



Ethnopharmacology and Study of Medical Plants in the Pacific Islands

Will McClatchey PhD

Recently there has been a debate in Hawaii about bioprospecting plants as sources of new pharmaceuticals, and the roles of traditional knowledge. The issues are important, although poorly understood by advocates. Most people seem to think that the process proceeds by a researcher simply testing every plant to see what it is good for. However, the truth is that no molecules from plants have been discovered and marketed as pharmaceuticals in the United States in the last 30 years (a period of the most intensive search for drugs in history.) The myth that the next cure for cancer is to be found by searching in a rainforest should be set aside. However, we should not abandon study of traditional medicine, but instead be more realistic about the process and outcomes of research.

Modern pharmacology is built upon a set of observations and predictions about relationships between receptors (often proteins imbedded in membranes) and ligands (any drug or other chemical mediator). The interaction between receptor and ligand results in an event or effect. Pharmaceuticals are selected based upon their actions at this level and our abilities to distinguish positive effects in a range of assays from the molecular to the whole animal level. Therefore, when a drug is administered to a patient, we expect the drug to exert its effect through interactions at receptors (or other target molecules). Although there are drugs that do not work by this kind of mechanism, this is the general pattern of modern pharmacological thought. This causes us to look for a magic bullet with a one to one correspondence between remedy and efficacy.

For decades, the emphasis has been on simplistic collection of as many plants as possible, extraction of their chemical contents, and testing those contents in a wide range of biological assays. After much work, this has proved to be a poor method for identification of new drugs. A more efficient way is to look at how the plants are used by people in traditional communities. This is a difficult task for professionals; we tend to ignore comments of people when they do not correspond to our world view. For example, there are very few patients who enter and leave the doctor's office with a receptor-ligand mechanism of action in their heads. Over a 10-year period I worked as a pharmacist in a variety of settings. I do not recall any discussions with patients, wherein the receptor-ligand theory was articulated by the patient as a mechanism for the effects of drugs. Instead, patients consistently discussed ideas based upon simple assumptions such as can be seen in the following frequent comments: "if a medicine tastes good it must not be very strong (effective)"; "if a medicine tastes bad it must be strong (effective)"; "if a little bit is good, more must be better"; "I suffer from a chemical imbalance and this medicine balances my system"; "why do I need to take the

medication if I feel fine"; and "my body is immune to that antibiotic". Each of these statements made perfect sense to the patient. Most professionals, however, would dismiss these statements as lacking real information. They find it uncomfortable to work with people who have a different world view, particularly if that view is as different as that of someone from another culture.

As it turns out, there are many different world views about drugs and drug-action in the human population. Commonly, these are articulated within the construct of languages, cultural groups, and religious and philosophical perspectives. Within each of these world views is included a set of logically consistent ideas about how and why people become ill and how to return to a healthy state, often with the assistance of plant-based medications. The study of the logical explanations for how medications work, as understood from a specific cultural perspective, is ethnopharmacology.

Ethnopharmacology

Ethnopharmacology is not the search for new drugs from cultural sources. Rather, it is the development of more clear understandings of how, when, where, and why people use their own pharmacopoeia. Ethnopharmacology reveals an entire system of which bioprospectors are unaware.

As a researcher, I have spent the last 15 years exploring the perspectives of professional healers from communities in the Solomon Islands, Fiji, Rotuma, Samoa, Marshall Islands, and Hawaii, trying to better understand the logic behind their selection of plant remedies and why and how they feel particular remedies work. I have learned that it is rare for the logic employed to be consistent with or even close to what I was taught in pharmacy school. However, healers are able to diagnose illnesses in patients, prescribe and administer remedies, and see positive results leading to healthy patients.

Medicinal Plants in the Laboratory

Although the pharmacological explanations for selection of a plant as a remedy are not the same across cultures, the effects of molecules within cells are the same. For instance, recent reviews of the roles of plants in the treatment of cancer (such as McClatchey & Stevens 2001) reveal that there is still an important role for plants as sources of ideas for development of pharmaceuticals. With cancer, there are even examples of molecules from plants that have been brought to market such as taxol, since its discovery more than 40 years ago. In order to follow new leads, researchers must first determine how to properly test the information that arrives in the laboratory from other cultures. This is not an easy task. With diseases such as cancer,

it is difficult to tell what is being considered as the same disease in another culture, and therefore, what remedies from other cultures might be useful for treatment of cancer.

A number of important problems are faced by laboratory researchers seeking to study plant medicines based upon observations of usage in other societies and the complexity of plant systems. These include:

- Complexity of traditional remedies (usually several plants, processed in complex ways).
- Identification of an appropriate evaluation assay when the logic for the efficacy is inconsistent with anything in modern medicine.
- Complexity of natural plant systems (usually several molecules work together to bring about an action.)
- Reactive molecules that are released from plant cells, thereby profoundly changing the chemical contents of a remedy.
- Differences between usage in humans and in-vitro or in-vivo lab assays. Effects of body processing include degradation of many constituents, binding of some to proteins or lipids, concentration of some constituents in specific tissues or fluids, activation of some constituents, and separation of some constituents from others in ways that may enhance activity only minimally identifiable in extracts of the plant.
- Even intellectual property rights and ownership of plant resources are important considerations.

Researchers tend to test a plant extract or fraction of a plant. This is consistent with the goal of identification of a single ligand that is active at one or more receptors. However, this is probably inconsistent with the logic of most other cultures, particularly for complex categories of disease such as cancer.

Cancer in Pacific Traditions

One of the questions I have been exploring is: Do traditional Pacific Island healers recognize cancer, and if so, how do they go about treating it? There are several problems with this question. 1. Pacific communities are typically very small and occurrence of any particular kind of cancer must be exceedingly rare. The chances of a healer seeing a particular cancer more than once in their lifetime is rare. Therefore, how would a healer be able to develop remedies? 2. Many kinds of cancer have few external symptoms until they are quite advanced. How would a healer diagnose a disease that does not manifest symptoms? 3. Assuming that a tumor/lesion could be recognized and treated, how would a healer know that the treatment was effective?

I cannot be certain that I have identified any traditional healers who are treating cancer. However, I have found individuals using plant remedies: to treat skin lesions that appear to be melanomas; to treat large lumps under the skin; and to remove polyp growths from mucosal tissues. In each of these, the treatments were described as

making the diseased area shrink in size and then disappear. This description has been consistent across a range of cultures with fairly different world views and explanations for diseases. In one case, a tumor-like growth was determined to be caused by bad feelings that the patient was having about his brother-in-law. In another case, a skin lesion was determined to be caused by eating too many sweet foods. In a third case, a persistent lump in a breast was determined to be caused by an evil spirit that had been sent by an enemy. Although the logic in each cause is different, and the resolution of the problem was actually different, the resulting effect was described as the same (reduction and disappearance of the problem.)

What the healers are doing and how they use plants does not always make sense to us. However, as is illustrated below, this is more a matter of lack of understanding on the part of the researcher than on the part of the traditional practitioner.

Recent Research

One of the most important plants used by healers in tropical Pacific Islands is *Morinda citrifolia* (known as “noni” in Hawaii). The plant is used in combination with other plants to treat a wide range of illnesses including diabetes symptoms; healing of wounds, bruises, varicose veins; and treatment of lumps under the skin and skin lesions, headaches, fevers, and topical fungal infections (Dixon et al. 1999, McClatchey 2002). Most biologists would pass off such a broad list as not having any common thread, and therefore, not take the value of the plant seriously. However, recent research conducted at Louisiana State University by Hornick et al. has shown that noni juice (produced from fruit grown in Hawaii) inhibits the ability of breast cancer masses to develop new angiogenic growth and induces apoptosis in newly formed angiogenic masses. Noni may therefore be effective in the treatment of some kinds of tumors via reduction of blood supply to the cell mass and/or promotion of programmed cell death. With this perspective the same mechanisms could support other claims for noni such as the treatment of some vascular disorders and healing of wounds, varicose veins and bruises.

We are fortunate in the case of noni to gain insight from two world views in understanding its mechanism. In general we need to bring in more of the traditional knowledge by following more closely what a traditional healer would do. A model that more accurately follows would be to:

1. Have a healer prepare a fresh sample as it is intended for use in a human.
2. If the sample is swallowed, then treat the sample with a “digestion” process followed by filtration across a membrane that simulates the digestive tract filtering effects.
3. If the assay is intended to measure effects within a cell then a second filter should be used that simulates crossing a cell membrane.
4. The final product should then be suspended in a solution with appropriate pH and other characteristics to simulate cytosol of the target tissue and tested in an appropriate assay that is actually based upon the healer’s logic rather than assumptions on the part of the researcher.

In our search for magic bullets that are highly specific, we may be overlooking genuine efficacy that is right in front of us. We need to listen carefully to traditional healers, especially because their message is complex and not easily understood from our world view.

For more information on the Cancer Research Center of Hawaii, please visit our website at www.crch.org.

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