and as such, it is important that they are treated not only as equals, but also with respect.

In addition to ethnographic skills, fieldwork in ethnopharmacology also requires a substantial knowledge of botany and botanical procedures. Not only is it important to correctly identify the plant species used as a traditional source of medicine, and the methods used to prepare and administer them, but it is also necessary to know

how to prepare suitable voucher specimens to document their identification. These specimens provide an indispensable link between field observations and experimental evaluation (Cappelletti et al.,1982; Gill et al.,1986; Anton,1988; De Smet et al.,1989; Lipp,1989).

Data collected for medicinal plants often includes a degree of pharmacological information as well as botanical data. The data may include information on the geographic location of the plant plus any relevant geological and ecological data; a description of the plant before and after harvesting; the preparation of the plant drug; and the drug therapy (Penso,1980; Gill et al.,1986; Anton,1988; De Smet et al., 1989; Lipp,1989).

Thus, the interdisciplinary collaboration among anthropology, botany and pharmacology provides ethnopharmacological research with a cross-cultural outlook and a source of new data to augment health care in both western and non-western societies.

Footnote

1. Why are Secondary Metabolites (Natural Products) Biosynthesized? J. of Natural Products 52: p.1190

5.0 Antimicrobial Bioassays of Carrier Medicinal Plants

5.1. Introduction

The use of bioassays to determine the antimicrobial activity of higher plants has been well documented in the literature over the past 40 years (Bishop & MacDonald, 1951; MacDonald & Bishop, 1953; Nickell, 1959; Mitscher et al., 1972; Leven et al., 1979; Wat et al., 1980; Boilly & Van Puyvelde, 1986; Giron et al., 1988; Rios et al., 1988).

Two methods commonly used by researchers to determine antimicrobial activity in higher plants are the diffusion, and/or the dilution methods. Both of these methods provide good, preliminary indications of antimicrobial activity. Although neither one is ideal for use as a standardized test, the dilution method is better (Rios et al., 1988). To standardize methods many factors including culture medium composition, microorganisms tested, extractive method, and the solubility of the sample in the culture medium need to be considered, as the slightest variation to any one of these factors affects the results (Rios et al., 1988).

The diffusion method, originally designed to determine the

degree of antibiotic substances in crude extracts uses the technique of agar-overlay with a disk, hole or cylinder as the sample reservoir. The sample to be tested is brought into contact with an innoculated medium and after incubation the zone of inhibition (clear area around the reservoir) is measured. The disk diffusion method requires that the filter paper disks with the sample antibiotic be placed on the surface of the agar immediately after innoculation with the test organism (Wat et al., 1980; Giron et al.,1988). In an alternate diffusion method, the hole-plate assay method, wells or small holes are bored into the agar which has been innoculated with a test organism. This method relies on the diffusion of the sample antibiotic from the vertical hole through the solidified agar so that a clear, circular zone is produced around the hole containing the sample antibiotic (Leven et al., 1972). A similar method, the cylinder method, uses stainless steel or porcelain cylinders for assay rather than wells. After incubation the cylinders are removed and the zone of inhibition is measured (Rios et al.,1988).

Dilution techniques for antimicrobial assays are used to determine the minimum inhibition concentration (MIC) values of an

extract, essential oil or a pure substance (Mitscher et al., 1972; Boily & Van Puyvelde, 1986; Rios et al., 1988). Two methods, the turbidity and the agar dilution methods, can be used to determine MIC values. In the former, turbidity is taken as an indication of bacterial density or growth and can be measured by spectrophotometry. When the sample antibiotic being tested is active, there will be no growth and the medium will remain clear. The latter method requires that a fixed amount of antibiotic sample be mixed with the nutrient agar and then allowed to set. Four to six microorganisms can be seeded in the Petri dish and when no growth occurs the sample antibiotic is active (Mitscher et al., 1972; Rios et al., 1988).

Diffusion methods are the ones most often used as a preliminary means to screen for antimicrobial activity. They are a useful way to test the sensitivity of a test organism but they do not show any relation between diffusion power and antimicrobial activity (Rios et al.,1988). Their major advantage is that they do not require large sample sizes and can be used to screen up to six compounds at a time against a single microorganism. Unfortunately, this method is not satisfactory when the samples are not highly soluble in water as is

the case with essential oils (see results of this survey - p.154).

5.2 Materials and Methods in this Study

5.2.1. Plant Material

The following specimens were collected between April and July 1991 in and around the city of Prince George, B.C.; Abies lasiocarpa (Hook.) Nutt. (pitch); Alnus incana (L.) Moench. (bark); Arctostaphylos uva-ursi (L.) Spreng. (whole plant); Artemisia frigida Willd. (plant); Berberis aquifolium (Pursh.) (stems & roots); Cornus sericea L. (bark); Fragaria virginiana Duchesne (stems & roots); Juniperus communis L. (branches & berries); Ledum groenlandicum Oeder (leaves); Lonicera involucrata (Rich) Banks. ex Spreng. (bark & berries); Picea glauca (Moench) Voss (pitch & inner bark); Pinus contorta Dougl. ex Loud (pitch); Populus tremuloides Michx. (bark); Prunus virginiana L. (stems); Rubus idaeus L. (stems); Salix ?discolor Muhlenberg (stems); Sambucus racemosa L. (leaves); Shepherdia canadensis (L.) Nutt. (stems).

In addition to the above dried specimens, the following authentic herbal preparations were given to the researcher by Sophie Thomas,

a Carrier elder and herbalist: "Spruce pitch ointment" [Picea glauca (pitch) & lard]; "Hair ointment" [Clematis occidentalis (leaves) & bear grease]; "Flu medicine" [dec of Populus tremuloides (bark) & Salix sp. (stems) with honey & lemon added for flavour]; "Eye medicine" [Lonicera involucrata (berries)]; "Heart medicine" [dec of Arctostaphylos uva-ursi (whole plant) & Fragaria virginiana (roots)]; "Ulcer medicine" [dec of Alnus incana (bark) & Salix sp. (stems)].

5.2.2. Specimen preparation

Four different specimen preparations were used for the anti-microbial assays which included: the authentic medicines prepared by Sophie Thomas; aqueous decoctions of herbal medicines prepared by the researcher according to recipes supplied by Sophie Thomas; methanolic extracts of ground plant material; and dilutions of medicine or pitch in agar preparations.

Aqueous Extracts (Herbal decoctions prepared by researcher)

The aqueous decoctions were prepared as follows:

1. Spruce Inner Bark Medicine (for sore mouth)

~10 g fresh spruce inner bark (Picea glauca) in 1 L water and boil

slowly for one hour;

2. Alder Medicine (for sore mouth, skin sores, or burns)

1 small bunch of alder (Alnus incana) bark shavings (~16 g) in 1 L of water and boil for about one hour.

3. Medicine for Swellings

1 small handful of red willow (Cornus sericea) bark shavings (~5 g) in 400 ml hot water and soak for about 20 mins.

4. Flu Medicine

1 bundle of fresh "pussy willow" (Salix discolor) stems (~25 g)

5 small strips of fresh aspen (Populus tremuloides) bark (~7 g)

Boil together in a large enamel mug (~350 ml) water for about 40 mins. Add lemon juice and honey to taste.

5. Cough Medicine

1 bundle of fresh "pussy willow" (S. discolor) stems (~25 g)

5 small strips of fresh aspen (P. tremuloides) bark (~7 g)

Boil together in a large enamel mug (~350 ml) water for about 40 mins.

6. Kidney Medicine

1 good-sized, fresh branch of juniper (Juniperus communis) with

lots of berries (~180 g). Boil in 5 L water for about two hours.

7. Bladder Medicine

1 bundle of kinnikinnick (Arctostaphylos uva-ursi) (fresh ~200 g). Boil in 6 L water for about two hours.

8. Bladder and Kidney Medicine

1 good sized fresh branch of juniper (Juniperus communis) (~200 g)

1 bundle of fresh kinnikinnick (Arctostaphylos uva-ursi) (~250 g)

Boil in 7 L water for about two hours.

9. Medicine for Weak Blood (Anemia)

4 bundles of fresh choke cherry (Prunus virginiana) stems (~90 g)

7 bundles of fresh raspberry (Rubus idaeus) stems (~175 g)

Boil together in about 3 L of water for two hours.

10. Eye Medicine "A"

1 small handful bearberry (black twinberry) (Lonicera involucrata) bark shavings (~3 g)

Boil in 350 ml water for one hour.

11. Eye Medicine "B"

1 small handful bearberry (black twinberry) (L. involucrata) fresh berries (~8 g)

Crush and boil in their own juice for about 5 to 10 mins.

12. Heart Medicine

10 fresh strawberry (Fragaria virginiana) roots (~15 g) and boil in 1 L water for two hours.

13. Cancer Medicine (Internal)

1 handful fresh alder (Alnus incana) bark shaving (~17 g) and boil in 1 L water for one hour [when the alder (A. incana) does not work use soopolallie (Shepherdia canadensis)]

1 bundle fresh soopolallie (S. canadensis) stems (~75 g) and boil in 2 L water for about two hours.

14. Medicine for High Blood Pressure or Clots

4 bundles of fresh raspberry (Rubus idaeus) stems (~65 g)

2 bundles of kinnikinnick (Arctostaphylos uva-ursi) (~44 g)

Boil together in 4 L of water for 2 hours.

15. Leukemia Medicine

Mix 5 ml of Ulcer Medicine (Alnus incana & Salix sp.) with 100 ml Anemia Medicine (Prunus virginiana & Rubus idaeus).

Methanolic Extracts

Five grams of ground plant material were added to 100 ml of methanol and left to soak for two days. The liquid in the flasks was then filtered using a cotton wool plug and cheesecloth. The sediment in the flasks was rinsed with methanol and refiltered until the liquid was clear (~75 ml methanol was used to rinse). The liquid solutions were evaporated in vacuo to dryness at a temperature of 39°C. The dry extract was dissolved in 5 ml of methanol to obtain a concentration of 1g/ml. These extracts were stored in vials.

Agar Dilution Method

Two different dilutions of the aqueous extracts and the pitches were set up using microorganism specific agar. The dilutions of the aqueous extracts (medicines) and the pitch were made at full and half strength; but the "half strength" pitch /agar dilutions were 0.10 of the original concentration rather than 0.50 of the full strength dilutions.

The full strength dilution of the aqueous extracts contained 50 ml of medicine, while the half strength dilutions contained 25 ml of

medicine diluted in 25 ml of distilled water. The pitch/agar dilutions were prepared in concentrations of 100g/L (full strength, 0.1g/ml) and 10g/L ("half strength", 0.01g/ml).

The medicine/agar and pitch/agar dilutions were prepared as follows:

Nutrient Broth (Difco)

Full strength	Half strength
0.4 g nutrient broth	0.4 g nutrient broth
0.75 g agar	0.75 g agar
50 ml medicine /or	25 ml medicine in 25 ml
5.0 g pitch	water /or 0.5 g pitch

Nutrient Broth Control contained 0.4 g nutrient broth; 0.75 g agar; 50 ml distilled water.

Sabouraud Dextrose Broth (Difco)

Full strength	Half strength
1.5 g SAB broth	1.5 g SAB broth
0.75 g agar	0.75 g agar
50 ml medicine /or	25 ml medicine in 25 ml
5.0 g pitch	water /or 0.5 g pitch

SAB Control contained 1.5 g SAB broth; 0.75 g agar; 50 ml distilled water.

The flasks containing the control, full and half strength dilutions were autoclaved for three consecutive days at 100°C for 20 minutes, and then poured into tissue culture dishes (3 cm diameter).

5.2.3. Microorganisms

Five common human pathogens were used to test the degree of antimicrobial activity in the medicinal plant extracts: Escherichia coli, a Gram-negative bacterium commonly occurring in the human intestinal tract; Staphylococcus aureus, a Gram-positive bacterium often found in boils or skin lessions; Pseudomonas aeruginosa, a Gram-negative bacterium commonly inhabiting wounds, burns or skin ulcerations; Candida albicans, a Gram-positive yeast often found in the mouth, intestinal tract or vagina; and Aspergillus fumigatus, a Gram-negative mold which invades lung tissue.

Gram-positive microorganisms have simple cell walls comprised mostly of polysaccharides which hold the stain when colonies are actively growing. Gram-negative microorganisms have complex cell walls containing lipids and proteins as well as polysaccharides

which do not hold the stain (Barrett et al.,1986).

5.2.4. Antimicrobial Bioassays

The disk diffusion method was used as a preliminary method to screen the aqueous extracts, pitch preparations and methanolic extracts. Sterile paper disks, 7 mm in diameter, prepared from Whatman No. 1 filter paper were inoculated with 25 uL of extract and allowed to air dry before being applied directly to the surface of the agar immediately after inoculation with the test organism. The Petri plates were then incubated at 37°C for 24 hours. Following incubation the plates were examined and any zones of inhibition were measured and recorded. A control test was performed with gentomyicin and fungisone.

The agar dilution method was used to verify antimicrobial activity in certain samples with low solubility in water (pitches). This was done by dispersing samples of medicines and pitches in a microorganism-selective culture medium, (as described above); but rather than being used to determine the MIC values, this method was used as a qualitative test to determine antimicrobial activity.

The tissue culture plates containing agar dilutions were later innoculated with 100 uL of overnight suspensions and incubated at 37°C for 24 hours. Following incubation the plates were examined for signs of microbial growth using a "Blak-Ray Light" to check for signs of phosphorescence. Any tissue culture plates showing no apparent growth were then re-plated onto a microorganism selective culture medium and incubated at 37°C for 24 hours. Assays were carried out in triplicate.

5.3. Results and Discussion

The results of the antibacterial and antifungal screenings are presented in Tables 5, 6 ,7 and 8. Using the disk diffusion method a total of 23 samples were tested (Table 5). Only two of the methanolic extracts inhibited the growth of the test microorganisms; Berberis aquifolium inhibited the growth of both S. aureus and C. albicans, while Picea glauca was active against S. aureus. In this survey the pitch samples used were all fresh extracts and none of these showed any signs of antimicrobial activity. Five authentic medicines plus the decoctions of 13 herbal medicines

TABLE 5

PLANTS WITH ANTIMICROBIAL ACTIVITY (Disk Diffusion Method)

Methanolic Extract*	E. coli	S. aureus	P. aeruginosa	C. albicans	A. fumigatus
Abies lasiocarpa (pitch)	-	-	-	-	-
Alnus incana (bark)	-	-	-	-	-
Arctostaphylos uva-ursi	-	-	-	-	-
Berberis aquifolium (rhz)	-	8 mm	-	10 mm	-
Cornus sericea (branch)	-	-	-	-	-
Fragaria virginiana (rt)	-	-	-	-	-
Juniperus communis (br)	-	-	-	-	-
Juniperus communis (ber)	-	-	-	-	-
Ledum groelandicum (lvs)	-	-	-	-	-
Lonicera involucrata (br)	-	-	-	-	-
Lonicera involucrata (st)	-	-	-	-	-
Picea glauca (inner bk)	-	8 mm	-	-	-
Picea glauca (pitch)	-	-	-	-	-
Picea glauca (ointment)	-	-	-	-	-
Pinus contorta (pitch)	-	-	-	-	-
Pinus ponderosa (pitch)	-	-	-	-	-
Populus tremuloides (bk)	-	-	-	-	-
Prunus virginiana (br)	-	-	-	-	-
Pseudotsuga menziesii (pt)	-	-	-	-	-
Rubus idaeus (stems)	-	-	-	-	-
Salix discolor(branch)	-	-	-	-	-
Sambucus racemosa (lvs)	-	-	-	-	-
Shepherdia canadensis (br)	-	-	-	-	-
Gentomycin	15 mm	17 mm	14 mm	-	-
Fungisone	-	-	-	15 mm	14 mm

*Key to plant parts: br= branch; bk= bark; ber= berries; lvs = leaves; pt = pitch; rt= root; rhz= rhizome; st = stems.

TABLE 6

HERBAL DECOCTIONS WITH ANTIMICROBIAL ACTIVITY

(Disk Diffusion Method)

Authentic Medicines*	**E. coli**	**S. aureus**	**P. aeruginosa**	**C. albicans**	**A. fumigatus**
Eye medicine	-	-	-	-	-
Flu medicine	-	-	-	-	-
Hair medicine	-	-	-	-	-
Heart medicine	-	-	-	-	-
Ulcer medicine	-	-	-	-	-
Herbal Decoctions'					
#2 Alder medicine	-	-	-	-	-
#3 Medicine for Swelling	-	-	-	-	-
#4 Flu Medicine	-	-	-	-	-
#5 Cough Medicine	-	-	-	-	-
#6 Kidney Medicine	-	-	-	-	-
#7 Bladder Medicine	-	-	-	-	-
#8 Bladder & Kidney Med.	-	-	-	-	-
#9 Medicine for Anemia	-	-	-	-	-
#10 Eye Medicine "A"	-	-	-	-	-
#11 Eye Medicine "B"	-	-	-	-	-
#12 Heart Medicine	-	-	-	-	-
#13 Cancer Medicine	-	-	-	-	-
#14 Blood Pressure/Clots	-	-	-	-	-
Controls					
Gentomylcin	13 mm	18 mm	15 mm	-	-
Fungisone	-	-	-	15 mm	14 mm

*Authentic Medicines - see Materials for ingredients

' Herbal Decoctions - see Materials for recipes.

(made from recipes collected by the researcher), were also tested for antimicrobial activity using the disk diffusion method (Table 6). None of these decoctions showed any antimicrobial activity.

As the results of the two assays (Tables 5 & 6) using the disk diffusion method were somewhat disappointing, a further assay was conducted in which some of the herbal decoctions as well as some samples of pitch were dissolved in nutrient specific agar. The results of the assay using the herbal decoctions (Table 7), showed that, although, none of the samples totally inhibited the growth of the microorganisms (bacteriacidal), a few did appear to retard the growth of some of the microorganisms (bacteriastatic).

E. coli, for example, was considerably slowed (25% or less growth) by the presence of either Arctostaphylos uva-ursi (dec #7), or by Juniperus communis (dec #6) within the agar medium. Visible retardation of E. coli growth was also observed when the two plant decoctions were mixed together (dec #8). Shepherdia canadensis (dec #13) also caused a slowing of E. coli growth but to a lesser extent (25% - 50% growth).

The growth of A. fumigatus appeared to be only slightly retarded

TABLE 7 ANTIMICROBIAL ACTIVITY OF HERBAL DECOCTIONS IN AGAR-DILUTION PREPARATIONS AFTER 48 HOURS. *

Aqueous Extracts	E. coli	S. aureus	P. aruginosa	C. albicans	A. fumigatus
Bladder Medicine #7					
Arctostaphylos uva-ursi	+++	-	-	-	-
A. uva-ursi (1/2)	++	-	-	-	-
Alder Medicine #2					
Alnus incana	-	-	-	-	++
A. incana (1/2)	-	-	-	-	+
Leukemia Medicine #15					
Alnus mixture*	-	-	-	-	++
Alnus mixture (1/2)	-	-	-	-	+
Kidney Medicine #6					
Juniperus communis	+++	-	-	-	-
J. communis (1/2)	-	-	-	-	-
Bladder/Kidney Med. #8					
Juniper mixture*	+++	-	-	-	-
Juniper mixture (1/2)	++	-	-	-	-
Med. for Sore Mouth #1					
Picea glauca inner bark	-	-	-	-	-
P. glauca inner bark (1/2)	-	-	-	-	-
Cancer Medicine #13					
Shepherdia canadensis	++	-	-	-	+
S. canadensis (1/2)	++	-	-	-	-
Controls					
Nutrient Broth	-	-	-		
SAB Broth				-	-

*Key: +++ = 25% or less growth
++ = 25% - 50% growth
+ = 50% - 75% growth
- = 75% - 100% growth

'Alnus mixture = alder & "pussy willow" dec plus raspberry & choke cherry dec
" Juniper mixture = dec of juniper & kinnikinnick

TABLE 8 ANTIMICROBIAL ACTIVITY OF HERBAL MEDICINES OR PITCH EXTRACTS IN AGAR-DILUTION PREPARATIONS AFTER 48 HOURS. *

Fresh Extract	E. coli	S. aureus	P. aeruginosa	C. albicans	A. fumigatus
Subalpine Fir					
Abies lasiocarpa (pitch)'	-	++	-	-	-
A. lasiocarpa (1/2)"	-	-	-	-	-
Spruce					
Picea glauca (pitch)	++++	++++	++++	++++	++++
P. glauca (1/2)	++	+++	-	+	-
Spruce medicine (Sophie)					
P. glauca (ointment S.T.)	-	++	+	++	++
P. glauca (oint. 1/2)	-	++	-	-	-
Lodgepole Pine					
Pinus contorta (pitch)	++++	++++	+++	-	-
P. contorta (1/2)	-	-	-	-	-
Douglas Fir					
Pseudotsuga menziesii (pt)	-	-	-	-	-
P. menziesii (1/2)	-	-	-	-	-
Controls					
Nutrient Broth	-	-	-		
SAB Broth				-	-

*Key ++++ = 100% active / no growth
+++ = 25% or less growth
++ = 25% - 50% growth
+ = 50% - 75% growth
- = 75% - 100% growth

' full strength = ~100g/L (0.1g/ml)
" 1/2 strength = ~10g/L (0.01g/ml)

when either Alnus incana (dec #2), or Shepherdia canadensis (dec #13), were dissolved in the agar medium.

The agar-dilution assay in which extracts of fresh pitch

samples were mixed into the agar medium (Table 8) showed some startling results. The sample of Picea glauca (spruce pitch) at full strength totally inhibited the growth of all five test micro-organisms. Pinus contorta (pine pitch) at full strength totally inhibited the growth of both E. coli and S. aureus as well as substantially slowing the growth of P. aeruginosa (25% or less growth). The spruce pitch ointment (Picea glauca provided by Sophie Thomas) also appeared to retard the growth of S. aureus, C. albicans and A. fumigatus to some extent (25% - 50% growth).

The disappointing results experienced using the disk diffusion method (Tables 5) may have been due to the molecular structure of the compounds. Samples not highly soluble in water (i.e. essential oils or non-polar extracts) are difficult to test by this method (Rios et al.,1988). On the other hand, the results of the herbal decoctions (Table 6), were surprising because all of these samples were highly soluble in water. The negative results may have been an indication that the concentration of the 25 µL samples (of herbal decoctions), applied to the filter paper disks, was not great enough to create a zone of inhibition. Since the majority of the decoctions were

prepared by the researcher, rather than by a Native herbalist, the final concentrations of the products may have been slightly different than those of authentic medicines.

In the second assay some of the decoctions from Table 6 were diluted into an agar medium containing either nutrient broth or SAB broth. Although none of these decoctions showed total inhibition of the test microorganisms, there was some evidence of antimicrobial activity. The medicines used to treat bladder infections, kidney infections or a combination of both kinds of infections showed a remarkable slowing of E. coli growth. This is significant because E. coli is known to cause irritation and infections of the bladder and kidney. Native herbal medicines are usually consumed several times a day in quantities of approximately 100 - 150 ml per dose, for a period of about two weeks. Such an exposure would, in all probability, increase the concentration levels of the antimicrobial agent so that over a period of time the herbal medicines cited might effectively inhibit the growth of the microorganism.

It was thought that some activity would be evident against C. albicans and P. aruginosa in the medicinal decoctions #1 (Picea)

and #2 (Alnus), as these decoctions are used either for sore mouths or to treat burns and skin infections. Neither of these medicines showed any signs of activity against these two microorganisms. However, decoction #2 (Alnus), decoction #15 (containing Alnus) and decoction #13 (Shepherdia) all had a slight degree of activity against A. fumigatus. This result was not expected as these herbal medicines are used in the treatment of leukemia and/or cancer, and one would expect to find antiviral rather than antimicrobial activity.

According to the literature the pitches (oleoresins/essential oils) should show antimicrobial activity (Lewis & Elvin Lewis,1977; Tyler et al.,1981; Ryman,1984; Turner,1988; Evans,1989), but the results obtained from the disk diffusion method (Table 5) did not show any activity. Therefore, an attempt was made to disperse the pitch extracts throughout microorganism specific mediums. The pitch/agar mixtures were prepared so that the effect of two different concentration might be observed. The original concentrations in the flasks were 100g/L and 10g/L.

Unfortunately, the pitch would not blend or dissolve in the aqueous agar solution. Even the heat generated from autoclaving the

solutions three times did not enhance the situation. When the solutions were poured into tissue culture plates following the third autoclave, each flask containing the pitch/agar solution had a solid undissolved mass on the bottom of the flask and a ring of oils on the top surface. Thus, the final concentrations of the pitch/agar mixtures are uncertain. Qualitatively, however, the assays did reveal antimicrobial activity within a number of these pitch/agar mixtures.

The most striking of all, was the mixture of Picea glauca (spruce pitch) which totally inhibited the growth of all micro-organisms, while Pinus contorta (pine pitch) was able to inhibit the growth of E. coli and S. aureus in addition to significantly slowing the growth of P. aeruginosa.

The spruce pitch ointment (Picea), provided by Sophie Thomas, formed an emulsion when it was autoclaved. When the ointment was poured into the tissue culture plates it separated leaving a layer of oils on the surface of the agar. This mixture, although it did not totally inhibit the growth of the microorganisms, did retard the growth of S. aureus, C. albicans and A. fumigatus. Hence, the use of pitch, particularily spruce (Picea glauca) or pine (Pinus contorta), in

the preparation of poultices to promote the healing of wounds and sores is an effective remedy, as claimed by the many Native people who use these preparations.

The assays did establish that some well-known and often used Carrier herbal remedies do elicit antibiosis in microorganisms.

5.4. Further Assays

With technical assistance from Zyta Abramowski (laboratory technician) a cytotoxicity assay - colorimetric method - was used to test the anticancer activity of the "cancer" and "leukemia" medicines (decoctions #2, #13 and #15). The MTT method (Mosmann, 1983), was followed and mouse mastocytoma cells (P 815 from the Tumor Immunology Bank [ATCC TIB 64] were employed as the test reagent).

The preliminary assays were very promising and showed that the alder medicine (Alnus incana) possessed definite anticancer properties. The soopolallie medicine (Sheperdia canadensis) also showed some evidence of anticancer activity, but to a lesser extent than the alder.

The results of this preliminary assay indicate that the alder and soopolallie decoctions used by the Carrier people to treat leukemia or other forms of internal cancer do in fact contain anticancer ingredients, and would thus be effective therapeutic agents to use in the treatment of these disorders.

Further research will be required to determine the optimum concentrations of the crude plant extracts needed to produce cytotoxicity; and also to isolate the active, ingredients present in the plant extracts should preliminary tests warrant further study.

6.0 Summary and Conclusions

Ethnobotany, as its name implies, is an interdisciplinary science which combines the knowledge and skills of anthropology and botany, but which also requires the collaboration of many other disciplines including chemistry, pharmacology, history and nutrition to create a comprehensive portrait of an indigenous people's use of plants. Ethnobotany, the study of human/plant relationships, provides a broader view of a cultural group than does its sub-discipline ethnopharmacology, which is restricted to the study of drugs, or active principles in traditional medicines.

The use of plants for the drugs they contain goes back to the earliest days of civilization. Today, vast archives of knowledge and expertise are rapidly vanishing as many of the world's indigenous cultures are dying out or being absorbed into modern civilization (Linden,1991). The knowledge stored in the memories of the elders, healers, or hunters in indigenous societies is in many cases undocumented, and its loss is ultimately a loss to humanity. This ancient knowledge serves as a lifeline to our past when people lived in harmony with nature, accepting her authority and learning through

observation, trial and error. Much of this expertise and wisdom has already disappeared and much of what is left could be gone within the next generation (Linden,1991).

The indigenous peoples of North America had a great respect and love for the natural world. When plants were harvested for medicinal or other reasons, the collection was done with a sense of conservation and a knowledge of the local environment. The Native people of North America possessed a knowledge of herbal medicine rich in the use of bark, twigs, roots and leaves. The medicines prepared as decoctions, infusions, poultices and ointments were used to cure a myriad of ailments (Arnason et al.,1981; Johnson,1987; Turner et al.,1990; Turner & Hebda,1990).

The Carrier people, who inhabit the northcentral region of British Columbia, were primarily a hunting and fishing society who relied on the plants and animals of the northern plateau for their survival until the arrival of the fur traders and European settlers in the late 1800's. Over the past 150 years, the growth of European settlements in the area has contributed to the disruption of Carrier culture, and led to the erosion of many of the traditional values and

ways of life (Jenness,1943; Moran,1989). Today, there are only a few elders remaining who are cognizant of traditional Carrier folklore, rituals and herbal remedies - much of which may disappear forever with the passing of the present generation of elders. Thus, a documentation of some local plants and herbal remedies may allow the preservation of a small, but important portion of the cultural heritage of the Carrier people.

Like many other North American cultures, Carrier remedies generally consist of a single plant administered in the form of a decoction. The major sources of medicine are the barks, branches, roots and rhizomes of the local conifers, deciduous shrubs and a few perennials. Fresh plants are preferred in the preparation of many medicines although certain plants are harvested and stored for use over the winter months; these are never kept for more than one season. Important Carrier medicinal species, some of which have a wide variety of applications and modes of administration include: alder (Alnus incana), black currant (Ribes hudsonianum), choke cherry (Prunus virginiana), red-osier dogwood (Cornus sericea), red elderberry (Sambucus racemosa), subalpine fir (Abies lasiocarpa),

common juniper (Juniperus communis), kinnikinnick (Arctostaphylos uva-ursi), Oregon-grape (Berberis aquifolium), cow-parsnip (Heracleum lanatum), lodgepole pine (Pinus contorta), wild raspberry (Rubus idaeus), white spruce (Picea glauca), wild strawberry (Fragaria virginiana), wild sage (Artemisia frigida), soopolallie (Shepherdia canadensis), trembling aspen (Populus tremuloides), black twinberry (Lonicera involucrata), willows (Salix sp.) and yarrow (Achillea millefolium).

Long ago Native people recognized that the plants around them contained therapeutic, active ingredients. Today, 25% of the active ingredients dispensed in western prescriptions originate from plants (Phillipson et al.,1989). Plants are and will continue to be an important source of biologically active natural products. From a total of 120 plant-derived therapeutic agents 74% were discovered from documentation in ethnomedicinal records (Farnsworth et al.,1985; Cordell et al.,1991). Many of these active ingredients are the result of secondary plant metabolism produced by the plant to enhance its survival (Williams et al.,1989). The stress compounds which accumulate due to injury (eg. oleoresins and gums) have been

shown to be pharmaceutically important.

One of the most important aspects for the future of both ethnobotany and ethnopharmacology is the establishment of close working relationships among researchers in different disciplines: botanists, anthropologists, linguists, chemists, ecologists, soil scientists and others (De Smet,1991). The interdisciplinary approach of ethnobotany is the cornerstone of the discipline and is nowhere more apparent than in the field, as it is here that many different skills (i.e. ethnographic skills, plant collection and pressing skills, and an awareness of the biodynamic properties of plants) must be integrated in gathering field data.

Similarily, for ethnopharmacology, any analysis of the plants as medicines should not be detached from the people's own cultural system (Bernardi,1980). This is particularly important for some traditional medicines which may not appear to have any obvious pharmacological benefits. Substantial relief may be achieved, in certain disorders, from the placebo effect when the medicine is administered in a traditional, non-secular setting (De Smet, 1991). A positive psychosocial effect achieved through the use of a placebo

is an asset, and should not be ignored when evaluating traditional medicines.

Preliminary examinations of Carrier medicinal remedies conducted in this study indicated that a number of well-known, and often used preparations to promote the healing of wounds and sores contained active antimicrobial agents. The most effective of these being the spruce pitch ointment made from spruce pitch (Picea glauca) and lard (or traditionally, from bear grease). The spruce (P. glauca) pitch showed activity against five common human pathogens: E. coli, S. aureus, P. aeruginosa, C. albicans and A. fumigatus.

Preliminary assay results also indicated that both the alder medicine (Alnus incana & Salix sp.) prepared to treat "leukemia" and the soopolallie medicine (Shepherdia canadensis) for the treatment of internal "cancers" possessed definite anticancer properties. Further research is now required to determine if the anticancer effect was significant and if attempts should be made to determine and isolate the active ingredients producing this effect.

It is hoped that this work will be a beginning in the documentation of Carrier ethnobotany, serving not only as a

reference guide to some traditional medicinal plants, but also contributing toward the preservation of an important part of Carrier heritage. A more intensive study will be required to document the important plant species used as food sources, for technology, for scents and cleaning agents, for ritual and purification ceremonies, as well as any additional medicinal plants not noted here which are, or have been, important in the traditional life of the Carrier people. If this work serves as an initial step in the documentation of Carrier ethnobotany, or as the source of new data to augment health care, in western or non-western societies, it will have achieved a useful purpose.

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APPENDIX A

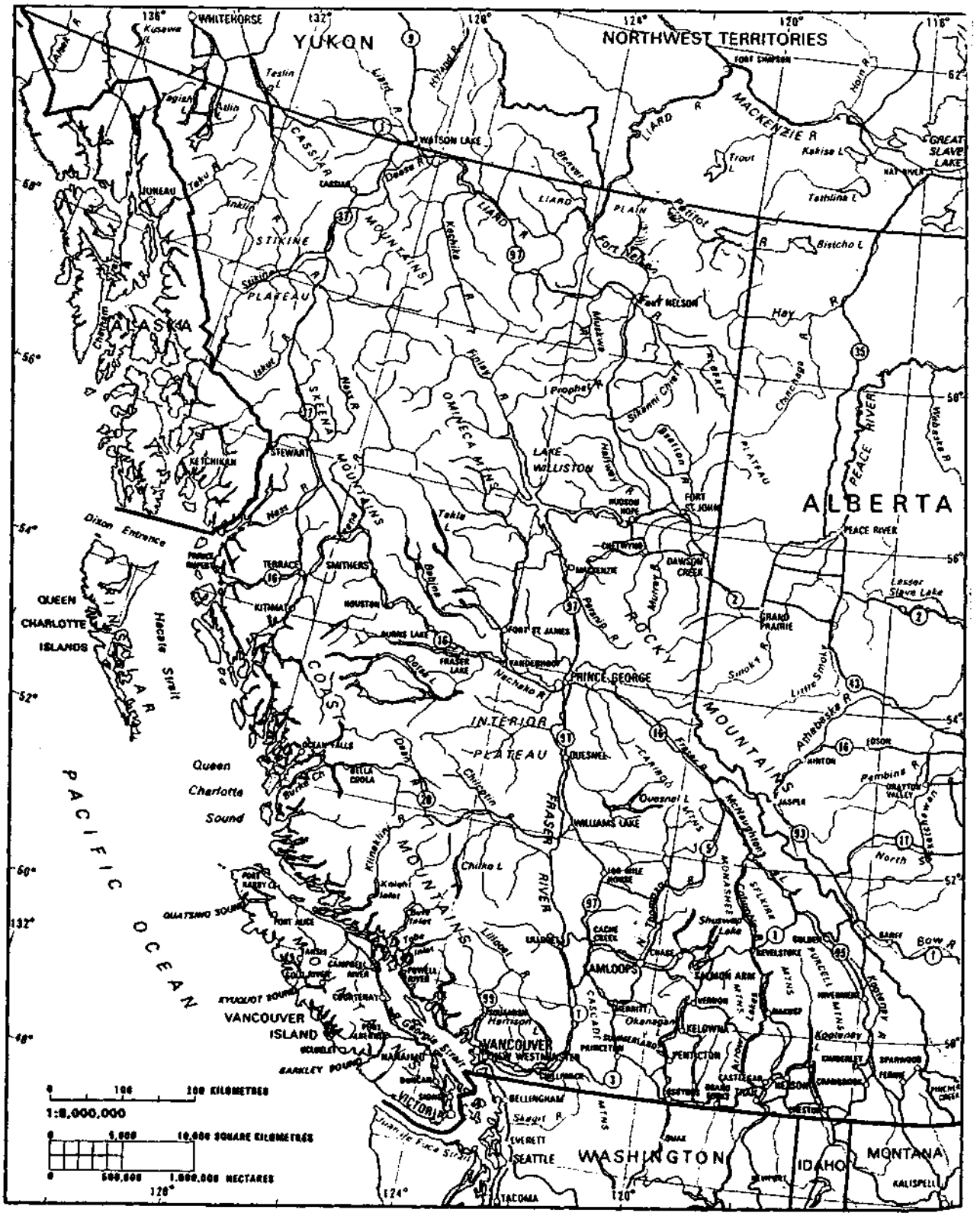
TWO SCIENTIFIC APPROACHES TO RESEARCH

BOTANY	ANTHROPOLOGY
Experimental Design -a standard experimental framework to test the effects of a controlled experiment. -goal is to reduce variability & focus on a limited set of predetermined measurements.	**Naturalistic Design** -leaves things as they are and doesn't try to manipulate the program or the participants being studied.
Hypothesis -a statement of hypothesis is made prior to data collection.	**No Hypothesis** -no statement of hypothesis is made prior to data collection. Hypotheses arise from the data.
Quantitative Data -generally is numerical and collected using scientific instruments,surveys & grids.	**Qualitative Data** -is descriptive and often collected by direct or participant observation, in-depth interviews, written documents, diaries & photos.
Deductive Analysis -involves the use of statistics to determine generalities or trends.	**Inductive Analysis** -content analysis to determine themes or hypotheses using domain & taxonomic analysis, or cognitive mapping.
Conclusions	**Generalizations**

(cf. Bogdan & Taylor, 1975; Bogdan & Biklen, 1982)

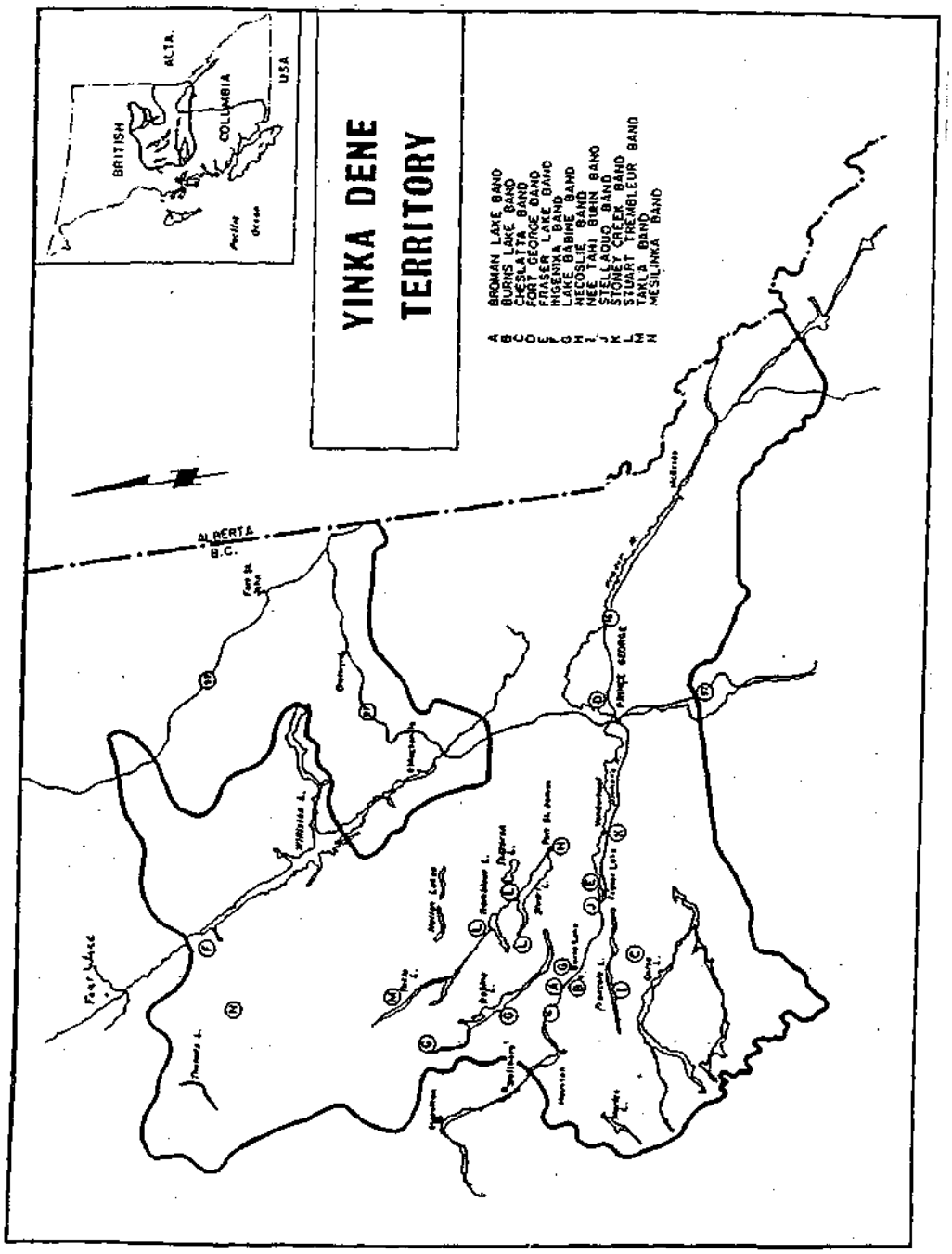
APPENDIX B

MAP OF BRITISH COLUMBIA



APPENDIX C

MAP OF YINKE DENE TERRITORY



Courtesy of the Carrier - Sekani Tribal Council, Prince George.

APPENDIX D MYTHOLOGY

The Orphan Boy and the Owl

[told by Sophie Thomas, 1991 - an adaptation of Mus dzi 'udada' The Owl (Rossetti, 1991)]

The little orphan boy stayed with his grandmother because his parents had passed on and now the old lady raised the little boy. But the owl took the boy away from the old lady.

One evening when the old lady and the boy were about to go to sleep, the little boy didn't want to go to sleep. He just kept crying and sitting by the campfire. Then all of a sudden a big fat beaver came down the steam and it attracted the eyes of that little boy. Just then the owl swooped down and grabbed the little boy and took him away. The little boy was then raised by the owl.

The owl used to go out every morning hunting, for something to eat, for the little boy. Soon the people started looking for the little boy and they asked every animal. They asked the crow (raven). The crow came along first and they told him, "We have lost our little boy and we never see him." The crow (raven) moved his head up and down, trying to tell the people the little boy was up somewhere but the people didn't understand the crow. Instead they blackened him up with charcoal, and that's how the crow (raven) turned black - long ago he used to be white.

The people kept on asking all the animals. Then one little bird told them, "the boy is up somewhere, you've got to look up", and they started looking up in the trees. Soon the people saw a big nest, that's how they came to it, and there was the little boy sitting in the nest.

The people decided they would take the little boy back. They decided that they would put a big stump in the boy's place and cover it, to pretend that the boy was sleeping. When the owl went out to find food for the little boy the people stole the child back.

Later, when the owl returned he told the little boy to take the top pack out of his bag because it was very heavy. The pack was full of animals that the owl had killed for the little boy. But nobody answered and the owl wondered what was going on. He

APPENDIX D (cont'd)

said "I'm going to whip you if you don't listen to me". Then he kept on waiting and he got so tired that he dropped the pack. When he went to throw the blankets off the little boy there was nothing there but a stump and then the owl started to cry. From that day when you hear that owl, when he is hooting, it is just like he is talking. He said, "you people, you didn't raise the little boy. I was the one who raised him ... Hoo ... Hoo ....Hoo", and he cried for the little boy.

The people told the owl (they had made a little bridge for him), "If you walk on this creek and you go out to the center of that stick and you rock back and forth, then we will give you back the little boy", they said to the owl.

So the owl believed the people, and he went out on the little bridge they had made for him. Then in the middle of that bridge the owl started to rock and the bridge collapsed and it broke. The owl was carried away with the rapids and was drowned.

The owl floated down the creek and must have got stuck in an eddy. A bunch of kids were playing in the yard and they saw the owl and they took it. "Grandma, we bring you owl feathers so you can make clothes for yourself", they told her.

The old woman had become so tired of her skirt that she threw that skirt into the fire. She never even made the owl feathers dry. Then she began to dry the feathers. Suddenly a big flame caught on the fire, and the feathers all went on fire. So the poor little old woman had no clothes and was left naked in the woods. At this sight the trees began to laugh, and they laughed and laughed. The old woman became cross and told the trees to stop. But they did not stop. So, the old lady took some ashes and she threw them at Poplar and Poplar stopped laughing but Jack-pine, he would not stop. He just kept on laughing. The old woman was very angry and she took her knife and cut the bark on Jack-pine, only then did he stop laughing.

And so today, the poplar has black marks like ashes and when you rub your hands on the bark it is like ashes on your hands - the poplar still carries them. That's how all the trees got marks. Those who laughed were cut to stop them from laughing and so today they are marked.

APPENDIX E MYTHOLOGY

Story about Sharing
(told by Sophie Thomas, 1991)

This story shows you how to share. You shouldn't keep everything to yourself because something tragic might happen and then it would be too late to think about what had happened. When we were children my grandmother used to tell us, "Sit down I'm going to tell you a good story", and then she used to tell us:

"Long ago when there was hardly any food, the old lady was weary and could no longer go out hunting for the kids anymore. So, to make ends meet, the kids had to go out everyday to search for something to eat. Sometimes they went the whole day and didn't get anything and had to go hungry. The old lady said to them, "You never talk to the Great Spirit that's why we are this way", she said to the little children. That night when they were going to sleep the little girl said, "I don't think I will make it until morning."

The next morning the little boy went out with his bow and arrow. The whole day he walked and walked and finally he found a red-headed woodpecker. He aimed at it, shot it and it fell dead.

On his way home the little boy plucked the feathers off. When he got home he cleaned the bird and put it on a stick. (You put the bird on the stick and then you put it on the side of the campfire - that is how they used to roast their food.)

The little boy roasted it and when it was about ready to eat his little sister begged him, "My brother, even if you give me a little bit- maybe a wing- maybe, I'll survive until morning", she told him. But the boy was so hungry he didn't notice anything or that the little girl was begging - he never listened. The little boy ate all of it himself and he let that little girl go to sleep hungry. She died in her sleep, that little girl. She didn't make it to the morning.

The children also had set fish traps in the creek for some fish to go in. The next morning the little boy got up he went down

APPENDIX E (cont'd)

to the creek to check his fish traps. The traps were all moving - full of trout. Then he thought, "Now we will all have our bellies full. I will make lots to eat, it will last us a long time", he thought and he ran up to tell his little sister - but his little sister was stiff.

He just sat, and then he went down to the creek and he sat on a rock and he cried. He cried so much that his eyes were all puffed up. He said to himself, "Why didn't I do that? I should have given her half of what I had last night. Now she would have eaten. We would have lots to eat now. Who's going to eat it? There's nobody."

His grandmother told him, "That's why I tell you - don't take anything all yourself. Always give - give - give." And a big sadness fell on that little boy. He lost that little sister who kept him company.

That's why from that day on when we learn this story we learn how to share. The Indian people never keep anything - even when you think somebody has lots to eat we will share with him what we have.