



INFLAMMATION AND ETHNOMEDICINE: LOOKING TO OUR PAST

| Michael Balick, PhD, and Roberta Lee, MD |

One of the things we have learned firsthand from our work in the forests, fields, and marine environments of the world, carrying out our ethnobotanical investigations, is that inflammation is a common condition for those who live in close contact with nature. Acute inflammation, which might come on as the result of an insect bite or brush with a stinging plant, or chronic inflammation, manifested by arthritic pain, is commonly treated by indigenous cultures with traditional remedies. For example, in Belize, Maya healers put three drops of the clear sap from *Commelina diffusa* Burm.f. into the eye three times daily for the treatment of presumed allergic conjunctivitis. This is a very common condition in humid forest environments. In Micronesia, similarly, the juice from the stem of a vine from a plant in the Piperaceae (Pepper family) is used for eye irritation and redness (Balick M, personal observation). In Central America, *Pluchea odorata* (L.) Cass., known locally as *Santa Maria* in Spanish or *Ix chal che* in Mopan

Maya, is used to treat swellings, inflammation, and bruises on the skin by taking two handfuls of leaves, boiling them in a gallon of water, and bathing the affected area frequently until the inflammation subsides. In that same area, “inflammation of the kidneys” is treated with a tea of the roots of *Hyptis verticillata* Jacq.¹ This condition, manifested by the symptoms of lower backache and difficulty with urination is said to have been used for hundreds of years (Balick M, personal observation). Ayurvedic practitioners such as David Frawley and Vasant Lad² discussed many herbs that are used in that ancient healing system to treat inflammation. For example, the leaves of the common coriander, *Coriandrum sativum* L. can be crushed, and the juice that exudes from the leaves applied directly to skin irritation and inflammation. Flaxseed, *Linum usitatissimum* L., widely recognized for its internal uses, can also be made into a poultice and applied to ulcerated and inflamed areas of the skin, on which it is an effective treatment.

The ethnomedical literature is rich in indigenous observation of how external inflammation (and to some degree internal inflammation) is treated with plants, both commonly cultivated and harvested from the wild. How was this specific property discovered, and why should plants contain the equivalent of herbal Vioxx (Merck & Co, Inc, Whitehouse Station, NJ)? The answer to the first question is quite simple—traditional healers are consummate experimentalists. Over the many hundreds or thousands of years that a people have inhabited a region, they have carried out human clinical trials on their patients, inspired by observations of animals’ use of plants, perhaps, or by the concept of “like cures like” posited by the Doctrine of Signatures. In other instances, a healer

Above photo: A vendor offers fresh ginger rhizomes (center) in an open air market in Pune, India. Photo by M. J. Balick, from *Plants, People and Culture*, by M. J. Balick and P.A. Cox, Scientific American Library, 1996.

would eat a fruit or berry and note a numbing sensation in the mouth and decide instead to consider it for medicinal use. Other discoveries would be by blatant experimentation, for instance, an observation that a leaf rubbed on an insect bite reduced the redness and swelling. Being resourceful, the use of that specific plant was quickly incorporated into their ethnopharmacopoeia. Traditional healers, like the readers of this journal, enjoy learning about new modalities, including evaluating and exchanging new ideas.

Many summers ago, we were in Micronesia, on the island of Pohnpei, working with two people quite knowledgeable about the use of local plants, Maria Raza and her late husband Ionis Raza. Maria taught us how to make the perfumed coconut oil that has been used traditionally to soften and heal the skin. Ionis walked with us around to various spots on the island of Sokehs, pointing out the valuable plants that he had learned as a child, using these for food, medicine, weaving, and ritual well into his 70s. All the time, we were taking notes in our waterproof field notebooks—how this vine is prepared, what that tree is used for, why this fern needs to be harvested just at the right time if the spell is to be strong, and so forth. He was very patient with us, freely providing his knowledge so that it might be saved. At the same time, over those weeks, we began to intersperse our field walks with comments on the uses of plants in other parts of the world—in Europe, in India, in Asia, and in North America. After all, close to half of the plants now growing on Pohnpei and its associated islands were introduced from elsewhere, and, because many of these were brought in because of their economic use, we had knowledge that we could impart as well. Ionis nodded his head in interest and acknowledgement each time we discussed an outside use. One day, when we took our lunch break on the rocks that surrounded his house, Ionis went inside and came out with a manila file. As we ate, he began to write on papers that were in the file, stopping to think about something and then proceeding to note it down. He then looked up and asked us how the common yellow daisy, *Sphagneticola trilobata* (L.) Pruski, which had been introduced to Pohnpei several decades ago, was used in Central America. As we explained how lo-



Francisco Sohl holding a piece of a vine in the pepper family and dripping its sap into his eye for the treatment of conjunctivitis on the island of Pohnpei. Photo by Roberta A. Lee.

cal people use it to treat swellings, wounds, rheumatism, cramps, and other conditions, he began to write furiously, trying to keep up with our elaboration. I then asked him what he was writing, and he looked up, smiled, and said, “The information you are telling me.” Very surprised, I asked why he was taking so many notes. Without skipping a beat he looked at me (M.B.) and replied, “We need to record *your* information and knowledge about *our* plants here on Pohnpei. We are all interested in this and, even though you think you are a young man, this information needs to be preserved while you are alive, and well, so that future generations of my family and friends will remember it!” Clearly, he had gotten the message that ethnobotany can teach us all, young or old, no matter where we live.

The curiosity of healers and their willingness to exchange information has diffused these experiences both locally and across continents. During times of exploration and international trade, beginning many centuries ago, trade routes were a means by which knowledge of medicinal and food plants was disseminated. People also brought their plants with them as they traveled to new places. Early Polynesian explorers carried their valuable green treasures in canoes during journeys of hun-

dreds or thousands of miles. For instance, the banana cultivated initially for its fruit has been genetically traced to the wild species *M. acuminata* Colla.³ The banana’s original source is either Southeast Asia or the Phillipines. Its botanical cousin *Musa x paradisiaca* L.⁴ found on Pohnpei, serves as a topical remedy for boils, cuts, and sprains (Balick M, personal observation).

That plants have evolved to contain so many chemicals is equally interesting. They have developed an extraordinary diversity of compounds as a means of defense to ward off insect predation, infection by fungi, or to stem the flow of sap from a wounded stem or leaf or to regulate growth. Because plants are relatively immobile, these vast array of compounds serve to stave off a variety of assaults that bring harm sometimes by the introduction of toxic substances from organisms that potentially could kill the plant were it not for these compounds. The chemical mechanisms that impart damage often create a specific kind of chemical reaction mediated by oxidizing an oxygen molecule—or changing its chemical stability so that it creates localized tissue damage that can spread if not neutralized—a phenomenon known as oxidative stress. Flavonoids and other antioxidants such as carotenoids and anthocyanins, classes of chem-

icals that we value in multivitamins, are present in significant proportions in most plants. Flavonoids subdue this type of chemical damage. Other chemicals such as enzymes, also found in plants, function to regulate genetic activity by digesting proteins, which may assist in exposing specific DNA sequences of the plant, possibly creating damage to our DNA.

In the last several years, inflammation has been “discovered” as an underlying mechanism in several chronic diseases. Conditions such as coronary artery disease, asthma, Alzheimer’s, arthritis, and some cancers are thought to have a major inflammatory component in creating damage to the body. In response, pharmaceutical agents such as Vioxx and Bextra, antiinflammatory medications with very selective inhibitory activity against a pathway known as the *cyclooxygenase 2* pathway (COX-2), were developed for their effectiveness in reducing the inflammation related to these diseases. Use of these medications, commonly referred to as *COX-2 inhibitors*, steadily rose, until reports came to light in 2003 of increased rates of heart attacks and strokes with prolonged use of these agents.⁵ Suddenly, the safety of the new, more powerful nonsteroidal antiinflammatory medications was questioned, and certain products were pulled from the market. Soon after this discovery, the use of their predecessors, the nonselective nonsteroidal antiinflammatory medications or NSAIDs known to inhibit COX-2 and COX-1, raised safety issues. The push to refine the NSAID predecessors had been a result of findings in earlier studies substantiating high rates of gastrointestinal toxicity observed with prolonged use.⁶ In one study, it was estimated that over 100,000 patients were hospitalized, and 16,500 died each year as a result of “NSAID-associated gastrointestinal events.”^{7,8} Subsequent studies evaluating the reasons for these adverse events determined that the COX-1 pathway created a protective mechanism that shielded the gastric mucosa or inner lining of the stomach from the damage of hyperacidity.⁹ Thus, in suppressing COX-1 activity, vital stomach protection was lost, and the vulnerability of ulcer formation increased. Until 2003, the COX-2 selective inhibitors were documented to show equivalent efficacy in reducing pain and inflammation while associated with far less gastrointestinal toxicity

and no other reported adverse effects.¹⁰ Consequently, with the recognition of the high rates of heart attacks and strokes with long-term COX-2 use, the search began for alternative methods for reduction of inflammation. One result is a reevaluation of a variety of botanicals that have proven antiinflammatory activity, such as ginger, the ancient food and medicine.

Ginger (*Zingiber officinale* Roscoe) has been used for thousands of years in Ayurvedic and Chinese medicine and is known to contain a vast array of compounds important to maintaining health. Ginger was such a coveted and lucrative item to the early Arab traders that stories were fabricated about a fabled land, Troglodytia. This fictitious land, thought to be somewhere in the far south at the edge of the known borders of the earth near the Red Sea, was inhabited by a primitive and fierce tribe of fish-eating people called the Troglodytes. The Troglodytes, also reported as a “ugly, hole-dwelling” people, grew the Arab trader’s ginger.¹¹ The Arab’s intention in this fabrication was to distract and protect their sources of ginger from the Greeks and Romans who bought it from the Arabs but had no idea of its origin.¹² The myth persisted until the 13th Century when Europeans finally discovered its true origin. Marco Polo saw it grown in China, and Giovanni de Montecoirvino, a Franciscan monk, wrote of its cultivation in India.¹¹

Ginger has a group of compounds known as “pungent principles.” These compounds derive their name as a result of their significant influence in creating the sharp and distinctive citrus-like aroma, smell and taste that distinguishes ginger from other rhizomes. This class of chemicals is divided into two major groups: gingerols and shogaols. These compounds are a vast array of 477 chemically distinct moieties that provide most of the medicinal activity of ginger.¹² Ginger’s demonstrated effects are numerous. It has been documented to have activity as an analgesic, antidiabetic, antibacterial, antiemetic, antiviral, antifungal, antiulcer, and antiinflammatory, to name a few of its attributes. Worldwide, its ethnobotanical uses are providing treatment for conditions ranging from digestive ailments, rheumatism, fevers, and even as an aphrodisiac. The medical literature reflects more on ginger’s effectiveness for the treatment

of nausea, via numerous clinical trials. However, its antiinflammatory aspects are now more than ever a subject of great interest.

In a small randomized trial of 261 patients with osteoarthritis, a mixture of ginger and galanga (*Alpinia galanga* (L.) Sw.), another rhizome with antiinflammatory activity found a 63% reduction in pain after 6 weeks of use as compared with 50% in the controls. The results were modest but promising.¹³

In another trial of 75 patients with osteoarthritis, ginger was compared with ibuprofen or placebo over three weeks of use. The results did not show an improvement in the ginger arm. However, the authors noted that, in the first stage of the study, ginger and ibuprofen showed some improvement, suggesting that the study might have been too small.¹⁴ For some who favor food as their medicine, I (R.L.) will recommend candied ginger as a great treat for arthritis. One square inch piece is the equivalent to 500-1000 mg dried ginger.¹⁵ A typical “dose” of ginger for inflammatory conditions is one to two grams per day of a solid extract (standardized to 20% gingerols and shogaols) or two to four grams of the cut fresh rhizome.¹⁶

Turmeric (*Curcuma longa* Linn.), another rhizome used in traditional Asian and Indian medicine, has been prescribed for arthritic pain, gastric upset, amenorrhea, parasitic infections, and headaches. However, these medicinal uses are by no means comprehensive. Turmeric has a bright yellow color and is easily identified as one of the spices in curry. It is often used as a food coloring as well. Recent animal trials indicate that turmeric suppresses the lipooxygenase and cyclooxygenase pathways that activate inflammation similarly to aspirin and the NSAIDs. However, turmeric also has powerful antioxidant activity, which gives this rhizome, as well as ginger, added value in reducing inflammatory damage in tissues. Recently in a number of in vitro studies, turmeric has been found to have anticancer effects. Turmeric’s major active constituents are the curcumoids including curcumin. Much of turmeric’s pharmacologic activity is ascribed to curcumin. Gastroprotective effects (effects against stomach ulcers) and lipid-lowering properties have also been reported. Most promising is turmeric’s anticancer activity against breast, co-

lon, prostate, and skin cancer cell lines.¹⁷ Although currently no clinical trials have been published, some major research centers are beginning to consider preliminary human trials to clarify further turmeric's anticancer activity. Few human trials evaluating turmeric for arthritis have been published. Furthermore, the few studies published have been so small that the lack of efficacy could be attributed to the limited trial sizes.^{18,19}

There are countless botanicals with promising antiinflammatory activity: boswellia, rosemary, stinging nettle, black willow bark, and devil's claw are but a few. Practitioners interested in botanical alternatives for inflammation must address the fact that few large clinical trials exist. For those trained in medicine, this potentially is problematic because we have been taught to rely solely on large randomized clinical trials for the evaluation of medical efficacy. However, there is a certain subset of plants that have been used to treat inflammation in Chinese and Ayurvedic medicine or Western herbalism for hundreds if not thousands of years. Using this information, in combination with current information we now have from in vitro and animal trials, could be a reasonable way to begin incorporating herbs in clinical practice.

Paracelsus (1493-1541) is credited with noting that the only difference between a medicine and a poison is the dose. Over time, as we have become more scientifically sophisticated, single active compounds or drugs have become the gold standard in clinical medicine. Could it be that, for such a complex phenomenon as inflammation, such thinking is too simplistic a model? Botanicals are rich in pharmacologic complexity, containing groups of similar compounds with antiinflammatory activity, antioxidant activity,

and even antiulcer activity. Herbal remedies most often contain groups of similar compounds that achieve the same physiologic effects while using smaller concentrations. Experts argue that the reduced doses of active ingredients make the likelihood of toxicity more remote. Thus, it seems that the complexity of nature has provided us once again with another option to the recent troubling adverse effects of the selective single compound COX-2 inhibitors.

REFERENCES

1. Arvigo R Balick M. 1998. *Rainforest Remedies: One Hundred Healing Herbs of Belize*. Twin Lakes, WI: Lotus Press;1998
2. Frawley D, Lad V. *The Yoga of Herbs*. Twin Lakes, WI: Lotus Press; 1986.
3. Menzies G. 1421, *The Year China Discovered America*. New York: HarperCollins Publishers; 2003.
4. Kagy V, Carrel F. Bananas in New Caledonian Kanak society: their socio-cultural value in relation with their origins. *Ethnobotany Res Applications*. 2004;2:29-35.
5. Finckh A, Aronson M. Cardiovascular Risks of Cyclooxygenase-2 inhibitors: where we stand now. *Ann Intern Med*. 2005; 142:212-213.
6. Wolfe MM, Lichtenstein DR, Singh G. Gastrointestinal toxicity of non-steroidal anti-inflammatory drugs. *N Engl J Med*. 1999;340:1888-1899.
7. Bombardier C, Laine L, Reicin A, et al. Comparison of upper gastrointestinal toxicity of rofecoxib and naproxen in patients with rheumatoid arthritis. VIGOR Study Group. *N Engl J Med*. 2000;343:1520-1528.
8. Singh G, Rosen Ramey D. NSAID-induced gastrointestinal complications: the ARAMIS perspective—1997. *Arthritis, Rheumatism and Aging Medical Information System. J Rheumatol Suppl*. 1998;51:8-16.
9. Laine L. Approaches to NSAID use in the high-risk patient. *Gastroenterology*. 2001;120: 594-606.

10. Laine L. The gastrointestinal effects of non-selective JNSAIDs and COX-2 selective inhibitors. *Semin Arthritis Rheum*. 2002; 32(suppl 1):25-32.
11. Swain JO. *The Lore of Spices*. London: Senate Publishing; 1999:110.
12. Schulick P. *Ginger: Common Spice and Wonder Drug*. Prescott, AZ: Hohm Press; 1996.
13. Altman RD, Marcussen KC. Effects of a ginger extract on knee pain in patients with osteoarthritis. *Arthritis Rheum*. 2001;44: 2531-2538.
14. Bliddal H, Rosetszky A, Schlichting P, et al. A randomized, placebo-controlled, cross-over study of ginger extracts and ibuprofen in osteoarthritis. *Osteoarthritis Cartilage*. 2008;8:L9-L12.
15. Grant K, Lutz R. Ginger. *Am J Health Syst Pharm*. 2000;57:945-947.
16. Blumenthal M, Hall T, Goldberg A, Dinda K, Brinckmann J, Wollschlaeger B. *The ABC Clinical Guide to Herbs*. Austin, TX: American Botanical Council; 2003
17. www.naturalcomprehensivedatabase.com. Accessed May 30, 2005.
18. Deodhar SD, Sethi R, Srimal RC Preliminary study on antirheumatic activity of curcumin. *Indian J Med Res*. 1980;71:632-634.
19. Kulkarni RR, Patki PS, Jog VP, et al. Treatment of osteoarthritis with a herbomineral formulation: a double-blind, placebo controlled, cross-over study. *J Ethnopharmacol*. 1991;33:91-95.

Michael J. Balick, PhD, is Vice President and Chair of Botanical Research and Training, Phileology Curator, and Director, Institute of Economic Botany, The New York Botanical Garden. An ethnobotanist, he studies the use of plants by traditional cultures.

Roberta Lee, MD, is Medical Director at the Continuum Center for Health and Healing at Beth Israel Medical Center, New York. She is Codirector of the Integrative Medicine Fellowship. Her research involves ethnomedicine, the study of healing systems used by traditional cultures.