



Special Feature

Toxicology, Folk Medicine and Witches' Potions

by Robert W. Samuels

Toxicology, a demanding profession in any country, presents a unique challenge in Panama because of the variety of specimens received. In addition to the licit and illicit drugs which are used in the continental United States, there are drugs of European and Central American manufacture. (The *Diccionario de Especialidades Farmacéuticas* is almost as thick as its counterpart, the *Physician's Desk Reference*.) Then, there are the medications which are used by the practitioners of folk medicine or traditional medicine. Finally, it is not uncommon to receive specimens which originate with our local witch doctors. The purpose of this article is to describe some of the challenging analytical problems that are frequently presented to this laboratory involving folk medicines and witches' potions.

Folk Medicine

The healing properties of different plants and herbs, used either intact or as a potion or tea, have been known for thousands of years and instructions in their use have been passed down from generation to generation. Through the years each country or particular geographical area developed its own brand of traditional medicine, depending of course on the customs of the people and the nature of the plants indigenous to the area.

The records of antiquity are filled with accounts of the therapeutic use of plants and herbs by the early Romans, the Hindus, the Mayas of Central America, the Chinese and the Africans, to name only a few. The value of some of these traditional medicines has been proven with time and with modern techniques of chemical analysis.

Witness, for example, the account of the scholar, Emperor Shen Nung (2735 B.C.), who described the antifebrile effects of "ch'ang shang," which has since been shown to contain antimalarial alkaloids. He also observed the diaphoretic and stimulatory effects of the plant "ma huang," which contains the alkaloid, ephedrine.¹

In the New World, the Indians of Chile and Peru were, and still are, chewing coca leaves mixed with guana to obtain the stimulatory effects of cocaine. In Mexico, the Aztecs were using "yoloxchitl" or heart flower as a cardiac stimulant, and "cochitzapotl," the fruit that brings sleep, for blood pressure problems. Interestingly, the latter plant was not prescribed for pregnant women, and rightly so, for scientists at the Mexican Institute of Medicinal Plants (IMEPLAM) have recently extracted from the plant an as yet unidentified compound with powerful properties as a womb constrictor.²

Panama, too, is not without its practitioners of traditional medicine representing a wide variety of cultures. Among the native Indian

tribes of Panama—the Guaymí, the Cuna and the Choco—as well as in the other nations of Central and South America, folk medicine was thriving long before the arrival of Christopher Columbus in 1492.³ The influx of workers from the Caribbean and other areas who were hired to participate in the construction and operation of the Panama Canal, and the immigration of people of many nationalities after the establishment of the Isthmus as a major crossroad for world commerce, also contributed to the varied folklore of traditional medicine in Panama. Thus, in the practice of traditional medicine, one can see the influence of the European, the Central and South American Indian, the traditions and practices of Africa by way of Jamaica and the West Indies, as well as the folk medicine of Southeast Asia which arrived with the natives of India. Because of the lush tropical vegetation, the local practitioners have traditionally had a wide variety of plants from which to choose.

In January 1978, a study of traditional medicine as practiced in the Cerro Punta region of Panama, near the Costa Rican border, was initiated as part of a major investigation of medicinal folklore in the Republic of Panama. A representative listing of herbs and plants used in Cerro Punta for the treatment of specific diseases is presented in Table I. Where possible, the English translation or the author's translation of the local name is given. Note that many of the plants are used to cure several

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different diseases. Table II is a list of plants used to cure miscellaneous diseases that are not mentioned specifically in Table I.

The majority of these plants are boiled in water and consumed in the form of tea several times a day. However, with some plants such as ruda, artemisa, salvia, and cuadritos de alcanfor, the user is instructed in certain cases to use an alcoholic extract of the active ingredient. Others are even applied directly to a wound, as in the case of the roble de montaña (the bark of a tree that grows in the mountains), which is used to stop bleeding.

The problems of drug side effects or idiosyncracies are not restricted to the users of commercial drugs, and in some cases the folk medicine used does not produce the desired reaction. Several case histories follow which illustrate the unique problems encountered with patients practicing traditional medicine.

Case Reports

Case 1. The first case involved an elderly man of Jamaican ancestry who was admitted to the intensive care unit with unexplained symptoms of dementia in addition to other problems. The patient's routine urine drug screen was positive for the presence of phenothiazine-type compounds, specifically the sulfated analogues such as Sparine[®].^{4,5} Although his medical history did not show the previous use of phenothiazines, further investigation revealed that the patient often drank a tea made from leaves known locally as "jackass bitters." The plant is used in this area in the belief that it will lower blood pressure.

A solution or tea was prepared in the laboratory by boiling the leaves of jackass bitters in water. The tea also gave a positive phenothiazine test. The extract and the patient's urine were then analyzed by thin layer chromatography. Although no phenothiazines were detected in the patient's urine, an unknown compound was noted at R_f 0.75. This compound was equal in migration distance, and in color formation with iodoplatinate and Dragendorff's reagents, to a compound extracted from the jackass bitters. Larger amounts of this unknown compound were collected using preparative thin layer chromatography, and the aqueous solution of the

Table I—Medicinal Plants Useful in the Treatment of Various Diseases*

Disease	Local name	English translation
Colds	Hoja y flor de sauco	Elder leaf and flower
	Hoja de eucalipto	Eucalyptus leaf
	Llantén con sauco y eucalipto	Rib grass with elder and eucalyptus
	Hoja de violeta chica (morada)	Leaf of a little purple violet
	Hoja de higo	Fig leaf
	Clavellina con anís	Pink carnation with anise
	Orozul	---
	Vira vira	---
	Anís	Anise
	Hoja de limón	Lemon leaf
	Cola de caballo	Horse's tail
	Hoja de pino	Pine leaf
Upset stomach	Hierba buena	Good grass
	Hierba de limón	Lemon grass
	Manzanilla	Camomile
	Mastranto	Round-leaved mint
	Hoja de durazno	Peach leaf
	Hoja de naranja	Orange leaf
	Ruibarbo	Rhubarb
Liver disorders	Matico	---
	Cola de caballo	Horse's tail
	Ruibarbo	Rhubarb
	Llantén	Rib grass
	Rafz de la India	Root of India
	Mil en rama	---
Bronchitis	Flor de sauco	Elder flower
	Hoja de higo	Fig leaf
	Hoja de eucalipto	Eucalyptus leaf
	Llantén	Rib grass
Blood disorders	Mil en rama	---
	Ajo	Garlic
	Salvia	Sage
	Esencia	---

* Information on plant specimens and their use presented in Tables I and II was obtained by Robert W. Samuels, Jr., through personal interviews with practitioners of traditional medicine in Cerro Punta, Chiriqui Province, Republic of Panama.

compound did react positively in the phenothiazine test.

Unfortunately, due to the patient's death, we were unable to pursue this case to determine if there was a cause-effect relationship between the patient's use of jackass bitters tea and his dementia. However, studies are under way to extract and identify the active component of this popular herbal medicine.

Case 2. We are presently investigating the case of an 11-year-old Negro child whose mother has been giving him a sassafras root tea for a period of four years in order to prevent the occurrence of sickle cell anemia. The child presented with an enlarged spleen and suspected hepatitis.

Cases of herbally-induced necrodegenerative hepatitis have been documented in the literature.⁶ Although toxicity is attributed chiefly to pyrrolizidine alkaloids of the senecio species, there are many other plants used as foods or as traditional

medicines which may contain hepatotoxic compounds.

Tea prepared from the root bark of the sassafras tree has a long history of use as a healing tonic for a wide variety of medicinal purposes, and extracts of the root have been used as a flavoring agent for soft drinks such as root beer. However, the hepatotoxicity of safrole, the major component of sassafras root, was demonstrated in early studies by the Food and Drug Administration,⁷ and subsequently confirmed by independent investigators.^{8,9} Segelman, et al.,¹⁰ have also reported that extracts of sassafras root bark are capable of inducing pharmacologic responses in test mice including ataxia, ptosis, hypersensitivity to touch, central nervous system depression, and hypothermia.

Case 3. Some of our cases involve plants used for food rather than for medicinal purposes. A middle-aged Panamanian woman was found unconscious, and was subsequently admitted to the intensive

Table II—Medicinal Plants of Limited Usage*		
Disease/disorder	Local name	English translation
Intestinal hemorrhages, gargle, external bleeding	Roble de montaña	Bark from a tree that grows on a mountain
Colic	Esencia	—
Cancer, kidneys	Calaguala	—
Headache	Salvia	Sage
Worms, parasites	Mastranto	—
Diarrhea	Hoja de guanábana	Custard apple leaf
Kidneys, high fever	Hoja de chayote	Chayote leaf
Rheumatism	Artemisa	Mugwort
Fever	Hoja de limón	Lemon leaf
Constipation	Hoja de pino	Pine leaf
Earache	Ruda	—

* See footnote to Table I.

care unit of our hospital where she remained unconscious for another day, before making an uneventful recovery with only supportive therapy.

The patient's medical examination had revealed nothing that would account for her comatose period. It was learned, however, that on the afternoon before her admission she had eaten chirimoya, or anon, a member of the guanábana family that has a delicious, fruity pulp inside a large pod. In addition, she had consumed several bottles of beer. It is interesting that there is a widespread belief in many of the remote rural areas of Panama that chirimoya, or any member of the guanábana family, should never be consumed with alcohol because of the dire consequences that result. Apparently, the woman was not aware of this belief.

In the laboratory we attempted to ascertain what changes, if any, resulted from the combination of chirimoya and ethanol. Aqueous extracts of the fruit were analyzed by ultraviolet spectrophotometry and thin layer chromatography. Ethanol was then added to the extracts, and the mixture was acidified to simulate conditions in the stomach. The specimens were then re-analyzed by the aforementioned techniques, but no significant changes in the ultraviolet spectra or the chromatographic patterns of the extracts were noted.

Although the analytical results were non-conclusive in this case, it was the unanimous conclusion of all observers that chirimoya and ethanol made a tempting combination. No one, however, volunteered to taste the concoction.

Witches' Potions

Faith in the local witch doctor is typified by two neighbors who were quarreling. One of the women involved obtained what appeared to be a mixture of seeds,

dried herbs and other unidentified components, with the instructions to sprinkle the mixture in the neighbor's yard. The product was guaranteed to make the neighbor move within several weeks.

A case of forensic interest involved a clear liquid which was submitted for toxicologic examination by the local police. A man who was having a domestic quarrel with his wife brought the liquid to the police after he discovered his maid adding the liquid to foods that she was preparing to serve him. According to the maid, the woman had left the house in anger, and visited one of the local witch doctors who provided her with the liquid. The woman then told the maid to add the liquid to her husband's food in the belief that, after the husband had consumed a sufficient amount of the liquid, their marital problems would be resolved.

Since there was no way of knowing if the wife intended to eliminate her marriage problems, her husband, or both, an intensive investigation for any potential "poisons" was initiated. Tests for all of the common drugs and poisons, e.g., arsenic, strychnine, pesticides and rodenticides were negative. Eventually, the clear liquid was shown to be tap water.

Although there were no harmful results in this case, it does serve to illustrate that there is a continu-

ing belief in the powers of the witch doctor. This belief is not restricted to the uneducated, as one might first expect. The woman who purchased the special powder to drive her neighbor away is from a wealthy Panamanian family and received her formal education in one of the more exclusive universities in the United States.

Conclusion

The beneficial aspects of plants and herbs used in the practice of folk or traditional medicine have been recognized and documented for centuries. Although the toxicologist's concern has traditionally been with the toxic effects of commercial medications, the effects associated with persons practicing folk medicine present new and interesting analytical problems. With the increasing use of organic foods and the reemphasis on the value of plant and herbal medicines, these problems may occur more frequently.

The analysis of witches' potions adds to the challenge of toxicology in Panama.

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