

# Problems in ethnomedicine: evaluating traditional knowledge and transferring it outside its native context.

Prof. Laurent RIVIER, PhD  
Scientific Consulting  
Place de l' Europe 7  
CH - 1003 Lausanne, Switzerland  
e-mail : [info@rivier-consulting.com](mailto:info@rivier-consulting.com)

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## **Abstract:**

Traditional usage - which can be many centuries old - is considered in Western medicine as not sufficient for safe application of these natural remedies. Most often, strict scientific validation is required specially when a new drug preparation is proposed to other people living in a completely different context. During this transition phase, many shortcuts can occur, the consequences of which can be a disaster!

Ayahuasca, as first example, has been known since the beginning of the 19<sup>th</sup> century to science. This hallucinogenic decoction has been used traditionally for several centuries by South American Shamans of the Amazon region. Made from a unique combination of several tropical plants, this bitter drink is considered as an effective medicine both used to diagnose and treat disease. Actually, its basic chemical constituents - psychoactive tryptamines and beta-carbolines - are well characterized but the pharmacology of the brew is not yet completely understood. Over the last decade, its original native use has spread not only among mestizos population all over the Amazon area and several "churches" in Brazil, but also among few Western psychiatrists in the hope of treating dependence on drugs. Recently, its use has spread between "psychonauts" with much adaptation and changes compared to its original ritualistic use. For example, new plant admixtures growing in the temperate zones have been suggested to replace the original tropical ones that are difficult to obtain outside the Amazon. Their selection was made on a rapid phytochemical survey without any knowledge concerning their toxicity. Safety put apart, such proposal contradicts any sound ethnopharmacological behaviour as it negates the crucial importance of the ritual settings.

The second example deals with the zombification process of the Haitian peasant folklore. Induced by the application of a powder containing tetrodotoxin from

globefish species as main toxic ingredient, this extra-ordinary transformation attracted contra-productive publicity from the media. Many sensational articles were published in the USA. A horror movie was even produced by Hollywood that was largely broadcasted via satellites. Many Haitians were able to watch the film and could realize how the Western world was considering one of their most secret traditions. From that time on, any further attempt in collecting new ethnotoxicological information in Haiti was impossible! As a consequence of these two examples, scientists are faced now with considerable difficulties to gather reliable information during new field trips aiming to understand better the complexe pharmacology of these drugs.

### **Introduction:**

Ethnomedicine is aimed to obtain and maintain a broad multidisciplinary perspective on the human use of crude drugs and poisons in a traditional context. Widely differing disciplines are involved such as cultural anthropology, linguistics, history, botany, zoology, chemistry, pharmacology, toxicology and medicine. Irrespective of any practical medical relevancy, ethnomedicine or ethnopharmacology broadens our general knowledge of mankind and put our own attitude towards drugs into a cultural and historical perspective.

When observing and interpreting native use of medicinal plants, observers are faced with specific difficulties: how should they, as western educated persons, understand correctly the customs, the gestures and the words of the so called « primitive » people? Cultural references, symbols, words meanings have to be decrypted in an independent way. Then, fieldwork studies are instrumental for bringing essential information to ethnopharmacologists who can use these discoveries for more basic research. Field trips rely on the quality of the informants. These people should be chosen very carefully with the aim of trust, reliability and friendship (Cox and Balick, 1994).

With the outcome of globalisation, information spread very rapidly. Scientists have to be aware of these new aspects as they might be faced with many artefacts. The following two examples are taken from my own field trips on hallucinogens and poisons. They illustrate the various problems that might arise during the exchange of information between the indigenous people and us, as well as the disastrous consequences that uncontrolled return of information may have.

Among the indigenous people of the tropics, there are generally two classes of plant medicines: those regarded as sacred and used exclusively by and under the strict surveillance of the shaman or sorcerer; and those known and used by the general population. Hallucinogens and poisons are always related to the first class of specialists and this may explain why it has been so difficult to discover them. It is natural that a lot of efforts and time will be spent into gathering reliable information. Diffusing within our own western society the essence of these rituals and the recipe of making magic preparations cannot be done without minimal caution. On the other hand, the retrocession of information to indigenous people requests great care in order to maintain contact and credibility with these unique and fast disappearing informants.

### **Ayahuasca:**

Ayahuasca is a hallucinogenic decoction made from potent psychotropic plants indigenous to the Amazon basin of South America. This "entheogen" has been discovered 200 years ago and since then known under a number of different names including *caapi*, *natema*, *yage*, *daime*, *vegetal* or *huasca*. Entheogens is a word suggested by R. Gordon Wasson and others to name in a non-pejorative manner certain substances whose ingestion induces altered states of consciousness, leading to states of shamanic ecstasy or possession.

Originally used for purposes of divination, magic and religious rituals, Ayahuasca is considered by most native Indian tribes to be an effective medicine and used to both diagnose and treat disease. Among these peoples the plants used to prepare the decoction are called "teacher plants" and they are felt to give the user direct access to the spiritual world and to storehouses of wisdom not otherwise available to them (Luna, 1984). Thus, it is common for shamans to claim that their knowledge of the healing power of plants and the correct ways of using them was given to them in dreams and visions produced by the ingestion of ayahuasca (Narby, 1999).

**Figure 1:** Reproduction of an original painting by Pablo Amaringo, a Peruvian shaman. This illustration was adapted from Luna and Amaringo (1991), showing the shaman visions under the influence of Ayahuasca.

*(Refer to the published article)*

The scientific study of ayahuasca began with the explorer Richard Spruce in 1908 when he identified one of the primary ingredients in the decoction as a large woody vine that would later be attributed the botanical name of *Banisteriopsis caapi* (Spruce ex Griseb.) Morton. Consequent field research also revealed that other plants, including the hallucinogenic tryptamine-rich *Psychotria viridis* (R. and P.) were often added to the liana in the preparation of the drink. Chemical studies indicated the presence of the  $\beta$ -carboline harmine as the major alkaloid and N,N-dimethyltryptamine (DMT) as the second most important alkaloid. Other alkaloids comprised harmaline, tetrahydroharmine, harmol and 6-Methoxytryptamine. Typical drug intake will correspond to 25 mg DMT and 40 mg of  $\beta$ -carboline, primarily harmine (Rivier and Lindgren, 1972). Minor alkaloids are frequently present originating from the variety of other plant constituents often added by shamans to possibly modulate the subjective effects of the drink.

Most investigators believe that the unique properties of ayahuasca decoction arise from the combination of harmine and DMT. It has been proposed that due to their monoamine oxidase (MAO) inhibiting properties, harmine and related  $\beta$ -carbolines possibly increase the oral bioavailability of DMT, which is not well absorbed by this route of administration. Another schema of DMT protection has been proposed: it refers to the action of mixed function oxidases inhibitors which can be also present in these plants (McKenna and Towers, 1985) but this hypothesis has not yet been verified. A scientifically documented study has contributed to correlate the occurrence of both the beta-carbolines and DMT with the subjective effects of the drink in religious settings (Callaway et al., 1999). However, except from testimonies from natives and the few explorers who have tried several brands of the preparation in the Amazon, only little is known about the psycho-pharmacology of these compounds in combination. Recently, the behavioural profile of constituents in ayahuasca has been determined indicating that each of them directly contribute to the unique subjective effects of ayahuasca (Freeland and Mansbach, 1999). The high variability in the bioavailability of the ayahuasca alkaloids in humans, as observed by Yritia et al. (2002), indicates the complexity of the pharmacokinetics of the oral administration of the drink and suggests that the knowledge concerning the general pharmacology of the psychoactive decoction should be completed.

In South America, the traditional use of ayahuasca has spread among mestizo members of the rural population and, more recently among the urban middle class with the expense of major changes in the observance of traditional taboos and rituals (MacRae, 1998). The issues of abuse liability or toxicity of ayahuasca are becoming increasingly important with the advent of syncretic religious groups such as Union de Vegetal and Santo Daime in Brazil which utilize the decoction as a ritual sacrament (Callaway et al., 1994).

Moreover, the suggested application of ayahuasca as a pharmacotherapy for cocaine addiction by groups such as the Takiwasi treatment clinic in Peru (Mabit, 1996), its increasing consumption in several European countries, the USA and Japan are indications of the radical changes which have occurred in the practice of ayahuasca ceremonies compared to the original ritualistic and shamanistic practices of South American Indians. The recent proliferation of web sites advocating ayahuasca use and proposing the selling of the drink itself (e.g.: <http://www.yage.net>), the very detailed indications to select plant or chemical substitutes to make the so-called "Pharmahuasca" or *Ayahuasca borealis* (Ott, 1999) make such pressure even more intense.

Finally, in search of exotic and possibly original psychedelic experiences, Western visitors are flooding into the tropic forests, contacting shamans to buy the right to sit at an organized ayahuasca setting. This aspect associated with the raising interest for ethno-eco-tourism travelling in the Amazon basin these last 10 years have brought considerable pressure on the small villages inhabited by isolated ethnic groups of various Indian tribes. The clients of these adventure trips in the Amazon region are searching only for the entheogenic experience with little interests in meeting the natives. They want their hallucinogenic trip rapidly and are not at all interested in following the taboos that traditions might impose to them, nor worried by the impact their brutal arrival may cause on the fragile bio-ecosystem. As consequence, one can understand why the local shamans, adapting to the new demand, change the original settings of the ayahuasca ceremony their ancestors have taught them to follow and respect. Very soon, parts of the orally transmitted tradition will be lost forever. We know for long how important it is to document as exactly and completely as possible the use of these medicinal and magical plants among the natives before these interesting practices are completely corrupted or simply forgotten.

Davis' hypothesis that TTX is an important toxic element of the powder, and therefore plays a major role in the zombification process, is based mainly on the similarities existing between symptoms of zombification and tetrodotoxication. TTX is present in both cases but other ingredients are added in the zombification powder. It is not clear today whether or not they are of significance. The active ingredients in toad venom are bufotenine and other psychoactive tryptamines and bufotoxin. These possibly may enhance the effects of the primary toxin derived from the puffer fish. Nothing is known about the tree frog and the plant additives reported by Davis although a few of them are psychoactive. Additional information has to be gathered to understand better the inter-relationship between these powerful molecules. Anyway, the biochemical effects of the toad and puffer toxins are certainly strongly mediated by the beliefs of the victims. Part of the sorcerer's power is that the victim expects to be punished and know what will happen during the process of being converted into zombie.

Following Davis' discovery and scientific publication, TV shows were arranged around the zombification, several books on vodoun sorcery were published and translated in different languages and several non scientific expeditions were even set up in order to track any reminding information on contemporaries zombies and modern powder makers in Haiti. The subject was hot, could increase significantly the sales of the sponsors. In fact, no new information was brought back from these travels, on the contrary! The Haitian peasants understood quickly the reasons of this sudden interest around their traditions and became immediately suspicious against any foreigner who was interested in zombies. The worst had still to come with the disclosure in 1988 of a fiction movie based on Davis' own history in Haiti and produced by Hollywood with the same title as the book: "The serpent and the rainbow" (Davis, 1986). This horror movie was broadcasted by US satellite free televisions and received easily by many homes in Haiti where it was recorded and diffused all around the country.

When I travelled in Haiti in 1989 in an attempt to scientifically collect authentic ethnomedical data on the same subject, I was faced with a totally polluted field: all informants that I was able to contact during my short stay in Haiti - from the educated school teacher to the most humble village inhabitant - were more keen in bringing many details originating from the movie itself rather than from their own traditions.

**Figure 2:** The author sitting in 1989 together with the brother and 4 sisters of Clairvius Narcisse, a man who claimed to have been zombified 18 years earlier (photographed by Dr. Roland Ney).

*(Refer to the original article)*

Recently, ethnobotanists travelling in Haiti for collecting information about medicinal plants could still verify how deep this external contamination around the zombification stands. I am very much afraid that it would take a very long time until this pollution will be erased.

### **Discussion and conclusion:**

Many challenges face ethnomedicine in future years, particularly the rapid loss of biodiversity and the concomitant loss of indigenous knowledge. Balick and Cox (1996) have pointed out that: "Some contemporary critics fear that outsiders' studies of traditional knowledge is not without risk. Published reports of the use of medicinal plant might create a demand for the resource... Only the most sensational information is written down, the more hidden or mundane information may be lost or left apart".

The two examples described above show the importance of controlling the flux of information between the indigenous people and the scientists. The protection of the source of information is mandatory to preserve its virginity and the interests of the indigenous people. Sensational reports may attract too many visitors looking for new adventures. These reporters or tourists bring strong pressure on the fragile equilibrium of the natives. Short-sited views might jeopardize for many years further attempts to verify original data. It will be extremely hard to the ethnopharmacologist to fill and complete any unavoidable loopholes in the understanding of these secret and magic practices as hallucinogenic diagnostic or poison administration for justice might be.

I hope that the present contribution will allow additional argumentation in offering to indigenous people the proper information and in granting them as equal partners to us. As the information flows most of the time from the indigenous people to us, we have also to care about the other way around. This

has to be done with delicate attention only, keeping in mind the necessity of original knowledge and biological diversity conservation.

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## Zombification:

In Haiti, some vodoun (or voodoo) sorcerers are reportedly capable of putting their victims into a cataleptic state, which can be mistaken for death, through the administration of a powder made of native plants and animals containing toxic ingredients (Davis, 1983). This is the co-called zombification process.

Zombies of the Haitian peasant vodoun religion have been portrayed as half-decayed creatures that claw their ways out of the grave to prey upon the helpless living. Vodoun is a combination of beliefs and social traditions originating from many African religions and a blend of Christianity. The rules of Vodoun are mainly kept in secret societies and by their sorcerers. In Haitian villages, zombies are part of the traditional system of social control that oversees individual behaviour and dispenses justice (Booth, 1988). Being made zombie is a punishment set by the sorcerer who has prepared a powder and arranged to administer it to the victim after this one has been taken before a tribunal, judged and condemned to become a zombie.

Haitians believe that the powder has an effect when merely brushed on the skin. The cataleptic state that follows is taken for death and the process of zombification is initiated. Ingredients of the powder include puffer fish (*Spherooides testudineus* L. or *Diodon hystrix* L. or *D. holacanthus* L.), a tree frog (*Osteopilus dominicensis* Tschudi) and the new world toad (*Bufo marinus* L.) (Davis, 1983). Puffer fish is known to contain tetrodotoxin (TTX), a powerful blockers of sodium ion transport channels in neurons and disruptor of nerve voltage (Nakumura and Yasumoto, 1985). TTX has been demonstrated to be present in a single sample out of five collected samples of the zombis' powder (Benedek and Rivier, 1989) at low concentration.

TTX effects are well documented in Japan as it is responsible of much intoxication after eating the highly prized puffer fish delicacy called *fugu*. Japanese researchers have described three degrees of poisoning. The first is distinguished by a progressive numbing sensation and loss of motor control akin to having the entire body "fall asleep". The second includes paralysis of the body, difficulty in breathing, cyanosis, and a precipitous drop in blood pressure. Meanwhile, the victim can see and hear what is going on around him, although he has no sense of touch. In the third and last degree, death is caused by acute respiratory failure. The difficulty of diagnosing the death of victims of *fugu* poisoning has been stated by physicians, as several cases of recovery have occurred, even though the patient had been declared dead beforehand (see Halstead 1988, for references).

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