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Photo by Larm Rmah

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LUKANKA

Lukanka is a Miskito word for "thoughts"

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RUDOLPH C. RŸSER
Editor in Chief
Fourth World Journal

Three years ago I wrote in this space: "Fourth World scientific scholarship has entered into a new and exciting phase. No longer merely local knowledge (though it can be), and no longer considered primitive and backward as so often described by the learned exponents of the Enlightenment ..." with a considerable sense of celebration" [FWJ 142, 2016). The Center for World Indigenous Studies and, therefore, the Fourth World Journal, have been committed to applying traditional knowledge systems to current problems in the Fourth World through education, research and public policy. Since 1979 we have seen some success with this mission; and that the United Nations Permanent Forum on Indigenous Peoples in its 18th Session (April 2019) is focusing its agenda on "Traditional knowledge: Generation, transmission and protection" raises the visibility of traditional knowledge as a serious the topic. Recognizing "traditional knowledge" is one thing, but applying different traditional knowledge systems to actual problems moves the discussion toward solving problems using the most appropriate knowledge system. A problem of immense importance to Fourth World peoples is the value of foods and medicines to daily and generational security. It is for this reason that this issue of Fourth World Journal is dedicated to the application of knowledge systems to ensuring the benefits of traditional foods and medicines on which 80% of indigenous peoples worldwide depend.

This **Special Issue on Traditional Foods and Medicines** draws on the research conducted by scholars at the Center for World Indigenous Studies. The articles in this issue constitute our contribution to the global dialogue on the application of traditional knowledge systems focused on a critical problem affecting the lives of Fourth World peoples. It is our view that unless there is recognition of the many different traditional knowledge systems and systematic application of anyone of these systems to Fourth World social, economic, political, cultural and strategic problems, the popular recognition of traditional knowledge generally will be meaningless. We seek to find and implement traditional knowledge system-based study, research and analysis to the critical concerns of Fourth World peoples. Examples of study, research and analysis based in Fourth World Research Theory are included in this Special Issue of Fourth World Journal. As Activist Scholars we take seriously the need to conduct research and analysis that has near-term benefits for Fourth World peoples. This Special Issue is dedicated to this commitment.

The Center for World Indigenous Studies was gifted in 2017 with a significant grant from the Elina Vesara Ostern Fund administered by the California Community Foundation to conduct research on the medicinal/pharmacological uses of wildlife products for small communities, The Ostern Fund became a multi-year study entitled "Indigenous Peoples' Health: Effects of Elevated Atmospheric CO2 on Plant and Animal based Foods and Medicines" that has the goal of determining the extent and degree that increased carbon dioxide in the atmosphere due to human activity affects traditional foods and medicine nutritional and health benefits. As the Principal Investigator for this study I have written **Traditional Foods and Medicines and Mounting Chronic Disease for Indigenous Peoples Worldwide.** This essay discusses how the research is being conducted applying Fourth World Research Theory. I discuss how the "relational investigative approach" is being applied that reflects the multi-dimensional research approach of the Purépeche knowledge system. I explain how the research approach is being applied to five Fourth World communities or nations that are experiencing increased incidents of Type 2 Diabetes even as they rely on traditional foods. The essay is published in both the English language and in the Spanish language so as to provide a wider understanding of the approach being applied.

In **"Salish Medicinal Plants for the Prevention and Treatment of Diabetes Type 2" Dr. Leslie Korn**, Director of the Center for Traditional Medicine examines the plants that nature has provided that actually can serve as medicine to prevent and treat diabetes. Dr. Korn's research over the past forty years has been deeply influenced by the traditional knowledge system of the Cora in Central-Western México. Here work has been published in seven books and numerous articles with one distinct characteristic: application of the results of research to provide health and healing to Fourth World peoples. Dr. Korn's article applies Cora research approaches to the identification and description of plants typically found in the forest of Salish peoples living in southwestern Canada and northwestern United States plants taken from forests in countries around the world. The singular message of this important essay is that there are plants that can prevent diabetes, and even reverse this chronic disease that affects so many Fourth World peoples. Dr. Korn prefers to use the term "nutritional trauma" to describe the growing chronic health problems in the Fourth World largely created by growing reliance of Fourth World peoples on commercially produced and marketed foods rapidly introduced into Fourth World communities. Her article can help restore the nutritional and medicinal needs that increasingly plague indigenous peoples.

The Center for World Indigenous Studies research team conformed by Rudolph Ryser, Heidi G. Bruce, Dina Gilio-Whitaker, and Dr. Leslie E Korn conducted a year-long mixed-methods study that identified thirteen key policy recommendations for a tribal council to establish control over food access and regulation for tribal members. In **"Tribal Food Sovereignty Assessment – Toward Control of Food"** the authors detail the results of a detailed home survey, and economic assessment of tribal potential for economic benefits of food access and regulatory measures, and evidence that tribal health depends on restoring access to traditional plant-based and animal-based foods. The significance of this study is that it was conducted based in a theoretical framework that required employment of the tribal knowledge system, and the active involvement of major parts of the tribal community and tribal decision-makers. The study approach relied on a historical assessment of the

tribal community's food and cultural organization, a household survey that focused on food uses, extent of population chronic disease exposure, as well as preferences for commercial versus traditional foods, and finally, Talking Circles involving some participants in the household survey, general community and tribal government to focus on policy options. In addition, a Food Policy Council made up of five six tribal youth, a field coordinator, and elder mentor actively engaged in the study and formulation of outcome recommendations.

Center for World Indigenous Studies Herbal Medicine Intern **Ms. Naneh Israelyan** connects Armenian history, geography, plants and animals as significant factors in the types of herbal therapies available to Armenians in **"Fecund Earth: Plant Medicine Traditions in Armenia."** Israelyan is an active horticulturalist that cultivates a medicinal garden crafting medicinal tease and tinctures. This article documents numerous flowers, roots, trees and other plants native to Armenia, but increasingly available worldwide. Israelyan demonstrates the relevance of traditional knowledge about herbal medicines reflecting an intimate connection to the plant and medicines of her home country.

When Dream Bear Sings

Bertha Miller returns to the Fourth World Journal in this Special Issue on Traditional Medicines by reviewing **"When Dream Bear Sings, Native Literature of the Southern Plains"** and anthology of original stories (histories) edited the Gus Palmer. Miller echoes the importance of the selections in this work urging readers to understand different knowledge systems by recognizing the "theatric" importance of indigenous languages from the great lakes in North America to the lands to the west and south. As the editor points out "word-for-word" translations of indigenous languages tends to produce a form of "pidgin English." Recognizing the theatre or ceremonial accompaniments to speeches along with facial expressions, hand and body gestures, Miller asserts is critical to truly understanding the meaning intended by the indigenous speaker. This observation is critical to understanding traditional medicine since the mere extraction of medicinal compounds from plants as is the tendency of conventional sciences results in missing the true knowledge conveyed by healers and herbalists in indigenous communities.

In this Special Issue on Traditional Medicine we bring together the key elements for more fully appreciating herbal medicines, traditional foods, language, research and their significance in Fourth World Communities through the application of traditional knowledge. We are especially pleased to devote Center efforts in this Special Issue to elaborate Traditional Medicine in a different light.

Traditional Foods and Medicines and Mounting Chronic Disease for Indigenous Peoples Worldwide

By Rudolph C. Ryser, PhD

(This article was written as part of the Center for World Indigenous Studies Research Study on the medicinal/pharmacological use of wildlife products for small communities supported by a grant from the California Community Foundation's Elina Vesara Ostern Fund)

ABSTRACT

This essay discusses the rationale, theoretical foundation, method and focus of the two-year study: **"Indigenous Peoples' Health: Effects of Elevated Atmospheric CO2 on Plant and Animal-based Foods and Medicines"** undertaken by the Center for World Indigenous Studies beginning in late 2017. The study employs a relational investigative approach aimed at establishing the effects of elevated atmospheric CO2 on traditional plants and animals on which indigenous peoples rely for their daily diet. There are many factors such as "nutritional transition" where Fourth World (indigenous) peoples have become reliant on commercially produced foods and medicines, industrial development intervening through mineral extraction, oil extraction and construction of towns which have all contributed to adverse health effects among Fourth World peoples. Researchers (conventional and indigenous) have identified evidence that elevated CO2 in the atmosphere may contribute to a significant decline in micro-nutrient and macro-nutrient values in plants and animals and increase sugars—potentially contributing to increased incidents of chronic disease. While increased CO2 levels (and other greenhouse gases) in the earth's atmosphere contribute to Global Warming—regularly referred to as "climate change"—the great concern in public research and public discourse is that the radically varying weather patterns contribute to destruction and growing risks of damage to human infrastructure and other economically important activities throughout the world. The "health factor" is usually associated with increased temperatures directly affecting human health, but the food base that is reliant on photosynthesis to produce the nutrients and medicines on which human beings rely tends to be ignored. In this article the author discusses the multivariate factors limiting orthodox researchers examining plant-based and animal-based food, medicines used by Fourth World communities that prevent a full understanding of growing levels of chronic disease among Fourth World peoples. This analysis may provide valuable information for future research and for reporting to indigenous health leaders as well as orthodox health providers concerning the use of plant-based and animal-based for food, medicines, and pharmacological support.

Key Words: Fourth World peoples, climate change, atmospheric CO2 levels, wild foods, plant-based, animal-based, traditional medicine, ethno-botany, indigenous health, food policy

Fourth World nations around the world live under conditions of frequent, if not constant, threat to their cultural, social, economic and political continuity as culturally distinct peoples. The threats come in the form of military violence committed by state authorities and notably development carried out by industrial societies through their constant expansion into biodiverse regions of the world to gain control over the use of petroleum, conduct of nuclear tests, establishment of cities, extraction of minerals and coal, clearing of forests to set up industrial farming and taking of timber for pulp and precious wood, and commercial taking of plants and animals for foods and pharmaceuticals. The consequence of these activities conducted in the name of "growth to increase stock payouts and stock margins" is the production of enormous quantities of nuclear, commercial, medical, and human waste, plastics, elevated levels of CO2 and other gases in the earth's atmosphere driving global temperature ever higher. The combination of constant "development expansion" and waste not only spoils earth's environment threatening the life of every living being on the planet, but indigenous nations are the first to receive the adverse effects. Indigenous nations, like the proverbial canary in the coal mine (I had to use this industrial metaphor), suffer from the adverse effects of constant development pressing into their territories and breaking down the biodiverse environments in which they live. They are the first in the world to die or become chronically ill due to the uncontrolled industrial disaster ravaging the Fourth World largely unnoticed by industrial peoples.

While I recognize the extensive damage to indigenous nations by industrial development and waste production, indigenous peoples' reliance on plants and animals for foods and medicines from biodiverse environments appears to be seriously endangered by elevated levels of CO2 in the earth's atmosphere. The Center for World Indigenous Studies (CWIS) is conducting a multi-year study to assess the actual and potential adverse effects on plant-based and animal-based foods and medicines and the potentially changing nutritional and medicinal values of those foods and medicines on which indigenous peoples rely. This essay discusses factors, theories and methods applied in the CWIS study entitled, **"Indigenous Peoples' Health: Effects of Elevated Atmospheric CO2 on Plant and Animal-based Foods and Medicines."**

Incidents of chronic disease in countries worldwide (e.g., diabetes, heart disease, kidney disease, cancers, anemia, wasting, iron deficiencies, low birth weight) have increased at a steady pace since the beginning of the twentieth century. Rates more rapidly increase for Fourth World indigenous peoples living in rural and biologically diverse areas while lower rates of increase are occurring for non-indigenous peoples living in urbanized settings. One third of the deaths due to diet and physical

activity related chronic disease between 1960 and 2007[1] or 16.6% of all deaths were recorded by the Center for Disease Control for the United States populations. While for the general population of countries such as India, Brazil, Mexico, China, Australia, and Canada, there is a slow rise (possibly associated with population increase as a factor) in incidents of chronic disease, state health institutions generally report that, in urban and suburban areas, through various prevention and treatment methods, the increases in heart disease, Type 2 Diabetes and obesity increases have slowed. This is in contrast to academic and health agency reports that chronic diseases (Type 2 Diabetes, Chronic Kidney Disease, Heart disease, etc.) among indigenous peoples continue to increase unabated in countries as diverse as Australia, Nigeria, India, Brazil, Canada, and China ("Chronic disease in China" 2018; Garcia-Garcia et al., 2015; Harris et al., 2017).

Clearly there are factors associated with the changes in chronic health results for indigenous peoples that are not fully reported or understood. Indeed, researchers in the state institutions frequently report that they lack access to indigenous communities and cannot document evidence associated with indigenous communities unless people from these communities use facilities sponsored by universities and state agencies for treatment. And the primary emphasis of these agencies generally has been chronic disease management instead of prevention. Most researchers approach chronic health research as a "top-down" proposition or from a deeply "reductive" perspective. When examining causes and preventions of chronic disease for indigenous peoples there are, as some researchers report, serious obstacles including lack of access to populations, narrowly focused research on only individuals who have access to health clinics or hospitals, and significantly the general fact that data that may exist in institutional records have not be disaggregated to separate out indigenous peoples as a specific cohort. The consequence of these obstacles is that virtually all published research and even data provided by indigenous health centers tend to be skewed to only cohorts served in clinics and hospitals with variable definitions of "indigenous" recorded in databases.

With the obvious shortcomings of state generated chronic health data some researchers report the incidence of chronic disease among Fourth World (indigenous) peoples around the world as trending significantly upward (Harris et al., 2017)—exceeding the incidence of chronic diseases in the non-indigenous populations. Indigenous peoples in virtually every country where they are located experience many preventable diseases such as Type 2 Diabetes, obesity, wasting, cancers, heart disease, arthritis, chronic kidney disease and allergies. Yet, despite even superficial evidence of rapidly increasing levels of chronic diseases among the many different indigenous peoples around the world, very limited research or analysis of the problem focuses on their causes and prevention. When causes are mentioned, alcohol consumption, tobacco use and lack of physical activity are commonly referenced and treatment is focused on managing the disease.

Epidemiological Transitions over Time

Epidemiological transitions have typically fol-

[1] Mokdad, A.H., Marks, J.S., Stroup, D.E., Gerberding, J.L.(2004). Actual cases of death in the United States, 2000. JAMA,291:1238—45.

lowed a pattern in human history. To better understand the advancement of health changes in populations in relation to death rates researchers postulate stages of epidemiological transition beginning with the Age of Pestilence and Famine (roughly dated as before the Neolithic Age 7000 BCE – 9000 BCE to about 1,750 AD), followed by the Age of Receding Pandemics (about 1750 – 1920), and the Age of Degenerative and Age of Man-Made Diseases (1920 to 1960) (Omran,1971, 2005; Popkin, 2002). To these transitions I would add the "Age of Human-made Disease, overlapping the previous age and running from about 1920 to the present day.

The Age of Pestilence and Famine is characterized as a period of high and shifting mortality rates in the population reducing the potential for sustained growth. This is a period of epidemic infections such as tuberculosis, cholera, typhus, smallpox, famine, and unsanitary conditions and diseases transmitted from other animals (zoonotic diseases). The average life expectance is between 20 and 40 years and childbirth mortality is high.

The Age of Receding Pandemics can be described as a period of mortality decline and as epidemics peak and then decline, so does the mortality. In urbanized areas the average life expectancy improved to 30 to 40 years. For Fourth World communities coming into closer contact with urbanized, industrialized societies, tuberculosis, smallpox, measles, cholera and similar "Age of Pestilence" diseases persisted while zoonotic diseases begin to decline. Life expectancy is about 30 to 50 years. Population begins to grow.

Age of Degenerative Disease including heart diseases like cancers and strokes begin to dominate populations in industrialized societies, yet life spans improve to 70 years and more. Among indigenous societies life expectancy is still hampered by pandemics and diseases associated with the "Age of Pandemics" due to proximities to industrialized societies and expansion of industrialized societies into indigenous territories.

Age of Human-made Disease includes the rise of chronic disease such as diabetes, obesity, new cancers, hypertension and associated heart disease, chronic kidney disease, and malnutrition, wasting, low child birth weights and, for increasing numbers of women outside industrialized societies, iron deficiencies and other micro-nutrient deficiencies including zinc, manganese and copper (Cohen, Tirado, Aberman, & Thompson, 2008) due to industrial development, environmental damage, industrialized food production, and population development pressures. Industrial societies develop management approaches to reduce the adverse effects of the factors producing chronic diseases, but indigenous people are unable to prevent the expanding interventions into their societies.

The proposition of epidemiological transition is postulated on the premise of "progressive time" that defines conventional scientific analysis (time occurring from the "primitive to the advanced in perpetual motion") as contrasted with "spiralist time" (time occurring with a past, present and future all occurring simultaneously) that is more typically characteristic of time conceived by Fourth World peoples (Atleo, 2004, 2005; McDonough, 2010; R. Rÿser, 2015; R. C. Rÿser, 1997; Stone, 2004). The Fourth World health reality appears to be reflective of all transitions from pre-Neolithic to contempo-

rary—thus suggesting the indigenous measure of time of simultaneity is an important distinction to understand. In other words, many conditions typical of each of the transitional phases do appear among indigenous peoples though among urban populations most have lapsed.

Orthodox, reductionist researchers performing inquiries for the World Health Organization, the Science and Research Board, New Delhi, India and the Department of Community Medicine in Kerala State, India, generally conclude that deteriorating chronic health conditions among Fourth World peoples are due to "poverty, lack of cleanliness, infrastructure inadequacy" (Nalinam M., 2016) and lack of education. The solution to the growing levels of chronic disease is repeatedly stated by researchers as a need to "change behavior" in connection with food consumption and physical exercise. For indigenous peoples it may not be accurate to suggest that "behavioral change" is appropriate. Instead, the advances of industrial development and urbanization into indigenous peoples' lives and territories may be the culprit that requires change.

Disaggregation of Fourth World Health Data

States' governments and their subsidiary institutions collect and maintain social, economic, and health data descriptive of the populations they serve. These figures are generally "global" unless specific cohorts are defined in terms of specific circumstances. In the United Nations World Conference on Indigenous Peoples Outcome Document (2014) the consensus document committed all states' governments to the proposition that social, economic and health data specifically descriptive of each indigenous population within their boundaries must be "disaggregated" as discrete information (UNWCIP, 2014). As of the publication of this article, no state in the world has as yet undertaken to separate indigenous peoples' social, economic and health data in databases or any other form.

Perhaps the closest researchers may get to disaggregated data about the health and nutrition of indigenous peoples is to focus on the work of the nutritionist Dr. Harriet Kuhnlein[2], director of the Centre for Indigenous Peoples' Nutrition and Environment (CINE) at McGill University in Montreal, Canada. Her work over more than 35 years has documented traditional foods, their nutritional benefits, the community health and social and environmental conditions of specific indigenous populations conducting research on the ground and in the communities. In recent years Kuhnlein's team of researchers has contributed to major studies on targeted populations under the aegis of the United Nations Food and Agriculture Organization. Perhaps the greatest benefit of these studies is that they specifically test the nutritional values and uses of traditional foods for each indigenous community. It becomes possible then, to examine the health, nutritional and medicinal values of plant-based and animal-based foods and medicines used by particular indigenous societies in many different ecological and environmental circumstances. The data provid-

[2] Harriet Kuhnlein is a nutritionist based with the Centre for Indigenous Peoples' Nutrition and Environment (CINE) at McGill University, Montreal. Her research with Indigenous Peoples spanning more than 35 years is participatory, and includes many cultures of Indigenous Peoples in various parts of the world. Recent publications engage twelve diverse cultures of Indigenous Peoples and have the overall intent to provide evidence that biodiversity inherent in traditional food resources of Indigenous Peoples foster food security and good health. These local food systems can form the basis of health promotion actions and contribute to poverty reduction; they should be environmentally protected.

ed by Kuhnlein's team of researchers can open the door to more detailed consideration of the relationship between the consumption of traditional foods and medicines over time, commercial influences such as processed foods and urbanization, and the apparent increased incidence of chronic diseases in Fourth World communities.

Kuhnlein's team notes the important connection between culture, traditional knowledge and the exercise of community control over plant-based and animal-based foods and medicines. The team lists five factors (Kuhnlein et al., 2013):

- access to, security for, and integrity of lands, territories, natural resources, sacred sites and ceremonial areas used for traditional food production;

- abundance, scarcity and/or threats regarding traditional seeds, plant foods and medicines, food animals, and the cultural practices associated with their protection and survival;

- use and transmission of methods, knowledge, language, ceremonies, dances, prayers, oral histories, stories and songs related to traditional foods and subsistence practices, and the continued use of traditional foods in daily diets;

- Indigenous Peoples' capacity for adaptability, resilience and/or restoration regarding traditional food use and production in response to changing conditions;

- Indigenous Peoples' ability to exercise and implement their rights to promote their food sovereignty.

It will be necessary to consider elaborating on the fourth factor concerning adaptation to change by detailing the iatrogenic effects of conventional medicine and nutritionists as well as human-caused environmental, biodiversity and climate changes beginning in the 1750s with the Industrial Revolution.

Kuhnlein's response to the health and nutrition damage giving rise to growing chronic disease problems in indigenous communities is to encourage the restoration of traditional food sources and the consumption of plant and animal- based foods and medicines historically associated with the indigenous community. The Center for World Indigenous Studies advanced the same proposition through a series of "Culture, Foods and Medicines" workshops in the late 1990s premised on the concept that restoring the use of traditional foods and medicines would reduce and eliminate chronic diseases. Studies by the Center for World Indigenous Studies found that in several communities the chronic disease symptoms actually declined.

While there is agreement between Kuhnlein's CINE and the Center for World Indigenous Studies concerning the benefits of restoring traditional food systems for specific communities, recent investigations raise the possibility that, while restoration of traditional foods actually does improve community health and reduces the incidence of chronic diseases, other factors may now intervene to undermine the premise of restoration. The rapidly increasing levels of CO2 in the earth's atmosphere may work to over energize the photosynthetic processes particularly C3[3] and to some extent C4 plants resulting in greatly increased sugar concentration in plant cells and reduced proteins, micronutrients and vitamins. The result is that many C3 plants convert into sources of sugars that can contribute to chronic diseases.

Forest and jungle animals and commercially raised animals may also consume plants (both traditional plants and cultivated plants) containing higher levels of sugars. When human beings consume the animal flesh the animal metabolic reactions to higher sugars and lower protein and micronutrients can be passed on to human beings—affecting human health and nutrition. The result may be that when humans eat animal flesh, the levels of nutrition may also decline.

Obtaining Health Data Directly from Indigenous Nations

Because the aggregated health data collected by state institutions is absent, the Center for World Indigenous Studies is conducting The Indigenous Peoples' Health: Effects of Elevated Atmospheric CO2 on Plant and Animal based Foods and Medicines research study, relying on the Kuhnlein on-site data for six nations located in a variety of ecosystems in the African continent, Asia and the western hemisphere. The conventional scientific community and indigenous scientific community have conducted inquiries into the effects of "elevated CO2" in the atmosphere on the nutritional and medicinal values of plants and animals. More than 1,000 studies focusing on primarily cultivated C3 plants have been conducted under the sponsorship of corporations and state institutions as well as indigenous health agencies. The CWIS recognizes that numerous methodologies and target plants and some animals have been employed and the principal method for cross study evaluation is usually a meta-study. CWIS has collected several meta-studies and single focus studies seeking to apply a traditional knowledge system to evaluate the effects of elevated atmospheric CO2 on the health of peoples reliant on traditional plants and animals for food and nutrition.

The five nations selected for the CWIS inquiry include the Nuxalk Nation in western Canada, Awajun in northern Ecuador, Karen Nation in eastern Burma and western Thailand, Bhil in western India and Igbo in southeastern Nigeria. The choice of these nations is based on the completeness of data collected and the range of ecosystems represented. Plants and the animals consumed by indigenous peoples fall into three broad metabolic categories designated by virtue of the photosynthetic process of fixing carbon from the atmosphere turning CO2 into organic molecules such as carbohydrates, fats and proteins. The vast majority of the world's plants (85%) are classified as C3 including common plants such as spinach, peanuts, cotton, wheat, rice, barley, and most trees and grasses. These plants extract carbon from the atmosphere and then release 25% of that carbon back into the atmosphere—a process called photorespiration—affecting the water retention of the plant. This is due to the structure of cells in the plants. Three percent of the world's plants are C4 plants including mostly flowering plants, including maize, sugar cane, millet, sorghum, pineapple, daises and cabbage. These plants retain most of the CO2 taken from the atmosphere. A third group of plants is classed as CAM (crassulacean acid metabo-

[3] Eighty-five percent of all plants including commercially grown wheat, rice, soybean, grasses, spinach and similar broadleaf plants, barley, rye, berries, nuts and all trees are among the C3—the primary food source for the planet. These plants do not have the adaptation necessary to reduce or prevent photorespiration that causes the plant to extract oxygen instead of carbon dioxide from the atmosphere causing some of the energy from photosynthesis to be wasted. C4 plants have different cell types permitting them to separate the initial fixation of carbon dioxide and the Calvin Cycle and thus preventing photorespiration. CAM plants (Crassulacean acid metabolism) reduce exposure to photorespiration and save water in their cells by actively separating processes between day and night.

lism) that efficiently store water. They include cacti, sedum, jade, orchids, and agave. The geographic location, ecology and biodiverse community strongly influence which of the plant metabolic categories apply. The central issue of importance with these three categories is the effects of elevated CO2 in the atmosphere on the nutritional and medicinal values of the plants. Similarly, the nutritional values that may change with higher levels of CO2 absorption can affect the nutritional values of animal (sea and terrestrial) consumption. The effects of elevated CO2 in the atmosphere on the nutritional and medicinal values of plants may be a hidden factor in the increased levels of chronic diseases experienced by Fourth World communities.

The Center for World Indigenous Study seeks to assess the degree to which elevated CO2 in the atmosphere affects both cultivated and traditional plants and animals in terms of nutritional and medicinal values, and thus the health of Fourth World communities. The CWIS study focuses on several nations that are historically or currently dependent on traditional plant and animal foods found in their biodiverse environment. Each nation is experiencing increased levels of chronic diseases. A brief description of each nation follows.

Nuxalk

Nuxalk is a nation located on the southwest coast of Canada on the Bella Coola River system with a population of 3,000 people. Talyu, Suts'lhm, Kwalhna, and Q'umk'uts are the nation's main villages located on rivers flowing through the nation's territory[4]. Nuxalk consider themselves a "fish people" with their significant historical and contemporary reliance on salmon, oolichan, and seal as major contributors to their diet, material wealth and their cultural practices. According to the Food and Agriculture Organization, the Nuxalk are 30% reliant on 67 species and varieties of plants and animals (Kuhnlein, Erasmus, & Spigelski, 2009). Cultural changes and health problems became significant factors in Nuxalk life due to reduced food types and increased reliance on non-Nuxalk influences. These included deforestation, which caused food sources to become more remote from main villages, along with intensive interventions into Nuxalk villages and rivers by industrial development by the Canadian government.

The Nuxalk are reported to be suffering from alcoholism, poor dental health, obesity, diabetes and conditions associated with high-risk infants. These pathologies are now full-blown among the Nuxalk despite the fact that prior to 1950 there was no evidence of any of these conditions. Prior to 1950 the Nuxalk population relied primarily on local foods and medicines from the surrounding environment, rivers and the ocean (Kuhnlein et al., 2013, 2009).

Typically, before Canadian interventions Nuxalk experienced a balanced diet without the pathologies by consuming wild greens and berries [e.g., black hawthorn, blackcap raspberry, crowberry, kinnikinnick berry, huckleberry, rose hips and thimbleberry], hemlock inner bark, wild game (moose, deer, rabbit) and fishes (flounder, herring roe, salmon (five varieties) dried, smoked and raw ooligan (also oolichan) and the grease extracted from ooligan, and trout. These plant and animal species and varieties provided the full complement of vitamins, minerals (macro and micro) as well as carbohydrates, fats and proteins supporting early childhood, maternal and adult diets (Kuhnlein et al., 2009, 35).

[4]Retrieved on December 15, 2018 from https://nuxalknation.ca/about/

But, by the 1950s and 1960s young girls no longer consumed the many berry species, hemlock inner bark, herring, sea urchins, abalone, mussels, seal and mountain goat and rabbit (Kuhnlein et al., 2009. 34). The generational shift from preferences for traditional foods to reliance on imported foods and medicines seemed to significantly contribute increased levels of chronic disease (obesity, Type 2 Diabetes, heart disease, etc.). While the chronic pathologies have increased throughout the Nuxalk population, reliance on many traditional foods continue even though environmental contaminations and reduced harvests have undermined consumption. The salmon, trout, herring, cod species, salmon eggs, some berries that are accessible (blackcaps, wild raspberries, salmon berries, soap berries) thimbleberry and salmon berry sprouts, seaweed, Labrador tea, cow parsnips, deer, moose, duck and grouse continue to be consumed albeit in lesser quantities and less frequently.

Since the Nuxalk are now 30% reliant on traditional foods, and the remainder reliant on commercially produced, imported foods and medicines, it is possible that this reduced reliance is wholly responsible for the increased levels of chronic disease. But, it may also be a concern that the wildcrafted foods that continue to be consumed are of lesser nutritional and medicinal value owing to environmental, ecological and climate changes.

The bulk of Nuxalk plant-based foods are C3 type plants, which renders them more vulnerable to photosynthetic processes that reduce productivity and increase sugars. The process may lower protein and micronutrient content due to elevated CO_2 in the atmosphere and consequent effects of adverse photorespiration.

Awajun

The Awajun nation of 8,000 people is located in an 86 square mile territory on the Marañón River in 52 communities at the northern border of Peru with Ecuador[5]. The Awajun are 93% reliant on 223 species and varieties of plants and animals in their territory (Kuhnlein et al., 2009). While the Peruvian life expectancy average for both sexes is 75.5 years, it is notable that 50 percent of the Awajun die before reaching 40 years, though the population strength appears to be maintained as a result of high fecundity with more than 7 children born to each woman. Their primary health pathologies include early childhood deaths (where 25% die before the age of 9), parasitosis, malnutrition, stunting and anemia attributable to changing "ecological, cultural and food systems" (Kuhnlein et al., 2009).

The tropical rain forest environment is conducive to the wild crafted and cultivated foods on which the Awajun depend. The Awajun people are agriculturalists as well as managers of the rainforest producing the foods on which their diet depends. They produce sugar cane, coffee, papaya, achiote, pineapple, sacha papa, sweet potato, red peppers and a wide range of medicinal plants including ginger, garlic, coriander, and lemon grass. Fruit trees are cultivated to produce arazá, carambola, aquaje, pijuayo and cacao.

Karen

The Karen nation of about 9 million people is scattered in Burma along the eastern border in the states of Kayah, Shan, Ayeyarwady, Southern Kaw-

[5]Retrieved on December 12, 2018 from http://www.orgbyvio.com/awajun/

tholei and in western Thailand where they are under frequent armed attacks and village burnings by the Burmese military. Hundreds of thousands of Karen fled their villages in Burma to internally displaced persons' camps (IDP) and to refugee camps on the western border of Thailand beginning in 1984. The study community is Sanephong with a population of 661 inhabitants in 126 households located in the Thungyai Naresuan National Wildlife Sanctuary northwest of Bangkok, Thailand. The remote village is only accessible by a mountainous and muddy trail or by four-wheel-drive vehicles through muddy paths. The Thai government heavily restricts the Karen community in Sanephong as to the plants and animals that can be harvested due to the wildlife sanctuary designation of the areas around the village. Food sources are then a combination of farming and gathering from four specific cultivation, and gathering locations ranging in size from 4.8 hectares to 320 hectares. In these locations families grow bananas, mangos, jackfruits, gourds, pumpkins and wet rice. Fresh water fish are taken with other aquatic animals (crabs, shells, shrimp, frogs) along with plants and vegetables (on the banks) from the Kheraw-Khi, a perennial stream from nearby mountains. Rice is the dominant base food on which members of the village rely.

The Karen (Burma, Thailand) are 85% reliant on 387 species and varieties of plants and animals. Researchers identified about 387 traditional food species and varieties where 17% were animals and 83% were plants. Of the animals, ducks, cows, buffalo and goats are domesticated, and 51 rice and root varieties, 89 vegetables and 37 fruits are cultivated while 126 varieties are harvested from the forest.

The village of Sanephong, unlike the refugee camps where more than 150,000 Karen are held in eight locations along the Thai eastern border, is organized with a primary school that promotes health and nutrition and offers gardens, a milk program, daily lunches and support with iodized cooking salt and weekly iron supplementation. The village also has volunteer health workers responsible for primary health care. Generally, the village of Sanephong depends on foraging and domestication with the purchase of food increasing as the market economy has been entering the village. Still, locally grown rice has remained the main source of food energy while animal sources for protein are available but not abundant. Fruits, vegetables and some wild game, such as green frogs and crickets, contribute to the bulk of macronutrient support. Carbohydrates constitute more than 70 percent of the total energy intake for Karen children in this village. While infants appear to receive sufficient nutrition from breast milk, children aged 2-12 were found to have deficient intake of vitamin A and vitamin C; and iron and calcium intakes were also found to be very low (Kuhnlein et al., 2009, 180). Significant fruit consumption for children has proved problematic with many experiencing abdominal discomfort and diarrhea in infants.

Bhil

Bhil are the largest pre-Aryan indigenous nation in India with a combined population in excess of 16 million people located in southeastern Pakistan and western India. Part of the Bhil population is located in mountainous regions in Madhya Pradesh, Maharashtra, Gujrat, Karnataka, Tripura, Andhra Pradesh, Chhattisgarh and Rajasthan states and Sindh state in Pakistan. The population is mainly engaged in farming drawing on plants

(greens, roots, fruits) and animals including fish and deer from nearby rivers and forests. The Bhil population located in the Dang district of Gujarat state is the primary data source with a population of 11,500 people in 53 villages. Neighboring indigenous peoples include Kolchas, Kotwalias, Kuknas and Warlis. A quarter of the Bhil population is gainfully employed earning an average of $500 annually with fishing and hunting and gathering 95 species and varieties of animals and plants in the forest is usual (Kuhnlein et al., 2009, 212).

The Bhil in the Dang District cultivate cereals such as amaranth, millet, rice, sorghum wheat and maize. Fish and other seafoods include shark, mandeli, duck, crab, and other smaller river fish including ravas, kokil zinga and muru. Cultivated vegetables include mushroom, bamboo, red pumpkin, bottle gourd, scarlet runner beans, eggplant and fenugreek. Bhil consume animal-based foods from cows, goats, rabbits, rat, wild pig and monitor lizard and poultry including pigeon, whistling kites, woodpeckers, parakeets and parrots, as well as traditionally captured ghuvad, chakvat, and titar. Fruits, nuts, seeds pulses and legumes play a major role in the Bhil diet including: Sapodilla fruit, Custard apple (sweetsop), jackfruit, Papaya, gooseberry, wild figs, tomato, mango and guava; and pulses include red gram dhai, field beans, soybeans, lentils, peas, cow pea; and roots are an important part of the diet including Elephant foot (yam), Colocasia, spinney yam, sweet potato, potato and red tubers.

An in-depth study of India's chronic disease profile concluded " that chronic diseases will account for slightly less than three-quarters of all deaths in India by 2030" (Patel et al., 2011).

"Generally, tribals consume foods like wild tubers and flowers, for which information is not available in nutrition composition tables. Thus, information of these foods was not reflected in the consumption of various nutrients" (Laxmaiah et al., 2015).

"Multivariate regression analysis showed that age, education, HH wealth index, tobacco use, alcohol consumption, high BMI, abdominal and truncal obesity are risk factors for hypertension among tribal men and women in India. Higher risk of hypertension among illiterate tribal women was similar with findings reported by other studies" (Laxmaiah et al., 2015). "The use of natural substances, particularly plants, to control diseases is a centuries-old practice that has led to the discovery of more than half of all modern pharmaceuticals" (Priyanka & Shrikant, 2014)

Igbo

The Biafra Nation includes Igbo with an estimated 32 million along with the Efik, Ibibio, Annang, Ejagham, Eket, Ibeno and the Ijaw located in southeastern Nigeria on the Atlantic Coast and bordering the Republic of Cameroon. The Igbo led a secessionist war against Nigeria (that had itself only recently become a state after British colonial rule) to establish the Republic of Biafra between 1967 and 1970. Their Republic was recognized by Gabon, Ivory Coast, Tanzania and Haiti and received aid and support from seven other countries including France, Norway and Israel. The war devastated the Igbo resulting in more than 2 million people killed. This background is directly relevant to understanding the focus of the Kuhnlein study that focused on eight communities randomly selected in four states: Ohiya/Huhu in Abia State and Ezinifite/Aku in Anambra State, Ubulu-Uku/Alumu in Delta State and Ede-Oballa/Ukehe in Enugu State. Thus these Igbo communities are included in the CWIS study.

The combined population of these communities is estimated to be in excess of 500,000 people with the Ede-Oballa comprising the smallest at 12,447.

The geographic and environmental character of Igbo areas may be best described as plains that are less than 200 meters above sea level. The land experiences rainy seasons with variations from year-to-year. Consequently, there are essentially two seasons: rainy, and hot and dry.

The health status of the general populations in the whole state of Nigeria described 42% of the children as stunted, 25% as underweight and 9% wasted. In the southeast the Igbo were described as being characterized as 20% children stunted, 5% wasted and 8.5% underweight. The Igbo population described in 1993 was experiencing micronutrient deficiencies specifically associated with limitations of Vitamin A. Iodine and zinc deficiencies are associated with as high as 27 percent of the mothers and pregnant women in the Igbo population. These deficiencies seem to have persisted despite iodine and β-carotene being readily available in three leaf yams, yellow hams, and zinc and iron in banana's plantain, bread fruits, cashews and legumes. Stunting and wasting can be attributed to dietary deficiencies in nursing mothers as well. A food preparation such as Achicha (dried cocoyam mixed with pigeon pea, oil bean, palm oil and green leafy vegetables) is rich in iron, zinc, β-carotene, folate and copper—all significant counters to dietary deficiencies. Okpa is a dish with Bambara ground nut flour paste mixed with palm oil, pepper, salt and spices providing protein, iron, niacin, magnesium and β-carotene. These and numerous other preparations provide ample evidence that micronutrients are available in the diet. However, the question remains whether these micronutrients are in sufficient quantity per serving to provide for full nutrition. Their nutritional value may be declining.

While these health status factors reflect dietary conditions, it is the case that the Igbo use a total of 220 species and 400 varieties of foods (Kuhnlein et al., 2013, 2009). Twenty-one (21) species of starchy roots and tubers, 20 legumes, 21 nuts/seeds, 116 vegetables, 12 mushroom varieties and 36 fruits have been documented in southern Nigeria. Igbo territory in the southeastern part of Nigeria depends largely on agriculture and fishing while peoples in the north emphasize farm production, meats and fruits.

Foods from biodiverse environments

The Food and Agriculture Organization of the United Nations (FOA) sponsored studies resulting in intensive documentation of foods and their nutritional values used by 13 selected indigenous peoples located in the western hemisphere (4 nations), Africa (2 nations), Sub-continent of India (2 nations), Asia (2 nations) and Pacific Island (1 nation). The studies were carried out by the Center for Indigenous Peoples' Nutrition and Environment (CINE) offices in Quebec, Canada and researchers from the FOA. These studies provide the first evidence of nation-specific nutritional and health data that under conventional circumstances would not be collected or would become embedded and thus invisible in state population studies.

The world's Fourth World peoples may depend up to 80% on non-commercial or non-cultivated plant-based and animal-based foods and medicines for their daily diet. This is generally true despite the fact that growing numbers of Fourth World peoples have been forced by states' government policies that

"favor abandonment of traditional crops" (Rodrigo, Andrade, Orbe, & Terán, 2018) from their traditional territories into closer proximity to towns and outposts and have as a result become dependent on commercially processed foods and medicines resulting in "transition nutrition" directly affecting health responses. Fourth World communities' report evidence of growing increasing levels of chronic diseases.

Limitations of Conventional Research

Conventional or orthodox academic, political, and public media commentary centered on the term "climate change" primarily discusses in terms of infrastructure and economic costs associated with effects such as rising sea levels, changes in global food supply, relocation of communities, and mitigation strategies. Little emphasis is placed on the repercussions that human-induced changes have on climate—and the major effects the elevated atmospheric CO2 levels have on human health. While there is an emerging body of orthodox scientific literature reporting research results about the effects of elevated carbon dioxide levels (CO2) on plant-based and to a minor extent animal-based foods and medicines, the bulk of that research tends to focus on commercially/agriculturally produced plants and animals with an essentially economic bias. Some orthodox researchers conducting meta-analyses of extant literature note with concern that elevated CO2 and other greenhouse gases in the atmosphere have negatively affected cultivars of various commercial crop species resulting in serious chronic disease consequences for human beings (Dietterich et al., 2015a; Loladze, 2014; Thompson & Cohen, 2012). Researchers tend to agree that peoples dependent on agriculture are particularly vulnerable to the effects of climate change on nutritional values of plant-based and animal-based foods. The particular effects of CO2 levels on traditional foods and medicines harvested from forests, prairies, jungles and rivers on which more than a billion Fourth World people depend for nutrition and health may be of greater significance. The dearth of information on the changing nutrition (protein, micronutrients, bioavailability) of wild plants and animals, which constitute from 40% to 80 of Fourth World peoples' diet and sources of medicine, suggests the need for further research.

As distinct political nations encapsulated by states, Fourth World nations—and the bio-culturally diverse regions they represent—hold roughly 80% of the world's biodiversity. Collectively, CWIS estimates there are 1.3 billion people representing 6,000 distinct Fourth World nations ranging in size from 100 people to 25 million people throughout the world. Their long histories of cultivating mutually-beneficial relationships with the ecological niches they inhabit, place them in both a vulnerable position, with regards to climate change; and in a strategic position, with regards to holistic and effective approaches towards mitigating its effects.

Nearly every ecosystem has been altered so that plants and animals can be used as food and medicine, as well as Bharucha & Pretty write, "[T]he mean use of wild species is 120 per community for indigenous communities in both industrialized and developing countries" (Bharucha & Pretty, 2010). In Igbo communities in southeast Nigeria the people obtain 96% of their daily energy from 220 possible species or varieties of plant and animals sources. The Awajun in northern Peru obtain 93% of their daily energy from as many as 223 plant and animal

species and varieties (Kuhnlein et al., 2009). But with the quantity, quality, and accessibility to wild foods diminishing—as a result of climate change, overdevelopment, and conservation-exclusions—it becomes necessary to evaluate the role that wild foods play/will play in nourishing the physiological and cultural realities of Fourth World peoples and beyond.

Recent studies (Dietterich et al., 2015b; Loladze, 2014; Ziska et al., 2016) suggest an alarming possibility that through human cultivated plant and foods and plant/animal foods and medicines obtained from the biodiverse environment, the changing atmospheric composition may be radically altering the nutritive and medicinal values on which human beings depend from these sources.

Indeed, it may be that the levels of chronic diseases suffered by Fourth World peoples may be a significant marker that, though indigenous peoples generally obtain an average of 80% of their daily nutrition and medicines from the wild, the changes in plant and animal nutritive composition may be changing significantly. The changes may be directly affected by the rapid elevation of CO2 and other greenhouse gases in the atmosphere that alters the photosynthetic actions in plants. These changes may be reduction of proteins, micronutrients, and vitamins and increased levels of sugars and other carbohydrates. The consequence could be that even though there is an increased consumption of favored plant and animal based foods, the actual level of nutrition may decline. The result could be increased stunting, and wasting, low birth weights and early childhood deaths due to micronutrient reductions, increased chronic diseases such as Type 2 Diabetes, heart disease, kidney disease and cancers due to increased sugar levels.

It is within this context that the following research questions frame the research study:

Q1: What is known about increased atmospheric CO2 on wildlife (plants and animals) used for food, medicinal and pharmacological purposes by Fourth World peoples?

Q2: What is the effect on indigenous health? Global health in general?

Q3: Given that CWIS advocates returning to wild foods and medicines are we urging Fourth World peoples towards more harm than health?

Q4: What are the alternatives? Since states cannot deal with this issue, how can Fourth World nations address these changes?

Theoretical Framework

Fourth World Theory (FWT)[6] in research states that the concepts of comparison, relational reasoning, balance between contending forces, and an equality of kind (that human beings are part of all living things and not the dominant living thing) will— when applied in life and thought— ensure comity between peoples, between peoples and living nature, and with the forces of the cosmos. If human demands exceed the capacity of the natural world to reproduce a destructive imbalance causes the destruction of life. Studies of wild foods, nutrition, ethno-botany, and physical, emotional, and cultural health are all within the frame of Fourth World theoretical inquiry (Ryser, Gilio-Whitaker, & Bruce, 2016). Fourth World Theory is rooted in systems of knowledge such as those birthed in Sub-Saharan

[6]Fourth World Theory asserts that history, memory, and thought processes are multi-dimensional— where two-dimensional thought (linear past progressing to the future, fatalistic, cyclical, or providential) is in reality seven dimensional. Tracing thought diagrammatically the process is more like a spiral where motion and change move in all directions simultaneously in time and space.

Africa (Kongo Knowledge System), the Western Hemisphere (Anahuac Knowledge System, Tsawalk Knowledge System, Anishinabek Knowledge System) and northern Europe (Saami Four Winds). These systems, though independent, share common conceptual foundations based in the metaphor: Four Directions.

It is this theory that serves as the foundation for the research study the Center for World Indigenous Studies started in December 2017 to evaluate the extent to which elevated CO2 levels in earth's atmosphere may contribute to the incidence of preventable chronic disease among indigenous peoples.

Fourth World Theory asserts that history, memory, and thought process are multi-dimensional—where two-dimensional thought (the linear past progressing to the future, fatalistic as in preordained, cyclical as in repetition or providential as in ordained by God) is in reality seven dimensional (R. C. Rÿser, 1997). Tracing thought diagrammatically the process is more like a spiral where motion and change move in all directions simultaneously in time and in space. Fourth World knowledge systems have typically illustrated these epistemological conceptions in another metaphoric shape typically rendered as the Four Directions. Yet it is an incomplete statement to assert that there are only four directions when in reality there are seven directions with an infinite number of intermediate points on a "circle cross" when each of the points on a cross indicate four directions associated with solar and lunar movements, the center point where all four lines meet in the middle and unmarked lines extending outward from the top and bottom of the center point provide the above and below dimensions: equaling seven dimensions from four directions. The diagrams are indeed metaphoric as in the Purépeche Agrocosmology diagram ***(See Figure 1)*** that provides essential information for plant, meteorological, cosmological and environmental guidance. The Congo Cross ***(See Figure 2)*** is similar to the Purépeche four directions diagraph also serves as a practical tool for aiding in noticing, recognizing, explaining and predicting material and immaterial phenomena of which human beings are an intimate part.

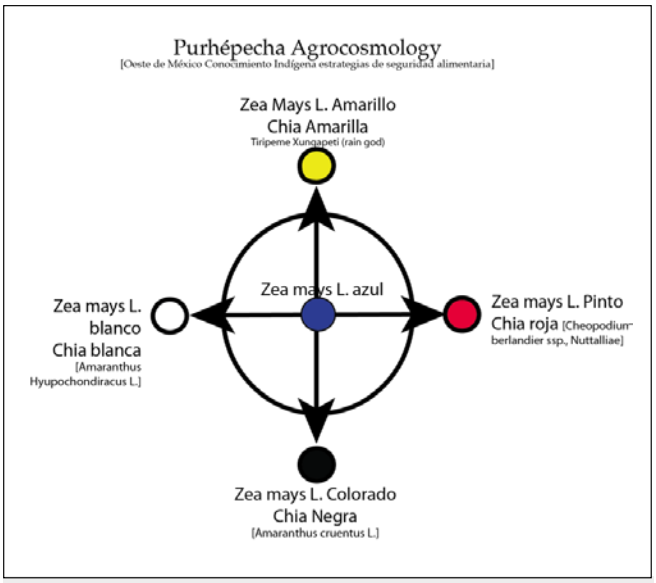

Figure 1: Purépeche Four Directions Cosmogram – México

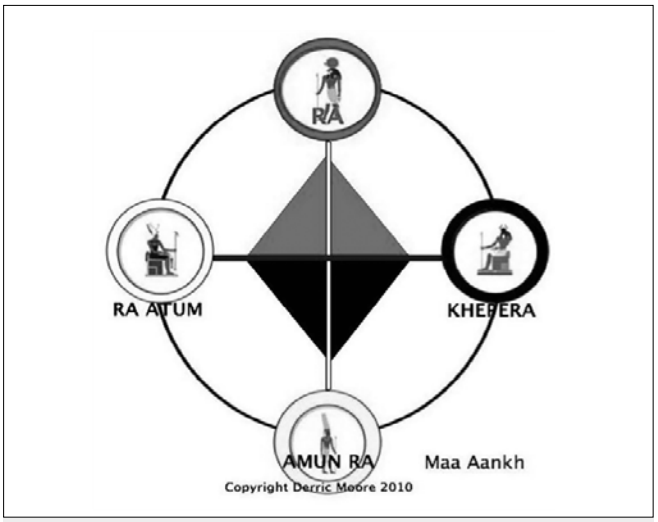

Figure 2: Congo Cross

Fourth World peoples' knowledge systems vary from locality to locality, reflecting the cultural uniqueness that arises from their dynamic and evolving relationships with the land, sea, and the cosmos (Ryser, 2012). These knowledge systems differ from positivism in that they conceive of many different ways to apprehend truth applying different scientific approaches focusing on relationships between observable and repeated phenomena. An illustration of relationship mapping is depicted in Figure 1 where the Purhépecha in Mexico provide the metaphoric "four directions" showing the relationship between directions, the cosmos, plants, animals, and human uses by season. There is not just one form of indigenous knowledge, there are many as illustrated in the relational "four directions" image from the Congo in Figure 2. While the sources and methods for acquiring knowledge differ, the themes of change and relationships occur repeatedly—thus informing the methodology of the CWIS study.

Knowledge systems such as these constitute sciences that contribute to conventional science as conceived in 17th century Europe in which "humanism produced a version of human nature by tethering to human-ness the requirement of rationality" (Watson 2008, 258). Fourth World sciences may be comparable or of greater importance than orthodox sciences in potential benefit to humanity when addressing complex problems such as the effects of changing climate on earth's living populations. Long-established Fourth World sciences in the fields of plant and animal behavior, nutrition, medicines, as well as non-domesticated as well as domesticated foods and medicines, harvesting, hunting and processing knowledge, for example, formed the foundations of orthodox allopathy, homeopathy, nutritional practices, psychology, pharmacology and the "natural sciences." Fourth World knowledge systems express explanations, concepts, ideas, practices and restorative relief in virtually all scientific domains and as indicated over time directly and indirectly informed Western science as a whole.

One indigenous knowledge system embedded in Fourth World Theory originates with the Nuu-chah-nulth (Pacific Coast of Vancouver Island, Canada) based in the concept of tsawalk, meaning, "all is one." In Tsawalk, A Nuu-chah-nulth Worldview, Richard (Umeek) Atleo (2004, 2005), offers a locally embedded yet broadly relevant perspective on the ontology and epistemology of global ecological crisis. Tsawalk makes no distinction between physical and metaphysical (spiritual) processes—every aspect of the world is connected through energy and spiritual relations—significantly informing Fourth World Theory. The Anahuac knowledge system (R. C. Rÿser, 2015) is possibly the grandmother of knowledge systems in the Western Hemisphere rooted in México's civilizations extending to more than 3,500 years. This system of thought also informs Fourth World Theory with practical conceptions explaining and depicting material and immaterial realities (Lara, 2007; R. C. Rÿser, 1997). Living relationships in the Anahuac system, just as in the Tsawalk system, require moral accountability among all sentient beings (plants, animals, humans), including the Earth, the Cosmos and—by extension—Earth's climates.

With regards to climate change—such as the effects of elevated CO2 levels in the atmosphere on wildlife used for food, medicinal and pharmacological purposes by indigenous communities—Nietschmann (1994) argues that it is imperative to include a diverse set of cultural responses and scien-

tific know-how in order to holistically and effectively develop and implement policies that will secure livelihoods for all people. Technological innovation can help mitigate some of the challenges humans face. But if that innovation comes at the cost of an increasingly narrow list of solutions, humans will learn a painful existential lesson. In order for long-term systemic change to occur, the full and effective political participation of those who have a historically proven track record of sustainability must be implemented.

Methodology

In this study we apply several concepts offered by Fourth World theory to evaluate, compare, describe and infer the effects of elevated atmospheric carbon dioxide (CO_2) levels on the nutritional and health benefits of plant-based and animal-based foods and medicines used by Fourth World peoples collected or otherwise obtained in localities such as forests, jungles, savannahs, prairies, rivers, oceans, deserts and mountainous areas.

Role-based Relational Reasoning is best represented by analogical reasoning, where analogy is an instrument of scientific inquiry and conceptual change applied to discover causal relationships and set of systematic correspondences that serve to align the elements of a source and target. Applied to common human experiences role-based relational reasoning would use an observed phenomenon of ants carrying bits of plant leaf torn from a bush and then carrying the bits in their jaws in single file across a field to their nest and relate by metaphor the observed event to an army of humans carrying supplies to a barracks. Both represent essentially the same phenomenon that can be subsequently described as wires carrying electrical charge from a generator to a light bulb. The analogy draws on the target (ants) to explain the source (electricity) rendering the process of electrifying a light understandable. The elements used to apply analogical reasoning include retrieving a target (observed or factored) and rendering it as a source (analogized), mapping the relationship between the target and the source, and then derive inferences that can lead to various schematics that can lead to observable or factored categories or situations that mirror the original target and source.

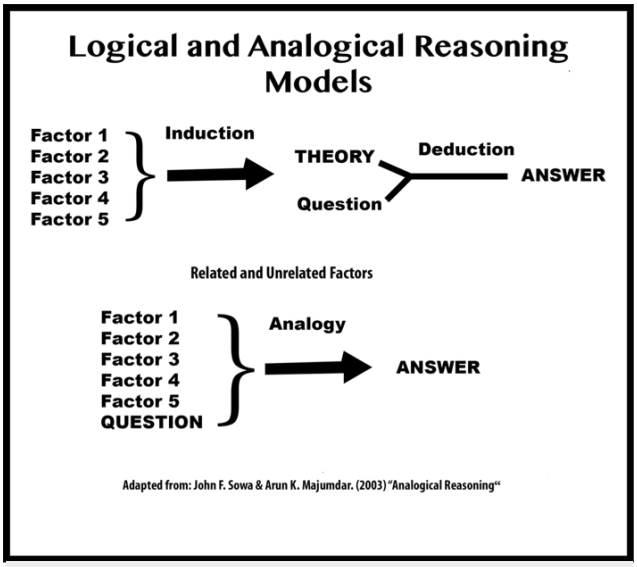

Figure 3: Relational Reasoning by Analogy

The complexity of orthodox and Fourth World scientific research may only be understandable through the application of relational reasoning illustrated as inductive and inferential thinking:

Through repetitive application of the logical and analogical reasoning model using different factors the study conclusions are derived. Comparing orthodox and Fourth World scientific research outcomes and Fourth World peoples' consumption of plant-based and animal-based foods and medicines affected by elevated atmospheric carbon dioxide levels

may reveal nutritional and medicinal effects in different populations based on the foods they consume.

Structure of Data Collection depends on a constructed database focused on 15 factors and their associated variables constituting data contained in more than 1,200 orthodox research studies and indigenous research studies focused on plant and animal food identities, locations and uses and the effects of elevated atmospheric levels of CO2 on plant-based and animal-based foods and medicines used by Fourth World peoples.

Database Structure

The database contains specific identifying factors that can be compared with the specific activity of inferring or documenting specific relationships between the orthodox and Fourth World research results and the effects on plants and animals and ultimately effects on Fourth World population health. The data collected permits relational comparisons between the atmospheric gases and their levels in the atmosphere with effects on the nutritional and medicinal values as may be reflected in changes of protein, micronutrient and vitamin levels over time. The comparisons may include descriptions of early to mid-20th century nutritional values with current levels as set by the data as recently documented in 2009.

REFERENCE CATEGORY	DATA ENTRY
Research literature classification	C3 C4 CAM
Literature publication date Author(s) Professional Field(s) Literature title Publisher Geographic Location	
Greenhouse Gas levels	CO2 CH4 O3
Plant (F=food, M=Medicine, B=Both	C3 – F/M/B C4– F/M/B Ce– F/M/B Fungi – F/M/B

REFERENCE CATEGORY	DATA ENTRY
Animal Plant (F=food, M=-Medicine, B=Both	Insect/Bug – F/M/B Mollusk– F/M/B Mammal– F/M/B Reptile– F/M/B Fish– F/M/B Other– F/M/B
Method of Inquiry Nutritional Change Medicinal Change	Free Air Enclosed
FW nations Affected Name Nation/State/Region	
Epidemiology	Malnutrition Wasting Stunting Diabetes Heart Disease Cancers Other

The application of relational reasoning based in Fourth World Theory may serve to provide a more plausible and certain explanation of the relationship between elevated levels of atmospheric carbon dioxide on the nutritional and medicinal values of cultivated, domesticated, and traditional plant-based and animal-based foods and medicines that has been possible with conventional, reductionist research methods and techniques. The supposition is that the numerous variables that come into play affecting plant and animal nutrition and medicines from numerous studies may employ different methods and techniques requiring a broader, whole data approach. That is what the present study is designed to do. If successful there will be a strong, inferential connection between carbon dioxide levels and Fourth World peoples' health. Ultimately, the study will inform how this may be equally true for virtually all humans on the planet.

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Alimentos Tradicionales y Medicinas y Enfermedad Crónica creciente para los Pueblos Indígenas alrededor del mundo

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Traducción de Inglés a Español por Alina Castañeda Cadena, Directora de Edición de Fourth World Journal

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RESUMEN

Este ensayo discute las razones, fundamento teórico, método y enfoque del estudio de dos años: **"Salud de los Pueblos Indígenas: Efectos del Dióxido de Carbono Atmosférico Elevado en los Alimentos y Medicinas basados en Plantas y Animales"** llevado a cabo por el Centro de Estudios Indígenas del mundo y que comenzó a finales de 2017. El estudio emplea un enfoque de investigación relacional que tiene como objetivo establecer los efectos del dióxido de carbono atmosférico elevado en plantas tradicionales y animales de los que dependen los pueblos indígenas para su dieta diaria. Hay muchos factores tales como la "transición nutricional" donde los pueblos del Cuarto Mundo (indígenas) se han vuelto dependientes de alimentos y medicinas producidos de manera comercial. El desarrollo industrial por medio de la extracción mineral, la extracción de petróleo y la construcción de ciudades han contribuido para ocasionar efectos adversos en la salud entre los pueblos del Cuarto Mundo. Los investigadores (convencionales e indígenas) han identificado evidencia de que el dióxido de carbono elevado en la atmósfera puede contribuir al deterioro de los valores de los micro y macro nutrientes en plantas y animales y aumenta las azúcares – lo que potencialmente contribuye al aumento en la incidencia de enfermedades crónicas. Mientras que los niveles en aumento de dióxido de carbono (y otros gases de efecto invernadero) en la atmósfera de la tierra contribuyen al Calentamiento Global – usualmente conocido como "cambio climático" – la gran preocupación en la investigación y el discurso públicos es que los patrones climáticos cambiantes de manera radical contribuyen a la destrucción y aumentan los riesgos de daño a la infraestructura humana y otras actividades económicamente importantes alrededor del mundo. El "factor salud" con frecuencia está

relacionado con el aumento de las temperaturas que afectan directamente a la salud humana, pero la base alimenticia que depende de la fotosíntesis para producir los nutrientes y medicinas de las que dependen los seres humanos, tiende a ser ignorada. En este artículo el autor discute los múltiples factores que limitan a los investigadores ortodoxos al examinar los alimentos y medicinas basados en plantas y animales utilizados por las comunidades del Cuarto Mundo que impiden un entendimiento completo de los niveles en aumento de enfermedades crónicas entre los pueblos del Cuarto Mundo. Este análisis puede proporcionar información valiosa para investigaciones futuras y para reportar a los líderes en la salud indígena, así como médicos ortodoxos interesados en el uso de alimentos y medicinas basados en plantas y animales, y apoyo farmacéutico.

Palabras clave: Pueblos de Cuarto Mundo, cambio climático, niveles de dióxido de carbono atmosférico, alimentos silvestres, basado en plantas, basado en animales, medicina tradicional, etno-botánico, salud indígena, política alimenticia.

Las naciones del Cuarto Mundo viven en condiciones de amenaza frecuente, si no constante, a su continuidad cultural, social, económica y política como pueblos distintos culturalmente. Las amenazas vienen en forma de violencia militar cometida por autoridades estatales y, de manera notable, del desarrollo realizado por sociedades industriales por medio de su expansión constante en regiones diversas del mundo para ganar control sobre el uso del petróleo, conducir pruebas nucleares, establecimiento de ciudades, extracción de minerales y carbón, limpieza de bosques para establecer reservas industriales y talar madera para desecho, madera preciosa y el uso comercial de plantas y animales para alimentos y usos farmacéuticos. La consecuencia de estas actividades llevadas a cabo en nombre del "crecimiento para aumentar pagos de acciones y márgenes de acciones" es la producción de cantidades enormes de desperdicio en muchas formas, incluyendo el desperdicio nuclear, de plásticos, desperdicio comercial, niveles elevados de dióxido de carbono y otros gases en la atmósfera de la tierra, aumentando aún más la temperatura global, desperdicio médico y humano. La combinación de "expansión de desarrollo" constante y acumulación de desechos no sólo estropean el ambiente de la tierra amenazando la vida de cada ser vivo en el planeta, sino que las naciones indígenas son las primeras en recibir esos efectos adversos. Las naciones indígenas, como el proverbio del canario en la mina de carbón (tuve que utilizar ésta metáfora industrial) sufren los efectos adversos de la presión constante en sus territorios y la descomposición de la biodiversidad de los ambientes en los que viven. Son los primeros en morirse o enfermarse de manera crónica debido al desastre industrial descontrolado que hace estragos en el Cuarto Mundo olvidado por mucho tiempo por los pueblos industriales.

Si bien reconozco el daño excesivo a las naciones indígenas por el desarrollo industrial y la producción de desperdicios, la dependencia de los pueblos indígenas en plantas y animales para alimentos y medicinas de ambiente biodiversos parece estar en peligro serio por los niveles elevados de dióxido de

carbono en la atmósfera de la tierra. El Centro de Estudios Indígenas del Mundo (CWIS, por sus siglas en inglés) está dirigiendo un estudio de muchos años para evaluar los efectos adversos actuales y potenciales en alimentos y medicinas basados en plantas y animales y los valores medicinales y nutricionales que cambian potencialmente de aquellos alimentos y medicinas de los que dependen los pueblos indígenas. Este ensayo discute factores, teorías y métodos aplicados en el estudio de CWIS titulado: "Salud de los Pueblos Indígenas: Efectos de Dióxido de Carbono Atmosférico Elevado en Alimentos y Medicinas basados en Plantas y Animales"

Las incidencias de enfermedades crónicas en países alrededor del mundo (por ej., diabetes, enfermedad cardiovascular, enfermedad de los riñones, cáncer, anemia, deficiencias de hierro, bajo peso al nacer) han aumentado a pasos firmes desde comienzos del siglo veinte. Las tasas crecen con más rapidez para los pueblos indígenas del Cuarto Mundo que viven en áreas rurales y biológicamente diversas, mientras que las tasas más bajas de aumento están ocurriendo para pueblos no indígenas que viven en asentamientos urbanizados. Un tercio de las muertes relacionadas con la dieta y actividad física están relacionadas con enfermedades crónicas entre 1960 y 2007 o 16.6% de todas las muertes fueron registradas por el Centro de Control de Enfermedades de las poblaciones de los Estados Unidos. Mientras que la población general de países tales como India, Brasil, México, China, Australia, y Canadá, por ejemplo, indican un aumento bajo (posiblemente relacionado con el aumento de la población como un factor) en incidencias de enfermedades crónicas, las instituciones de salud del estado generalmente reportan que, desde áreas urbanas y suburbanas, a través de varios métodos de prevención y tratamiento, los aumentos en enfermedad cardiovascular, diabetes Tipo 2 y aumentos obesidad, han bajado. Esto es en contraste con los reportes académicos y de agencias de salud que las enfermedades crónicas (diabetes tipo 2, enfermedad crónica de riñón, enfermedad cardiovascular, etc.) entre pueblos indígenas continúa aumentando sin cesar en países tan diversos como Australia, Nigeria, India, Brasil, Canadá y China ("Enfermedad Crónica en China", 2018; García-García y otros., 2015; Harris y otros, 2017).

Hay factores claramente relacionados con los cambios en los resultados de salud crónica para pueblos indígenas que no han sido reportados o entendidos por completo. De hecho, los investigadores en instituciones estatales frecuentemente reportan que no tienen acceso a las comunidades indígenas y que no pueden documentar evidencia relacionada con las comunidades indígenas a menos que la gente de esas comunidades utilice facilidades patrocinadas por universidades y agencias estatales para su tratamiento. Y el énfasis principal de esas agencias generalmente ha sido el manejo de enfermedades crónicas en lugar de la prevención. La mayoría de los investigadores se aproximan a la salud crónica como una proposición "de arriba hacia abajo" o desde una perspectiva profundamente "reductiva". Cuando se examinan las causas y prevenciones de enfermedades crónicas para pueblos indígenas, hay, como algunos investigadores reportan, serios obstáculos que incluyen la falta de accesos a las poblaciones, investigaciones estrechamente enfocadas sólo a individuos que tienen accesos a clínicas de salud u hospitales, y de manera significativa, el hecho general de que los datos que puedan existir en los registros institucionales no han sido divididos para separar a los pueblos indígenas como

una población específica. La consecuencia de estos obstáculos es que virtualmente toda la investigación publicada, e incluso los datos proporcionados por centros de salud indígenas, tienden a sesgarse en poblaciones atendidas en clínicas y hospitales con definiciones variadas de "indígenas" registradas en bases de datos.

Con las fallas evidentes en los datos de las condiciones crónicas de la salud generados por el estado, algunos investigadores reportan la incidencia de enfermedades crónicas entre los pueblos del Cuarto Mundo (Indígenas) alrededor del mundo con tendencia a subir (Harris y otros, 2017) – excediendo la incidencia de enfermedades crónicas en las poblaciones no indígenas. Los pueblos indígenas en cada país donde se ubican la mayoría de las enfermedades prevenibles, como la diabetes tipo 2, obesidad, cáncer, enfermedad cardiovascular, artritis, enfermedad crónica de los riñones y alergias. Incluso, a pesar de la evidencia casi superficial de los niveles crecientes de enfermedades crónica entre los muy diferentes pueblos indígenas alrededor del mundo, muy poca investigación y análisis del problema se enfoca en las causas y la prevención. Cuando se mencionan las causas, el consumo de alcohol, el uso del tabaco y la falta de actividad física, el tratamiento se enfoca en cuidar la enfermedad.

Transiciones Epidemiológicas a través del tiempo

Las transiciones epidemiológicas han seguido un patrón en la historia de la humanidad. Para ayudar a entender mejor el avance de los cambios en la salud en poblaciones en relación con los índices de mortalidad, los investigadores postulan etapas de la transición epidemiológica que comienza con la Era de la Peste y Hambruna (aproximadamente anterior a la Era del Neolítico 7000 A.C. – 9000 A.C. a alrededor 1750 D.C.), seguido por la Era de las Pandemias (cerca de 1750 – 1920), y la Era Degenerativa y la Era de las Enfermedades hechas por el hombre (1920 a 1960) (Omran, 1971, 2005; Popkin, 2002). A esas transiciones, yo añadiría la "Era de las Enfermedades hechas por los humanos" superponiéndose a la era anterior y yendo de alrededor del 1920 a la actualidad.

La Era de la Peste y la Hambruna está caracterizada como un periodo de altas tasas de mortalidad en la población y con un potencial reducido de crecimiento prolongado. Este es un periodo de infecciones epidémicas tales como la tuberculosis, cólera, tifoidea, varicela, hambruna, condiciones insalubres y enfermedades transmitidas de otros animales (zoonosis). La esperanza de vida promedio es entre 20 y 40 años y las muertes maternas son más altas.

La Era de la Disminución de Pandemias puede ser descrita como un periodo de disminución de la mortalidad y como un pico de epidemias y luego disminución, también la mortalidad. En áreas urbanizadas, la esperanza de vida promedio mejoró por treinta o cuarenta años. Para las comunidades del Cuarto Mundo con mayor contacto con las sociedades urbanizadas, industrializadas, la tuberculosis, varicela, sarampión, cólera y enfermedades similares a la "Era de la Peste" persistieron mientras que las zoonosis comenzaron a disminuir. La esperanza de vida es alrededor de 30 a 50 años. La población comenzó a crecer.

Era de la Enfermedad Degenerativa, que incluye las enfermedades cardiovasculares, varios

tipos de cáncer y derrames comenzaron a dominar a las poblaciones en sociedades industrializadas, incluso la esperanza de vida aumentó a 70 años y más. Entre las sociedades indígenas, la esperanza de vida aún se ve obstaculizada por las pandemias y enfermedades relacionadas con la "Era de las Pandemias" debido a la proximidad con las sociedades industrializadas y la expansión de las sociedades industrializadas en territorios indígenas.

Era de las Enfermedades Hechas por los Humanos incluye el aumento de enfermedades crónicas tales como diabetes, obesidad, nuevos tipos de cáncer, hipertensión y enfermedades relacionadas con las enfermedades crónicas, enfermedad crónica de los riñones, y malnutrición, bajo peso en recién nacidos y un aumento en el número de mujeres viviendo afuera de sociedades industrializadas con deficiencia de hierro y otras deficiencias en micronutrientes, tales como el zinc, manganeso y cobre (Cohen, Tirado, Aberman & Thompson, 2008) debido al desarrollo industrial, ambiental, producción de alimentos industrializados y presiones en el desarrollo de la población. Las sociedades industriales desarrollan enfoques de dirección para reducir los efectos adversos de los factores que provocan enfermedades crónicas, pero la población indígena es incapaz de prevenir las intervenciones que se expanden en sus sociedades.

La propuesta de la transición epidemiológica se postula en la premisa del "tiempo progresivo" que define el análisis científico convencional (el tiempo que ocurre de lo "primitivo a lo avanzado en movimiento perpetuo") en contraste con el "tiempo en espiral" (tiempo que ocurre con un pasado, presente y futuro, todos ocurriendo de manera simultánea) que es más característico del tiempo concebido por los pueblos del Cuarto Mundo (Atleo, 2004, 2005; McDonough, 2010; R. Rÿser, 1997; Stone, 2004). La realidad de la salud del Cuarto Mundo tiende a ser reflejo de todas las transiciones del pre-Neolítico al contemporáneo – por lo tanto, sugiere que la medida del tiempo de simultaneidad indígena es una distinción importante para entender. En otras palabras, muchas condiciones típicas de cada una de las fases transicionales aparecen entre los pueblos indígenas, aunque han cesado entre las poblaciones urbanas.

Los investigadores, ortodoxos, reduccionistas que dirigen consultas para la Organización Mundial de la Salud, el Consejo de Ciencias e Investigación, en Nueva Delhi, India y el Departamento de Medicina de la Comunidad en el Estado de Kerala, India, generalmente concluyen que las condiciones crónicas de la salud entre los pueblos del Cuarto Mundo, es debido a la "pobreza, falta de limpieza, infraestructura inadecuada" (Nalinam M, 2016) y falta de educación. La solución a los niveles crecientes de enfermedades crónicas se ha expuesto repetidamente por investigadores como una necesidad de "cambiar el comportamiento" en relación con el consumo de alimentos y ejercicio físico. Para los pueblos indígenas puede no ser preciso sugerir que el "cambio en el comportamiento" sea adecuado. A su vez, los avances en el desarrollo industrial y la urbanización en las vidas y territorio de los pueblos indígenas puede ser el responsable que requiera el cambio.

Desglose de los Datos de Salud del Cuarto Mundo

Los gobiernos de los Estados y sus instituciones

subsidiarias colectan y mantienen datos sociales, económicos y de salud que describen a las poblaciones a las que sirven. Esas figuras generalmente son "globales", a menos que se definan grupos específicos en términos de circunstancias específicas. En los Resultados de la Conferencia Mundial de los Pueblos Indígenas de las Naciones Unidas (2014) el documento comprometía a todos los gobiernos de los estados a la propuesta dentro de los límites debía ser "desglosada" como información discreta (UNWCIP, 2014). En cuanto a la publicación de este artículo, ningún estado en el mundo se ha comprometido hasta ahora a separar los datos sociales, económicos y de salud de los pueblos indígenas en bases de datos o cualquier otra forma.

Quizá lo más cerca que llegan los investigadores a los datos desglosados sobre salud y nutrición de los pueblos indígenas es a enfocarse en el trabajo del director y nutricionista del Centro para la Nutrición y Ambiente de los Pueblos Indígenas (CINE, por sus siglas en inglés), la Dra. Harriet Kuhnlein en la Universidad McGill en Montreal, Canadá. Su trabajo de más de 35 años ha documentado alimentos tradicionales, sus beneficios nutricionales, la salud de la comunidad y las condiciones sociales y ambientales de poblaciones indígenas específicas y lleva a cabo investigación en campo y en las comunidades. En años recientes, las investigaciones de Kuhnlein ha contribuido en estudios importantes de poblaciones etiquetadas bajo el auspicio de la Organización de Alimentos y Agricultura de las Naciones Unidas. Quizá el mayor beneficio de estos estudios es que prueban específicamente los valores nutricionales y usos de alimentos tradicionales para cada comunidad indígena. Se vuelve posible entonces, examinar los valores de salud, nutricionales y medicinales de alimentos y medicinas basados en plantas y animales utilizados por sociedades indígenas particulares en circunstancias ecológicas y ambientales muy diferentes. Los datos proporcionados por las investigaciones de Kuhnlein pueden abrir la puerta a una consideración más detallada de la relación entre el consumo de alimentos y medicinas tradicionales a través del tiempo, influencias comerciales y urbanización del aparente aumento en la incidencia de enfermedades crónicas en las comunidades del Cuarto Mundo.

El equipo de Kuhnlein señala la conexión importante entre la cultura, conocimiento tradicional y el ejercicio del control de la comunidad en los alimentos y medicinas basados en plantas y animales. El equipo enlista cinco factores (Kuhnlein y otros, 2013):

• Acceso a, seguridad de, e integridad de tierras, territorios, recursos naturales, sitios sagrados y áreas ceremoniales utilizadas para la producción de alimentos tradicionales;

• Abundancia, escasez y otras amenazas relacionadas con semillas tradicionales, alimentos y medicinas basados en plantas, alimentos basados en animales, y las prácticas culturales relacionadas con su protección y supervivencia;

• El uso y transmisión de métodos, conocimiento, lenguaje, ceremonias, danzas, oraciones, historias orales, historias y canciones relacionadas con alimentos tradicionales y prácticas de subsistencia, y el uso continuo de alimentos tradicionales en sus dietas diarias;

• La capacidad de adaptabilidad, resiliencia y/o restauración de los Pueblos Indígenas relacionados

con el uso y producción de alimentos tradicionales en respuesta a las condiciones de cambio;

• La habilidad de los pueblos indígenas para ejercer e implementar sus derechos para promover su soberanía.

Será necesario considerar la elaboración del cuarto factor relacionado con la adaptación al cambio detallando los efectos iatrogénicos de la medicina convencional y los nutricionistas, así como los cambios ambientales, de biodiversidad y climáticos a comienzos de 1750 con la Revolución Industrial.

La respuesta de Kuhnlein al daño en la salud y la nutrición da lugar al aumento de los problemas de enfermedades crónicas en comunidades indígenas es animar a la restauración de fuentes de alimentos tradicionales y el consumo de alimentos basados en plantas y animales históricamente relacionados con la comunidad indígena. El Centro de Estudios Indígenas del Mundo avanzó en la misma propuesta con una serie de talleres "Cultura, Alimentos y Medicinas" a finales de 1990 basados en el concepto de que restaurar el uso de alimentos y medicinas tradicionales reduciría y eliminaría las enfermedades crónicas. Los estudios del Centro de Estudios Indígenas del Mundo encontraron que, en varias comunidades, los síntomas de hecho disminuyeron.

Si bien hay un acuerdo entre el CINE y el Centro de Estudios Indígenas del Mundo sobre los beneficios de restaurar los sistemas de alimentos tradicionales, investigaciones recientes para comunidades específicas, plantean la posibilidad de que la restauración de los alimentos tradicionales de hecho mejora la salud de la comunidad y reduce la incidencia de enfermedades crónicas. Otros factores pueden intervenir para desvirtuar la premisa de la restauración. El rápido aumento de los niveles de dióxido de carbono en la atmósfera de la tierra pueden servir para sobre energizar los procesos fotosintéticos, particularmente plantas C3 y en cierto grado las C4 con el resultado de un gran aumento de concentración de azúcar en las células de la planta y proteínas, micronutrientes y vitaminas reducidas. El resultado es convertir muchas plantas C3 en fuentes de azúcares que puedan contribuir a las enfermedades crónicas. Los animales de los bosques y selvas y los animales criados comercialmente también pueden consumir plantas (tanto plantas tradicionales como plantas cultivadas) que contienen altos niveles de azúcares. Cuando los seres humanos consumen la carne animal, las reacciones metabólicas a azúcares altos y la baja proteína y micronutrientes pueden pasarse a los seres humanos – afectando a la salud y nutrición humanos. El resultado puede ser que cuando los humanos comen carne animal, los niveles de nutrición también pueden disminuir.

Obtener Datos de Salud Directamente de las Naciones Indígenas

En ausencia de datos de salud recolectados por instituciones de estado, el Centro de Estudios Indígenas del Mundo está conduciendo la investigación La Salud de los Pueblos Indígenas: Efectos del Dióxido de Carbono elevado en Alimentos y Medicinas basados en Plantas y Animales basándose en los datos de campo de Kuhnlein para seis naciones ubicadas en una variedad de ecosistemas en el Continente Africano, Asia y el hemisferio oeste. La comunidad científica convencional y la comunidad científica indígena han realizado consultas sobre los efectos del "CO2 Elevado" en la atmósfera en valores

nutricionales y medicinales de plantas y animales. Se han conducido más de 1000 estudios que se enfocan en plantas primarias C3 cultivadas bajo el patrocinio de sociedades e instituciones estatales, así como agencias de salud indígenas. El Centro de Estudios Indígenas del Mundo (CWIS, por sus siglas en inglés) reconoce que se han empleado numerosas metodologías y plantas seleccionadas, así como algunos animales, siendo un meta-estudio el principal método para una evaluación de estudio cruzado. CWIS ha tomado varios meta-estudios y estudios de un solo enfoque buscando aplicar un sistema de conocimiento tradicional para evaluar los efectos del CO_2 atmosférico elevado en la salud de los pueblos dependientes de plantas y animales tradicionales para su alimento y nutrición.

Las cinco naciones seleccionadas por la consulta de CWIS incluyen la Nación Nuxalk en el oeste de Canadá, Awajun en el norte de Ecuador, Nación Karen al este de Birrmania y oeste de Tailandia, Bhil al oeste de India e Igbo al sureste de Nigeria. La elección de esas naciones se basa en la totalidad de los datos obtenidos y el rango de ecosistemas representados. Las plantas y los animales consumidos por pueblos indígenas caen en tres amplias categorías metabólicas designadas en virtud del proceso fotosintético de fijación del carbono de la atmósfera, que convierte el CO_2 en moléculas orgánicas, tales como carbohidratos, grasas y proteínas. La gran mayoría de las plantas en el mundo (85%) se clasifican como C3, incluyendo las plantas comunes, tales como la espinaca, cacahuate, algodón, trigo, arroz, cebada y la mayoría de los árboles y pastura. Esas plantas extraen carbono de la atmósfera y luego liberan el 25% de ese carbono hacia la atmósfera – un proceso llamado fotorespiración – que afecta la retención de agua de la planta. Esto es debido a la estructura de las células en las plantas. Tres por ciento de las plantas del mundo son plantas C4, incluyendo la mayoría de las plantas con flor, como el maíz, la caña de azúcar, mijo, sorgo, piña, margaritas y repollo. Esas plantas retienen la mayoría del CO_2 tomado de la atmósfera. Un tercer grupo de plantas se clasifica como CAM (Metabolismo ácido de las craculáceas) que almacenan el agua eficientemente. Incluyen los cactus, sedum, jade, orquídeas, y agave. La locación geográfica, la ecología y la comunidad de biodiversidad influyen fuertemente qué categoría metabólica de la planta aplica. El tema central de importancia con estas tres categorías es el efecto del CO_2 elevado en la atmósfera en los valores nutricionales y medicinales de las plantas. De manera similar, los valores nutricionales que pueden cambiar con los niveles altos de la absorción de CO_2 puede afectar los valores nutricionales del consumo animal (de mar y terrestre). Los efectos de CO_2 elevado en la atmósfera en los valores nutricionales y medicinales de las plantas pueden ser un factor escondido en los niveles incrementados de enfermedades crónicas experimentadas por comunidades del Cuarto Mundo.

El Centro de Estudios Indígenas del Mundo busca evaluar el grado en el que el CO_2 elevado en la atmósfera afecta tanto plantas cultivadas como tradicionales y animales en términos de valores nutricionales y medicinales, y así la salud de las comunidades del Cuarto Mundo. El estudio de CWIS se enfoca en varias naciones que son dependientes históricamente o actualmente de alimentos animales y plantas tradicionales encontrados en su ambiente biodiverso. Cada nación está experimentando niveles en aumento de enfermedades crónicas. Se hace una descripción brece de cada nación a continuación.

Nuxalk

Nuxalk es una nación ubicada en la costa suroeste de Canadá en el sistema del Río Bella Coola con una población de 3,000 habitantes. Talyu, Suts'Ihm, Kwalhna y Q'umk'uts son los pueblos principales de la nación ubicados en el río que fluye por todo el territorio. Los Nuxalk se consideran "gente de peces" con su significante histórico y dependencia contemporánea al salmón, eulachón, y foca como principales contribuidores de su dieta, riqueza material y de sus prácticas culturales. De acuerdo con la Organización de Alimentos y Agricultura, los Nuxalk son 30% dependientes de 67 especies y variedades de plantas y animales (Kuhnlein, Erasmus & Spigelski, 2009). Los cambios culturales y problemas de salud se volvieron factores significativos en la vida de los Nuxalk debido a los reducidos tipos de alimentos y la dependencia en aumento de las influencias no Nuxalk. Éstos incluían deforestación, que provocaba que las fuentes de alimentos se volvieran más remotas para aldeas principales, junto con intensivas intervenciones en aldeas Nuxalk y en sus ríos debido al desarrollo industrial llevado a cabo por el gobierno canadiense.

Se reporta que los Nuxalk sufren de alcoholismo, problemas de salud dental, obesidad, diabetes y condiciones relacionadas con niños de alto riesgo. Estas patologías se encuentran ahora entre los Nuxalk, a pesar del hecho de que antes de 1950 no había evidencia de cualquiera de estas condiciones. Antes de 1950, la población Nuxalk dependía principalmente de alimentos y medicinas locales provenientes de su ambiente circundante, ríos y el océano (Kuhnlein y otros, 2013, 2009).

Antes de las intervenciones canadienses, los Nuxalk solían tener una dieta balanceada y sin patologías debido al consumo de verduras y moras silvestres (por ej., espino negro, frambuesa negra, arándanos, uvas de oso, mora azul, escaramujos y frambuesas, corteza de abeto, carne de alce, ciervo, conejo y pescado (lenguado, hueva de arenque, cinco variedades de salmón (seco, ahumado y crudo), eulachón y la grasa extraída del eulachón y trucha). Éstas especies y variedades de plantas y animales proporcionaban el complemento total de vitaminas, minerales (macro y micro) así como carbohidratos, grasas y proteínas, apoyando su dieta desde la infancia temprana, la dieta materna y adulta (Kuhnlein y otros, 2009, 35).

Pero para 1950 y 1960 las jovencitas ya no consumían las muchas especies de bayas, corteza de abeto, arenque, erizos de mar, abulón, mejillones, foca y cabra de montaña y conejo (Kuhnlein y otros, 2009. 34). El cambio generacional de preferencias por alimentos tradicionales a la dependencia en alimentos y medicinas importados, parecía contribuir de manera significativa al aumento de los niveles de enfermedades crónicas (obesidad, diabetes tipo 2, enfermedad cardiovascular, etc.). Mientras que las patologías crónicas han aumentado en toda la población Nuxalk, la dependencia a muchos alimentos tradicionales continúa a pesar de la contaminación ambiental y las reducidas cosechas han minado el consumo. El salmón, trucha, arenque, especies de bacalao, huevos de salmón, algunas bayas (frambuesa negra, frambuesas silvestres, bayas de salmón, nueces de jabón) frambuesas y brotes de baya de salmón, algas marinas, té de Labrador, chirivía, ciervo, alce, pato y urogallo se siguen consumiendo, aunque en menos cantidades y con menos frecuencia.

Desde que los Nuxalk son ahora 30% depen-

dientes de alimentos tradicionales y el resto en alimentos y medicina producidos comercialmente e importados, es posible que ésta dependencia reducida sea totalmente responsable de los niveles en aumento de enfermedades crónicas. Pero también puede ser una preocupación que los alimentos cultivados de manera silvestre que continúan consumiéndose son de menor valor nutritivo y medicinal debido a los cambios ambientales, ecológicos y climáticos.

La mayoría de los alimentos basados en plantas de los Nuxalk son plantas tipo C3, lo que las vuelve más vulnerables a los procesos fotosintéticos que reducen la productividad y aumentan las azúcares. El proceso puede reducir el contenido de proteína y micronutrientes debido al CO2 elevado en la atmósfera y los efectos consecuentes de fotorespiración adversa.

Awajun

La nación Awajun de 8,000 personas está ubicada en un territorio de 86 millas cuadradas en el Río Marañón en 52 comunidades en la frontera norte de Perú con Ecuador. Los Awajun son 93% dependientes de 223 especies y variedades de plantas y animales en su territorio (Kuhnlein y otros, 2009). Mientras que el promedio de esperanza de vida peruana para ambos sexos es de 75.5 años, es notable que el 50 por ciento de los Awajun mueren antes de alcanzar los 40 años, a pesar de la fuerza de su población que parece mantenerse como resultado de su alta fecundidad, con más de 7 niños nacidos de cada mujer. Sus patologías de salud principales incluyen: muerte prematura en niños (donde 25% muere antes de los 9 años), parasitosis, desnutrición, falta de crecimiento y anemia. Éstas se atribuyen a los “sistemas ecológicos, culturales y de alimentos” (Kuhnlein y otros, 2009).

El ambiente tropical de la selva favorece a los alimentos cultivados de manera silvestre de los que los Awajun dependen. Los Awajun son agricultores, así como administradores de la selva al producir los alimentos de los que depende su dieta. Producen caña de azúcar, café, papaya, achiote, piña, sacha papa, camote, pimiento rojo y una amplia variedad de plantas medicinales, tales como el jengibre, ajo, cilantro y hierba de limón. Los árboles frutales son cultivados para producir arazá, carambola, aquaje, pijuayo y cacao.

Karen

La nación Karen, de cerca de 9 millones de personas distribuidas en Birmania, a lo largo de la frontera este de los estados de Kayah, Shan, Ayetarwady, Kawtholei del sur y al oeste de Tailandia, donde se encuentran bajo frecuentes ataques armados e incendios provocados por los militares Birmanís. Cientos de miles de Karen huyeron de sus aldeas en Birmania a campamentos de personas desplazadas (IDP, por sus siglas en inglés) y a campamentos de refugiados en la frontera oeste de Tailandia a principios de 1984. La comunidad estudiada es Sanephong, con una población de 661 habitantes en 126 hogares ubicados en el Santuario Nacional de Vida Silvestre Thungyai Naresuan al noroeste de Bangkok, Tailandia. Esta aldea remota sólo es accesible por un sendero montañoso y fangoso o por vehículos de doble tracción por caminos fangosos. El gobierno tailandés restringe fuertemente a la comunidad en Sanephong en cuanto a las plantas y animales que pueden ser cosechados, debido al nombramiento de santuario de vida silvestre de las áreas alrededor de la aldea. Las fuentes de alimentos son entonces una combinación de cultivo y recolección

de cuatro lugares específicos de cultivo y recolección que varían de tamaño de 4.8 a 320 hectáreas. En estos lugares las familias cultivan plátanos, mangos, yaca, calabazas y arroz mojado. Los peces de agua dulce se toman con otros animales acuáticos (cangrejos, conchas, camarón, ranas) junto con plantas y vegetales (en las orillas) de Kheraw-Khi, un arroyo perenne de las montañas cercanas. El arroz es el alimento base dominante del que dependen los miembros de la aldea.

Los Karen (Birmania, Tailandia) son 85% dependientes de 387 especies y variedades de plantas y animales. Los investigadores identifican cerca de 387 especies y variedades de alimentos tradicionales donde 17% son animales y 83% plantas. De los animales, los patos, vacas, búfalos y cabras son domesticados y 51 variedades de arroz y raíces, 89 vegetales y 37 frutas son cultivadas mientras que 126 variedades son cosechadas de la selva.

La aldea de Sanephong, a diferencia de los campamentos de refugiados donde más de 150,000 Karen son detenidos en ocho lugares a lo largo de la frontera este de Tailandia, está organizada con una escuela primaria que promueve la salud y nutrición y ofrece jardines, un programa de leche, almuerzos diarios y apoyo con sal de cocina yodada y suplementos de hierro semanales. La aldea también cuenta con voluntarios de la salud responsables del cuidado de la salud primaria. Generalmente, la aldea de Sanephong depende de la búsqueda de alimento y domesticación con la compra de alimento en aumento, la economía de mercado ha estado entrando a la aldea. Aun así, el arroz cultivado de manera local ha permanecido como la principal fuente de alimento, mientras que las fuentes animales de proteína están disponibles, pero no abundan. Las frutas, vegetales y animales, como las ranas verdes y grillos, contribuyen a la mayoría del soporte de macronutrientes. Los carbohidratos constituyen más del 70% del total del consumo de energía para los niños Karen en su aldea. Mientras que los niños parecen recibir suficiente nutrición de la leche materna, se encontró que los niños de entre 2 y 12 años tenían deficiencia en la ingesta de vitamina A y C; y también se encontró que las ingestas de hierro y calcio eran muy bajas (Kuhnlein y otros, 2009, 180). Se ha demostrado que el consumo significante de fruta en niños es problemático, ya que muchos experimentan malestar abdominal y diarrea.

Bhil

Bhil es la nación indígena pre-Aria más grande en India con una población combinada de 16 millones de personas ubicadas en el sureste de Pakistán y Oeste de India. Parte de la población Bhil está ubicada en las regiones montañosas de Madhya Pradesh, Maharashtra, Gujrat, Karnataka, Tripura, Andhra Pradesh, Chhattisgarh y los estados de Rajastán y el estado de Sindh en Pakistán. La población se dedica principalmente a la agricultura de plantas (verduras, raíces, frutas) y animales, incluyendo los peces y ciervos de los ríos y bosques cercanos. La población Bhil ubicada en el Distrito Dang del estado de Guajarat es la primera fuente de datos con una población de 11,500 personas en 53 aldeas. Los pueblos indígenas vecinos incluyen a los Kolchas, Kotwalias, Kuknas y Warlis. Un cuarto de la población Bhil está empleada lucrativamente y gana un promedio de $500 anuales con la pesca, caza y recolección de 95 especies y variedades de animales y plantas en el bosque (Kuhnlein y otros 2009, 212).

Los Bhil en el Distrito Dang cultivan cereales tales como el amaranto, mijo, arroz, sorgo, trigo y

maíz. El pescado y otros mariscos incluyen tiburón, anchoa, cangrejo y otros pequeños pescados de río como rava, kokil, zinga y muru. Los vegetales que se cultivan son los champiñones, bambú, calabaza roja, mate, habichuelas rojas, berenjena y fenogreco. Los Bhil consumen alimentos basados en animales como las vacas, cabras, conejos, ratas, jabalíes y aves de corral, incluyendo la paloma, milano silbador, pájaros carpinteros, periquitos australianos y loros, así como las aves tradicionalmente capturadas, como la lechuza y francolín. Las frutas, nueces, semillas, legumbres y leguminosas juegan un papel importante en la dieta Bhil que incluye: chicozapote, anón, yaca, papaya, grosella, higos silvestres, tomates, mangos y guayaba; y las legumbres incluyen: habas, soja, lentejas, guisantes, chícharos salvajes; y las raíces forman una parte importante de la dieta que incluye la pata de elefante, colocasia, camote, papa.

Un estudio a profundidad del perfil de las enfermedades crónicas de la India concluyó que "las enfermedades crónicas contarán por ligeramente menos de tres cuartos de todas las muertes en India para 2030" (Patel y otros, 2011),

"Generalmente, las tribus consumen alimentos como tubérculos silvestres y flores, de los cuales no hay información disponible en tablas de nutrición. Por lo tanto, la información de estos alimentos no se reflejó en el consumo de varios nutrientes" (Laxmaiah y otros, 2015).

"Un análisis de regresión multi-variable mostró que la edad, educación, índice de riqueza, uso de tabaco, consumo de alcohol, índice de masa muscular, obesidad abdominal y troncal son factores de riesgo para padecer hipertensión entre los hombre y mujeres indígenas en la India. El alto riesgo de padecer hipertensión entre mujeres indígenas iletradas fue similar en conclusiones reportadas por otros estudios" (Laxmaiah y otros 2015). "El uso de sustancias naturales, particularmente plantas para controlar enfermedades es una práctica de siglos que ha llevado al descubrimiento de más de la mitad de todos los fármacos modernos" (Priyanka & Shrikant, 2014).

Igbo

La nación de Biafra incluye a los Igbo, con un estimado de 32 millones junto con los Efik, Ibibio, Annang, Ejagham, Eket, Ibeno y los Ijaw ubicados en el sureste de Nigeria en la Costa Atlántica y frontera con la República de Camerún. Los Igbo lideraron una guerra secesionista en contra de Nigeria (que recientemente se convirtió en estado después del dominio colonial Británico) para establecer la República de Biafra entre 1967 y 1970. Su República fue reconocida por Gabon, Costa de Marfil, Tanzania y Haití y recibió ayuda y apoyo de siete países que incluyen a Francia, Noruega e Israel. La guerra devastó a los Igbo, dando como resultado más de 2 millones de personas asesinadas. Este antecedente es directamente relevante para entender el enfoque del estudio de Kuhnlein, que se enfocó en ocho comunidades seleccionadas al azar en cuatro estados: Ohiva/Huhu en el Estado de Abia y Ezinifite/Aku en el Estado Anambra, Ubulu-Uku/Alumu en el Estado Delta y Ede-Oballa/Ukehe en el Estado Enugu. Así que las comunidades Igbo se incluyen en el estudio de CWIS. Se estima que la población combinada de estas comunidades supera las 500,000 perdonas, con el Ede-Oballa que comprende a las más pequeñas con 12,447.

El carácter geográfico y ambiental de las áreas Igbo pueden ser mejor descritas como llanuras que están a menos de 200 metros sobre el nivel del mar. La tierra experimenta estaciones lluviosas con vari-

aciones año con año. En consecuencia, hay esencialmente dos estaciones: lluviosa, y caliente seca.

El estado de salud de las poblaciones en general en todo el estado de Nigeria describió a 42% de los niños como atrofiados, 25% con bajo peso y 9% como debilitados. En el sureste los Igbo fueron descritos como 20% de niños atrofiados, 5% debilitados y 8.5% de bajo peso. La población Igbo descrita en 1993 estaba experimentando deficiencias en micronutrientes específicamente relacionadas con limitaciones de Vitamina A. Las deficiencias de yodo y zinc están relacionadas con 27 por ciento de las madres y mujeres embarazadas en la población Igbo. Estas deficiencias parecen haber persistido a pesar de que el yodo y ß-caroteno estaban disponibles en ñames de tres hojas, mermeladas amarillas y el zinc y hierro en los plátanos, pan de frutas, anacardos y legumbres. La atrofia y el debilitamiento pueden atribuirse a las deficiencias dietéticas en las madres también. Una preparación como la Achicha (taro seco mezclado con arveja, aceite de haba, aceite de palma y vegetales de hoja verde) es rica en hierro, zinc, ß-caroteno, folato y cobre – todos importantes en las deficiencias dietéticas. Okpa es un plato con pasta de harina de cacahuate Bambara mezclada con aceite de palma, pimienta, sal y especias que proporciona proteína, hierro, niacina, magnesio y ß-caroteno. Estas y otras numerosas preparaciones proporcionan suficiente evidencia que hay micronutrientes disponibles en su dieta. Sin embargo, la pregunta permanece si esos micronutrientes se encuentran en cantidad suficiente por porción para proporcionar una nutrición completa. Su valor nutricional puede estar disminuyendo.

Si bien éstos factores sobre el estado de salud reflejan las condiciones de la dieta, el caso es que los Igbo utilizan un total de 220 especies y 400 variedades de alimentos (Kuhnlein y otros, 2013, 2009). Se han documentado veintiún (21) especies de raíces y tubérculos con almidón, 20 legumbres, 21 nueces/semillas, 116 vegetales, 12 variedades de hongos y 36 frutas en el sureste de Nigeria. El territorio Igbo en la parte del sureste de Nigeria depende ampliamente de la agricultura y la pesca, mientras que pueblos en el norte dependen de la producción agrícola, carnes y frutas.

Alimentos de ambientes biodiversos

La Organización de Alimentos y Agricultura de las Naciones Unidas (FOA, por sus siglas en inglés) patrocinó estudios que resultaban en documentación intensiva de alimentos y sus valores nutricionales utilizados por 13 pueblos indígenas seleccionados ubicados en el hemisferio oeste (4 naciones), África (2 naciones), Sub-continente de India (2 naciones), Asia (2 naciones) e Isla del Pacífico (1 nación). Los estudios fueron realizados por las Oficinas de Nutrición y Ambiente del Centro de Pueblos Indígenas en Quebec, Canadá y los investigadores de la Organización de Alimentos y Agricultura de las Naciones Unidas (FOA). Estos estudios proporcionaron la primera evidencia específica de cada nación sobre datos nutricionales y de salud que bajo circunstancias convencionales no se hubieran recopilado o hubieran sido enterradas y por lo tanto invisibles en estudios poblacionales estatales.

Los pueblos del Cuarto Mundo del mundo pueden depender hasta de 80% de alimentos y medicinas basados en plantas y animales no comerciales o no cultivados para su dieta diaria. Generalmente esto es verdad, a pesar del hecho del incremento en el número de pueblos del Cuarto Mundo que han sido forzados por las políticas de

gobierno de los estados que "favorecen el abandono de cultivos tradicionales" (Rodrigo, Andrade, Orbe & Terán, 2018) de sus territorios tradicionales en proximidad más cercana a pueblos y puestos fronterizos y tienen como resultado que se vuelven dependientes de alimentos y medicinas procesados comercialmente, lo que resulta en "nutrición de transición" que afecta directamente las respuestas de salud. Las comunidades del Cuarto Mundo reportan evidencia de aumento en los niveles de enfermedades crónicas.

Limitaciones de la Investigación Convencional

Los comentarios de medios académicos, políticos y públicos convencionales u ortodoxos se centran en el término "cambio climático" y se analizan principalmente en términos de infraestructura y costos económicos relacionados con los efectos tales como el aumento del nivel del mar, cambios en el suministro mundial de los alimentos, la reubicación de comunidades y estrategias atenuantes. Se hace poco énfasis en las repercusiones que los cambios inducidos por los humanos tienen en el clima – y los mayores efectos de los niveles elevados de CO_2 atmosférico tienen en la salud humana. Pese a que hay un cuerpo emergente de literatura científica ortodoxa que reporta los resultados de las investigaciones sobre los efectos de los niveles elevados de dióxido de carbono (CO_2) en alimentos y medicinas basados en plantas y en menor grado basados en animales, la mayoría de esa investigación tiende a enfocarse en plantas y animales producidos comercialmente/agrícolamente con una preferencia esencialmente económica. Algunos investigadores ortodoxos que dirigen meta-análisis de literatura existente, mencionan con preocupación que el CO_2 elevado y otros gases invernadero en la atmósfera han afectado negativamente variedades de diversas especies de cultivo comerciales que resultan en consecuencias serias de enfermedades crónicas para los seres humanos (Dietterich y otros, 2015a; Loladze, 2014; Thompson & Cohen, 2012). Los investigadores acuerdan que los pueblos dependientes de la agricultura son particularmente vulnerables a los efectos del cambio climático en los valores nutricionales de los alimentos basados en plantas y animales. Los efectos particulares de los niveles de CO_2 en alimentos y medicinas tradicionales cosechados de los bosques, praderas, selvas y ríos en los que más de un billón de gente del Cuarto Mundo dependen para su nutrición y salud, pueden ser de mayor importancia. La escasez de información en la nutrición cambiante (proteína, micronutrientes, biodisponibilidad) de plantas y animales silvestres, lo que constituye del 40% al 80% de la dieta y fuentes de medicina de la gente del Cuarto Mundo, sugiere la necesidad de mayor investigación.

Las naciones políticas distintas encapsuladas por los estados, las naciones del Cuarto Mundo – y las regiones bioculturalmente diversas que representan – mantienen aproximadamente 80% de la biodiversidad del mundo. Colectivamente, CWIS estima que hay 1.3 billones de personas que representan 6,000 naciones del Cuarto Mundo distintas que oscilan entre 100 a 25 millones de personas alrededor del mundo. Sus largas historias de cultivo de relaciones mutuamente benéficas con los campos ecológicos, los ubican en una posición vulnerable con relación al cambio climático; y en una posición estratégica, con relación a los enfoques efectivos y holísticos hacia sus efectos atenuantes.

Casi cada ecosistema ha sido alterado para que las plantas y animales puedan ser utilizados como alimento y medicina, así como Bharucha & Pretty escriben: "El principal uso de las especies silvestres es 120 por comunidad para comunidades indígenas en países tanto industrializados como en desarrollo" (Bharucha & Pretty, 2010). En comunidades Igbo en el sureste de Nigeria, la gente obtiene 96% de su energía diaria de 220 especies de variedades de fuentes de plantas y animales. Los Awajun en el norte de Perú obtienen 93% de su energía diaria de 223 especies y variedades de plantas y animales (Kuhnlein y otros, 2009). Pero con la cantidad, calidad y accesibilidad a los alimentos silvestres disminuyendo – como resultado del cambio climático, sobre desarrollo y conservación-exclusiones – se vuelve necesario evaluar el papel que juegan/jugarán los alimentos silvestres en alimentar las realidades fisiológicas y culturales de los pueblos del Cuarto Mundo y más.

Estudios recientes (Dietterich y otros, 2015b; Loladze, 2014; Ziska y otros, 2016) sugieren una posibilidad alarmante que mediante plantas y alimentos cultivados por humanos y alimentos y medicinas de plantas/animales obtenidos de un ambiente biodiverso, la composición atmosférica cambiante puede alterar radicalmente los valores nutritivos y medicinales en los que los seres humanos dependen.

De hecho, puede ser que los niveles de enfermedades crónicas que padecen los pueblos del Cuarto Mundo pueden ser un mercado significativo que, a pesar de que los pueblos indígenas por lo general obtienen un porcentaje del 80% de su nutrición y medicinas diaria de lo silvestre, los cambios en la composición nutritiva animal y vegetal pueden cambiar significativamente. Los cambios pueden ser afectados directamente por la rápida elevación del CO_2 y otros gases de efecto invernadero en la atmósfera que alteran las acciones fotosintéticas en las plantas. Esos cambios pueden ser la reducción de proteínas, micronutrientes y vitaminas y niveles altos de azúcares y otros carbohidratos. La consecuencia podría ser que a pesar de que hay un consumo en aumento de alimentos basados en plantas y animales favorecidos, el nivel actual de nutrición puede disminuir. El resultado podría ser el aumento de atrofia, debilitamiento, bajo peso al nacer y muerte prematura en niños debido a las reducciones en micronutrientes, aumento de enfermedades crónicas tales como la Diabetes Tipo 2, enfermedades cardiacas, enfermedad de los riñones y varios tipos de cáncer debido a los altos niveles de azúcar.

Es dentro de este contexto que se plantean las siguientes preguntas en el estudio de investigación:

1: ¿Qué se conoce por CO_2 atmosférico elevado en la vida silvestre (plantas y animales) utilizados como alimento, con propósitos farmacéuticos y medicinales por los pueblos del Cuarto Mundo?

2: ¿Cuál es el efecto en la salud indígena? ¿Salud global en general?

3: Ya que CWIS aboga por regresar a los alimentos y medicinas silvestres, ¿estamos impulsando a los pueblos del Cuarto Mundo a perjudicarse más que a la salud?

4: ¿Cuáles son las alternativas? Ya que los estados no pueden lidiar con este asunto, ¿Cómo pueden las naciones del Cuarto Mundo abordar estos cambios?

Marco Teórico

La Teoría del Cuarto Mundo (FWT, por sus siglas en inglés) en investigación, declara que los conceptos de comparación, razonamiento relacional, balance entre fuerzas contendientes, y en igualdad de género (que los seres humanos son parte de todas las cosas vivientes y no la cosa viviente dominante) asegurará cortesía – cuando se aplique en la vida y el pensamiento entre los pueblos, entre los pueblos y la naturaleza viviente, y con las fuerzas del cosmos. Si las exigencias de los humanos exceden la capacidad del mundo natural para reproducirse, un desbalance destructivo provoca la destrucción de la vida. Estudios sobre alimentos silvestres, nutrición, etnobotánica, y salud física, emocional y cultural están dentro del marco de la investigación teórica del Cuarto Mundo (Ryser, Gilio-Whitaker & Bruce, 2016). La Teoría del Cuarto Mundo está arraigada en sistemas de conocimiento tales como aquellos concebidos en África Sub-Sahariana (Sistema de Conocimiento del Congo), el Hemisferio Oeste (Sistema de Conocimiento Anahuac, Sistema de Conocimiento Tsawalk, Sistema de Conocimiento Anishinabek) y el norte de Europa (Cuatro Vientos Saami). Estos sistemas, a pesar de ser independientes, comparten fundamentos conceptuales comunes basados en la metáfora: Cuatro Direcciones.

Es esta teoría la que sirve como el fundamento del estudio de investigación que el Centro de Estudios Indígenas del Mundo comenzó en diciembre de 2017 para evaluar el grado en el que el CO2 elevado en la atmósfera de la tierra puede contribuir a la incidencia en enfermedades crónicas prevenibles entre los pueblos indígenas.

La Teoría del Cuarto Mundo afirma que la historia, memoria, y proceso de pensamiento son multi-dimensionales – donde hay pensamiento bi-dimensional (el pasado lineal progresando hacia el futuro, fatalista como predestinado, cíclico como en repetición o providencial como decretado por Dios) es en realidad en siete dimensiones (R. C. Rÿser, 1997). Si se traza el pensamiento diagramáticamente, el proceso es más como una espiral donde el movimiento y el cambio se mueven en todas direcciones simultáneamente en tiempo y espacio. Típicamente, los sistemas de conocimiento del Cuarto Mundo han ilustrado estas concepciones epistemológicas en otra forma metafórica representada típicamente como las Cuatro Direcciones. Aun así es una declaración incompleta afirmar que hay cuatro direcciones cuando en realidad hay siete con un número infinito de puntos intermedios en un “círculo cruz”, donde cada uno de los puntos de una cruz indican cuatro direcciones relacionadas con los movimientos solar y lunar, el punto central donde las cuatro líneas se encuentran y las líneas que se extienden hacia afuera de arriba hacia abajo del punto central, proporcionan las dimensiones superior e inferior: igualando siete dimensiones desde cuatro direcciones. De hecho, los diagramas son metafóricos como en el diagrama de Agro cosmología Purépecha ***(Ver la Figura 1)*** que proporciona información esencial para una guía vegetal, meteorológica, cosmológica y ambiental. La Cruz del Congo ***(Ver la Figura 2)*** es similar al diagrama de cuatro direcciones Purépecha y también sirve como una herramienta práctica para ayudar a darse cuenta, reconocer, explicar y predecir los fenómenos materiales e inmateriales de los que forman parte íntima los seres humanos.

Los sistemas de conocimiento de los pueblos de Cuarto Mundo varían de localidad en localidad, reflejando la singularidad cultural que surge de sus

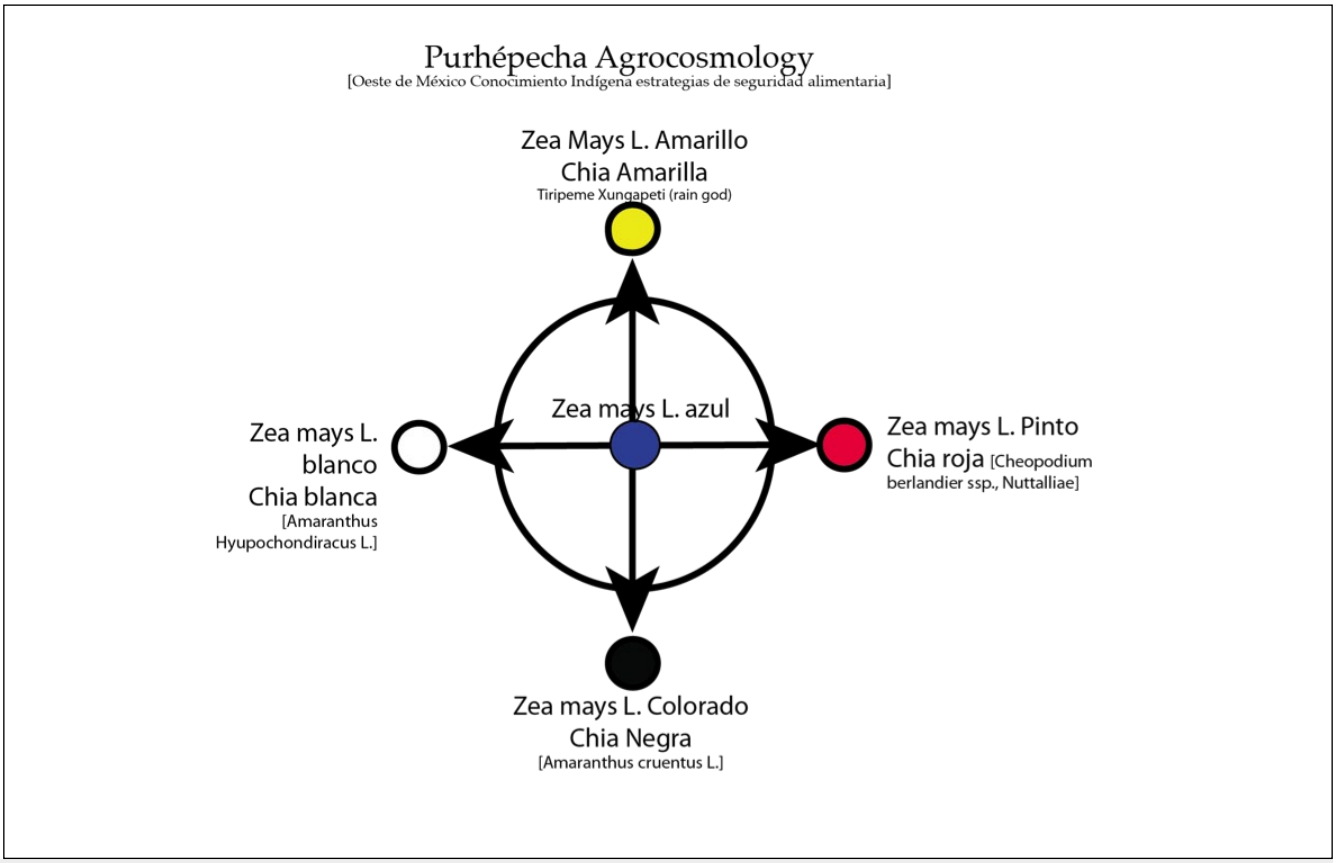

Figura 1: Cosmograma Purépecha de "Cuatro Direcciones" - Mexico

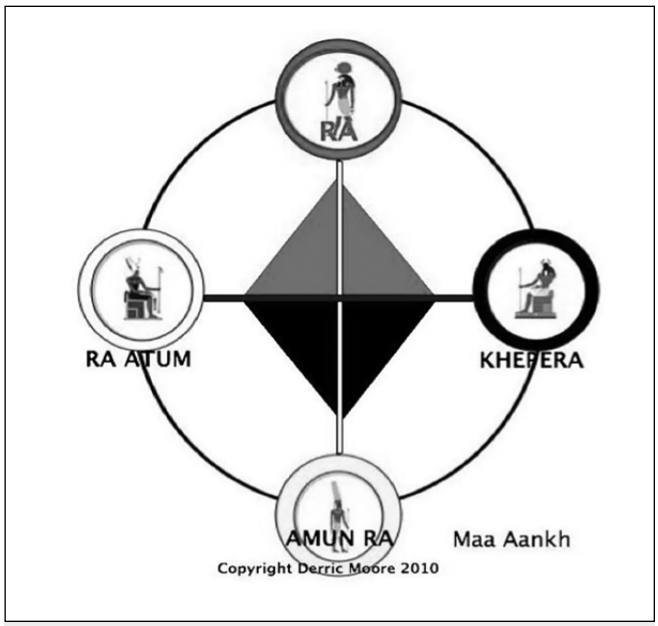

Figura 2: Congo Cross

relaciones dinámicas y evolutivas con la tierra, el mar y el cosmos (Ryser, 2012). Estos sistemas de conocimiento difieren del positivismo en que conciben de muchas maneras diferentes comprender la verdad al aplicar diferentes enfoques científicos, enfocándose en relaciones entre fenómenos observables y repetidos. Se muestra una ilustración del mapeo en la (**Figura 1**) donde los Purépechas de México proporcionan las "cuatro direcciones" metafóricas que muestran la relación entre direcciones, cosmos, plantas, animales y usos humanos por estación. No hay sólo una forma de conocimiento indígena, hay muchos como se ilustra en la imagen relacional "cuatro direcciones" del Congo en la (**Figura 2**). Mientras que las fuentes y méto-

dos para adquirir conocimiento difieren, los temas de cambio y las relaciones ocurren repetidamente – informando así la metodología del estudio de CWIS.

Los sistemas de conocimientos como estos constituyen ciencias que contribuyen a las ciencias convencionales como se concibieron en el siglo 17 en Europa en el que "el humanismo producía una versión de la naturaleza humana atando a la humanidad el requisito de la racionalidad" (Watson 2008, 258). Las ciencias del Cuarto Mundo pueden ser comparables o de mayor importancia que las ciencias ortodoxas en beneficio potencial a la humanidad cuando se dirigen a problemas complejos, tales como los efectos del cambio climático en las poblaciones de la tierra. Las ciencias del Cuarto Mundo establecidas hace tiempo en los campos de comportamiento, nutrición, medicinas de plantas y animales, así como alimentos y medicinas domesticados y no domesticados, la recolección, la caza y el procesamiento de conocimientos, por ejemplo, formaron los cimientos de la alopatía ortodoxa, homeopatía, prácticas nutricionales, psicología, farmacología y las "ciencias naturales". Los sistemas de conocimiento del Cuarto Mundo expresan explicación, conceptos, ideas, prácticas y alivio restaurativo en virtualmente todos los dominios científicos y como se indica a lo largo del tiempo, informan directa e indirectamente a la ciencia occidental en su conjunto.

Un sistema de conocimiento indígena incorporado en la Teoría del Cuarto Mundo originada con los Nuu-chah-nulth (Costa del Pacífico de la Isla Vancouver, Canadá) basado en el concepto de tsawalk que significa "todo es uno". En Tsawalk, una Cosmovisión Nuu-chah-nulth, Richard (Umeek) Atleo (2004, 2005), ofrece una perspectiva localmente incorporada y ampliamente relevante de la crisis ecológica global ontológica y epistemológica. Tsawalk no hace distinción entre los procesos físicos y metafísicos (espirituales) – cada aspecto del mundo está conectado a través de relaciones de energía y espirituales – que forma parte significativamente de la Teoría del Cuarto Mundo. El sistema de conocimiento Anahuac (R. C. Rÿser, 2015) es probablemente el abuelo de los sistemas de conocimiento en el Hemisferio Oeste enraizados en las civilizaciones de México que se extienden por más de 3,500 años. Este sistema de pensamiento también forma parte de la Teoría del Cuarto Mundo con concepciones prácticas que explican y representan realidades materiales e inmateriales (Lara, 2007; R. C. Rÿser, 1997). Las relaciones vivientes en el sistema Anahuac, así como en el sistema Tsawalk, requieren responsabilidad moral entre todos los seres sintientes (plantas, animales, humanos), incluyendo la Tierra, el Cosmos y – por extensión – los climas de la Tierra.

Con relación al cambio climático – tales como los efectos de los niveles elevados de CO_2 en la atmósfera en la fauna silvestre usada como alimento, propósitos medicinales y farmacéuticos por comunidades indígenas – Nietschmann (1994) argumenta que es imperativo incluir un conjunto diverso de respuestas culturales y "saber cómo" científico para desarrollar holística y efectivamente e implementar políticas que asegurarán el sustento para todos. La innovación tecnológica puede ayudar a mitigar algunos de los retos que enfrentan los humanos. Pero si esa innovación tiene el costo de una lista cada vez más estrecha de soluciones, los humanos aprenderán una lección existencial dolorosa. Para que ocurra un cambio sistémico a largo plazo, debe

implementarse la participación política efectiva de aquellos que históricamente tienen un registro probado de sostenibilidad.

Metodología

En este estudio aplicamos varios conceptos ofrecidos por la Teoría del Cuarto Mundo para evaluar, comparar, describir e inferir los efectos de los niveles elevados de dióxido de carbono en la atmósfera (CO_2) en los beneficios nutricionales y para la salud de los alimentos y medicinas basados en plantas y animales utilizados por los pueblos del Cuarto Mundo u obtenidos de otra forma en localidades tales como los bosques, selvas, sabanas, praderas, ríos, océanos, desiertos y áreas montañosas.

Razonamiento Relacional basado en roles es mejor representado por razonamiento analógico, donde la analogía es un instrumento de consulta científica y un cambio conceptual aplicado a descubrir las relaciones causales y conjunto de correspondencias sistemáticas que sirven para alinear los elementos de una fuente y objetivo. Aplicado a las experiencias humanas comunes, el razonamiento relacional basado en roles usaría un fenómeno observado de hormigas cargando pedazos de hojas de plantas arrancadas de un arbusto y luego cargando los pedazos en sus quijadas en una sola fila a lo largo de un campo a su nido y relatar por metáfora el evento observado como un ejército de humanos cargando suministros hacia sus cuarteles. Ambas representan en esencia el mismo fenómeno, que puede ser descrito subsecuentemente como cables cargando carga eléctrica de un generador hacia un foco. La analogía recurre al objetivo (hormigas) para explicar la fuente (electricidad) que hace que el proceso de electrificación sea una luz comprensible. Los elementos utilizados para aplicar el razonamiento analógico incluyen

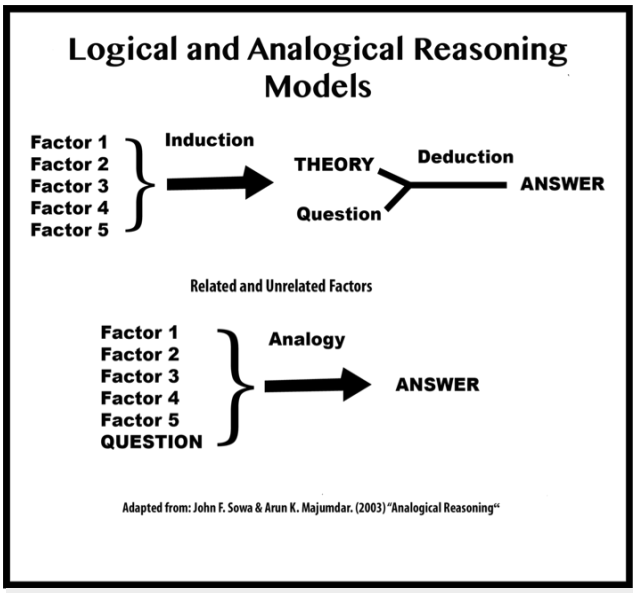

Figura 3: Razonamiento Relacional por Analogía

interpretar un objetivo (observado o fabricado) e interpretarlo como una fuente (analizado), mapeando las relaciones entre el objetivo y la fuente, y luego derivar interferencias que pueden llevar a varios esquemas, que pueden llevar a categorías observables o fabricadas o situaciones que reflejan el objetivo y fuente originales.

La complejidad de la investigación científica ortodoxa y del Cuarto Mundo puede ser comprensible a través de la aplicación del razonamiento relacional ilustrado como pensamiento inductivo e inferencial.

A través de la aplicación repetitiva del modelo de razonamiento lógico y analógico utilizando factores diferentes, se derivan las conclusiones del estudio. Al comparar los resultados de la investigación científica ortodoxa y del Cuarto Mundo y el consumo de los pueblos de alimentos y medicinas basados en plantas y animales del Cuarto Mundo afectados por los niveles elevados de dióxido de carbono atmosférico, pueden revelar efectos nutricionales y medicinales en diferentes poblaciones basados en los alimentos que consumen.

Estructura de la Recopilación de Datos depende de la elaboración de una base de datos enfocada en 15 factores variables que constituyen los datos contenidos en más de 1,200 estudios de investigación ortodoxos y estudios de investigación indígena enfocados en identidades de alimentos de plantas y animales, lugares y usos y efectos de los niveles elevados de CO2 atmosférico en los alimentos y medicinas basados en plantas y animales por los pueblos del Cuarto Mundo.

Estructura de la Base de Datos

La base de datos contiene factores de identificación específicos que pueden compararse con la actividad específica de inferir o documentar relaciones específicas entre los resultados de la investigación ortodoxa y la del Cuarto Mundo y los efectos en las plantas y animales, y finalmente, los efectos en la salud de la población del Cuarto Mundo. Los datos recopilados permiten comparaciones relacionales entre los gases atmosféricos y sus niveles en la atmósfera con efectos en los valores nutricionales y medicinales que pueden verse reflejados en cambios de proteína, micronutrientes y niveles de vitamina a través del tiempo. Las comparaciones pueden incluir descripciones en los niveles nutricionales de principios del siglo 20 con niveles actuales como lo establecen los datos documentados recientemente en 2009.

CATEGORIA DE REFERENCIA	ENTRADA DE DATOS
Clasificación de la Literatura de Investigación	C3 C4 CAM
Fecha de Publicación de Literatura Autor(es) Campo(s) Profesional(es) Título de Literatura Editor Localización Geográfica	
Niveles de Gases de Efecto Invernadero	CO2 CH4 O3
Planta (F=alimento, M=medicina A=ambos)	C3 – F/M/A C4– F/M/A Ce– F/M/A Fungi – F/M/A

CATEGORIA DE REFERENCIA	ENTRADA DE DATOS
Planta Animal (F=alimento, M=medicina A=ambos	Insecto – F/M/B Molusco – F/M/B Mamífero – F/M/B Reptil – F/M/B Pez – F/M/B Otro – F/M/B
Método de Consulta Cambio Nutricional Cambio Medicinal	Aire Libre
Nombre de Naciones del Cuarto Mundo Afectadas Nación/Estado/Región	
Epidemiología	Malnutrición Debilitamiento Atrofia Diabetes Enfermedades del Corazón Tipos de Cáncer Otros

La aplicación del razonamiento relacional basado en la Teoría del Cuarto Mundo puede servir para proporcionar una explicación más plausible y cierta de la relación entre los niveles elevados de dióxido de carbono atmosférico en los valores nutricionales y medicinales de los alimentos y medicinas basados en plantas y animales cultivados, domesticados y tradicionales que ha sido posible con los métodos y técnicas de investigación convencionales, reduccionistas. La suposición es que las numerosas variables que entran en juego que afectan la nutrición de plantas y animales y medicinas de numerosos estudios, pueden emplear diferentes métodos y técnicas que requieran un enfoque de datos más amplio y completo. Eso es lo que el presente estudio está designado a hacer. Si tiene éxito, habrá una conexión fuerte e inferencial entre los niveles de dióxido de carbono y la salud de los pueblos del Cuarto Mundo. Finalmente, el estudio informará cómo esto puede ser igualmente cierto para prácticamente todos los humanos en el planeta.

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ACERCA DEL AUTOR

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Rudolph Rÿser ha trabajado en el campo de Asuntos Indígenas por más de treinta y cinco años como escritor, investigador y abogado de los derechos de los indígenas. Rudolph ha enseñado ampliamente sobre el trauma histórico, modelos culturales de recuperación de adicciones, diabetes y cultura, alimentos y medicina. Es el arquitecto líder de la Geopolítica del Cuarto Mundo – el estudio y práctica de las relaciones sociales, económicas, políticas y estratégicas entre las Naciones del Cuarto Mundo y los Estados. Ha desarrollado y dirigido talleres tribales y de dos o más tribus y seminarios de salud, organización de la comunidad, auto gobierno, cumplimiento de la ley y manejo de recursos naturales. Ha dirigido esos programas en Estados Unidos, Canadá, Australia, México y Perú en comunidades indígenas. Rÿser se desempeñó como Director Ejecutivo Interino del Congreso Nacional de Indios Americanos y fue miembro del personal de la Comisión de Revisión de Políticas de los Indios Americanos. Tiene un doctorado en relaciones internacionales y es autor de Naciones Indígenas y Estados Modernos, publicado por Rutledge en 2012.

Plants for the Prevention and Treatment of Type 2 Diabetes

Salish Country and Plants from around the world

By Leslie Korn, PhD, MPH

ABSTRACT

Salish speaking peoples in southwestern Canada and northwestern United States use a wide range of plants for medicinal purposes that contain compounds that naturally prevent and treat chronic diseases—in particular Type 2 Diabetes. These populations have been engaged in nutritional transition for over 50 years and are more dependent on processed and commercial foods that stimulate insulin and thus contributes to Type 2 Diabetes. Indigenous peoples' incidence of chronic diseases is increasing more rapidly than other populations, though it is evident that the incidence of Type 2 Diabetes experienced by adults is increasing at a higher rate in middle income and lower income countries throughout the world. Many plants are available globally and in Salish Country are hypoglycemic, anti inflammatory and anti-oxidant all of which can to help prevent and treat Type 2 Diabetes.

Key Words: Type 2 Diabetes, indigenous peoples, World Health Organization, chronic disease.

Plants are one of the earth's gifts of medicine and, until recently, were the primary source of medicine before pharmaceuticals. Plant medicine is one form of spirit power that an experienced and knowledgeable person of medicine can help reverse. For example, stinging nettles provide a powerful treatment for arthritis when the freshly harvested canes are brushed over the painful area. The same plant makes a fine tea that helps "clean the blood" and helps the liver release its toxins. Oregon grape, a low growing evergreen that produces a deep blue berry, is a good source for taming upset stomachs. Numerous other plants have powers to stop diarrhea or help soften the stools. Salal berries, huckleberries, and cranberries slow sugar absorption and consequently serve the purpose of helping people prevent or slow the adverse effects of diabetes. They are also rich in blue pigment that scavenges the "rust" that collects in the bloodstream. Leaves, berries, bark, roots, stems and flowers are all power parts of plants that act as helpful energizers, digestive stabilizers or aids for sight, and serve as skin cleansers, hair washers, fungus managers, and pulmonary congestion reducers. With such immense capacities to help, it is no wonder that plant medicine is so important. Below is a selection of plants used in Salish Country and while most of these plants are endemic to the Pacific Northwest, some of them are also found elsewhere, with some brought by contact with outsiders that have become part of the local pharmacopeia.

The process of identifying, cataloging and preparing plants for medicinal use is an important part of cultural and medical revitalization within communities. The Salish repertory of plant medicine is extensive. Below is a brief selection of plants with special application for Diabetes Type 2 and related cardiovascular sequelae.

Alaskan Blueberry

Vaccinium alaskaense Howell

Uses: Blueberries are eaten fresh, dried, and cooked into sauces, jellies and jams. They are a good source of fiber, as well as vitamins A and C. Traditional uses of blueberry include blending the berries with meat and fat to make pemmican, as well as eating them fresh or dried. The Inupiat people use blueberries to pickle fish and bearded seal. The berries are also used as a bluish dye, and the twigs of the plant are used in the joints of cedar wood boxes.

Medicinally, blueberries are known to be helpful in treating cystitis/urethritis, diabetes, and hypoglycemia. For diabetes, an afternoon dose of one-half cup of a blueberry leaf infusion helps the effects of insulin (injections) last longer. To prepare this infusion, steep one ounce of dried blueberry leaves (or three ounces fresh) in two cups of just boiled water for 10 minutes. Strain and drink. This may help lower the number of necessary insulin injections throughout the day.

Black Hawthorn

Crataegus douglasii Lindl

Uses: Hawthorn berries are dried and ground into flour for making bread and cakes. Hawthorn berry jelly is another way to eat this wonderful plant. Hawthorn flowers support heart health, and especially improve coronary circulation, stabilize blood pressure, and reduce angina attacks. The flowers have been used to treat hypertension, arteriosclerosis, and angina pectoris for centuries. The berries are rich in bioflavonoids, which prevent bruising and are a powerful antioxidant.

To prepare a Hawthorn flower infusion, steep one ounce of the dried herb (or three ounces fresh) in two cups of just boiled water for 10 minutes. Drink half a cup, three times a day. The berries can be made into a decoction by simmering one ounce of dried berries in three cups of water for 15 minutes. Drink one-half cup up to three times a day.

Blackberry, Pacific Blackberry, Wild Blackberry

Crataegus douglasii Lindl

Uses: Blackberries are edible and are commonly added to jams, or canned or frozen. Traditionally, they are mashed and made into cakes and mixed with fish and meat. Tea is made from very fresh or dried leaves for diarrhea, stomach problems, sore throats, and mouth sores, while the roots are sometimes used to treat colds. Beyond medicinal uses, many Salish peoples make tea from the leaves for a delicious beverage, or add the leaves to bitter beverages to sweeten them.

Blue Elderberry

Sambucus cerulea Raf.

Uses: Blue elderberries are edible, although the stems, leaves and bark of this plant are toxic and should be avoided. Red elderberries are also toxic and should not be eaten. The blue berries are frequently used to make preserves and syrup, and they are rich in vitamin C. They are eaten fresh in late summer or dried for winter use. The bark and leaves are made into an extract and used to treat diarrhea, colds, sore throats, fevers, cuts, and sores. Removing the pith from the stems allows the stems to be used as whistles or flutes.

To make a tea of elderberry, steep one ounce of the dried berries (or three ounces fresh) two cups of just boiled water for 10 minutes. Drink half a cup, three times a day. Combining it with peppermint leaves makes a relaxing tea.

Bog Cranberry, Small Cranberry, Wild Cranberry

Vaccinum oxycoccos L.

Uses: Cranberries can be eaten fresh, cooked, or dried. Salish peoples prefer to cook the berries and eat or store them in oolichan oil. Dried cranberries are stored for winter use and used in desserts. The Quinault, Klallam, and Makah of Washington steam the green berries and eat them or wrap them in moss until they soften. Medicinally, cranberries are used to help with urinary infections; it is believed that D-Mannose in the cranberry prevents bacteria from adhering to the epithelium of the urinary tract.

Cattail

Typha latifolia L

Description: Cattail, an aquatic perennial, forms in dense stands in wetlands, marshes and shallow ponds. The leaves are narrow and erect, sprouting from the base of the stem and growing to around seven feet long. The flower stalk is strong and unbranched, typically rising to around six feet. Mature plants have both yellowish male and greenish female flowers, with the male flowers occurring above the female flowers on the stem. Flowers bloom in summer and afterwards the male flowers break up and are dispersed, leaving the tips of the stalk bare. The female flowers turn brown and form a cylindrical spike that resembles a cat's tail.

Uses: The cattail has many edible parts. The roots can be dug up in early spring and the young shoots peeled and eaten. The flowers, which are high in carbohydrates, can be steamed or cooked when in bloom, or collected late in the season when they are filled with nutritious pollen that can be used to enrich flour. This pollen is high in amino acids and protein. Traditionally, the roots and the stocks of the cattail are baked in ashes and eaten. Cattail is used for weaving mats and baskets. Cattail flowers are used for diarrhea and indigestion, and the boiled roots are applied to burns and skin problems.

Chestnut, American Chestnut

Castanea dentata (Marshall) Borkh.

Description: Chestnut is a large tree, reaching over 100 feet in height, that grows in North America, Europe and western Asia. It has alternate, toothed, long and narrow leaves that are dark green on top and lighter underneath. The pale green to white flowers are long catkins which may be male or female. Fruits form inside of round spiny burrs in groups of 1-5 brown nuts. Chestnuts ripen in early fall and are nearly round except for one or two flattened sides. The chestnut is not native to the Pacific Northwest, but it was introduced to this region in the 19th century.

Uses: The leaves and inner bark of the chestnut have medicinal properties, and the chestnuts are edible and high in carbohydrates, starch, and potassium. Fresh or dried leaves are useful in treating coughs, hiccoughs and other respiratory conditions. Chestnut leaves are also helpful in cases of diarrhea, arthritis, hemorrhoids, and intestinal inflammation.

Chickweed

Stellaria media (L.) Vill.

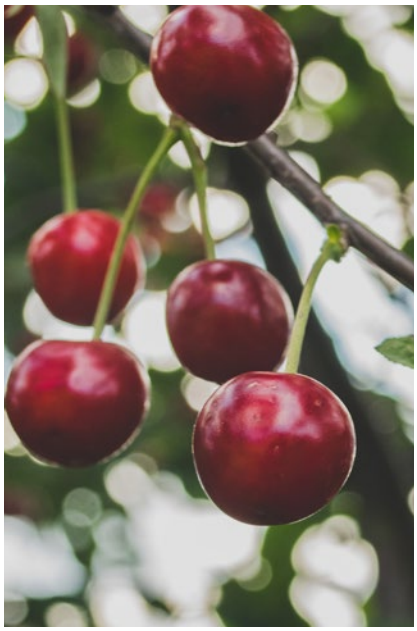
Description: A small, widespread plant, chickweed is low growing and tends to form mats. The small plants are not bothered by frost and can be found in bloom or in seed throughout the year. It has small oval and opposite leaves, and tiny, white flowers with five, deeply-notched petals. The fruits are small pods containing large numbers of tiny seeds. Since it is widespread and non-native, chickweed is frequently considered an invasive weed in many areas.

Uses: Chickweed is rich in iron and potassium, and it tastes similar to spinach. It can be included in soups or stews, and the raw leaves, seeds, and flowers can be added to salads. The small seeds can also be ground into a flour to be added to other cereals, breads, or used for thickening. Chickweed is used for any condition involving itching as it is astringent. It can be added to bath water to help relieve inflammations, typically those specific to joints. Decoctions are used to improve circulation, and juice from the plant.

To make an infusion of the leaves and flowers, steep 2-3 ounces of the fresh plant in two cups of just boiled water for 10 minutes. Drink one-half cup up to three times daily.

Choke Cherry

Prunus virginiana L.



Description: A deciduous shrub, 3 to 10 feet high, with alternate, broadly oval, pointed, toothed leaves. The small, whitish, flowers grow in elongated clusters and develop into round, bright red to purplish black fruits with large stones. Choke cherry grows in thickets, ravines, sandy and rocky areas, and woodlands.

Uses: Choke cherries are eaten fresh, cooked, or dried. They are easy to harvest and ripen in August and September. Traditionally, they are crushed with fat, dried bear, or elk meat. They are also dried in large quantities on mats in the sun and saved for winter use. Dried cakes are also eaten with fish or as a dessert. Choke cherries are also commonly used to make juice, jellies, and wine. Medicinally, this fruit has been used extensively for trade as a cough medicine. It is also good for high blood pressure, heart problems, stomachaches, diarrhea, and flues. A tea made from the leaves, stems, barks and roots, is beneficial for loosening phlegm in the throat.

Dandelion

Taraxacum campylodes
G.E. Haglund

Description: This well known plant was originally introduced from Europe and quickly adapted to North America, where it is pervasive. It has thick leaves in a rosette form that release a milky white fluid when broken. The root is a long taproot, and it has single yellow flowers growing on hollow stalks. When broken, the stems release a milky fluid.

Uses: Dandelion greens are commonly eaten in salads and cooked and steamed. They are an excellent source of vitamin A, calcium, potassium, and iron. Young leaves harvested before the flowers bloom are the best, as the older leaves tend to have a bitter flavor. As a diuretic, dandelion is helpful for retaining fluids and helping with urinary problems. The root, which can be roasted and made into a delicious, coffee-like tea, is mildly laxative and detoxifying for the liver. Dandelion root is also used for arthritis and skin problems.

To enjoy the benefits of dandelion, the fresh leaves can be pureed with water and made into a juice. Drink one-half ounce up to three times a day. A dandelion infusion can also be made by steeping one ounce of the dried herb (or three ounces fresh) in two cups of just boiled water for 10 minutes. Drink one-half cup three times daily.

Dock, Yellow Dock

Rumex crispus L.

Description: Dock is found everywhere and commonly grows along roadsides. It has tall, vertical stems rising from the root crown that turn a reddish-brown at maturity. The leaves of dock are crisped, or curly, at the margins and they are long and narrow. Small green flowers grow at the end of long stalks. The thick yellow taproot may reach as deep as four feet, with branches as long as three feet.

Uses: Dock is used both as an edible and medicinal plant. The greens are high in vitamin A, potassium, and magnesium. The Chehalis traditionally cook the larger plant stems on hot rocks over cedar and maple limbs, and the Cowlitz use a decoction made of the boiled stalks to treat leg sores. It is a cleansing herb and is useful in dealing with chronic skin problems, arthritis, jaundice, and rheumatism. It is also detoxifying and mildly laxative.

To make an infusion, steep one ounce of the dried herb (or three ounces fresh) in two cups of just boiled water and drink one half cup, three times a day.

Hazelnut

Corylus avellana L.

Description: This tall, branching shrub has smooth branches and pointed leaves that are broad and toothed. The young twigs of this bush are fuzzy. Hazelnut has both male flowers, which form in long yellow catkins, and female flowers, which are small and red at the ends of branches. The fruits are nearly round nuts encased in oblong, green, prickly husks. This plant is found along the coast in shady forests or in open areas inland throughout western, central, and eastern North America.

Uses: A valuable source of protein, calcium, phosphorus, and potassium, hazelnuts are edible and can be eaten fresh or stored for later use. They are traditionally buried in the ground for ten days in order for the prickly husks to rot off. The Cowlitz people store hazelnuts for winter by burying them in a cylindrical fish trap. The Lummi, Snohomish, and Swinomish eat the fresh nuts. In addition to a food source, the hazelnut bush is also used for making arrows from the young shoots, and the Skokomish twist the peeled shoots into rope. The twigs are used by the Chehalis to tie things together. Fresh branches were made into mats for sitting on, and a green dye is obtained from boiling the nuts.

Hemp

Cannabis sativa L.

Uses: The most commonly used parts of the plant are the leaves and flower buds, which may be either smoked or eaten; the leaves are often added to soups or stews. The leaves and buds, when grown in a hot climate, are well known for their narcotic effects. Seeds are edible in much the same way as sunflower seeds. They are made into snacks, cookies, porridge, and trail mix. They can be ground into flour and are used as a grain to make beer. Hemp seeds are very nutritious, with high amounts of protein, calcium, and phosphorus. The oil within the seed can be used for cooking, lubrication, and medicinal purposes. Hemp seeds may be purchased at health food stores and co-ops. Medicinal uses are wide, varied, and controversial in the United States. Hemp or Marijuana is most commonly used for pain relief, as a sleep aid, and to soothe nervous disorders.

The fibers of the hemp plant can be made into thread or rope, or a pulp can be made and formed into paper, while the plant itself acts as a repellant for cabbage white fly and some other soil microorganisms.

Juniper (Berries)

Juniperus communis L.

Uses: While juniper berries are edible, they are very astringent and are toxic for small children or when eaten in large quantities. Use a small amount in stews as flavoring or to make a diuretic tea. Juniper oil, the extract from the leaves, is toxic. Native peoples use many parts of the pungent juniper plant, but the berries are only eaten in times of scarcity. The leaves provide high amounts of protein, vitamin C, calcium, phosphorus, potassium, and magnesium. The berries are used to flavor deer meat while cooking. Juniper wood is used to make bows, and the branches are burned as a cleansing smoke and incense. Cleaning solutions are made from boiling the branches in water. As a medicine, juniper root is used by the Swinomish to treat rheumatism, and the leaves are boiled to use as a disinfectant.

Lamb's Quarter, Fathen

Chenopodium album L.

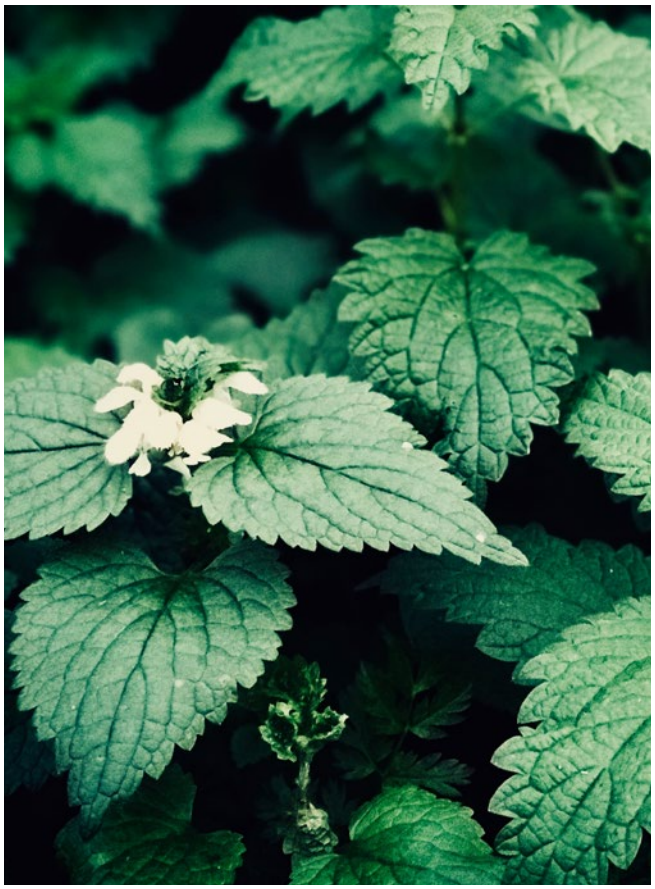
Uses: The young, tender leaves can be eaten like spinach, either raw in salads or cooked. It is more nutritious than spinach, and better tasting. The leaves are especially high in protein, vitamins A, B and C, iron, calcium, phosphorus and potassium.

The seeds are the size of poppy seeds and are rich in protein, carbohydrates, fiber, calcium, potassium, magnesium, and iron. They can be eaten as a grain or seasoning.

Medicinally, lamb's quarter can be made into an infusion to treat painful limbs, and can be used both externally to reduce inflammation. To make an infusion of lamb's quarter, steep three ounces of the fresh leaves in two cups of just boiled water for 10 minutes. Strain and drink one half cup, three times daily.

Nettle

Urtica dioica L.



Uses: The leaves and tender shoots are edible when cooked. Nettle leaves and plant tips should be collected with gloves on before they flower in spring. They can be cooked like spinach, simply steaming or parboiling for a few minutes, which deactivates the stinging hairs. They are rich in protein, chlorophyll, vitamins A, C and D, as well as iron, calcium, potassium, magnesium, and manganese. Traditional uses of nettle include making twine from the inner pith of the dried stems, and spinning fiber to make blankets.

As a medicinal nettle is an excellent spring tonic, and oils and ointments are useful in treating skin problems and arthritic or rheumatic pain.

Red Elderberry, Red Elder

Sambucus racemosa L.

Uses: Eating fresh red elderberries is not recommended, but they can be cooked and eaten as long as the seeds are removed before eating them. Indians eat them after cooking them, and they harvest the berries using long hooked poles. They are then boiled, mashed, and stirred while cooking, to make a thick, jam-like sauce which can be eaten or stored for winter in dried cakes. Elderberry stems have traditionally been hollowed out to make flutes, whistles, straws, and pipe stems.

Elderberry medicines are useful in treating colds, fevers, sore throats, diarrhea, and open wounds. The flowers are made into eyewashes and they are also used for rheumatism as a nerve relaxer. The leaves can be made into poultices to help with sprains and skin problems. Both the leaves and flowers are frequently used in topical treatments for hemorrhoids, boils, and burns.

The blossoms of elderberry can be made into a soothing herbal tea medicine useful in treating colds, fevers, sore throats, and diarrhea. Steep one ounce of dried blossoms (or three ounces fresh) in two cups of just boiled water for 10 minutes and strain, then drink the tea.

Red Huckleberry, Red Bilberry

Vaccinium parvifolium Sm.

Uses: The berries are used fresh or dried. Rather than picking individual berries, natives comb the berries off the twigs. Huckleberry syrup, jams, and jellies are a popular way to prepare these delicious berries. Tea can also be made from the dried fruit and leaves. Decoctions of the bark are used in the treatment of colds and red huckleberry juice is used for excessive menstruation. Infusions of the bark, leaves and berries are used to stimulate appetite and in the treatment of arthritis, diabetes, and heart trouble.

Redroot Pigweed, Redroot Amaranth

Amaranthus retroflexus L.

Uses: Both the leaves and stems are edible and can be cooked as a green, like spinach, or eaten fresh in salads. They are very nutritious and high in protein and many vitamins and minerals, including vitamin A, calcium, sodium, potassium, and zinc. The seeds of amaranth, which are very nutritious, can be cooked as a grain or made into flour. Amaranth is used as a restorative tonic.

An infusion can be made with the leaves by steeping one ounce of the dried leaves (or three ounces fresh) in two cups of just boiled water for 10 minutes. Strain and drink one half cup, up to three times a day.

Violet

Viola spp.

Description: There are approximately 22 genera and 900 species within the violet family. In the Northwest some common varieties include the early spring violet, marsh violet, Canada violet, stream violet and the trailing yellow violet. It is a low growing plant with leaves that are usually simple and alternating on the stems. Flowers are small and heart-shaped, ranging in color from blue to violet, white, and yellow.

Uses: The whole plant is edible; the leaves and flowers are used as greens and in salads, or in soups and sautés. There is more vitamin C in a small handful of violet leaves than in an entire orange. They are also high in vitamin A. Moderation should be used in eating the fresh wild leaves, however, because they contain soap-like compounds called saponins that can upset the stomach when eaten in large amounts.

As a medicine, violet is useful for inflammation, sore throats and coughs, pain, and swollen glands, as well as for chronic skin problems and bruising. An infusion can be prepared by steeping one ounce of the dried leaves and flowers (or three tablespoons fresh) in two cups of just boiled water for 10 minutes. Drink up to three cups a day. Crushed flowers may be used for pain relief by laying them on the chest or side, but leaving them on for more than two to three hours can cause blistering, so use caution.

Western Hemlock

Tsuga heterophylla (Raf.) Sarg.

Description: Western Hemlock is an evergreen shrub that grows from 100 to 160 feet tall with a trunk of about 3 feet in diameter. Both the top and the branches are drooping and it has thick, dark brown bark. The needles are varied in length, between 1/4 to 3/4 inches long, and they are flat with a blunt end. The underside of the needles has two white bands. It has light brown cones about an inch long. Western Hemlock is found growing from Alaska to California and prefers humid climates.

Uses: The twigs and tips of hemlock make a delicious tea that is high in vitamin C. Steep one tablespoon of the fresh or dried tips in one cup of hot water for at least 5 minutes, strain and drink. A tea made with the inner bark or twigs is traditionally used to treat colds, flu, and fevers. Hemlock is also used in the treatment of kidney and bladder ailments, and for skin sores, sore throats, and arthritis.

Wild Crabapple

Malus fusca (Raf.) C.K.Schneid.

Description: A small shrub like tree, wild crabapple grows between 9 to 30 feet tall. It has gray bark and dark green, pointed, toothed leaves. The white to pink flowers grow in flat groups of 5 to 12. The small, oblong, yellow to reddish crabapples hang from long stems in clusters. Western crabapple can be found growing in moist areas in the Pacific Northwest.

Uses: Crabapples are edible, although tart when eaten alone. They are usually made into jelly or sauces. The boiled bark is traditionally used as a decoction to treat stomachaches, ulcers, tuberculo-

sis, and loss of appetite. Crabapple wood is used to make handles, bows, wedges, sledge hammers, and digging sticks. The Quileute use the wood to make maul handles, seal-spear prongs, and lures.

To make a decoction of the bark, place one ounce of dried crabapple bark in two cups of cold water. Bring it to a boil and let simmer for 15-20 minutes until the liquid is reduced to about two-thirds of the original amount. Strain and drink as needed.

Wild Ginger

Asarum caudatum Lindl.

Description: Wild ginger has glossy, heart-shaped green leaves that grow directly out of the spreading rootstocks. When crushed the leaves release the smell of ginger. The rootstocks are usually spreading just below leaf mulch. The small lavender flowers have three long petals and bloom in mid-spring. The flowers are often difficult to see as they typically grow beneath the leaves.

Uses: Wild ginger can be used just like commercial varieties. The leaves can also be used to make tea. Medicinally, wild ginger is known for its sweat inducing properties. It is useful for hot, dry head colds, bronchial problems, and general issues of heat and dryness. The dried roots and leaves can be made into extracts or teas. To make a tea, steep one ounce of the dried root and/or leaves (or three ounces fresh) in two cups of just boiled water for 10 minutes.

Wild Raspberry

Rubus idaeus L.

Description: Similar to the garden variety of raspberry, wild raspberry grows between 1 to 6 feet tall. It is a spreading shrub with thin prickles. Its leaves grow in groups of three to five leaflets with irregular toothing and pointed tips. The small flowers are white with five petals and appear from May to July. The red, hollow berries ripen from July to August. It grows from south of Canada through Washington to California.

Uses: Raspberries are sweet, delicious, and full of vitamins B and C, and rich in magnesium, calcium, iron, and phosphorous. They can be eaten fresh, dried, or prepared as jellies, deserts, cakes, pies,

syrups, and vinegars. The young, tender sprouts are also edible and nutritious. The leaves are useful as a medicinal to sooth stomach problems, diarrhea, and influenza. It is also well known for its ability to relieve cramps and reduce menstrual bleeding. During pregnancy it will diminish morning sickness and tone the reproductive organs. Raspberry leaf tea is also beneficial for strengthening the body and the heart, and its mild sedative effect makes it an excellent bedtime tea.

To make raspberry leaf tea, steep one ounce of the dried leaves (or three ounces fresh) in two cups of just boiled water for 10 minutes. Strain and drink as needed to relieve stomach problems, diarrhea, and cramps.

Beach Strawberry

Fragaria chiloensis (L.) Mill.

Description: This perennial grows low to the ground from 2 to 8 inches high. It has thick, toothed leaves that grow in groups of three and turn reddish during the winter months. They are dark green above with fine hairs below. The flowers are white with five petals and grow on stalks separately from the leaves. The red berries are sweet and juicy with seeds on the surface. They appear between April and June.

Uses: Wild strawberries are eaten fresh, dried, or cooked in a multitude of desserts. They are high in vitamins A and C, as well as sulfur, calcium, potassium, and iron. The young shoots are also edible, as are the leaves, which can be used fresh or dried in herbal tea blends. Strawberry also has many medicinal values, especially as a tonic that is well suited for pregnant women. Strawberry tea is also known for healing loose teeth and spongy gums. Additionally, it is used externally to treat eczema, wounds, vaginitis, and as a gurgle for mouth sores and sore throats. Whereas the fruits are mildly laxative, the leaves and roots are astringent and will firm up loose bowels, making them useful for diarrhea, dysentery, and urinary tract problems.

Many plants native to locations around the world contain compounds that effectively prevent or treat Type 2 Diabetes. Indeed plants specifically provide compounds that lower blood sugar (hypoglycemic) reduce inflammation (anti- inflammatory) and reduce oxidative stress (Anti oxidants) Knowing the specific plants that can benefit the prevention and treatment of this chronic disease is significant in light of the growing level of incidence of diabetes people suffer around the world. As the figures illustrate, melons, grasses, roots and nuts are part of the repertoire of plants that has served human health since time immemorial. The Salish plants sources echo the global plant picture of foods that can be consumed to prevent and treat Type 2 Diabetes.

Most Widely-Used Traditional Anti-Diabetic Plants Around the World

COMMON	SCIENTIFIC NAME	COUNTRIES WHERE USED TRADITIONALLY
Bitter Melon	Curcurbitaceae (Momordica charantia L.)	Saudi Arabia, West Africa, Pakistan, India, Sri Lanka, Thailand, Fiji, Bimini, Panama, Puerto Rico, Belize, Jamaica, Trinidad, Virgin Islands, England, Mexico
Madagascar Periwinkle	Apocynaceae (Catharanthus roseus L.) G Don	Australia, England, Thailand, Zulu Natal, Mozambique, India, Philippines, Vietnam, Dominican Republic, Jamaica
Cashew Nut	Anacardiaceae (Anacardium accidentale L.)	Ecuador, Colombia, Mexico, Venezuela, Jamaica, Madagascar, India, Thailand, England
Cumin	Apiaceae (Cuminum cyminum L.)	India, Pakistan, Thailand, West Indies, USA, West Portugal
Eucalyptus	Myrtaceae (Eucalyptus globules Labill.)	Indies, Mexico, Guatemala, China
White Lupine	Leguminosae(Lupinus albus L.)	Canary Islands, India, Israel, Portugal, Morocco, Israel, Egypt
Fenugreek	Leguminosae (Trigonella foe-num-graecum L.)	France, India
Onion	Amaryllidaceae (Allium cepa L.)	Haiti, India, Tunisia, Kuwait, India, Saudi Arabia, Mexico
Aloe Vera (the wand of heaven)	Xanthorrhoeaceae (Aloe vera L.) Burm f.	Mexico, North Africa, Canary Islands, Cape Verde Islands, Florida Keys, Dominican Republic
Garlic	Amaryllidaceae (Allium sativum L.)	North Africa, Peru, India, Saudi Arabia, Mexico, Venezuela
Yellow Bells, yellow Elder	Bignoniaceae (Tecoma stans L.) Juss ex Kunth	India, Mexico, Guatemala, Virgin Islands, Cuba
Stinging Nettles	Urticaceae (Urtica dioica L.)	England, USA, Guatemala, Nepal, India
Dandelion	Compositae (Taraxacum campylodes G.E. Haglund)	Costa Rica, Mexico, USA

Adapted from: Farnsworth, N., *The Protocol Journal of Botanical Medicine*. Winter 1996, p. 90

Most Widely-Used Traditional Anti-Diabetic Plants Around the World

COMMON	SCIENTIFIC NAME	COUNTRIES WHERE USED TRADITIONALLY
Unispike Kyling	Cyperaceae (Kyllinga nemoralis J.R. Forst & G. Forst Dandy ex Hutch & Dalziel)	India, Ethiopia, Indonesia, South America (country not specified)
Emblic	Phyllanthaceae (Phyllanthus emblica L)	India, Nepal, Tibet, Pakistan, Indonesia, India, West Indies
Stone-breaker, gale-of-the-wind	Phyllanthaceae (Phyllanthus niruri L.)	India, Pakistan, Thailand, West Indies, USA, West Portugal
Neem Tree	Meliaceae (Azadirachta indica A. Juss)	India, Fiji, Saudi Arabia, Trinidad
White Mulberry	Moraceae (Morus alba L.)	India, USSR, China, Peru
Wild carrot, Queen Anne's lace	Apiaceae (Daucus carota L.)	India, China, England, USA
Onion	Amaryllidaceae (Allium cepa L.)	Haiti, India, Tunisia, Kuwait, India, Saudi Arabia, Mexico

Adapted from: Farnsworth, N., *The Protocol Journal of Botanical Medicine*. Winter 1996, p. 90

The World Health Organization reported in 2016 that the incidence of adults living with diabetes increased to 422 million documented cases by 2014 from an earlier measure of 108 million documented cases in 1980 (Chan, 2016; World Health Organization, 2017). As the WHO notes, the incidence of diabetes has grown at a faster rate in middle income and lower income countries than in higher income countries. The conventional remedy for preventing Type 2 Diabetes follows this line of thinking: "as exercising regularly, eating healthily, avoiding smoking, and controlling blood pressure and lipids" (Kuhnlein et al., 2013; World Health Organization, 2017). While the conventional wisdom is widely reported there is growing evidence that indigenous peoples experience even higher levels of chronic disease associated with what is increasingly understood as "nutrition transition"—the increased consumption of commercially produced foods at the expense of traditional foods and what is also called Nutrition trauma. [1] Nutrition trauma occurs when introduced foods overwhelm the capacity of the local (indigenous) peoples to digest and metabolize these new foods, which often cause conditions that were unknown or rare before the colonial process. (Korn, & Ryser, 2006). Type 2 Diabetes is fully associated with the consumption of commercially produced foods by indigenous peoples and this is

[1] Korn, L., & Rÿser, R. (2006). Burying the umbilicus: Nutrition trauma, diabetes and traditional medicine in rural West Mexico. In G. C. Lang (Ed.), Indigenous peoples and diabetes: Community empowerment and wellness (pp. 231–277). Durham, NC: Carolina Academic Press.

no less true among indigenous peoples in the southwest of Canada and the northwest of the United States (Korn, 2009). The varied diet of Salish peoples prior to contact ensured virtually no diabetes and its sequelae preceding the settlement of their homelands by Russians, Spaniards and the British between 1774 and 1855. The nutrition transition for the Salish began in the middle 19th and accelerated by the early to middle 20th century resulting in rapidly growing incidence of chronic disease. The restoration of native plants and the elimination of commercially processed foods in the diet of the Salish peoples as with peoples around the world will begin the process of eliminating many chronic diseases such as Type 2 Diabetes.

Many thanks to Ethnobotanist Juliet Totten, for assistance identifying the Latin Binomials for the plants in this paper.

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Tribal Food Sovereignty Assessment – Toward Control of Food

By Rudolph.Ryser, Heidi G.Bruce, Dina Gilio-Whitaker, Leslie E. Korn

(With research assistance by V. Segrest, C.K. Bem, K. Logan, N. Johnson, V.M. Marquez, M.A. Morsette, J. Sheldon, Louie Ungaro)

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ABSTRACT

Through collaboration between an American Indian Tribe (specific names have been substituted to ensure confidentiality) and the Center for World Indigenous Studies, the CWIS research team conducted the Tribal Food Sovereignty Assessment beginning in September 2016. The Assessment contemplated the formation of the Food Policy Council that would collaborate with the research team to gather Tribal Community information concerning the provision of adequate and culturally appropriate food supplies while investigating approaches for expanding locally controlled and locally based Tribal food systems that provide healthy foods for community members consistent with Tribal health needs and culture; and to identify proposed policies for implementation by the Tribal Council. Methods: The CWIS Research Team began planning and designing the investigations into the historical food used by Tribal ancestors, a Tribal Community Food Sovereignty Assessment Survey, Talking Circles of survey participants and purposively selected members of the community. Definitions: The underlying rational for the Assessment was that the meaning of Food Sovereignty would be for purposes of the study: the inherent right of the Tribal peoples, and communities to define their own labor, fishing, harvesting, agricultural, food and land policies that are healthfully, ecologically, socially, economically and culturally appropriate to their unique circumstances. It includes the true right to food and to produce food, which means that all people have the right to safe, nutritious and culturally appropriate food and to food processing-producing resources and the ability to sustain themselves as a vital society. (Based on the Political Statement of the NGO/CSO Forum for Food Sovereignty June 13, 2002, Rome). Findings: Ninety percent of the survey respondents affirmatively stated that traditional foods would be consumed if they were easy to obtain even as eight in ten of the respond-

ents were dependent on "neighborhood grocery stores." The Tribal community as a whole expended an estimated $1 million to $3.2 million annually for food obtained in local grocery stores that translated to an estimated $5.2 to $15.7 million annual expenditure that constituted a net loss to the tribal community economy that could be otherwise used to infuse the local economy and establish strong tribal food sovereignty. Conclusions: The Tribal Community survey results and Talking Circle conclusions produced a range of recommendations to the Tribal Council for action including the reestablishment of a farmers'/hunters' market for fresh traditional produce and meats; expand community gardens; provide traditional food education to tribal youth, eliminate junk foods in food banks; supply elk, salmon, berries and deer to the food bank; establish a beef, deer, elk meat processing butchery and conduct more ceremonial fisheries to bring fish into tribal homes.

Study Overview

The Tribal Food Sovereignty Assessment begun in September 2016 with the goal to examine the views and opinions of Tribal members concerning the provisions of adequate food supplies for the Tribal community. The Assessment was further conducted to focus on locally grown, culturally appropriate healthy foods, and in developing or expanding locally controlled and locally based food systems that provide healthy foods to community members consistent with Tribal health needs and culture. The objectives of the assessment included forming and supporting a Food Policy Council and collecting Tribal historical food usages and opinions of Tribal community members through a household survey, conducting and evaluating Talking Circles to establish possible policy recommendations, and revising the Tribal Foods map.

The Tribal Chairwoman wrote a letter to the Research Principal in August 2016 to authorize the Center for World Indigenous Studies to form a research team working directly with the six-member Food Policy Council to conduct the assessment directed at achieving the above goal and objectives. The Council Chairwoman Cross wrote, "We see the proposed project as enhancing our effort to promote the long-term health and wellness of Tribal community members."

Scope of Inquiry

Tribal Food Sovereignty Assessment was designed to determine what policies the Policy Council and the Tribal Council could be initiated that would most likely achieve the goals of Tribal Food Sovereignty. To aid in this effort, the Research Team designed the Tribal Household Survey to obtain Tribal Community perspectives and views.

The main goals of the Assessment were:

1. Progression toward the elimination of hunger and food insecurity in the Tribal Nation
2. Greater understanding of the community's linkages to food-supply chains.
3. Greater understanding of food production, consumption, and purchasing habits within the community and/or within households.
4. Develop an economic profile of how much money is spent by Native communities for food-related purchases.

5. Learn more about the nutritional needs,diet-related health, and hunger in the community.
6. Assess other aspects of the local food system that can lead to greater control, including policy, land use, local producer use, etc.
7. Document food-related cultural traditions and practices specific to the community.
8. Identify assets, resources, institutions, and community leaders that can be leveraged for the benefit of the community food system.

Tribal Food History

Employing the evaluation methodology rooted in Fourth World Theory, in October 2016 the research team began to examine and document the Tribal Food History based on Tribal Origin Stories, oral narratives, documentary background and previous Tribal history sources. This part of the investigation is the foundation for the whole inquiry since it defines the cultural foundations of the Tribal people and therefore the food fundamentals for the descendent people. Historical evidence demonstrates that Tribal ancestors have occupied the Enumclaw plateau for more than 5,600 years living as part of the Southern Coast Salish Lushootseed people. The ancestral peoples of longhouses depended on a wide variety of food sources through reciprocal relationships between plants, animals, people, the land, and the cosmos and their descendants carry the cultural and health needs from their ancestors.

Food Policy Council

After months of preparation and organizing, the "Food Policy Council" was established with six members including six leading tribal youth between the ages of 15 and 20. The Council members began immediately to undergo training and organization of the Council to participate in the Household Survey phase of the overall inquiry working with the Research Team. Under the guidance of the Assessment Field Coordinator and Mentor-Councilman, the Youth Council began conducting meetings each Thursday over the period of the inquiry to actively engage historical, survey and Talking Circle data and findings. Along with the Talking Circle participants, the Policy Council was instrumental in formulating recommendations for the study that would be presented to the Tribal Council.

Theoretical Framework

Fourth World Theory[1] is rooted in the dynamic and evolving relationships between people, the land and the cosmos. The theory provides a structure for understanding the relational human experiences with members of a community, the land and the cosmos—recognizing that in order to apprehend the truth it is necessary to blend qualitative, quantitative and relational reasoning. This implies recognizing the reasonable associations between material and immaterial factors that are part of a problem demanding explanation. Fourth World Theory approaches a problem from the global to the limited perspective requiring that a researcher maintain the global context in mind or in a structure within which more particular pieces of information can be connected. The present study will test Fourth World Theory to determine if it is validated, rejected or if it needs adjustments or modifications.

[1] Ryser, R., Gilio-Whitaker, D., Bruce, H.G. (2016). "Fourth World Theory and Methods of Inquiry." Chapter 3 in Handbook of Indigenous Knowledge and Research Methods in Developing Countries. Ed. by Ngulube, P. IGI Global: Hershey, PA.

Significance of the Study

Research Studies in tribal communities are complicated due to the common unwillingness of such communities to expose their social and cultural ways to outside researchers who tend not to share their study results from which the community would direct benefit. This study was specifically designed to avoid the natural resistance to "researchers" who tend to engage in invasive inquiries that may interest the researcher, but not show useful results to the community. The Research Team at the Center for World Indigenous Studies was not prepared to conduct a research study without the full permission of the tribal government and without the consent of all of the participants in the historical study, household survey and Talking Circles. Consequently, a lengthy period of time was committed to obtaining such permissions at each stage of the study. Full disclosures were required from the Researchers by community participants, and when objections were made, the study was adjusted to accommodate the required changes. In addition, the study specifically focused on producing findings, conclusions and recommendations that would be directed to the Policy Council and to the Tribal Council for consideration and implementation.

The added significance of this study is that it emphasized the controlling role of tribal council figures as the responsible players who would accept or reject recommended actions to establish a strong regime of food sovereignty in the tribal community and in tribal institutions. The study had the further significance of being based in the traditional knowledge system of the community. The resulting study then reflected a hybrid between the traditional knowledge system and the conventional knowledge system. While traditional knowledge systems may vary from one tribal community to another, the overall structure and process of this study may be duplicated for other similar studies in tribal communities.

Methodology

The study applied the "Salish Evaluation Methodology" developed by the Center for World Indigenous Studies based on the traditional knowledge system of Coastal Salish peoples. The Method emphasizes the importance of historical and cultural foundations of a society noting in particular origin stories, historical events, and language. The method further requires that words, usages and expressions play a role in defining questions for a survey and conducting discussions with participants in Talking Circles. Words and expressions are important to identifying relationships that are then iteratively reviewed to confirm meanings and accuracy of responses. In this study researchers conducted an historical assessment of food usages for the longhouses that are foundational to the tribal community studied. Based on word and expressions common to stories, oral communications researchers designed a community food assessment survey that contained 15 questions (See Appendix A). Finally, again based on the historical assessment and with the results of the survey, researchers designed three questions based on the presentation to participants in Talking Circles (See Appendix B) that would elicit recommendations for policy that could be submitted to the Tribal Council. This yearlong study combined historical assessments and traditional storytelling with conventional survey techniques, including three discussion groups, to compile an action agenda for the Tribal Council to consider implementing a Food Sovereignty program. Participation of tribal

members in the overall study was essential to establishing as close to accurate a picture of food sovereignty goals and outcomes that would reflect the tribal community's needs and aspirations.

Historical Assessment

The historical assessment relied on 27 documentary and oral sources (Burke Museum, tribal members, Native Peoples' Technical Assistant [University of Arizona] anthropologists, archeologists, University of Washington Library, linguists, history, interviews, stories (legend and origin), to obtain a tribal longhouse profile that dates pre-1854. The profile was confirmed with tribal councilmen and with tribal members. The Historical Assessment narrative focused on geographic location, plant and animal species, contemporaneous articles, ceremonial practices, legends and stories, and the tribal origin story. These elements when combined constitute a strong profile that is validated through the application of relational reasoning confirming a near accurate picture of the longhouse societies from the perspective of the longhouse people. Each source was recorded with reference to origin, date, author(s), period validating sources, type, geographic mapping and subject matter. The reference materials were compiled into a draft narrative, reviewed by three research team members and the field coordinator, followed by revisions. The tribal council members and tribal community members were asked to confirm the narrative during discussions. The final narrative informed the development of the survey instrument and the Talking Circles.

Tribal Household Survey

The Initial Household Survey conducted over a two-month period in 2017 produced 23 findings responding to eight projected outcomes sought for the study.

The Tribal Indian Tribe's population includes 1,852 enrolled by the Tribal government with 363 residents from other tribes in the community for a total of 2,215 residents and a total population of 3,870. There are 1,411± Tribal households (US Census 2010) within the Tribal territory (including those located in the cities of Auburn and Enumclaw). Female members comprise 44% of the total population while male members comprise 56% with 547 or 30% of the population 19 years and younger.

The Tribal Food Sovereignty Assessment Study was based on a randomly created target over-sample of 92 households with a final recruitment of n=62 households for the household survey. Oversampling allows for the probability of up to 14 households either being unwilling to participate or unable to participate. The 62 households from where individual interview participants were finally recruited comprised 22 (35%) males and 40 (65%) females; these numbers were not consistent with the overall population distribution, where the 2010 distribution was actually 56% male and 44% female. So it is fair to say that the opinions given in response to questions asking for personal opinion do not represent the whole of the Tribal population. Of the 18 randomly sampled participants, data is an accurate representation (3.5%±) of the whole population of enrolled members.

While the original random sample of recruitment candidates for participation in the study did favorably reflect the population gender distribution, a decision was made by Council members and Food Policy Council members to dispose of many randomly selected households due to concerns about safety. A purposive sample of households known

to be safe replaced those that were rejected from the original list that were considered unsafe. The remaining 18 randomly selected candidates were distributed 56% male and 44% female. The purposively selected household participants were distributed 12 (22%) male and 32 (59%) female. It is easy to see that the purposively selected participants produced a distortion in the distribution that tilts heavily to female. The general results, therefore, cannot be widely generalized to represent the whole Tribal Community. Seventy-eight percent of the recruited households were expected to be located in and around the main city while 22% were expected to be located in and around a smaller town on and near the Tribal Reservation.

Talking Circles

By early May 2017 the Tribal Food Sovereignty Assessment Household Survey had been completed providing detailed data on Tribal household food choices, uses and food access.

While the Survey provided a detailed snapshot of what Tribal household representatives think or know about their food choices and such, the Survey did not generally provide information about how participants felt or what their opinions were about these matters. Three Talking Circles of up to six participants each was scheduled and designed to allow the Research Team to document opinions and policy action recommendations for the Tribal Council to consider to obtain a safe, culturally acceptable, nutritionally beneficial diet through a sustainable food system that maximizes community self-reliance and social justice. Each Talking Circle was conducted for a period of 60 to 90 minutes and documented by recording and word/expression notation by Youth Council members.

Participants in the Talking Circle were given a brief story to stimulate discussion and three specific questions to focus their responses (See Appendix B). The responses were recorded and then reviewed using narrative analysis—discloses meaning of expressions and words given the verbal context. Words and expressions were tabulated for review outside of context and in context to determine the reliability of later interpretation.

Assessment Findings Historical Tribal Food Assessment: Pre-1854 Longhouse Society

For at least 5,600 years the Tribal community, part of the Southern Coast Salish Lushootseed people, occupied its present location. Now comprising six square miles with 20 miles of borderlines, the Tribal reservation is home to approximately 3,500 residents. The Tribe relied on complex and far-reaching seasonal food-sourcing rounds that included animals and plant resources. The peoples of the Tribe's traditional longhouses—whose descendants now make up the Tribal Community—have, for millennia, depended on a wide variety of food sources through reciprocal relationships between plants, animals, people, the land, and the cosmos. During winter months they lived in communities along the region's waterways, relying on caches of food and local resources. In the summer, they joined families from other winter communities at summer camps where they shared in fishing, clamming, hunting, and gathering. The network of kinship was fluid and spanned watersheds from the Salish Sea to the Cascade Mountains. Ties of marriages, joint feasting, ceremonies, and commerce linked the many tribal communities. These connections provided the Tribe

extensive access to resources outside of the ecological region they traditionally inhabited.

Origin Stories and Longhouse Relations/Locations

Similar to all Lushootseed origin stories, Tribal stories place the creation of their world far in the past, "when the world was in flux." They focus on a figure called the Transformer or Changer, whose actions gave sense to the Lushootseed world. Their stories emphasize resiliency, return, and perseverance and form the heart of Huchoosedah, a term meaning cultural knowledge and knowledge of self, which is an integral part of the Lushootseed spiritual tradition.

The Southern Lushootseed Epic, Fly, offers wisdom on themes of gratitude for the plants within the region and explains that taking the easiest path is not always the most helpful in the long run. This teaching demonstrates the struggle many contemporary indigenous peoples face when it comes to restoring food ways that once nourished and connected them.

For Lushootseed people, the world is full of spirits. Spirit powers were integral to ceremonies held in winter months, a time when Huchoosedah was kept alive through storytelling, feasting, and gift giving. In the longhouses, people performed the Winter Dance, releasing their spirit powers through movement and songs. The Spirit Canoe ceremony, in which doctors from several communities came together to perform a journey to the Land of the Dead to retrieve the souls of ill people, was the most important ritual of all.

Tribal communities consisted of longhouses that housed 40 or more people, usually related. Located near navigable water for transport purposes, some longhouses were right next to each other, while others were more dispersed for miles along a river. As the center of the Tribal community, longhouses provided far more than shelter—they symbolized people's bodies, their prized canoes, and their world as a whole. They reflected relationships among people and ranking in society.

Linked by trade and marriage with other communities, Tribal communities were far from isolated. Though conflict sometimes occurred, close connections ensured the sharing of resources between neighboring communities. Sgwigwi ("inviting") was an important tradition in maintaining connections and corresponds to the more familiar term "potlatch," in which wealthy people displayed their social status by sharing their wealth with others.

Longhouse identity stemmed from these permanent communities where they lived during winter months. During the rest of the year, however, bands would often merge and migrate to resource-rich areas. In the summer people gathered on the riverbanks to catch, clean, smoke and dry salmon. Later in the year, extended families reunited in longhouses and communities for the winter season of ceremonies, storytelling and crafting. These extended social networks provided access to a wider range of high quality, quantity, and valued foods, as well as a social safety net against challenges such as seasonal shortages or intra-community conflict.

Historical Record of Tribal Traditional Foods

The word "archaeobotany" is the study of historical people-plant relations, human landscape modification, plant cultivation, and human adaptation to environmental change.

Plants made up 20–30% of the caloric intake consumed by Coast Salish peoples prior to Europe-

an colonization. Providing dietary fiber, essential vitamins, minerals, and micronutrients not available in animal foods (particularly for children and pregnant/nursing women), plant availability and cultivability provided variety and sustainability to the Southern Lushootseed diet. Edible roots such as Q'awax (Chocolate Lily), for example, were cultivated with methods such as tiling, weeding, and fertilizing, but they also included large-scale alterations of the natural environment to increase the productivity of preferred species.

Root gardens were created in estuaries and offered important supplements to diets in the years when salmon runs were less bountiful or when other food sources were running low. In addition to their nutritional offerings, plant foods were central to the entire Tribal food system. The organization of labor; the creation of tools for cultivating, processing, storing, cooking, and consuming foods; and the use of fuel wood for cooking fires plants held profound social and economic value.

For more protein-dense foods, the Tribe in this study relied on a combination of land animals (more so than Coast Salish peoples to the north and west) and marine life. Tables 1-a, 1-b and 1-c below outline the variety of plant and animal foods on which the longhouse people relied.

Table 1-a: Longhouse Traditional Foods (Combined list from LeCompte, Khron, Ryser

NUTS	BERRIES	FRUITS	EDIBLE GREEN
Hazelnuts	*Blackcap Raspberry	Bitter cherry	*Cat-tail
Acorns	*Cranberry	Chokecherry	Cow Parsnip (Indian Parsley)
White Oask	Elderberry	Crabapple	*Fiddlehead Ferns
	Huckleberry	Current	*Fireweed Shoots
	Salal	Gooseberry	*Horsetail fertile Shoots
	*Salmonberry	Indian Plum	*Nettles
	*Saskatoon (Service Berry)	Wild Rose	*Sprouts (salmonberry or thimbleberry shoots)
	Soapberry		*Spruce shoots
***Thimbleberry**			**Wild lettuces - spring beauty, violet, watercress
Wild Blackberry			Chickweed
Wild Strawberry			*Dandelion Greens
			Lamb's Quarters

Figure 1-b:

FRESH BULBS	ROOTS	OTHER
Nuttall's wild onion	Biscuitroot (fresh) (wild carrot Lomatium)	Bedstraw (Cleavers)
Arrow-leaved balsam-root	Gairdner's yampah (dried)	Maple sugar Tree sap
Great/Common camas - Quamash	Wapato/arrowhead (Indian Swamp Potato)	Mustard
Avalanche lily	*Bracken Fern Root	Cambium – Red Alder, Cottonwood trees
Riceroot lily	*Pacific Cinquefoil	Seaweed
Dentalia	Springbank Clover	*Kelp (with herring row)

Table 1-c

COMMON SEAFOOD	FISH	WILD GAME
Clams (many types)	Salmon (Coho, Chinook Sockeye Salmon)	Duck
Geoduck	Smelt (oolichan)	Grouse
Muscles	Oolichan Grease (Fat)	Deer
Gooseneck barnacles	Sturgeon	Elk
Oysters	Ling cod	Bear
Shrimp	Trout	
Crab	Halibut	
Seal		
Octopus		
Gumboots		
Basket cockle		
Sea cucumber		
Pacific herring		

*Indicates species that were not found in archeological digs, but were considered important in interviews with elders or ethnographic texts

Nutritional Value of the Food Sources pre-1854

The pre-1854 longhouses harvested plants when seeds were ripe—ensuring both taste and nutrition. The timing of their harvest was important because nutrients deplete over time and during processing. In low-brush fields that were frequently burned after a harvest (in order to promote new growth the following year) mulch was used to protect seeds and catch nutrient rich ash that washed into the soil with rainstorms.

Root gardens offered important supplements to diets in the years when other food sources were running low. Cultivated bulbs added an important source of carbohydrates in the spring and fall, to complement the winter diet that was higher in proteins, oils, and fats. Bear fat, oolichan grease and rendered seal fat contributed to strong hearts, healthy brains and kidney health by providing the necessary fats for early childhood growth and body strength and freedom from microbes and funguses in later years.

Qwlawl or quamash (Blue Camas) was and remains to the present day one of the most important food plants in the Pacific Northwest for indigenous peoples. Qwlawl is rich in protein, fiber, calcium, phosphorus, iron, and inulin, and does not need to be cooked. It is easily digested without cooking. Unlike most sugars, inulin does not affect or alter blood sugar levels while providing glucose for brain health.

Balsamroot is a versatile plant and can be eaten raw, baked, or dried. Similar to quamash, it also contains inulin. Balsamroot's bark contains an antibacterial and antifungal compound called thiophene-E along with other antimicrobial properties that give the bark and its resin its unique ability to heal ailments such as open sores, poison ivy, and ulcer stones.

Red elderberry was another important and nutritious food among the Lushootseed. The flowers and fruit were cooked and made into syrup or spread out onto skunk cabbage leaves and dried to make berry cakes (fruit leather), which was often stored until the winter before being consumed. In addition to being rich in vitamins C and A and antioxidants, the fruit was used as an herbal remedy for rheumatism.

Cultural and Spiritual Practices in Exercising Control over Food Access

Longhouse core values centered on food and how it should be shared, given, and received with gratitude and respect. Traditional knowledge of food ways was passed down through careful observation, teaching, and learning.

Inter-community communication also contributed to the development of different cultivation techniques. Stories passed from group-to-group—and from generation-to-generation—served as an important means to share lessons on resource management. Lessons based on sensory experiments (i.e., listening, touching, tasting, feeling, smelling) helped people of the longhouse to select foods and medicines that were safe, digestible, and nourishing. The concept of tiχdx related to cultivation refers to maintaining good relations between people, plants, animals, the land, and spirit powers.

Colonization and Access to Food

Juan José Pérez Hernández sailed his frigate Santiago north from México in 1774 to affirm

Spanish claims over what would become Oregon, Washington, British Columbia and Alaska in the United States and Canada. These Spanish claims were based on the Papal Bull of 1493 and the Treaty of Tordesillas (1494) and Treaty of Zaragoza (1529) signed between Spain and Portugal stating that the lands "west of Castile" would belong to Spain (even at this point neither kingdom actually knew what was on the other side of the planet). Russian and British fur traders entered Alaska, British Columbia and then what would be called Oregon Territory competing with Spain's claims. Exploration was understood to be essential to making colonial claims so the completion was quite extensive. In 1775 the Spanish ship Santiago now captained by Lieutenant Bruno de Heceta arrived at Point Grenville (Punta de los Martires so dubbed by the Spaniards) visited the location where an earlier Spanish ship had attempted to anchor off the coast of the Quinault. The previous ship's captain and crew thus anchored off Point Grenville were met by a fierce round of attacks by the Quinaults resulting in many Spaniards killed and their heads placed on spears planted in the beach sand to ward off future visitors. Bruno de Haceta's visit was in some sense a marker to celebrate what he and his crew considered to be the Martyrs of that previous ship anchorage. As symbols of their colonial claims, ships' captains for Spain, Britain and Russia named various locations along the coasts from Alaska to Oregon. James Cook had earlier arrived in the region in 1778 leading British explorations, but did not form settlements.

British and Spanish colonization began at the shores of the Pacific Northwest of what is now the United States in 1789 when the Spanish planted their first colonial encampment at Nootka Sound. Beginning in 1825, the Hudson Bay Company set out to establish what would be called Fort Vancouver at the mouth of the Columbia River. Located in what the British called Rupert's Land (the drainage region of Hudson Bay east and west) the Hudson Bay Company set out to expand its fur trade sending a wagon train of about 200 people made up of Orkney Island/Cree, Iroquois and Scotsman to Oregon Territory in 1844. The Hudson Bay settlements drew competitors causing new settlers to pour into the area. They demanded the United States make treaties with local tribes to extinguish native title to the land. The treaties established "reservations" on to which tribal peoples were forced to move. The vast majority of tribal peoples would not move to the reservations, but the treaties had the effect of pitting the tribes against each other in a competition for land in areas where territory was shared. The resulting pressures on tribal communities in longhouses combined with introduced diseases caused longhouses to be abandoned and significantly reduced ranges for food gathering.

The processes of colonization led to massive changes in longhouse lives, including major changes in longhouse diets. These changes included:

- Introduction of diseases that frequently killed many and sometimes most members of a longhouse
- The increase of environmental toxins
- The loss of rights to land and access to plants and animals for food
- Replacement of traditional foods with modern foods (high in refined carbohydrates, sugar, dairy products, etc.), leading to illness and chronic diseases
- Non-native invasive plant and animal species introduced by settlers altered the environment.

• Hunting and food-gathering were hampered due to the demands of living in a cash-based community
• Over time tribal members grew to lack traditional foods knowledge

The arrival of colonizing settlers in the early 19thth century rapidly altered the accessibility of food and the role of tribal communities in the culturally defined controls.

Household Survey Results

The following is an assessment interpreting the data gleaned from survey questionnaires matched to eight identified Expected Outcomes of the study. Each of the outcomes projected for this study are based on the original goals proposed to the Tribal Council. The eight Household Survey Outcomes presented below were keyed to formulating Household Survey Questions and the results for each question are shown in the Appendix B.

Findings by Projected Outcomes:

1. Progression toward the elimination of hunger and food insecurity in the Tribal Community.

Finding (a): Findings suggest there is a great deal of interest in the Tribal Community to learn more about patterns of hunger, malnutrition and economic dependency. Tribal Community members express their confidence that traditional Tribal foods cause them to feel stronger and healthier.

Finding (b): Respondents report significant monthly expenditures on food and heavy reliance on markets to provide foods that mostly depart from traditional dietary choices, and cause high incidence of allergic reactions. This means food choice is dependent upon the economic health of a family as well as local business's ability to meet community needs.

Finding (c): The limited availability of traditional foods thus forces reliance upon outside sources; at the same time, it provides foods harmful to health. By recognizing these linkages, Tribal members can better address the root causes of chronic health problems and healthy food accessibility in the Tribal community.

2. Greater understanding of the community's linkages to food-supply chains.

Finding (a): Respondents primarily obtain their food from a neighborhood grocery store. Eight in ten of respondents indicated that they obtain their foods in neighborhood grocery stores.

Finding (b): Respondents indicate a good understanding of food supply chains, understood in terms of store bought or traditional foods. The data indicates they know where to get traditional foods and that they prefer traditional foods, but questions remain about accessibility to those foods (What limits them? Time, money/ land use access/policy?)

Finding (c): Respondents do not consider "local grocery store" foods as healthier than traditional Tribal foods.

3. Greater understanding of food production, consumption, and purchasing habits within the community and/or within households.

Finding (a): The data provides clarity about where respondents are getting their foods from (mostly stores), what they prefer (traditional foods), what they eat most (store bought food more than traditional foods).

Finding (b): While it indicates they know where to get traditional foods, it isn't clear how they acquire them (or what prevents them from acquiring/consuming more regularly.

Finding (c): Respondents indicate that it is possibly time/cost prohibitive or many of the traditional foods are no longer available in their immediate surroundings possibly due to overdevelopment/land use changes/land access policy- i.e., privately-owned land by non-Tribal.

Finding (d): Ninety percent of the respondents indicated that if access to traditional foods were easier, they would be consumed more frequently.

Finding (e): Most Tribal Community members do not or rarely consume traditional Tribal foods. Respondents indicate that nearly 60 percent "never" or only once a week have access to and consume traditional foods that they consider to be healthier than commercially purchased foods.

4. Develop an economic profile of how much money leaves Native communities for food-related purchases.

Finding (a): Survey responses provide a reasonably accurate snapshot, indicating that Tribal households obtaining food at commercial stores may spend an estimated $1.048 million and $3.146 million annually.

Finding (b): Assuming there are no grocery stores in the Tribal community that return taxes to the Tribal government, generate Tribal jobs, or incorporate Tribal traditional foods in the food chain, it is reasonable to conclude that the money is leaving the community eliminating the multiplier effect for the Tribal economy that would result (not only grocery store profit/employment, but also subcontractors/suppliers).

Finding (c): The Multiplier Effect ("when income is spent, this spending becomes someone else's income, and so on) generally means that for every Tribal dollar that is spent it generates $5 of economic activity. Given the estimated Tribal possible spending on food, the estimated range of current expenditure ($1.048 million to $3.146 million) translates through the multiplier effect to a Tribal economic lose of an estimated $5.240 million to $15.730 million each year.

5. Learn more about the nutritional needs, diet-related health, and hunger in the community.

Finding (a): The data indicates the Tribal community generally consumes a mixed diet from commercial sources and that combines traditional foods with store bought foods, but is more heavily weighted toward store bought foods.

Finding (b): While respondents indicate a general understanding of health associated with the foods they consume they indicate preferences for foods that are predominantly commercially produced while paradoxically they also report high levels of allergies and sensitivities to foods—particularly grain based products and dairy.

6. Assess other aspects of the local food system that can lead to greater control including policy, land use, local producer use, etc.

Finding (a): The survey data indicates a community desire to consume more traditional foods if they were available. And since large sums of money leave the community through purchasing food, this also provides evidence the community would advocate for policies that would lead to greater control in land use and local producer use, including local food production/gathering.

Finding (b): An upper most estimate of household expenditures suggests that each resident may average about $118 monthly expenditure on average.

7. Document food-related cultural traditions and practices specific to the community.

Finding (a): Respondents clearly indicate that traditional foods connect them to their culture and they consider commercial foods to be generally unhealthy and they express a desire for greater access to traditional foods.

Finding (b): However, data does not indicate when Tribal Community members consume traditional foods (is it part of special celebrations or part of regular weekly diet?) or how they obtain them, only that they know where to obtain them.

8. Identify assets, resources, institutions, and community leaders that can be leveraged for the benefit of the community food system.

Finding (a): The research data clearly points to a community desire and ability to identify assets, resources, institutions, and community leaders who can be leveraged for the benefit of the community food system.

Finding (b): Respondents express agreement that they know where to get traditional food. While they know where to obtain traditional foods, such food accessibility is considered to be a major obstacle.

Finding (c): Overwhelmingly (85%), respondents indicate they are interested in receiving the results of this research/survey – show a desire to learn more engagement in food sovereignty.

Summary Survey

The Household Survey was designed to obtain data from a random sample and a purposive sample of 62 households. The detailed survey results are documented in Appendix A, however the main findings of the Survey were as follows:

- Sixty-six percent Tribal members consume Traditional food once or more a week
- Dairy (37%) and or grains (16%) cause allergic inflammation in a significant portion of the Tribal population
- Like their ancestors, a significant proportion of Tribal members indicated a positive response to Fish (38%), Berries (48%), Fresh Greens (46%) and wildlife (46% foods).
- Fully 80% of Tribal community possesses personal knowledge to access traditional Tribal food.
- While the vast majority of Tribal households depended on commercial food sources, 83% consider these foods unhealthy.
- Sixty-four percent of the Tribal community

preferred traditional Tribal Foods.

- Sixty-three percent of the Tribal Community felt culturally connected to their traditional food.
- Eighty-one percent of the Tribal Community said that Traditional Tribal Foods were not easy to obtain, and 90% would eat these ancestral foods if they were easy to obtain.

Fully 90% of the Tribal Food Sovereignty Assessment Household Survey participants expressed the view that "I would eat our traditional foods if they were easy to obtain." But, the vast majority of the respondents (85%) are reliant on "neighborhood grocery stores" for their food source even though more than 8 in 10 respondents did not agree that food purchased at the "local grocery store" was healthier than traditional Tribal foods. This result supports the survey result that respondents "generally" believe they consume "natural (minimally-processed), healthy food, nearly 3 in 10 respondents indicated they do not consume such foods. Four in 10 respondents prefer a "protein, fat, green vegetable" based diet whereas another 4 in 10 prefer a mixed "protein, carbohydrate, fat" diet. This result suggests that 40% of the Tribal Community respondents actually prefer a traditional Tribal diet whereas another 40% prefer a diet commercially sourced. The respondents in this Tribal Food Sovereignty Assessment Household Survey tend to depend on the local grocery store for food sourcing with the result that annual household expenditure for the whole Tribal population is estimated at $1.048 million and $3.146 million. This represents a net loss to the Tribal economy and when the "multiplier factor" is applied to these figures the overall loss to the Tribal economy from Tribal "out expenditures for food" is estimated to be $5.240 million to $15.730 million each year—an overall net loss to the Tribal economy. The Tribal respondents expressed a strong desire to obtain more information about Tribal traditional foods and creating an infrastructure that ensures availability of traditional foods or healthful substitutes.

Talking Circles: Recommendations for Policy on Food Security

These findings were complemented by the extensive exchanges by participants in three Talking Circles where tribal officials and tribal community members (some of whom took part in the survey) were presented with a story and asked three questions to stimulate discussion. The purpose of the Talking Circles was to refine the study narrative with more specific recommendations that would be delivered to the Tribal Council for consideration and perhaps implemented.

Policy Recommendations

The three-tiered inquiry of historical food uses, household survey and the Talking Circles that focused the initial findings on possible recommendations for new Tribal Food Policy produced a series of Tribal Policy Recommendations were offered that they may be formed into specific policy proposals. They were as follows:

1. Reestablish a farmers'/hunters' market for fresh produce and meats
2. Continue to evaluate food policy over years
3. Expand Community Garden
4. Provide traditional food education to Tribal Youth
5. Get rid of Junk Foods in Food Bank
6. Supply Elk, Salmon, berries and Deer to Food Bank

7. Tribal Government should prevent pesticide and herbicide spraying of berries
8. Establish Beef, Deer, Elk meat processing-butchery
9. More ceremonial fisheries to bring fish to Tribal homes
10. Train young Tribal men to fish and make them feel valued
11. Set a policy that states that traditional food is healthier
12. Keep money spent on food inside Tribal
13. Need Tribal Grocery stores

These thirteen policy recommendations clearly suggest the need for specific initiatives that may call for assigning a Tribal government agency to implement each or all proposals that if implemented will respond to the popular views, health needs, nutrition needs and economic interests of the tribal community. The Tribal Government will also need to consider budgets and funding support as well as personnel in government capabilities, workforce capabilities as well as planning and implementation skills.

The Study results clearly demonstrate that the tribal population wishes to obtain and establish control over access and use of its traditional foods. The Study also demonstrates that the financial support necessary for the tribal economy to promote local control over traditional foods is adequate given the level of external food expenditures calculated for the population. The Study resulted in a series of thirteen concrete recommendations to the tribal council that if implemented appear to have the potential to establish food sovereignty with net health, economic and regulatory consequences beneficial to the tribal community. We conclude, furthermore, that the theory on which this study was based has been validated where the combination of qualitative, quantitative and relational reasoning tools produced a clear and incontrovertible outcome favoring specific measures for the tribal community to resume its control over food access and uses from traditional sources. The methods and results demonstrate reasonable relationships between health conditions; community choices, economic effects and historical realities for the community are affirmed in the recommendations that stand as the outcome of the Study.

Study Limitations

During the conduct of this Study it was apparent that several limitations entered into the outcomes. The three Talking Circles were originally planned to include tribal officials and individuals who had participated in the Household Survey and it can be said that two of the Talking Circles received full participation. A third Talking Circle was able to attract but one participant—a tribal councilman—who was willing to engage the process. But, a single participant significantly limited the utility of the third Talking Circle.

The Study was also limited in the Household Survey when it became apparent that many of the randomly selected households were either empty or potentially dangerous due to drug or other violent problems. To remedy was to engage in purposive sampling with the result that the survey relied on mixed sources with the potential that the results could be distorted. However, it is thought that the purposive sampling of 44 of the 62 households resulted in a fair though reduced level of utility for the results.

Conclusions

This Food Assessment was conducted as a research study employing three related components: Historical Assessment, Housing Survey and Talking Circles. The data obtained from all of these sources were iteratively reviewed to ensure consistency and accuracy as to the relationship between factors obtained in each component. The result of these inquiries was a series of policy recommendations compiled by the Food Policy Council and the final documentation was presented to the Tribal Council. The Study tested the Fourth World Theory that served as foundational to the structure and conduct of the study.

Despite barriers[2] to reviving traditional food ways, Tribal youth and elders alike increasingly consider food security essential for a healthy life. To better understand the current food system of the subject Tribal Community, it is important to look at origin stories and beliefs around ecosystems management, the history of traditional food usage and availability. It is equally important to understand the complex web of cultural, socio-political, economic, and legal barriers that impede people from accessing and deriving nourishment from the foods that have provided sustenance for millennia.

Contrary to assumptions held by earlier researchers in the Lushootseed region, this historical assessment finds that Tribal peoples were doing far more than fishing; they were actively managing the lands around them. Studies show that Lushootseed peoples intentionally managed their environments to increase food availability through various forms of cultivation, and were far more than hunter-gatherers.

The historical foundations of the Tribal Community are bound to the relationships with ancestors, the land and waterways and the continuing syncretic practice of ceremonies and rituals connected to the cosmos. The historical connections to longhouse culture for this Tribal Community continue even after more than 150 years or eight generations in the form of ceremonial practices, dance, language restoration, and stories. All of these factors were found to bear on the attitudes and responses of tribal participants and tribal officials throughout the study—directly bearing on the results of the Household Survey, Talking Circle and final recommendations for affirming Food Sovereignty.

To enhance the food security and health of their peoples today, Tribal members can create policies that promote the incorporation of traditional plants and cultivation practices that served an integral part of their society in the past. In his speech at the Nisqually Healing our Wounded Spirits Conference in 2006, professor of historical trauma Tom Ball emphasized the importance of looking to the past as a way of healing the present:

> "Those things that were in place before [colonization] heal us. Cultural practices are most important because this is our story…Things that help us are the things that we already had."

[2] Introduced educational system, commercial and industrial development, competition for access to lands, introduction of multiple governing jurisdictions (city, county, port, state, federal), competing claims for lands and resources.

The Research Team compiled data results from the Tribal Food Sovereignty Assessment Household Survey covering 62 households. The study relied on randomly selected households to 42 and 20 purposefully selected households, which means that the results can be used to reflect the popular opinions of the whole Tribal Community. This is important so that the Food Policy Council could state without reservation that policy recommendations proposed have significant popular support in the Tribal Community and are consistent with the historical foundations of the community.

Reflecting on the "Survey Findings," the basis for recommendations for a new Tribal Food Policy standout in relation to the preliminary results of the Talking Circles:

Finding 1 (c): The limited availability of traditional foods thus forces reliance upon outside sources; at the same time, it provides foods that are harmful to health. By recognizing these linkages, the Tribal Community can better address the root causes of chronic health problems and healthy food accessibility in the Tribal community.

Finding 2 (b): Respondents indicate a good understanding of food supply chains, understood in terms of store bought or traditional. The data indicates they know where to get traditional foods and that they prefer traditional foods, but questions remain about accessibility to those foods (What limits them? Time, money/ land use access/policy?).

Finding 2 (c): Respondents do not consider "local grocery store" foods as healthier than traditional Tribal foods.

Finding 3 (c): Respondents indicate that it is possibly time/cost prohibitive or many of the traditional foods are no longer available in their immediate surroundings possibly due to overdevelopment/ land use changes/land access policy- i.e., privately owned land buy non-Tribal).

Finding 3 (d): Ninety percent of the respondents indicated that if access to traditional foods were easier, they would be consumed more frequently.

Finding 4 (a): Survey responses provide a reasonably accurate snapshot, indicating that Tribal households obtaining food at commercial stores may spend an estimated $1.048 million and $3.146 million annually.

Finding 4 (b): Assuming there are no grocery stores in the Tribal community that return taxes to the Tribal government, generate Tribal jobs, or incorporate Tribal traditional foods in the food chain, it is reasonable to conclude that the money is leaving the community eliminating the multiplier effect for the Tribal economy that would result (not only grocery store profit/employment, but also subcontractors/suppliers).

Finding 4 (c): The Multiplier Effect ("when income is spent, this spending becomes someone else's income, and so on) generally means that for every Tribal dollar that is spent it generates $5 of economic activity. Given the estimated Tribal possible spending on food the estimated range of current expenditure ($1.048 million to $3.146 million) translates through the multiplier effect to a Tribal economic lose of an estimated $5.240 million to $15.730 million each year.

Finding 5 (a): The data indicates the Tribal community generally consumes a mixed diet from commercial sources and that combines traditional foods with store bought foods, but is more heavily weighted toward store bought foods.

Finding 5 (b): While respondents indicate a general understanding of health associated with the foods they consume they indicate preferences for foods that are predominantly, paradoxically they also report high levels of allergies and sensitivities to foods—particularly grain based products and dairy.

Finding 6 (a): The survey data indicates a community desire to consume more traditional foods if they were available. And since large sums of money leave the community through purchasing food, this also provides evidence the community would advocate for policies that would lead to greater control in land use and local producer use, including local food production/gathering.

Finding 7 (a): Respondents clearly indicate that traditional foods connect them to their culture and they consider commercial foods to be generally unhealthy. and they express a desire for greater access to traditional foods.

Finding 7 (b): However, data does not indicate when Tribal Community members consume traditional foods (is it part of special celebrations or part of regular weekly diet?) or how they obtain them, only that they know where to obtain them.

Finding 8 (a): The research data clearly points to a community desire and ability to identify assets, resources, institutions, and community leaders who can be leveraged for the benefit of the community food system.

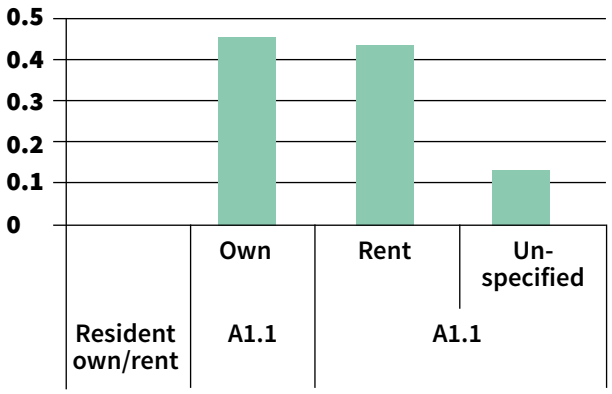
Finding 8 (c): Overwhelmingly (85%), respondents indicate they are interested in receiving the results of this research/survey – show a desire to learn more engagement in food sovereignty.

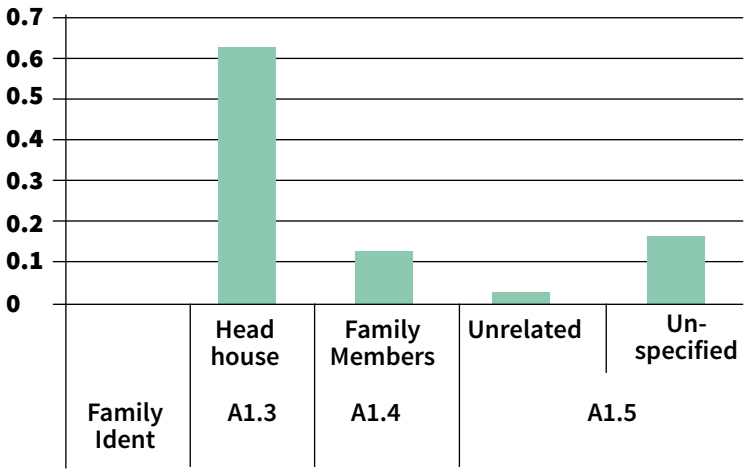
These fifteen specific findings and assessments provide strong support for the recommendations formulated by the Food Policy Council drawing on historical, House Survey and Talking Circle factors. The resulting thirteen policy recommendations were documented and transmitted to the Tribal Council for its consideration and implementation.

Overall Conclusions

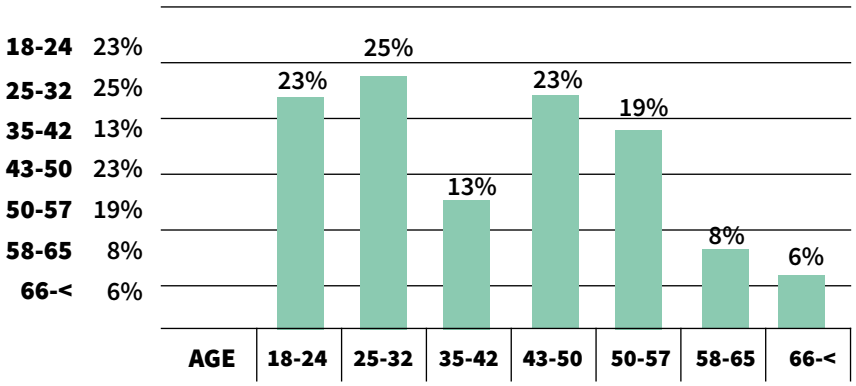
The 2002 Food Sovereignty Conference in Rome established the baseline for determining that indigenous communities must define their own labor, fishing, harvesting, agricultural, food and land policies that are healthfully, ecologically, socially, economically and culturally appropriate to their unique circumstances. The study conducted by the Center for World Indigenous Studies held closely to this principle in its design, theoretical framework and the results confirmed by participants from the Tribal Community. A comprehensive health, economic, cultivation, ecologic and social strategy can evolve from the 13 recommendations produced by this study and may be implemented in large measure since the participants essentially originated the recommendations.

Appendix A: Household Survey Raw results

CODE	TABULAR RESULTS	GRAPHICS RESULTS
A1.1	**RESIDENT OWN/RENT**	
A1.2	**OWN** 45% **RENTA** 42% **UN-SPECIFIED** 13%	

A1.3	**FAMILY IDENT**	
A1.4		
A1.5	**HEADHOUSE** 66% **FAM MEMB** 13% **UNRELATED** 6% **UN-SPECIFIED** 16%	

B1 **SURVEY AGE DISTRIBUTION**



C1 **GENDER**

MALE 65%

FEMALE 35%

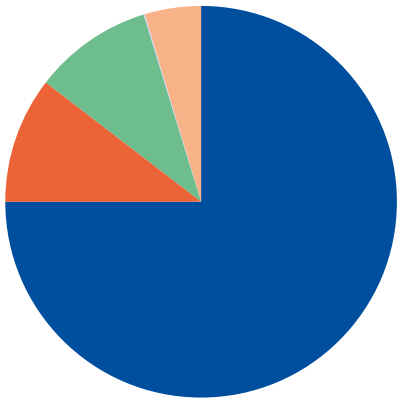
D1 **EDUCATION LEVEL**

K-12 72%

ASSOCI 20%

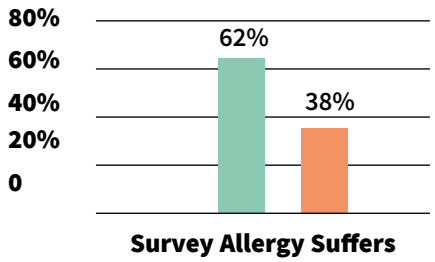
BACH 20%

MASTER 6%



E1 **ALLERGIES (FOOD, AIRBORNE, TOUCH)**

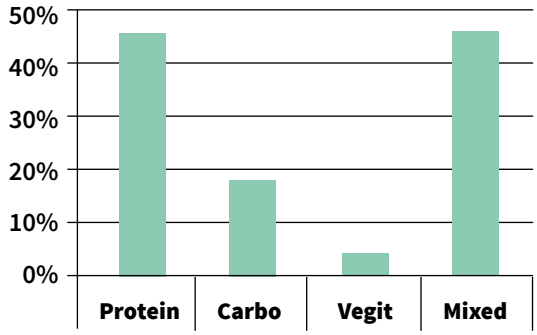
YES 62%
NO 38%



**The allergies question produced a remarkable spread suggesting there is a high level of body inflammation caused by foods and by exposures in the air and surfaces.

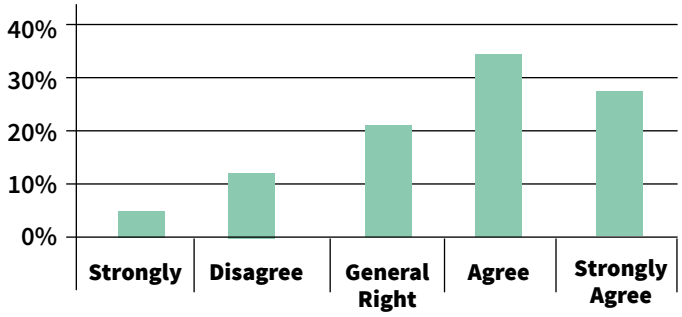
F1 **FOOD PREFERENCES**

PROTEIN 41%
CARBO 18%
VEGIT 3%
MIXED 48%



Q1 **BUY ALL FOOD AT NEIGHBORHOOD GROCERY**

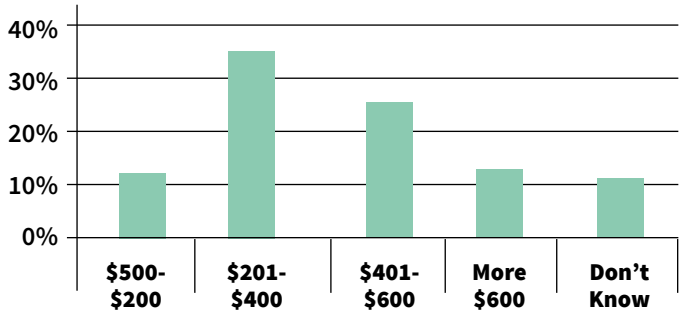
STRONGLY DISAGREE 6%
DISAGREE 11%
GENERAL RIGHT 21%
AGREE 34%
STRONGLY AGREE 27%



Q2 **AVERAGE MONTHLY GROCERY PURCHASE**

N=60

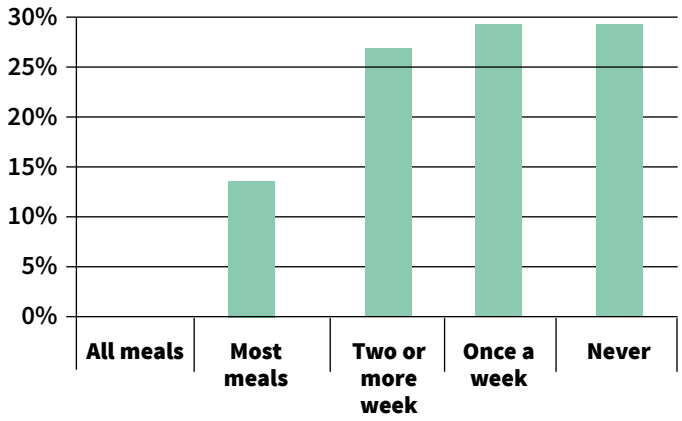
$500-$200	13%
$201-$400	35%
$401-$600	27%
More $600	13%
Don't Know	12%



Q3 **FREQUENCY EATING TRADITIONAL MIT FOODS**

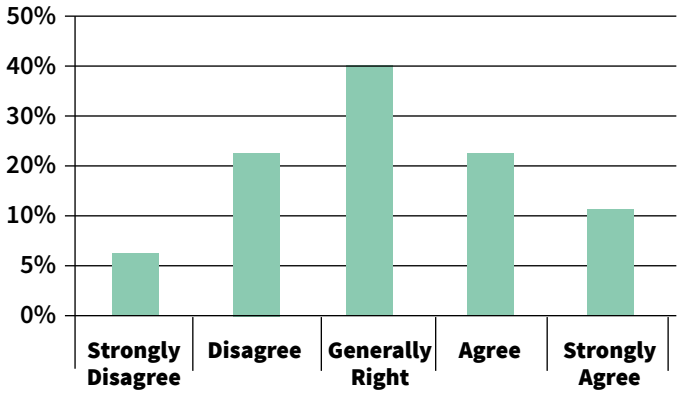
All Meals	0%
Most Meals	15%
Two or more week	27%
Once a week	29%
Never	29%

Sixty six percent individuals consume Traditional food once or more a week



Q4 **MY DAILY FOOD IS NATURAL AND HEALTHY - STRONG**

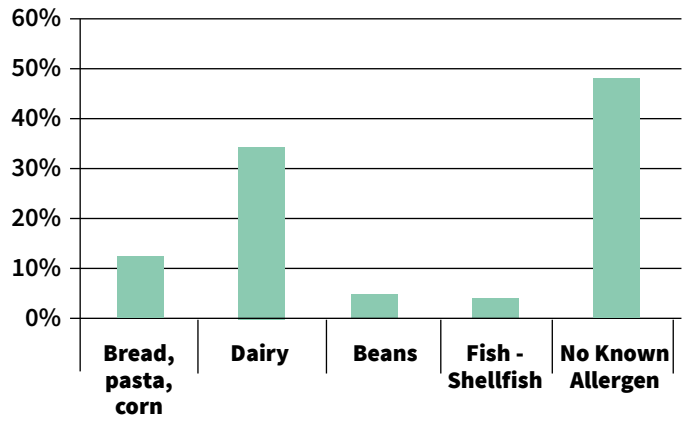
Strongly Disagree	6%
Disagree	21%
Generally Right	40%
Agree	21%
Strongly Agree	11%



Q5 ALLERGY SYMPTOMS WHEN I EAT

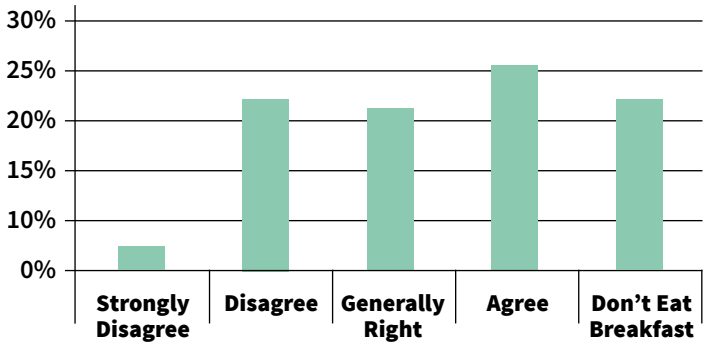
BREAD, PASTA, CORN	16%
DAIRY	37%
BEANS	6%
FISH - SHELLFISH	5%
NO KNOWN ALLERGEN	48%

Dairy and/or grains cause allergic inflammation in a significant portion of the Tribal population



Q6 ALWAYS EAT BREAKFAST LASTING ALL DAY

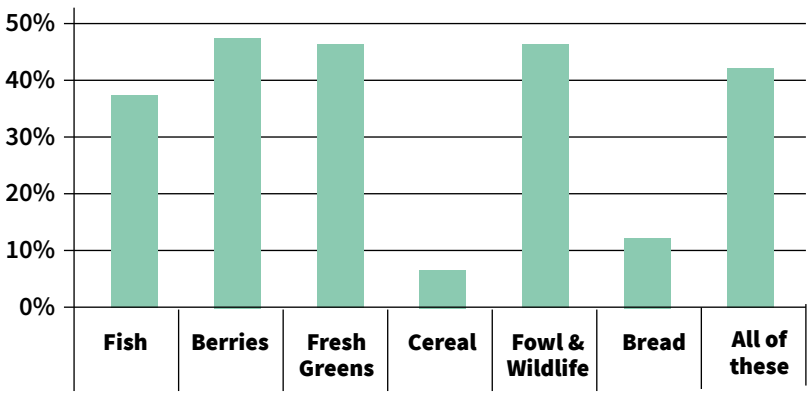
Strongly Disagree	6%
Disagree	24%
Generally Right	21%
Agree	26%
Don't Eat Breakfast	23%



Q7 BODY FEELS STRONG WHEN I EAT (N=61)

FISH	38%
BERRIES	48%
FRESH GREENS	46%
CEREAL	7%
FOWL & WILDLIFE	46%
BREAD	13%
ALL OF THESE	43%

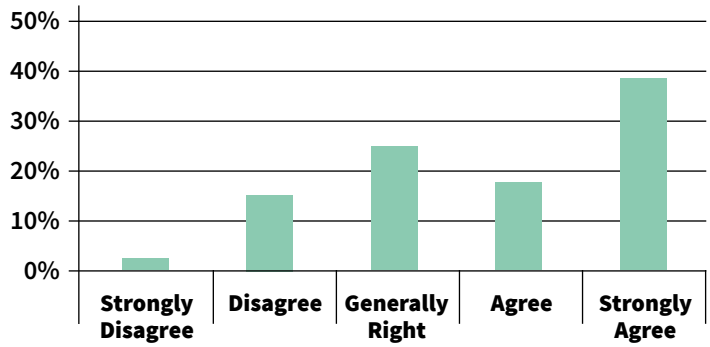
Like their ancestors, a significant proportion of Tribal members indicate a positive response to Fish, Berries and wildlife foods.



Q8 **PERSONAL KNOWLEDGE WHERE TO GET TRADITIONAL FOOD (N=59)**

Strongly Disagree	3%
Disagree	15%
Generally Right	24%
Agree	17%
Strongly Agree	39%

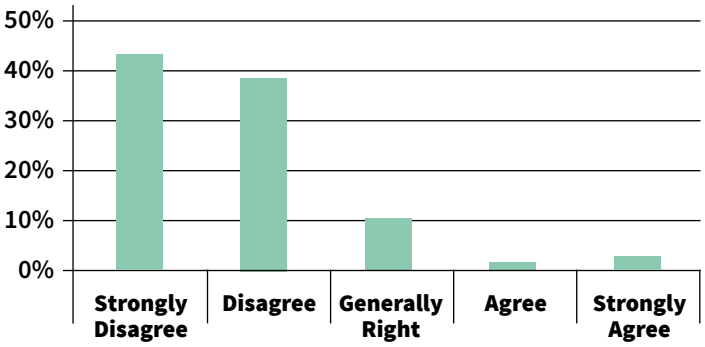
Fully 80% of Tribal community possess personal knowledge to access traditional Tribal foods



Q9 **STORE FOOD IS HEALTHIER (N=61)**

Strongly Disagree	44%
Disagree	39%
Generally Right	11%
Agree	2%
Strongly Agree	3%

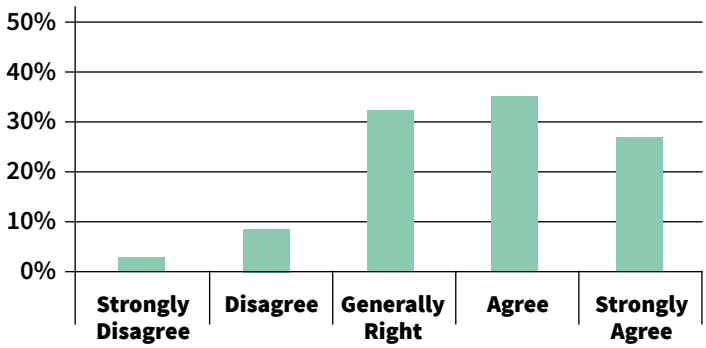
While the vast majority of Tribal households depend on commercial food sources, 83% consider these foods unhealthy.



Q10 **I PREFER TRADITIONAL FOOD (N=61)**

Strongly Disagree	2%
Disagree	9%
Generally Right	31%
Agree	36%
Strongly Agree	28%

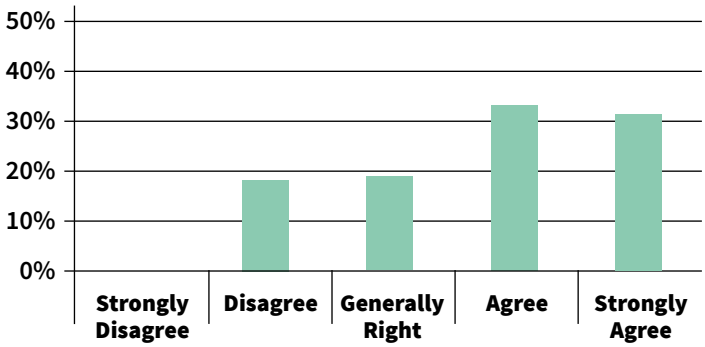
Sixty four percent of the Tribalcommunity prefers traditional Tribal Foods.



Q11 FEEL CULTURAL CONNECTION TO TRADITIONAL FOODS

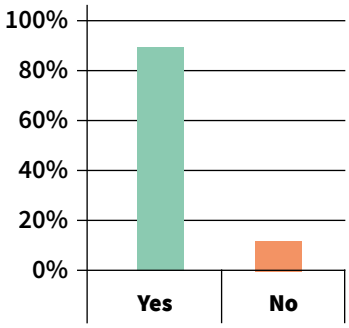
Strongly Disagree 0%
Disagree 19%
Generally Right 18%
Agree 32%
Strongly Agree 31%

Sixty-three percent of the Tribal Community feel culturally connected to their traditional foods.



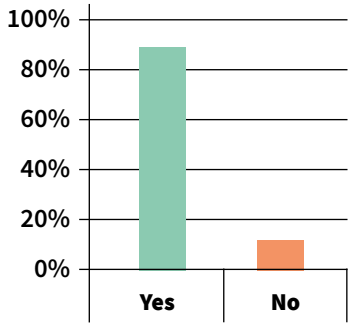
Q12 WHAT TO LEARN MORE ABOUT TRADITIONAL FOODS

YES 85%
NO 15%



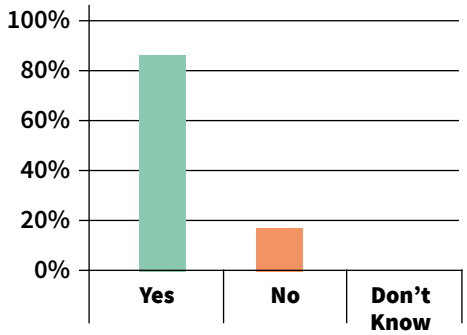
Q13 WISH TO RECEIVE SURVEY RESULTS

YES 85%
NO 15%



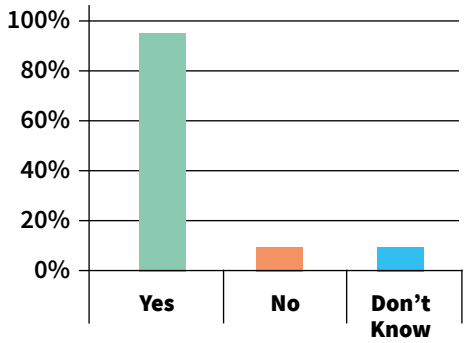
Q14 **TRADITIONAL FOODS NOT EASY TO OBTAIN NOW**

YES	81%
NO	19%
DON'T KNOW	0%



Q15 **WOULD EAT TRADITIONAL FOODS IF EASY TO**

YES	90%
NO	5%
MAYBE	5%



Appendix B: Tribal Food Assessment Talking Circles

The moderator presented a scenario of Tribal Community Food Sovereignty experience drawn in part from the findings of the 62 Household Survey.

Scenario: A little while ago a Tribal family related to the traditional longhouse had two members who suffered from severe allergies and one member had diabetes. Members of the family found themselves sometimes complaining about the "same ole food." Granma would tell the children that when she was growing up she and her family lived on government surplus foods like beans, spam, macaroni, cheese, margarine and hard tack. She said kids don't know how good they have it now. Whenever groceries were bought in the tribal household, the most common foods they got were loaves of bread for sandwiches, spaghetti, pizza, beans, chicken, pop, and sometimes pork chops.

"My favorite food is tacos, announced the 10-year-old.

Granma said, "You know, before the War, my mom and my Granma told how they ate just deer, elk, salmon, clams, fry bread, fresh greens and sometimes they had quamash, and wild carrots in their stew." "In those days", Granma went on, "our people could have all the food they wanted from the rivers, the Sound, and across the prairies up to the mountains. We had gatherers, hunters and fishermen." "The women," my Granma said, "picked wild greens, berries, and dug roots. We traded for oolichan grease and seal oil and we had trade over the mountains with the tribal peoples."

"But," Granma said, "we don't have the foods we used to eat and we seem to get a little sick from time to time." When my Granma was alive, she said, "We could pretty much get anything we wanted, but when we were moved out of our longhouses and the 'Bostons' (that's what they called the white people) came into our lands and began to make farms out of the places where we picked berries, quamash, and even our cattails. The elk, deer and other wildlife moved up into the mountains…farther away from where we could reach them in two or three days. We had to get food from the Bostons after a while and that was mostly wheat flour, pork fat, beans, and sugar. Longhouse people would go out to the rivers and the Sound to get fish, clams and mussels, but these also got to be harder to get with the Bostons moving in along the waterways.

I heard that the Food Policy Council that was recently created thinks we need to get control over our food again so all our tribal members, and especially our kids, will be healthier. They are saying we 'have the right to our cultural foods again and that we should have healthy food in the schools where our children go.' The Policy Council says our food from the store is not always good for us because what we buy, a lot of the time, has chemicals that are poisonous to Indians. They say we should 'Eat Indian.'

"Well," Granma said, "I don't know if the Policy Council is right since the food in stores could be just as healthy as our old Indian foods. Even though my diabetes and heart problems kick in ever so often I survived on commodities, and that didn't really hurt me. We can't even get a lot of those traditional foods our ancestors had. We have become dependent on the foods the 'Bostons' brought us. I don't know what we can do about that."

* * * * *

Once the story was delivered the Talking Circle commenced with the moderator asking three questions.

Talking Circle Outcomes

294-3006 Tribal Food Sovereignty Assessment
Talking Circles #1, #2, #3 | May 13, 2017 Tribal Cultural Center

Q1 After hearing that story, what is the first word that comes into your mind describing your reaction to the story?

Responses:

a) Importance of Elders' Knowledge
b) Concern about Contamination of food
c) Illness from White foods (Chronic Disease: Diabetes, Heart Disease)
d) Access to traditional foods further away
e) Unhealthy Foods in Schools

Q2. Do you think the Tribal government should work to have a strong, limited or no influence over food access for tribal members to improve food quality and support members' health?

Responses:

a) The Tribal Government must act in a strong way to ensure healthy food
b) Clean water is a concern
c) White food causes overweight
d) Our food is our identity
e) Tribal government prevents contamination of food
f) Hunting program to make food available
g) Develop Memorandums of Agreement with city, county and state to control food contamination
h) Health of Elders is an important concern
i) Establish regulations concerning appropriate harvesting of foods
j) Fishery is endangered due to imbalance in fishing industry, exploiting resources is not sustainable.

Q3: If you were going to suggest that the Tribal Council do something about getting more healthful food available to the Tribal Community, what would you want them to do?

Policy Recommendations:

- Reestablish a farmers'/hunters' market for fresh produce and meats
- Continue to evaluate food policy over years
- Expand Community Garden
- Provide traditional food education to Tribal Youth
- Get rid of Junk Foods in Food Bank
- Supply Elk, Salmon, berries and Deer to Food Bank
- Tribal Government should prevent pesticide and herbicide spraying of berries
- Establish Beef, Deer, Elk meat processing-butchery
- More ceremonial fisheries to bring fish to Tribal homes
- Train young Tribal men to fish and make them feel valued
- Set a policy that states that traditional food is healthier
- Keep money spent on food inside Tribal
- Need Tribal Grocery stores

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Heidi Bruce was born and raised in a trilingual (English, Spanish and German) home in Alaska. She is a researcher, writer and advocate in Fourth World geopolitics. Her specialties include human migration, refugee resettlement, climate change mitigation, political ecology, gender studies, conflict transformation and bio-cultural education. Prior to her role as research associate with CWIS she was a writer for YES! Magazine and worked in the fields of education, social work and regenerative development. She holds a Master degree in Intercultural Service, Leadership and Management from the SIT Graduate Institute in Vermont, USA.

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Dina Gilio-Whitaker (Colville Confederated Tribes) is Policy Director and Senior Research Associate at the Center for World Indigenous Studies, and is an award-winning journalist at Indian Country Today Media Network. With a bachelor's in Native American Studies and a master's in American Studies, Dina's research interests focuses on Indigenous nationalism, self-determination, environmental justice, and education. For the past several years she has been involved with Indigenous peoples' participation in the United Nations arena. She also works within the field of critical sports studies, examining the intersections of indigineity and the sport of surfing. She is coauthor with Roxanne Dunbar-Ortiz of the book "All the Real Indians Died Off" and 20 Other Myths About Native Americans, and is currently under contract with Beacon Press for a new book on environmental justice in Indian country.

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Fecund Earth: Health and History Traditions in Armenia

By Naneh Israelyan

ABSTRACT

This study aims to explore the ways in which Armenia's history and geography have shaped attitudes towards health and wellness, with an emphasis on the use of herbal therapies. The ancient literature of Armenia points to a particular affinity towards plant medicine, which continues to be a prevalent mode of healing to this day. This research outlines the most well-known herbal therapies today and investigates how these traditions of healing are closely woven into the Armenian identity.

Key Words: Armenia, herbal therapies, plant medicine, the Armenian Genocide, the Armenian highlands, geography, the humours, national pride.

Armenia is a mountainous landlocked nation located in the Southern Caucuses region bound by Georgia, Azerbaijan, Turkey and Iran. Approximately the size of Maryland (11,490 square miles), Armenia contains seven different geographical ecoregions, including swamps, alpine meadows, semi-deserts, dry and wet steppes, and forests with drastically varying elevations (390 meters at the Debed River and 4,090 meters at its peak on Mount Aragats). These altitudes house a diversity of climates from dry subtropical to the tundras and each is complete with its own endemic flora. The native vegetation is a source of immense pride for many Armenians. I know this because I am Armenian and my trips back to the homeland feature large, elaborate meals of in-season produce, meats, fish and beyond question, lavash, a traditional Armenian flatbread that is simultaneously an auxiliary utensil used to wrap up food. Before you've digested your first bite, someone has already refilled your plate with another serving of food, a smile and a "You'll never taste [insert in-season produce here] like this anywhere in the world. This only grows in Armenia." And so you eat it and of course it ends in a Gastronomic crisis. You experience an explosion of taste where each stratum of organic metabolite is at once ambiguously recognizable and harmoniously blended together by some delightful osmosis, as nature intended.

My inquiries have led me to some very unusual but intellectually and visually fascinating places. By the end of my trip, it became clear that healing with plant medicines is endemic to the Armenian character, which is defined almost unanimously by a strong sense of patriotism, along with unparalleled hospitality and a distinct sort of ingenuity. These traits, as one would expect, are tightly interwoven with Armenia's past.

The history of Armenia is a complex one, marked by waves of nomadic invasions, political unrest, and internal corruption. During the 18th century, Western Armenia was under the control of the Ottoman Empire, and Eastern Armenia was annexed to Russia. In 1915, the Ottomans led a program of extermination of the Armenian people within its province. Although massacres had begun well before then, the Young Turks, the political party in power at the time, carried out deliberate executions and mass killings of Armenians. By 1923, 80% of Ottoman Armenians had been killed and Western historic Armenia was absorbed into modern-day Turkey. The traumas of these genocidal crimes continue to be a defining trauma for Armenians, so long as the Turkish government continues to deny their war crimes. One and a half million Armenians lost their lives between 1915 and 1923 and half a million fled the country to avoid persecution, laying the foundation for the Armenian diaspora which today totals 8 million people worldwide.

The country's troubles did not end there. Eastern Armenia officially came under Soviet rule in 1922 until its independence in 1991. And although this time was characterized by economic and infrastructure development, Armenia lost more lives to the Soviet Union's repressive tactics. In an effort to silence any form of nationalism, Stalin ordered the execution and deportation of tens of thousands of Armenian politicians, artists, intellectuals, scientists, and other affiliated persons during The Great Purge. Then in 1988, a 6.8 magnitude earthquake hit the northern region of Armenia killing some 50,000 people and leaving many more homeless. Roadways, railways, buildings and other structures

were severely damaged and poor disaster contingency planning rendered any relief effort ineffectual. Damages from the earthquake are still very apparent today. Following that, the collapse of the U.S.S.R. in 1991 ushered in an era of food and energy shortages and a broken health care system aggravated by corrupt politicians. The Nagorno-Karabakh War between Azerbaijan and Armenia over Artsakh, the de facto independent state within the jurisdiction of Azerbaijan but historically and culturally Armenian, exacerbated many issues during those years. Azeri's blocked an integral gas pipeline into Armenia, cutting off 90% of Armenia's natural gas supply and with no functioning thermal or nuclear power stations of their own, energy resources were limited. The tension between Azerbaijan and Armenia over Artsakh continues to linger with attacks on both sides. The last outbreak of which was the Four Day War in 2016 ending in a ceasefire on April 5th.

At the heart of all the devastation is a sense of honor for what has survived everything that has been lost. The Armenian civilization is thought to have coalesced in 4th century CE from various Indo-European inhabitants of the Caucasus Mountains, Anatolia and Mesopotamia. The ancient medical practices of these societies eventually came to form the infrastructure for medical traditions that would come later in Armenia. Psycho-spiritual practices and beliefs in divinatory medicine among pagan societies were extremely common. Interestingly, certain endemic species, like black cumin (Nigella sativa), white bryony (Bryonia alba), campion (Lychnis L.) and oriental sycamore (Platanus orientales), were worshipped by cults for their curative properties, evidencing an early sensibility for phytotherapy - the medical use of plants and plant extracts for medicinal purposes. The regional flora and their therapies were well-known to the scholars of antiquity, the likes of Dioscorides, Pliny the Elder, Tacitus and Xenophon, who wrote about many coveted healing plants and minerals in the Armenian highlands. In 301 AD, Armenia was the first country to adopt Christianity as its state religion and as pagan temples were destroyed, monasteries and churches with hospitals in close proximity were erected in their place. Today, there are over 4,000 churches in Armenia and 93% of the population belongs to the Armenian Apostolic Church.

The cultural Hellenization of Armenia began in the early Middle Ages, during a time when scholars were eagerly studying and translating Greco-Roman, Islamic and Vedic texts, with a particular affinity towards Galen in the early Middle Ages. Ancient scholars like Eznik Koghbatsi, Mkhitar Heratsi and Amirdovlat Amasiatsi were all luminaries of Armenian medicine in their time. The text, *Useless for the Ignorant* by Amasiatsi was considered to be the holy grail of Armenian medical knowledge. Many of the pharmacopeias and manuscripts have been lost to wars throughout the years, but what has survived is preserved today at The Mesrop Mashtots Institute of Ancient Manuscripts, or better known as The Matenadaran. Located in the country's capital Yerevan, the research institute and museum houses medieval manuscripts on theology, philosophy, natural and medical sciences. Scholars such as Stella Vardanian and Armen Sahakian take on the task of translating these manuscripts into vernacular Armenian, Russian and English. Mr. Sahakian has unearthed some ancient, long-forgotten recipes and has altered them accordingly to create elixirs using native plants. Common ingredients include hawthorne, mountain thyme, ziziphora, mugwort, white bryony, elderberry, calamus root (Acorus calamus), cubeb or tailed

The Matenadaran

pepper (Piper Cubeba) and bilberry. The ingredients in these elixirs are sourced from mountainsides all over Armenia and are harvested in tune with the lunar calendar accompanied by prayers and rites per instructions from manuscripts.

Outside of plant therapies, ancient and modern Armenian scholars alike have a wealth of information regarding the use of other forms of therapeutic organic and inorganic matter. For example, mineral remedies occupy a large portion of Armenian healing traditions. The red earth clay Armenian bole was indicated as an anti-inflammatory and anti-allergenic, and the precious Armenian stone (Lapis armenus) was prescribed to persons who had recently undergone a traumatic experience. Fermented animal organs were used to shrink tumors and straighten broken bones. The Armenian cochineal or Vordan Karmir, a scale insect traditionally used as a crimson dyestuff, has a long history of medicinal applications as well. Scholars of antiquity point to its value as a febrifuge, antiseptic and contraceptive as well as its anti-aging properties. Today, Mr. Sahakian blends the essential oils from the cochineal into his elixirs and cosmetic products.

Scholars are not the only people participating in Armenia's heritage of plant knowledge. Every household contains an index of cotton pouches neatly labeled, in which various dried herbs are stored. Family matriarchs tend to be the stewards of these household staples, but ask most Armenians and they

will confidently explain its intended application. Naturally, there are overlaps. Oregano for stomach complaints, helichrysum for gallstones and bile-duct obstructions, Hawthorne for insomnia, plantain for throat complaints, St. John's Wort for melancholy, strawberry leaves as an analgesic, raspberry leaves as a diaphoretic, evening primrose as a relaxant, golden marguerite as an antispasmodic and mint for everything under the sun.

But the queen of them all is mountain thyme, or urtz, which grows so abundantly there that it even has a mountain named after it: urtz ler (Urtz Mountain). Closer to a mint variety than to the culinary sort found in grocery stores, urtz is used for a large spectrum of illnesses, from respiratory infections to digestive disorders and as a general immuno-modulator. But when you ask an Armenian what urtz is good for, they will boast of the herb's warming qualities. A peculiar feature of Armenian attitudes towards physical illness is that the root lies within body temperature. If one gets sick, it is, indubitably, because one felt too cold at some point within the past day. My impression of this mentality is that it is something of a vestige left by ancient Armenian traditions. Likely originating from Vedic texts, the concept of the four elements creating the material world and transfusing within the human body was of great interest to Armenian scholars. Eznik Koghbatsi, living in the 1st century AD, defined these elements within the body as hot, dry, cold and moist and optimal wellness was a harmonious balance of these states. Modern day Armenians have inherited quite a similar outlook on health.

The following twelve plants are commonly used medicine within the Armenian traditional healing lexicon. Note that common names of plants often vary in differing regions. More or less, common names included reflect the herbal language of Yerevan:

White Bryony
Bryonia alba

COMMON NAME: Loshtak, odzy khaghog (snake's grape)

The root of this plant is used traditionally in acute phases of illness. Though a toxic plant, white bryony has been employed in healing since, at least, pagan times, when it enjoyed the status of religious worship. In traditional Armenian medicine, loshtak is used seemingly for many human health conditions: fevers, viral infections, asthma, pleurisy, peritonitis, gastritis, migraines, rheumatism, neuralgia, hypertension, sciatica, radiation therapy and so many more. Clinical trials carried out on 57 athletes at the Center of Sport Medicine and Heath in Armenia demonstrated the efficacy of white bryony in increasing endurance and working capacity. These studies point to Loshtak's potential adaptogenic, immunomodulating and tonic properties (Panossian, Gabrielian, & Wagner, 1997).

Felty germander
Teucrium polium

COMMON NAMES: Maryamakhot

A popular choice for a relaxing herbal tea, maryamakhot is commonly sold by roadside vendors, selling regional teas, fruits and sweets. Medicinally, the plant is recommended as a remedy for acid reflux and high stomach acidity. Topically, a poultice of the flower heads is an emollient, anti-bacterial and anti-inflammatory. It is also indicated for certain gynecological health issues. Studies on maryamakhot are lacking; however, analysis of the terpenoids and flavonoids testify to the plant's therapeutic antioxidant, anticancer, antiinflammatory, hypoglycemic, hepatoprotective, hypolipidemic, antibacterial and antifungal properties (Bahramikia & Yazdanparast, 2011). Animal clinical trials have shown the potential benefit of maryamakhot in the management and prevention of menopause-related neurodegenerative memory loss (Simonyan & Chavushyan, 2016).

St. John's Wort
Hypericum perforatum

COMMON NAMES: Stohun, sasun, arevy kyurik (sister of the sun), muki aghik (mouse intestines)

Along with mint, thyme and oregano, St. John's Wort completes the holy quartet of household herbs in Armenia. Its mood-elevating properties are well-known and studies have indicated St. John's Wort collected in Armenia contain remarkably high levels of hyperforin, a metabolite responsible for the plant's anti-depressive properties (Kirakosyan, Gibson & Sirvent, 2004). It is indicated for constipation, irregular menstruation and as a heart tonic. The essential oil of the plant is used in the treatment for tinnitus, hearing loss, ear inflammation and also as a topical application for eczema and other skin irritations.

Armenian thyme
Thymus armeniacus

COMMON NAME: Urtz

The tea is drunk in the event of an illness or not, but in any case, it is a routine remedy in the treatment of colds, sinus and respiratory infections, fevers, coughs, insomnia, nausea, headaches, so on and so forth. In 2012, the lignan, sevanol, was identified in urtz, which demonstrated profound analgesic and anti-inflammatory properties (Dubinnyi, Osmakov, Koshelev, Kozlov, Andreev, Zakaryan & et al, 2012).

Everlasting flowers
Helichrysum armenium

COMMON NAME: Antaram

Sold simultaneously as ornamental flowers and herbal tea, Antaram is indicated for gallbladder and liver complications, particularly in cases of obstructed or weakened bile production. It is often used in the treatment of gallstones. Combined with honey, antaram can be used as a powerful vulnerary. Pharmacological studies on Helichrysum armenium are almost nonexistent, with a few exceptions of the plant's chemical compositions, its antimicrobial and antioxidant properties (Süzgeç-Selçuk & Birteksöz, 2011).

Linden Tree
Tilia cordata, Tilia L.

COMMON NAME: Loreni stradzev

The dried leaves and flowers of this tree are commonly used as a diuretic and anti-inflammatory for the urinary tract. Topically it is indicated for musculoskeletal conditions. A compress and/or poultice serves as an effective analgesic for rheumatism. The leaves are high in iron and recommended for persons suffering from anemia. Traditional use of the plant also points to its value as an effective diaphoretic. A tincture made from the leaves is a strong antibacterial. Clinical studies have supported the anxiolytic properties of the tree (Negri, Santi & Tabach, 2013), although the plant does not appear to be used for this purpose by the general population.

Cowslip
Primula veris

COMMON NAME: Gnarbuk, ginarp

This relative of Evening Primrose is expressly used for all categories of respiratory illness. It is prescribed as an expectorant, to settle a stubborn cough, and to clear the bronchial passages. Additionally, some vendors swear by its mood-enhancing powers. Cowslip is one ingredient of five in a proprietary formula indicated for sinusitis and bronchitis by The European Medicines Committee on Herbal Medicinal Products. Primula veris has not been well studied in humans; however, there may be some evidence that it may be an effective dose-dependent anticonvulsant (Başbülbül, Özmen, Biyik & Şen, 2008).

Horsetail
Equisetum arvense

COMMON NAME: Dzia hert

The dried grass is indicated for dissolving kidney and bladder stones. Horsetail contains silicic acid, making it particularly useful for connective tissue in the lungs and urinary tract. It is often found in formulas used to treat chronic and acute calculi. Horsetail's pharmacological actions have been well researched, including its antidiabetic, diuretic, antinociceptive, immunodulatory, (inducing, enhancing or suppressing an immune response), vulnerary, analgesic, sedative and anticonvulsant properties (Al-Snafi, 2017).

Burnet
Sanguisorba officinalis

COMMON NAMES: Aryunkhmik deghatu (Blood pharmacy)

Traditionally the root of burnet is used as a powerful astringent and emollient, both internally and externally. An effective styptic, a topical preparation of the root is excellent for wounds, insect bites, burns, rashes and other heat-related skin conditions. Internally, it is taken as an anti-diarrheal, to lower blood pressure, to regulate menstruation and as a uterine stimulant. There is limited literature on the therapeutic compounds of Sanguisorba officinalis, excluding those on its anti-inflammatory and anti-bacterial properties (Ginovyan, Petrosyan & Trchounian, 2017).

Sea buckthorn
Hippophae rhamnoides

COMMON NAME: Chetchkhani uhough

The sea buckthorn tree grows fairly rampantly throughout Armenia and is a commonly stocked item in grocery stores as processed food, such as juice, canned goods and marmalades. Meanwhile, its essential oil is available in every pharmacy, along with other staples like calendula and geranium oil. Topically, the oil is a popular choice for healing wounds, scars, eczema and psoriasis, and moisturizing dry skin. Internally, the oil is taken to soothe mucous membranes, with a particular affinity for the stomach and esophagus. It is useful for mouth sores and stomach ulcers. Sea buckthorn's therapeutic properties as cytoprotective, anti-stress, immunomodulatory, hepatoprotective, radioprotective, anti-atherogenic, anti-tumor, anti-microbial and tissue regenerator have been well-established within the ethnopharmacological community at large (Suryakumar & Gupta, 2011).

Hops
Humulus lupulus

COMMON NAME: Gayluk

Gayluk is an easy-to-source medicine, commonly sold at food bazaars as a dried tea. In Armenian folk practices, the hops plant is employed as an analgesic, diuretic and anti-diarrheal. A decoction made from the strobules is said to cure hair loss and dandruff. Today, Armenian doctors recommend hops for its estrogenic properties, using it to alleviate menopausal symptoms.

Ziziphora
Ziziphora clinopodioides

COMMON NAME: Urts'adaghdz nurp

A member of the Lamiaceae family, ziziphora grows on rocky slopes, sandy steppes and national forests. Similar to urtz in aroma, the essential oil of ziziphora has a well-deserved reputation as a potent anti-fungal (Mahboubi & Mahdizadeh, 2018) and antibacterial (Mohammadhosseini, 2017). It is also popular addition to soaps, lotions, and cosmetics for its pleasant scent and skin regenerating properties. Ziziphora shows great promise within the essential oil industry in Armenia; however, in traditional practice, an infusion is the preferred mode of application. The dried herb is taken as a cardio tonic, sedative, carminative and is indicated for morning sickness. Studies on ziziphora are lacking in regards to its pharmacological applications.

Armenian essential herbs are easy to source not only from indoor markets but also from outdoor vendors at mountainside monasteries, temples and ruins, of which there are innumerable in Armenia. The vendors tend to be older women who collect plants in and around historical sites. In more urban areas, a shuka, or an indoor food market, stocked with gourmet goods, like dried fruit and nuts, pickles, cheeses and meats will have all the herbal tea basics. And if you live in a village, chances are, you have access to land - either your garden, your neighbor's garden, or simply the vegetation of your natural environment. I often marveled at the familiarity and ease with which Armenians gather fruits, seeds, leaves and nuts from near-by greenery, whether it was acorns from oak trees that line the streets of Yerevan, fig leaves from someone else's property, or apricots from a grove of fruit trees in the forest. Armenians reciprocate the favor to the land by eating her fruits and spitting out the seeds every which way, thereby propagating more greenery.

Herbs are not the only source of natural healing, however. Pomegranates, a symbol tightly

Hills of Armenia

enmeshed with Armenian culture and history, can be used as an effective oral and gastrointestinal antibiotic and analgesic. Just dry the rinds and steep in boiling water. Homemade vodka distilled from Armenian fruits, like hon (cornelian cherry), tut (mulberry) and tziran (apricot) can be used as an internal cleanse-all. Stories of spry centenarians taking a daily shot of oghi at the crack of dawn, are commonplace and it is not unusual for a medical professional to recommend drinking vodka to detoxify the body. For diarrhea, drinking mineral water mixed with matsun, an Armenian yogurt rich in microflora, will do the trick. And I would be remiss not to mention aveluk. This native wild sorrel is a staple of traditional Armenian cuisine. Aveluk is harvested during the spring, braided and thoroughly dried to be cooked into stews, soups and salads. The taste of the dried herb is quite unique, marked by a bitter earthiness, similar to steamed dandelion greens but more redolent of a mossy forest floor. The astringency of its taste marks its medicinal applications. Steeping the braids in boiling water for two days and preparing a poultice acts as an effective vulnerary. The tea of the same preparation can be used to tighten a loose stomach.

There is no question healthcare in the U.S. needs a facelift. Simple things like getting a regular check-up or buying antibiotics can be insurmountable for those without health insurance. The whole operation is built to be costly, bureaucratic and often times, demoralizing for people within a certain social stratum. So much to my delight, I discovered in Armenia a system much more supportive and easy to navigate than I had imagined. Of course, there are problems. Soviet healthcare offered a free, comprehensive program and after its collapse, coupled with socioeconomic and political strains on the country, the system became inefficient, outdated and underfunded. And although healthcare reforms are on the rise, out-of-pocket payments are the main source of funding for healthcare, limiting access to low-income households in a society already deeply wounded by its rigid social stratifications. And so while I delighted at the ease with which I could obtain medications for an upset stomach or a bladder infection, medical care for more serious health complications, diseases like diabetes, kidney failure, cancer, HIV/AIDS, STIs, drug addictions and so on, are far more troublesome for many.

In Armenia, the first point of contact when one gets sick, after, of course, one has exhausted all forms of self-treatment with teas, preserves, honey and vodka, is the pharmacist. It was unclear to me whether this order to operation is out of financial necessity or just a common sense strategy. Why go to the doctor when the pharmacist can answer all your questions, recommend and sell you medicine all within ten minutes? Certain medicines like narcotics cannot be sold without an official prescription. But let's say you were having trouble sleeping, a pharmacist might recommend a pharmaceutical-grade standardized extract of passionflower, valerian and hops or a tablet made from Hawthorne flowers, poppies and magnesium oxide. Essential oils and teas are also part of a pharmacist's reservoir of treatments. And if you would prefer, you can request a plant-based treatment option as oppose to a synthesized one.

It is, perhaps, not a surprise that some larger Armenian pharmaceutical companies are manufacturing plant-based pharmaceuticals and dietary supplements. With 3,000 years of medicinal arts under its belt and a rich landscape that bears the life of therapeutic plants, Armenia is very proud of her resources. Preserving and applying its rich medicinal traditions, knowing off the cuff about growing, gathering and preparing herbal medicines -- these are forms of cultural knowledge that keep Armenia connected and grounded to her past, to her ancestors and to her earth.

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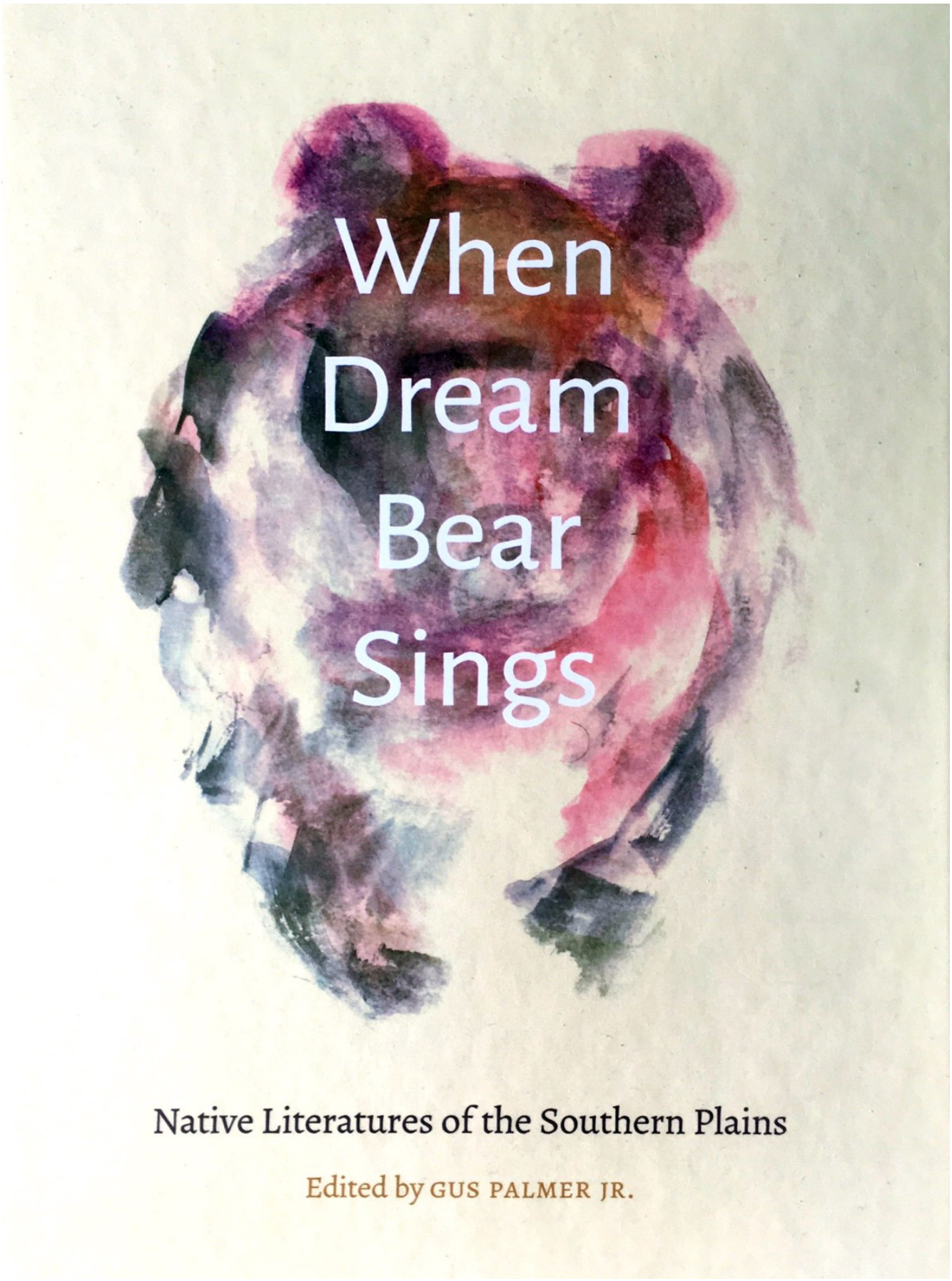
Naneh Israelyan is an artist, herbalist and researcher living in New York City. She received her BA in Sculpture from Bennington College and her postgrad education in the field of Plant Sciences from the New York Botanical Garden and Brooklyn Botanic Garden. With a work background in ethnobotanical research and horticulture, she cultivates a fruitful medicinal garden on her fire escape and uses her harvest to craft medicinal teas and tinctures. Her passion in herbal medicine lies in empowering individuals to regain autonomy over their own health by educating and counseling them through the benefits of plant therapies. Her written work explores the social and ethical implications of practicing and distributing plant medicines to the public. You can find her writings on her herbal medicine blog and store Pioneerflora.com.

Born in Armenia, Naneh is currently involved in a research project of collecting and documenting the use of plant medicines from her native country. This research, she hopes, will lay the foundation for introducing Armenian traditional medicines to the global community.


When
Dream
Bear
Sings
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Edited by GUS PALMER JR.

BOOK REVIEW

When Dream Bear Sings, Native Literature of the Southern Plains

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By Bertha Miller

The "oral literature" of Algonquian language family speakers has been hidden behind faulty European translations for more than a century. Algonquian nations located in North Central-Eastern North America speaking peoples, (including Gros Ventre, Menominee, Lenape, Mohican, Caddo, Maliseet, Ojibwe, Waskirini, Cheyenne, and Wampanoag among at least thirty-five different nations) make up the largest collection of peoples in North America speaking the Algonquian-based language. Early English speaking interpreters such as Christian missionaries, government agents, military personnel and scholars beginning in the middle 1700s made their attempts at translating what they thought they heard—attempting verbatim translations of sounds and placing their results in text form. The result was that their efforts produced essentially nonsensical renderings of oral presentations—reading like Pidgin English—missing much of the nuance and content. Long before English translation attempts by missionaries, military representatives and European scholars it had fallen to native Algonquian speakers who learned English, French and Dutch to serve as the mediators between the growing number of Europeans and the nations they met at the edge of forests for negotiation of treaties and for trade since early as 1609. It was common for people from the various nations to speak many different languages and dialects, thus affording effective communications between nations. While the speakers from such nations as the Lenape, Wampanoag, Waskarini, and the Mohican who had acquired knowledge of the Dutch, French and English languages well understood that meaning of their own language and they worked to render those meanings into the European languages. Their European counterparts needed to rely on the speakers from these and other nations to comprehend what would be their lifesaving exchanges—supporting trade and minimizing conflicts.

An important element in the translations from Lenape or Waskarini or other nation's language to English or French or Dutch is the "theatre" or ceremonial accompaniments to the speeches. Facial

expressions, hand and body gestures, and ceremonial gifting of wampum belts after each "stanza" of speech are all part of the speech to be translated. When the speech is conveyed in this manner, the "theatre" or associated expressions are part of the information to be conveyed.

Clearly both the nations of Algonquian language speakers possessed an "oral literature" that expressed deep and often profound meaning when one takes into consideration the physical, movement and sound (tonal) elements of speeches. These elements are even more important to the presentation of tales—of stories—given for entertainment, information or instruction. In Gus Palmer's "When Dream Bear Sings" one is swept into a new realm touching on the borders of story and instruction tales reading from the collection of thirty-five stories, fables, instructions and guidance narratives.

The Cheyenne story of the "The Bear and the Coyote" translated by Joyce Twins describes what can happen when two strong competitors meet on a path and seek to dominate the other. And, when they are confronted by a skunk in the midst of their argument over who should control the path they are faced with the formidable stink of the skunk backing up to both of them. The skunk claims the path and the bear and coyote are forced to abandon their argument and run away. There is a lesson in this story about unforeseen powers that render an argument irrelevant.

A history lesson is given by the Cheyenne storyteller Birdie Burns with the title "Birdie's Grandmother's Story of How Corn and Buffalo Were given to the Cheyennes" explaining how in a time of food shortage the Cheyenne came to have corn and buffalo. There is a controversy between two boys—one whose name was the same sound that the wind makes when it blows through the corn stocks and the other whose name was Tassel—having been informed by their dreams to dress in a manner that turns out to be exactly the same—clothes, paint, etc. They are told in their separate dreams, "My grandmother who lives in that mountain" they must go to the mountain and enter the mountain through an opening behind a water fall. Their friends and family watch the two boys enter the mountain and they express concern whether they would "come out alive." The people who watched them go into the mountain waited, and waited all through the day until the "sun was going pretty low." The people had been starving for a long time without buffalo meat for years.

The two boys had been instructed by grandmother about corn and then about buffalo—giving them large wooden bowls of cut meat and corn they could carry out of the mountain. When they did they found that the buffalo meat that had been carefully cut into small pieces "with lots of fat" and the ears of corn that had been roasted were plentiful for all the people to eat. This event led to the restoration of the buffalo herd and the introduction of corn for the people to eat and prosper. Grandmother was the source and the power that made all this possible through dreams given to the two boys. It was the grandmother giver of life that made it possible for the Cheyenne to survive.

Lillie Hoag Whitehorn, a Lenape/Caddo woman living in Anadarko, Oklahoma in 1977 tells the story of how the "Woman Dance" began in "The Lenape Story of the Origin of the Woman Dance." It is a dramatic story of kinship, the power of women and life and death; and the power of Spirit Medicine. The

story affirms the necessity of following instructions closely to avoid a calamity and to bring into being a dance that empowers the women.

Many of the stories are about tricksters who outsmart their opponents lending themselves as instructions for ensuring survival and prosperity in the face of opponents who may be stronger or advantaged in some way. The narrator of "Coyote and Rock Monster, Alonzo Chalepah Senior tells about the Apache or the Ghad-dindé (as they call themselves) whose name translates to "Cedar People." The Apache use a more familiar reference to themselves as Na'isha that literally translates to "thieves" … or more accurately "tricksters." Coyote, as a consequence, plays a major role in many Apache stories reflecting on the needed smart tactics to achieve successes. "Coyote and the Rock Monster" is one example offered in this anthology that dramatically poses the trickster against a formidable foe.

Many stories tell about how people obtain special powers and the importance of holding the knowledge of those powers in secret as Dollie Moore of the Pitahawirata Pawnee describes in her story "The Old Woman and Her Grandson Blessed by a Voice." Such "lesson stories" instruct young ones and remind older ones about the appropriate behaviors in social relations. The translator in Palmer's anthology gives great attention to details such that Moore's story powerfully delivers instructions to listeners.

Storytellers employ stylistic variations in the rendering of their tales giving personal touches that can only be identified with the storyteller. Capturing these stylistic differences can be a complex challenge that translators have to consciously recognize. Failure to do so can undermine the meaning and drama contained in the narrative. What is clear from Palmer's collection of stories—carefully translated from the original languages of the storytellers—is that the rich and powerful oral literature revealed by the narrators and storytellers brings to life a world that continues to exist despite the many efforts to make the world of Algonquian nations disappear. The lessons, instructions, entertaining and historical tales are profoundly human and deeply informative about the cultural reality that stems from thousands of years of living in what is now called North America.

The reality of the world of Lenape, Waskarini, Shawnee, Caddo and many other nations is not only embedded in the Algonquian languages, but in the people who remember the oral literature that is now, thanks to people like Lillie Hoag Whitehorn, Dollie Moore and the other contributors to Gus Palmer's anthology revealed in this valuable collection of translated works.

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