

Global Ayahuasca Project

Ali, M. (2016). "How to Disappear Completely. Community Dynamics and Deindividuation in Neo-Shamanic Urban Practices." *Shaman - Journal of the International Society for Shamanistic Research* **23**(1-2).

Abstract : This essay reflects on some community dynamics underlying neo-shamanic practices, starting from a review of field-notes taken by the author in the course of an ethnographic experience conducted in an urban context, in Colombia. The observation of the social and ritual procedures played by neo-shamanic therapists in post-colonial contexts reveals how indigenous performance has had to transform itself to survive the cultural pressure imposed by the hegemonic rationalism of modern mechanisms of knowledge. Urban shamanism, as an emerging social phenomena, appears as a hybrid creation, synchronizing forms and contents of the traditional shamanic practice with the post-modern needs of disciples (and clients) looking for their psycho-social balance in a climate of growing deindividuation. If ethno-biological knowledge were the core skill of traditional shamanism, neo-shamans prefer to strengthen their social position thanks to the tools offered by the same modernity (such as the ICT) and to confirm their social role of mediators and therapists through the development of a syncretic paraphernalia and a community of faithful aficionados.

Alsema, A. (2011). 2 die in north-Colombia ayahuasca ceremony. Columbia Reports.

Anderson, B. T. (2012). "Ayahuasca as Antidepressant? Psychedelics and Styles of Reasoning in Psychiatry." *Anthropology of Consciousness* **23**(1): 44-59.

There is a growing interest among scientists and the lay public alike in using the South American psychedelic brew, ayahuasca, to treat psychiatric disorders like depression and anxiety. Such a practice is controversial due to a style of reasoning within conventional psychiatry that sees psychedelic-induced modified states of consciousness as pathological. This article analyzes the academic literature on ayahuasca's psychological effects to determine how this style of reasoning is shaping formal scientific discourse on ayahuasca's therapeutic potential as a treatment for depression and anxiety. Findings from these publications suggest that different kinds of experiments are differentially affected by this style of reasoning but can nonetheless indicate some potential therapeutic utility of the ayahuasca-induced modified state of consciousness. The article concludes by suggesting ways in which conventional psychiatry's dominant style of reasoning about psychedelic modified states of consciousness could be reconsidered.

Anderson, B. T., et al. (2012). "Statement on ayahuasca." *Int J Drug Policy* **23**(3): 173-175.

Sixty years ago, the esteemed academic journal *Science* published a "Statement on Peyote" (La Barre, McAllester, Slotkin, Stewart, & Tax, 1951), in which a handful of leading researchers, dismayed by the misinformed and demonising drug politics of the time, defended the right of the Native American Church to consume a psychedelic plant in its religious rites. Today, we feel similarly compelled to speak out on behalf of an analogous, non-indigenous religious tradition—the Brazilian ayahuasca religions, including the Santo Daime, the União do Vegetal, and other related groups (Dawson, 2007; Labate & MacRae, 2010). We have studied various ritual uses of ayahuasca, participated in ceremonies and consumed the sacramental brew.

In light of the facts—that ritualized psychedelic plant use has expanded out of the Amazon in recent decades; that the available data consistently suggest that these practices are reasonably safe; and that, nevertheless, considerations of medical and public safety must be balanced with socio-historical and human rights considerations, such as the universal right to freedom of religion—we urge regulatory authorities in the countries where the Brazilian ayahuasca religions are currently arriving to demonstrate tolerance and grant these groups the necessary degree of legal freedom and respectful engagement for them to continue evolving into safe and responsible contributors to today’s multicultural and globalizing society.

Andritzky, W. (1989). "Sociopsychotherapeutic functions of ayahuasca healing in Amazonia." *J Psychoactive Drugs* **21**(1): 77-89.

The social and psychotherapeutic functions of healing rituals with ayahuasca among Amazonian groups are examined, and their healing effectiveness is explained in terms of Western scientific and sociopsychotherapeutic perspectives. The article includes an overview of the preparation and application of ayahuasca, the symbolic adaptations to the process of social change, the role of singing, the perceptive mode during the visionary state, and the structure of the visions. It is noted that the healing activities provide the entire community access to transcendental experiences, which clearly have integrative and cohesive social functions. Ethnopsychology provides important insights into the functions of archaic healing rituals, and can be used to illustrate the transcendental experiences and pathological use of drugs in modern societies.

Apud, I. (2015). "Ayahuasca from Peru to Uruguay: Ritual Design and Redesign through a Distributed Cognition Approach." *Anthropology of Consciousness* **26**(1): 1-27.

Ayahuasca is a psychoactive substance from the Amazon rainforest regions of Peru, Colombia, Ecuador, and Brazil. Although its use originated among indigenous tribes in the Amazon basin, it has become increasingly popularized in Western society through the transnational markets of spirituality and religiosity driven by globalization, Postmodernity, and new forms of religious practice. In this paper, we will overview the arrival of ayahuasca in Uruguay by way of four different groups. We will then focus on one of these groups, a holistic alternative therapies center, influenced by Peruvian shamanic traditions in the design of its ceremonies. Last we will introduce a “distributed cognition” model to explain ayahuasca rituals as a system of activity.

Araujo, A. M., et al. (2015). "The hallucinogenic world of tryptamines: an updated review." *Archives of Toxicology*(8): 1151.

In the area of psychotropic drugs, tryptamines are known to be a broad class of classical or serotonergic hallucinogens. These drugs are capable of producing profound changes in sensory perception, mood and thought in humans and act primarily as agonists of the 5-HT_{2A} receptor. Well-known tryptamines such as psilocybin contained in Aztec sacred mushrooms and N,N-dimethyltryptamine (DMT), present in South American psychoactive beverage ayahuasca, have been restrictedly used since ancient times in sociocultural and ritual contexts. However, with the discovery of hallucinogenic properties of lysergic acid diethylamide (LSD) in mid-1900s, tryptamines began to be used recreationally among young people. More recently, new synthetically produced tryptamine hallucinogens, such as alpha-methyltryptamine (AMT), 5-methoxy-N,N-dimethyltryptamine (5-MeO-DMT) and 5-methoxy-N,N-diisopropyltryptamine (5-MeO-DIPT), emerged in the recreational drug market, which have been claimed as the next-generation designer drugs to replace LSD

('legal' alternatives to LSD). Tryptamine derivatives are widely accessible over the Internet through companies selling them as 'research chemicals', but can also be sold in 'headshops' and street dealers. Reports of intoxication and deaths related to the use of new tryptamines have been described over the last years, raising international concern over tryptamines. However, the lack of literature pertaining to pharmacological and toxicological properties of new tryptamine hallucinogens hampers the assessment of their actual potential harm to general public health. This review provides a comprehensive update on tryptamine hallucinogens, concerning their historical background, prevalence, patterns of use and legal status, chemistry, toxicokinetics, toxicodynamics and their physiological and toxicological effects on animals and humans.

Arrevalo, G. (2005). "Interview with Guillermo Arrevalo, a Shipibo urban shaman, by Roger Rumrill. Interview by Roger Rumrill." J Psychoactive Drugs **37**(2): 203-207.

Roger Rumrill, a journalist headquartered in Lima, Peru who is a noted expert on the Peruvian Amazon, interviewed Guillermo Arrevalo, a Shipibo urban shaman in Pucallpa, who utilizes ayahuasca in curing rituals. Sr. Arrevalo comments on the phenomenon known as drug tourism, where urban men and women provide tours for foreigners, for a price, to experience drug-induced mystical experiences in urban settings like Iquitos and Pucallpa, Peru, as well as in Brazil, Bolivia and Ecuador. Arrevalo distinguishes between folkloric shamanism and touristic practices which are currently in vogue and, in his opinion, are the result of people trying to resolve personal problems. Arrevalo sees a spiritual and psychological crisis in Europe and North American society. The Shipibo shaman laments the misuse of toxic plants as additives to the ayahuasca potion and the damage that these plants cause to the unsuspecting tourist who doesn't really get his money's worth from shamans without experience, people who are liars and cheats and who don't have the capacity, the preparation or the boldness to do the work.

Baker, J. R. (2005). "Psychedelic Sacraments." J Psychoactive Drugs **37**(2): 179-187.

The use of psychedelic substances within a context that emphasizes religious experiences and aims to provide spiritual insights is not a new phenomenon. However, the proscription of these substances in most modern societies leads to such use now typically occurring in an underground and idiosyncratic manner that often leaves individuals on their own with regard to the interpretation and integration of their experiences and insights. In contrast, the numerous examples in the ethnographic and the historical literature indicate that many cultures independently developed similar frameworks for using these substances for both individually and socially beneficial purposes and arrived at similar conclusions as to which of the substances available to them were the most appropriate for these purposes. This article focuses on a special type of socially sanctioned framework called a "sacrament" and contrasts this with other, more idiosyncratic forms of psychedelic use. It discusses how this framework helps to structure and channel the experiences induced by these substances, thereby increasing the likelihood of individually constructive and socially integrative experiences. [ABSTRACT FROM AUTHOR]

Barbanoj, M., et al. (2008). "Daytime Ayahuasca administration modulates REM and slow-wave sleep in healthy volunteers." Psychopharmacology **196**(2): 315-326.

Objectives: Ayahuasca is a traditional South American psychoactive beverage and the central sacrament of Brazilian-based religious groups, with followers in Europe and the United States. The tea contains the psychedelic indole N, N -dimethyltryptamine (DMT) and β - carboline alkaloids with monoamine oxidase-inhibiting properties that render DMT orally

active. DMT interacts with serotonergic neurotransmission acting as a partial agonist at 5-HT 1A and 5-HT 2A/2C receptor sites. Given the role played by serotonin in the regulation of the sleep/wake cycle, we investigated the effects of daytime ayahuasca consumption in sleep parameters.

Measurements and results: Subjective sleep quality, polysomnography (PSG), and spectral analysis were assessed in a group of 22 healthy male volunteers after the administration of a placebo, an ayahuasca dose equivalent to 1 mg DMT kg⁻¹ body weight, and 20 mg d -amphetamine, a proaminergic drug, as a positive control. Results show that ayahuasca did not induce any subjectively perceived deterioration of sleep quality or PSG-measured disruptions of sleep initiation or maintenance, in contrast with d -amphetamine, which delayed sleep initiation, disrupted sleep maintenance, induced a predominance of 'light' vs 'deep' sleep and significantly impaired subjective sleep quality. PSG analysis also showed that similarly to d -amphetamine, ayahuasca inhibits rapid eye movement (REM) sleep, decreasing its duration, both in absolute values and as a percentage of total sleep time, and shows a trend increase in its onset latency. Spectral analysis showed that d -amphetamine and ayahuasca increased power in the high frequency range, mainly during stage 2. Remarkably, whereas slow-wave sleep (SWS) power in the first night cycle, an indicator of sleep pressure, was decreased by d -amphetamine, ayahuasca enhanced power in this frequency band.

Conclusions: Results show that daytime serotonergic psychedelic drug administration leads to measurable changes in PSG and sleep power spectrum and suggest an interaction between these drugs and brain circuits modulating REM and SWS.

Barbosa, P. C., et al. (2009). "A six-month prospective evaluation of personality traits, psychiatric symptoms and quality of life in ayahuasca-naive subjects." J Psychoactive Drugs **41**(3): 205-212.

The authors assessed 23 subjects immediately before and six months (27.5 weeks) after their first ayahuasca experience in an urban Brazilian religious setting, either Santo Daime (N = 15) or Uniao do Vegetal (N = 8). Measures included scores on instruments assessing psychiatric symptoms, personality variables and quality of life. Independent variables were the frequency of ayahuasca use throughout the period and the length of ayahuasca wash-out after six months. Santo Daime subjects had a significant reduction of minor psychiatric symptoms, improvement of mental health, and a change in attitude towards more confidence and optimism. The Uniao do Vegetal group had a significant decrease in physical pain, and attitude change towards more independence. Independence was positively correlated with the frequency of ayahuasca use and negatively correlated with the wash-out period. We discuss possible mechanisms by which these changes may occur and suggest areas for future research.

Barbosa, P. C., et al. (2012). "Health status of ayahuasca users." Drug Test Anal **4**(7-8): 601-609.

Ayahuasca is a psychedelic brew originally used for magico-religious purposes by Amerindian populations of the western Amazon Basin. Throughout the last four decades, the use of ayahuasca spread towards major cities in all regions of Brazil and abroad. This trend has raised concerns that regular use of this N,N-dimethyltryptamine- and harmala-alkaloid-containing tea may lead to mental and physical health problems associated typically with drug abuse. To further elucidate the mental and physical health of ayahuasca users, we conducted a literature search in the international medical PubMed database. Inclusion criteria were evaluation of any related effect of ayahuasca use that occurred after the resolution of acute effects of the brew. Fifteen publications were related to emotional,

cognitive, and physical health of ayahuasca users. The accumulated data suggest that ayahuasca use is safe and may even be, under certain conditions, beneficial. However, methodological bias of the reviewed studies might have contributed to the preponderance of beneficial effects and to the few adverse effects reported. The data up to now do not appear to allow for definitive conclusions to be drawn on the effects of ayahuasca use on mental and physical health, but some studies point in the direction of beneficial effects. Additional studies are suggested to provide further clarification.

Barbosa, P. C. R., et al. (2005). "Altered States of Consciousness and Short-Term Psychological After-Effects Induced by the First Time Ritual Use of Ayahuasca in an Urban Context in Brazil." J Psychoactive Drugs **37**(2): 193-201.

This report describes psychological assessments of the first time ritual use of ayahuasca in the religious groups União do Vegetal and Santo Daime. Nineteen subjects who tried the beverage in Santo Daime rituals and nine subjects who tried it in União do Vegetal rituals were evaluated one to four days before their first ayahuasca experience in life and one to two weeks after this experience. Semistructured interviews and a structured psychiatric scale were used in the first evaluation to elicit set variables concerning attitudes towards the ayahuasca experience and to elicit mental health status. Mental health status was reassessed in the second evaluation, which also included a semistructured interview concerning the phenomenology of altered states of consciousness (ASCs). Predominantly positive expectancies concerning the ayahuasca experience were the most prominent findings concerning set variables. Visual phenomena, numinousness, peacefulness, insights and a distressing reaction were the most salient ASC experiences. A significant reduction of the intensity of minor psychiatric symptoms occurred in the Santo Daime group after the hallucinogen experience. Subjects in both groups reported behavioral changes towards assertiveness, serenity and vivacity/joy. The set and setting hypothesis, suggestibility processes, as well as the supposed unique effects of ayahuasca are used in discussing these findings.

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BBC News (2014). "Why do people take ayahuasca?" BBC News Magazine(29 April).

Beyer, S. V. (2012). "Special Ayahuasca Issue Introduction: Toward a Multidisciplinary Approach to Ayahuasca Studies." *Anthropology of Consciousness* **23**(1): 1-5.

Blainey, M. G. (2013). A ritual key to mystical solutions: Ayahuasca therapy, secularism, & the Santo Daime Religion in Belgium. Ann Arbor, Tulane University. **3573932**: 444.

Approximately 600 people from across Europe have officially joined Santo Daime, a Brazilian religion organized around the ingestion of a potent psychoactive beverage called ayahuasca. Santo Daime members (called fardados) regularly attend ceremonies where they imbibe ayahuasca while meditating, singing, and dancing for between 6 and 12 hours. Deeming ayahuasca a dangerous "hallucinogen," most European governments have responded by arresting and prosecuting people who engage in Santo Daime rituals. Highlighting Belgium as a cultural bellwether of Europe, this dissertation pursues the following question: Residing within a social milieu that is dominated by secularism and mainstream Christianity, why are some Europeans adopting Santo Daime spiritual practices? The "secular" designates those aspects of social life that do not involve any recourse to supernatural entities. Through the latter half of the 20 th century, most social scientists welcomed progressive secularization as an inevitable substitute for declining religions in Europe. Recently, a budding anthropology of secularism has emphasized how the institutionalization of materialist disenchantment tends to exclude alternative ideas about the nature of mind and reality. Conversions to transnational religions portend deeper shifts in how some Europeans are adapting to an increasingly interconnected world. The clarification of this process is important because scholars have yet to account for why some Westerners are making unorthodox religious choices in the age of secularization. During fieldwork, I asked informants why they had become fardados. The collective responses are summarized by one Belgian fardado who said: "Santo Daime is the key to a lot of solutions." Fardados consider ayahuasca as a medicinal sacrament (or "entheogen"), which helps them to cure various maladies, such as depression, social anxiety, and alcohol/drug dependence. My informants' understand their Daime practice as a form of mysticism, whereby the entheogenic ritual acts as a kind of introspective technology (what I term a "suiscope"). Empirical studies corroborate fardados' claim that ayahuasca is benign and can be beneficial when employed in ritual contexts. One of the essential functions of anthropology is to render different cultural logics as mutually explicable. Accordingly, this dissertation endeavors to intercede in a misunderstanding between a secular hegemony and an unfamiliar religious subculture.

Blainey, M. G. (2014). "Forbidden Therapies: Santo Daime, Ayahuasca, and the Prohibition of Entheogens in Western Society." *J Relig Health*.

Santo Daime, a Brazilian religion organized around a potent psychoactive beverage called ayahuasca, is now being practiced across Europe and North America. Deeming ayahuasca a dangerous "hallucinogen," most Western governments prosecute people who participate in Santo Daime. On the contrary, members of Santo Daime (called "daimistas") consider ayahuasca a medicinal sacrament (or "entheogen"). Empirical studies corroborate daimistas' claim that entheogens are benign and can be beneficial when employed in controlled contexts. Following from anthropology's goal of rendering different cultural logics as mutually explicable, this article intercedes in a misunderstanding between policies of prohibition and an emergent subculture of entheogenic therapy.

Bouso, J. C., et al. (2013). "Acute effects of ayahuasca on neuropsychological performance: differences in executive function between experienced and occasional users." *Psychopharmacology (Berl)*.

BACKGROUND: Ayahuasca, a South American psychotropic plant tea containing the psychedelic 5-HT_{2A} receptor agonist N,N-dimethyltryptamine, has been shown to increase regional cerebral blood flow in prefrontal brain regions after acute administration to humans. Despite interactions at this level, neuropsychological studies have not found cognitive deficits in abstinent long-term users. **OBJECTIVES:** Here, we wished to investigate the effects of acute ayahuasca intake on neuropsychological performance, specifically on working memory and executive function. **METHODS:** Twenty-four ayahuasca users (11 long-term experienced users and 13 occasional users) were assessed in their habitual setting using the Stroop, Sternberg, and Tower of London tasks prior to and following ayahuasca intake. **RESULTS:** Errors in the Sternberg task increased, whereas reaction times in the Stroop task decreased and accuracy was maintained for the whole sample following ayahuasca intake. Interestingly, results in the Tower of London showed significantly increased execution and resolution times and number of movements for the occasional but not the experienced users. Additionally, a correlation analysis including all subjects showed that impaired performance in the Tower of London was inversely correlated with lifetime ayahuasca use. **CONCLUSIONS:** Acute ayahuasca administration impaired working memory but decreased stimulus-response interference. Interestingly, detrimental effects on higher cognition were only observed in the less experienced group. Rather than leading to increased impairment, greater prior exposure to ayahuasca was associated with reduced incapacitation. Compensatory or neuromodulatory effects associated with long-term ayahuasca intake could underlie preserved executive function in experienced users.

Bouso, J. C., et al. (2012). "Personality, Psychopathology, Life Attitudes and Neuropsychological Performance among Ritual Users of Ayahuasca: A Longitudinal Study." *PLoS ONE* 7(8): e42421.

Ayahuasca is an Amazonian psychoactive plant beverage containing the serotonergic 5-HT_{2A} agonist N,N-dimethyltryptamine (DMT) and monoamine oxidase-inhibiting alkaloids (harmine, harmaline and tetrahydroharmine) that render it orally active. Ayahuasca ingestion is a central feature in several Brazilian syncretic churches that have expanded their activities to urban Brazil, Europe and North America. Members of these groups typically ingest ayahuasca at least twice per month. Prior research has shown that acute ayahuasca increases blood flow in prefrontal and temporal brain regions and that it elicits intense modifications in thought processes, perception and emotion. However, regular ayahuasca use does not seem to induce the pattern of addiction-related problems that characterize drugs of abuse. To study the impact of repeated ayahuasca use on general psychological well-being, mental health and cognition, here we assessed personality, psychopathology, life attitudes and neuropsychological performance in regular ayahuasca users (n = 127) and controls (n = 115) at baseline and 1 year later. Controls were actively participating in non-ayahuasca religions. Users showed higher Reward Dependence and Self-Transcendence and lower Harm Avoidance and Self-Directedness. They scored significantly lower on all psychopathology measures, showed better performance on the Stroop test, the Wisconsin Card Sorting Test and the Letter-Number Sequencing task from the WAIS-III, and better scores on the Frontal Systems Behavior Scale. Analysis of life attitudes showed higher scores on the Spiritual Orientation Inventory, the Purpose in Life Test and the Psychosocial Well-Being test. Despite the lower number of participants available at follow-up, overall differences with controls were maintained one year later. In conclusion, we found no evidence of psychological maladjustment, mental health deterioration or cognitive impairment in the ayahuasca-using group.

Brierley, D. I. and C. Davidson (2012). "Developments in harmine pharmacology - Implications for ayahuasca use and drug-dependence treatment." *Progress in neuro-psychopharmacology & biology* **39**(2): 263-272.

Ayahuasca is a hallucinogenic botanical mixture originating in the Amazon area where it is used ritually, but is now being taken globally. The 2 main constituents of ayahuasca are N,N-dimethyltryptamine (DMT), a hallucinogen, and harmine, a monoamine oxidase inhibitor (MAOI) which attenuates the breakdown of DMT, which would otherwise be broken down very quickly after oral consumption. Recent developments in ayahuasca use include the sale of these compounds on the internet and the substitution of related botanical (anahuasca) or synthetic (pharmahuasca) compounds to achieve the same desired hallucinogenic effects. One intriguing result of ayahuasca use appears to be improved mental health and a reduction in recidivism to alternate (alcohol, cocaine) drug use. In this review we discuss the pharmacology of ayahuasca, with a focus on harmine, and suggest pharmacological mechanisms for the putative reduction in recidivism to alcohol and cocaine misuse. These pharmacological mechanisms include MAOI, effects at 5-HT_{2A} and imidazoline receptors and inhibition of dual-specificity tyrosine-phosphorylation regulated kinase 1A (DYRK1A) and the dopamine transporter. We also speculate on the therapeutic potential of harmine in other CNS conditions. (C) 2012 Elsevier Inc. All rights reserved.

Bustos, S. (2004). The healing power of the curanderos' songs or "icaros": a phenomenological study dissertation proposal. San Francisco, California Institute of Integral Studies.

The literature on the healing effect of the Peruvian Amazonian curanderos' songs or icaros is scarce despite their central position in the curanderos' healing practices, particularly in ayahuasca rituals. The purpose of this study is to explore in-depth the experience of the icaros as healing with a focus on the perception of their musical features, during a lived sound-recorded ayahuasca group ritual. The study will be conducted at Takiwasi, center for the study of traditional medicine and the rehabilitation of drug addicts in Tarapoto, Peru, as well as in other areas of the Upper Amazon. Participants will be five men and women with prior experience with the brew who have intensely felt one or more icaros as healing. The research approach is qualitative and the method phenomenological. Data collection will be based on the participants re-listening to musical extracts of the session and subsequently entering a writing and open-ended interviewing process about their experiences.

Cacic, V., et al. (2010). "Dimethyltryptamine (DMT): Subjective effects and patterns of use among Australian recreational users." *Drug and Alcohol Dependence* **111**(1-2): 30-37.

Dimethyltryptamine (DMT) is an endogenous hallucinogen with traditional use as a sacrament in the orally active preparation of ayahuasca. Although the religious use of ayahuasca has been examined extensively, very little is known about the recreational use of DMT. In this study, Australian participants (n = 121) reporting at least one lifetime use of DMT completed an online questionnaire recording patterns of use, subjective effects and attitudes towards their DMT use. Smoking DMT was by far the most common route of administration (98.3%) with a comparatively smaller proportion reporting use of ayahuasca (30.6%). The reasons for first trying DMT were out of a general interest in hallucinogenic drugs (46.6%) or curiosity about DMT's effects (41.7%), while almost one-third (31.1%) cited possible psychotherapeutic benefits of the drug. An increase in psychospiritual insight was the most commonly reported positive effect of both smoked DMT (75.5%) and ayahuasca (46.7%), a finding that is consistent with other studies examining the ritualised use of

ayahuasca in a religious context. Although previous studies of DMT use have examined ayahuasca use exclusively, the present study demonstrates the ubiquity of smoking as the most prevalent route of administration among recreational DMT users.

Callaway, J., et al. (1994). "Platelet serotonin uptake sites increased in drinkers of ayahuasca." *Psychopharmacology* **116**(3): 385-387.

The binding of [3 H]citalopram to the platelet 5-hydroxytryptamine (5-HT) transporter was measured in a group of healthy male drinkers of ayahuasca , a psychoactive sacrament indigenous to Amazonia, and a group healthy male controls. An increased number of binding sites (B max) in the platelets of ayahuasca drinkers was found, while the dissociation constant (K d) remained the same for both groups. If indicative of neuronal 5-HT uptake activity, these results would suggest a decreased concentration of extracellular 5-HT, or a response to increased production and release of 5-HT. Such changes in 5-HT synaptic activity, in this case, should not be misinterpreted as an indication of developing neurological or psychiatric illness.

Callaway, J. C. (2005). "Fast and Slow Metabolizers of Hoasca." *J Psychoactive Drugs* **37**(2): 157-161.

Abstract Harmine, a major alkaloid in ayahuasca (hoasca), is a selective and reversible inhibitor of the enzyme monoamine oxidase-A (MAO-A). It is also a selective inhibitor of the human cytochrome P450 isozyme 2D6 (CYP 2D6), which metabolizes harmine to a more hydrophilic derivative for eventual excretion. CYP 2D6 exhibits a wide range of polymorphisms in human populations, and variations in this enzymatic activity could account for differences in effects between individuals who use hoasca. This report broadly describes two subgroups of CYP 2D6 phenotypes?i.e., fast and slow metabolizers of harmine?in 14 experienced male members of the Uni?o do Vegetal (UDV) who received a standardized dosage of hoasca. To compensate for metabolic variations in their normal religious practice, the administered dose of hoasca is always determined by the presiding mestre, who is responsible for deciding the actual amount for each individual. This age-old method compensates for metabolic variations between individuals and variations in both the alkaloid profile and strength of the hoasca.

Harmine, a major alkaloid in ayahuasca (hoasca), is a selective and reversible inhibitor of the enzyme monoamine oxidase-A (MAO-A). It is also a selective inhibitor of the human cytochrome P450 isozyme 2D6 (CYP 2D6), which metabolizes harmine to a more hydrophilic derivative for eventual excretion. CYP 2D6 exhibits a wide range of polymorphisms in human populations, and variations in this enzymatic activity could account for differences in effects between individuals who use hoasca. This report broadly describes two subgroups of CYP 2D6 phenotypes?i.e., fast and slow metabolizers of harmine?in 14 experienced male members of the Uni?o do Vegetal (UDV) who received a standardized dosage of hoasca. To compensate for metabolic variations in their normal religious practice, the administered dose of hoasca is always determined by the presiding mestre, who is responsible for deciding the actual amount for each individual. This age-old method compensates for metabolic variations between individuals and variations in both the alkaloid profile and strength of the hoasca.

Callaway, J. C. (2005). "Various Alkaloid Profiles in Decoctions of Banisteriopsis Caapi." *J Psychoactive Drugs* **37**(2): 151-155.

Abstract Twenty nine decoctions of *Banisteriopsis caapi* from four different sources and one specimen of *B. caapi* paste were analyzed for N,N-dimethyltryptamine (DMT), tetrahydroharmine (THH), harmaline and harmine. Other plants were also used in the preparation of these products, typically *Psychotria viridis*, which provides DMT. There were considerable variations in alkaloid profiles, both within and between sample sources. DMT was not detected in all samples. Additional THH may be formed from both harmine and harmaline during the preparation of these products. The alkaloid composition of one decoction sample did not change significantly after standing at room temperature for 80 days, but the initial acidic pH was neutralized by natural fermentation after 50 days.

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Callaway, J. C., et al. (2005). "Phytochemical Analyses of *Banisteriopsis Caapi* and *Psychotria Viridis*." *J Psychoactive Drugs* **37**(2): 145-150.

Abstract A total of 32 *Banisteriopsis caapi* samples and 36 samples of *Psychotria viridis* were carefully collected from different plants on the same day from 22 sites throughout Brazil for phytochemical analyses. A broad range in alkaloid distribution was observed in both sample sets. All *B. caapi* samples had detectable amounts of harmine, harmaline and tetrahydroharmine (THH), while some samples of *P. viridis* had little or no detectable levels of N,N-dimethyltryptamine (DMT). Leaves of *P. viridis* were also collected from one plant and analyzed for DMT throughout a 24-hour cycle.

A total of 32 *Banisteriopsis caapi* samples and 36 samples of *Psychotria viridis* were carefully collected from different plants on the same day from 22 sites throughout Brazil for phytochemical analyses. A broad range in alkaloid distribution was observed in both sample sets. All *B. caapi* samples had detectable amounts of harmine, harmaline and tetrahydroharmine (THH), while some samples of *P. viridis* had little or no detectable levels of N,N-dimethyltryptamine (DMT). Leaves of *P. viridis* were also collected from one plant and analyzed for DMT throughout a 24-hour cycle.

Callaway, J. C. and C. S. Grob (1998). "*Ayahuasca* preparations and serotonin reuptake inhibitors: a potential combination for severe adverse interactions." *J Psychoactive Drugs* **30**(4): 367-369.

The Amazonian psychoactive plant beverage ayahuasca has attracted increasing interest in recent years. Little attention has been given, however, to potentially dangerous interactions with other drugs. In particular, the interaction between the potent monoamine oxidase-inhibiting harmala alkaloids in ayahuasca and the selective serotonin reuptake inhibitor (SSRI) class of antidepressants may induce a serotonin syndrome with potentially grave outcome. Caution is advised when combining ayahuasca with certain pharmaceutical drugs.

Callaway, J. C., et al. (2006). "A Demand for Clarity Regarding a Case Report on the Ingestion of 5-Methoxy-N, N-Dimethyltryptamine (5-MeO-DMT) in an Ayahuasca Preparation." J Anal Toxicol **30**(6): 406-407.

Callaway, J. C., et al. (1999). "Pharmacokinetics of Hoasca alkaloids in healthy humans." Journal of Ethnopharmacology **65**(3): 243-256.

N,N-Dimethyltryptamine (DMT), harmine, harmaline and tetrahydroharmine (THH) are the characteristic alkaloids found in Amazonian sacraments known as hoasca, ayahuasca, and yajè. Such beverages are characterized by the presence of these three harmala alkaloids, where harmine and harmaline reversibly inhibit monoamine oxidase A (MAO-A) while tetrahydroharmine weakly inhibits the uptake of serotonin. Together, both actions increase central and peripheral serotonergic activity while facilitating the psychoactivity of DMT. Though the use of such 'teas' has been known to western science for over 100 years, little is known of their pharmacokinetics. In this study, hoasca was prepared and administered in a ceremonial context. All four alkaloids were measured in the tea and in the plasma of 15 volunteers, subsequent to the ingestion of 2 ml hoasca/kg body weight, using gas (GC) and high pressure liquid chromatographic (HPLC) methods. Pharmacokinetic parameters were calculated and peak times of psychoactivity coincided with high alkaloid concentrations, particularly DMT which had an average T_{max} of 107.5±32.5 min. While DMT parameters correlated with those of harmine, THH showed a pharmacokinetic profile relatively independent of harmine's.

Cavnar, C. (2011). The effects of participation in Ayahuasca rituals on gays' and lesbians' self perception. Ann Arbor, John F. Kennedy University. **3481676**: 133.

The practice of drinking the psychoactive drink ayahuasca has been shown in several studies to have positive long-term effects on mental states, and several studies have suggested it has a particularly strong positive effect on perceptions of identity. This research sought to discover if and in what way, these previous findings would be seen in gay people, who are often taught by their culture and religion that their lifestyles, values and sexual orientation are unacceptable. This qualitative study examined the interview responses of 17 gay and lesbian-identified participants who had used ayahuasca in a group in the past three years regarding their self-perceptions. The results indicated that all participants reported positive effects on their lives from ayahuasca rituals, including affirmation of their sexual orientation, and no participants reported negative effects on perception of identity.

Cavnar, C. (2014). "The effects of ayahuasca ritual participation on gay and lesbian identity." J Psychoactive Drugs **46**(3): 252-260.

The practice of drinking ayahuasca—a psychoactive brew indigenous to the Amazon—has been investigated in several studies and shown to have positive long-term effects on mental states, and a particularly strong positive effect on perceptions of identity. This article discusses if these previous findings can be found in the experience of gay people, who are often taught by their culture and religion that their lifestyles, values, and sexual orientation are unacceptable. The qualitative study examined the interview responses of 17 self-identified gay and lesbian participants who had drunk ayahuasca in a ceremonial context within the past three years, regarding their self-perceptions and integration of group beliefs. Participants drank either in shamanic or Santo Daime ceremonies or, in the case of one participant, with an Afro-Brazilian group that used ayahuasca. Participants reported affirmation of their sexual orientation, and no participants reported negative effects on

perception of identity. Additional positive effects in other areas of their lives, which they attributed to ayahuasca sessions, contributed to the overall positive outcomes that were reported by this group as a result of their ritual participation.;

Ciprian-Ollivier, J. and M. G. Cetkovich-Bakmas (1997). "Altered consciousness states and endogenous psychoses: a common molecular pathway?" *Schizophrenia Research* **28**(2–3): 257-265.

Interest in the role of indolamines in the pathogenesis of psychoses has been renewed in recent years by the development of atypical antipsychotic drugs such as clozapine, olanzapine, and risperidone, which act on serotonin receptors. Discovery of the hallucinogenic compounds called methylated indolealkylamines (MIAs) (e.g. N,N-dimethylserotonin, or bufotenin, and N,N-dimethyltryptamine, or DMT) led proponents of the transmethylation hypothesis of schizophrenia to theorize that through some inborn error of metabolism, serotonin or tryptamine might undergo the addition of extra methyl radicals, thereby forming MIAs with hallucinogenic properties. Various studies have attempted to detect the excretion of MIAs, especially DMT, in the body fluids of psychotic patients and normal controls. Some of these studies have demonstrated elevated MIA concentrations in psychotic patients, including those with schizophrenia, compared with normal persons, and others have not. A number of variables may account for these contradictory findings. The mechanism whereby the beverage ayahuasca, which is used in certain cure and divination rituals in the Amazon Basin, exerts its hallucinogenic effects may serve as a model to explain the mechanism underlying hallucinogenic symptoms in schizophrenia and may lend support to the transmethylation hypothesis. Certain studies suggest that specific perceptual disturbances manifested by schizophrenic patients could contribute to progressive deterioration and negative symptomatology. All these findings point to the need for further study of the neurophysiology of MIAs and their pathogenetic role in endogenous psychoses.

Cozzi, N., et al. (2009). "Dimethyltryptamine and other hallucinogenic tryptamines exhibit substrate behavior at the serotonin uptake transporter and the vesicle monoamine transporter." *Journal of Neural Transmission* **116**(12): 1591-1599.

N,N -dimethyltryptamine (DMT) is a potent plant hallucinogen that has also been found in human tissues. When ingested, DMT and related N,N -dialkyltryptamines produce an intense hallucinogenic state. Behavioral effects are mediated through various neurochemical mechanisms including activity at sigma-1 and serotonin receptors, modification of monoamine uptake and release, and competition for metabolic enzymes. To further clarify the pharmacology of hallucinogenic tryptamines, we synthesized DMT, N -methyl- N -isopropyltryptamine (MIPT), N,N -dipropyltryptamine (DPT), and N,N -diisopropyltryptamine. We then tested the abilities of these N,N -dialkyltryptamines to inhibit [3 H]5-HT uptake via the plasma membrane serotonin transporter (SERT) in human platelets and via the vesicle monoamine transporter (VMAT2) in Sf9 cells expressing the rat VMAT2. The tryptamines were also tested as inhibitors of [3 H]paroxetine binding to the SERT and [3 H]dihydrotrabenazine binding to VMAT2. Our results show that DMT, MIPT, DPT, and DIPT inhibit [3 H]5-HT transport at the SERT with K_i values of 4.00 ± 0.70, 8.88 ± 4.7, 0.594 ± 0.12, and 2.32 ± 0.46 μM, respectively. At VMAT2, the tryptamines inhibited [3 H]5-HT transport with K_i values of 93 ± 6.8, 20 ± 4.3, 19 ± 2.3, and 19 ± 3.1 μM, respectively. On the other hand, the tryptamines were very poor inhibitors of [3 H]paroxetine binding to SERT and of [3 H]dihydrotrabenazine binding to VMAT2, resulting in high binding-to-uptake ratios. High binding-to-uptake ratios support the hypothesis that the tryptamines are transporter substrates, not uptake blockers, at both SERT and VMAT2, and also indicate that

there are separate substrate and inhibitor binding sites within these transporters. The transporters may allow the accumulation of tryptamines within neurons to reach relatively high levels for sigma-1 receptor activation and to function as releasable transmitters.

Da Silveira, D. X., et al. (2005). "Ayahuasca in adolescence: a preliminary psychiatric assessment." *J Psychoactive Drugs* **37**(2): 129-133.

Ayahuasca is believed to be harmless for those (including adolescents) drinking it within a religious setting. Nevertheless controlled studies on the mental/ psychiatric status of ritual hallucinogenic ayahuasca concoction consumers are still lacking. In this study, 40 adolescents from a Brazilian ayahuasca sect were compared with 40 controls matched on sex, age, and educational background for psychiatric symptomatology. Screening scales for depression, anxiety, alcohol consumption patterns (abuse), attentional problems, and body dysmorphic disorders were used. It was found that, compared to controls, considerable lower frequencies of positive scoring for anxiety, body dysmorphism, and attentional problems were detected among ayahuasca-using adolescents despite overall similar psychopathological profiles displayed by both study groups. Low frequencies of psychiatric symptoms detected among adolescents consuming ayahuasca within a religious context may reflect a protective effect due to their religious affiliation. However further studies on the possible interference of other variables in the outcome are necessary.

Dalgarno, P. (2008). "Buying Ayahuasca and other entheogens online: A word of caution." *Addiction Research & Theory* **16**(1): 1-4.

Since the mid 1990's a number of publications have appeared in the UK and Europe and stimulated interest in a number of psychoactive plants native to South and Central America that had previously been relatively obscure outside of their places of origin. While information describing the effects of these together with extraction techniques was widely available, the plants themselves remained difficult to source until the proliferation of online "headshops" trading in legal alternatives to controlled drugs. The main aim of this study was to assess users' own experience of accessibility of information available from online suppliers of these drugs. An online survey was carried out via relevant websites where the participants were users of such and such drugs. Measurements were done by semi-structured online interview. It was concluded that none of the online dealers provided any instruction regarding safety issues such as possible toxicity, methods of ingestion or possible interactions with other substances. Therefore, while the practice is legal, there remain larger ethical and moral questions to be addressed. [ABSTRACT FROM AUTHOR]

Davidov, V. (2013). "Amazonia as pharmacopia." *Critique of Anthropology* **33**(3): 243-262.

This article analyzes the commonly deployed imaginary of the Amazon as a pharmacopia – a cornucopia of ethnomedicinal cures unheard of in the West. Using several fictional narratives (two novels and a film) as a starting point, I explore how the Western imaginary of the Amazon as a pharmacopia is a discursive variation on the environmental imaginary of the Amazon as the “lungs of world” – a vulnerable entity of high import and in need of protection. Both the “lungs of the world” and the “pharmacopia” imaginaries construct the Amazon as a global commons. But I argue that while the “lungs of the world” narrative is conceptually anti-extractivist, as within it the Amazon’s value is attributed to its containment and intactness, which needs to be salvaged, the “pharmacopia” narrative legitimates certain contemporary forms of extraction in the Amazon, such as bioprospecting. Finally, I analyze the dislocations of indigenous ethnobotanical knowledge practices within these

representational geographies, and connect my analysis to the experiences of an indigenous Kichwa community in the Ecuadorian Amazon.

Davidov, V. M. (2010). "Shamans and Shams: The Discursive Effects of Ethnotourism in Ecuador." *The Journal of Latin American and Caribbean Anthropology* **15**(2): 387-410.

New commodified forms of shamanism have emerged in Kichwa communities due to the influx of tourists interested in the indigenous cultures of the Ecuadorian Amazon. Shamanic rituals are popular because they map onto the tourists' fantasies of cultural alterity, but the resulting economic exchanges raise issues of legitimacy and authenticity: tourism privileges the performative aspects of shamanism, rather than traditional training. As a result, Kichwa communities have seen a rise in "new" shamans skilled at shamanic performance, who have access to the hallucinogenic plants employed in the ritual, but lack the proper training traditionally associated with becoming a shaman. In this context the meaning and legitimacy of shamanic vocation is contested and constructed both interculturally and intraculturally.

de Araujo, D. B., et al. (2011). "Seeing with the eyes shut: Neural basis of enhanced imagery following ayahuasca ingestion." *Hum Brain Mapp*.

The hallucinogenic brew Ayahuasca, a rich source of serotonergic agonists and reuptake inhibitors, has been used for ages by Amazonian populations during religious ceremonies. Among all perceptual changes induced by Ayahuasca, the most remarkable are vivid "seeings." During such seeings, users report potent imagery. Using functional magnetic resonance imaging during a closed-eyes imagery task, we found that Ayahuasca produces a robust increase in the activation of several occipital, temporal, and frontal areas. In the primary visual area, the effect was comparable in magnitude to the activation levels of natural image with the eyes open. Importantly, this effect was specifically correlated with the occurrence of individual perceptual changes measured by psychiatric scales. The activity of cortical areas BA30 and BA37, known to be involved with episodic memory and the processing of contextual associations, was also potentiated by Ayahuasca intake during imagery. Finally, we detected a positive modulation by Ayahuasca of BA 10, a frontal area involved with intentional prospective imagination, working memory and the processing of information from internal sources. Therefore, our results indicate that Ayahuasca seeings stem from the activation of an extensive network generally involved with vision, memory, and intention. By boosting the intensity of recalled images to the same level of natural image, Ayahuasca lends a status of reality to inner experiences. It is therefore understandable why Ayahuasca was culturally selected over many centuries by rain forest shamans to facilitate mystical revelations of visual nature. *Hum Brain Mapp*, 2011. (c) 2011 Wiley-Liss, Inc.

de Castro-Neto, E. F., et al. (2013). "Changes in aminoacidergic and monoaminergic neurotransmission in the hippocampus and amygdala of rats after ayahuasca ingestion." *World J Biol Chem* **4**(4): 141-147.

AIM: To evaluate changes in neurotransmission induced by a psychoactive beverage ayahuasca in the hippocampus and amygdala of naive rats. METHODS: The level of monoamines, their main metabolites and amino acid neurotransmitters concentrations were quantified using high performance liquid chromatography (HPLC). Four groups of rats were employed: saline-treated and rats receiving 250, 500 and 800 mg/kg of ayahuasca infusion (gavage). Animals were killed 40 min after drug ingestion and the structures stored at -80 degrees C until HPLC assay. The data from all groups were compared using Analysis of

variance and Scheffe as post test and $P < 0.05$ was accepted as significant. RESULTS: The results showed decreased concentrations of glycine (GLY) (0.13 ± 0.03 vs 0.29 ± 0.07 , $P < 0.001$) and gamma-aminobutyric acid (GABA) (1.07 ± 0.14 vs 1.73 ± 0.25 , $P < 0.001$) in the amygdala of rats that received 500 of ayahuasca. Animals that ingested 800 mg/kg of ayahuasca also showed a reduction of GLY level (0.11 ± 0.01 vs 0.29 ± 0.07 , $P < 0.001$) and GABA (0.98 ± 0.06 vs 1.73 ± 0.25 , $P < 0.001$). In the hippocampus, increased GABA levels were found in rats that received all ayahuasca doses: 250 mg/kg (1.29 ± 0.19 vs 0.84 ± 0.21 , $P < 0.05$); 500 mg/kg (2.23 ± 0.38 vs 0.84 ± 0.21 , $P < 0.05$) and 800 mg/kg (1.98 ± 0.92 vs 0.84 ± 0.21 , $P < 0.05$). In addition, an increased utilization rate of all monoamines was found in the amygdala after ayahuasca administration in doses: 250 mg/kg (noradrenaline: 0.16 ± 0.02 vs 0.36 ± 0.06 , $P < 0.01$; dopamine: 0.39 ± 0.012 vs 2.39 ± 0.84 , $P < 0.001$; serotonin: 1.02 ± 0.22 vs 4.04 ± 0.91 , $P < 0.001$), 500 mg/kg (noradrenaline: 0.08 ± 0.02 vs 0.36 ± 0.06 , $P < 0.001$; dopamine: 0.33 ± 0.19 vs 2.39 ± 0.84 , $P < 0.001$; serotonin: 0.59 ± 0.08 vs 4.04 ± 0.91 , $P < 0.001$) and 800 mg/kg (noradrenaline: 0.16 ± 0.04 vs 0.36 ± 0.06 , $P < 0.001$; dopamine: 0.84 ± 0.65 vs 2.39 ± 0.84 , $P < 0.05$; serotonin: 0.36 ± 0.02 vs 4.04 ± 0.91 , $P < 0.001$). CONCLUSION: Our data suggest increased release of inhibitory amino acids by the hippocampus and an increased utilization rate of monoamines by the amygdala after different doses of ayahuasca ingestion.

de L. Osório, F., et al. (2015). "Antidepressant effects of a single dose of ayahuasca in patients with recurrent depression: a preliminary report." Revista Brasileira de Psiquiatria **37**(1): 13-20.

Objectives: Ayahuasca (AYA), a natural psychedelic brew prepared from Amazonian plants and rich in dimethyltryptamine (DMT) and harmine, causes effects of subjective well-being and may therefore have antidepressant actions. This study sought to evaluate the effects of a single dose of AYA in six volunteers with a current depressive episode. Methods: Open-label trial conducted in an inpatient psychiatric unit. Results: Statistically significant reductions of up to 82% in depressive scores were observed between baseline and 1, 7, and 21 days after AYA administration, as measured on the Hamilton Rating Scale for Depression (HAM-D), the Montgomery-Åsberg Depression Rating Scale (MADRS), and the Anxious-Depression subscale of the Brief Psychiatric Rating Scale (BPRS). AYA administration resulted in nonsignificant changes in Young Mania Rating Scale (YMRS) scores and in the thinking disorder subscale of the BPRS, suggesting that AYA does not induce episodes of mania and/or hypomania in patients with mood disorders and that modifications in thought content, which could indicate psychedelic effects, are not essential for mood improvement. Conclusions: These results suggest that AYA has fast-acting anxiolytic and antidepressant effects in patients with a depressive disorder. [ABSTRACT FROM AUTHOR]

de Rios, M. D. and C. S. Grob (2005). "Ayahuasca use in cross-cultural perspective." J Psychoactive Drugs **37**(2): 119-121.

de Rios, M. D., et al. (2002). "Hallucinogens and redemption." J Psychoactive Drugs **34**(3): 239-248.

This article examines drug substitution with regard to hallucinogens (ayahuasca, ibogaine, peyote and LSD) set within the concept of redemption. The model examines both religious and secular approaches to the contemporary use of hallucinogens in drug substitution, both by scientists and in religious settings worldwide. The redemptive model posits that the proper use of one psychoactive substance within a spiritual or clinical context helps to free an individual from the adverse effects of their addiction to another substance and thus restores them as functioning members of their community or group. Data is drawn from the

U.S., Brazil, Peru, and West Africa. Two principle mechanisms for this are proposed: the psychological mechanism of suggestibility is examined in terms of the individual reaching abstinence goals from addictive substances such as alcohol and opiates. Neurophysiological and neurochemical mechanisms to understand the efficacy of such substitution are highlighted from ongoing research on hallucinogens. Research by two of the authors with the Unaio do Vegetal (UDV) Church in Brazil is examined in terms of the model.

de Rios, M. D., et al. (2005). "Ayahuasca in adolescence: Qaualitative results." *J Psychoactive Drugs* **37**(2): 135-139.

Qualitative research was conducted in Brazil among 28 ayahuasca-consuming adolescents members of the Uniao do Vegetal Church, and 28 adolescents who never used ayahuasca. They were compared on a number of qualitative variables, including vignettes measuring moral and ethical concerns. Psychocultural studies utilizing co-occurrences of variables in the realm of qualitative studies are useful in understanding and complementing quantitative studies also conducted among this population. Qualitative data show that the teens in the Uniao do Vegetal religion appear to be healthy, thoughtful, considerate and bonded to their families and religious peers. This study examines the modern use of a powerful hallucinogenic compound within a legal religious context, and the youth who participated in these ayahuasca religious ceremonies (usually with parents and other family members) appeared not to differ from their nonayahuasca-using peers. This study helps to elucidate the full range of effects of plant hallucinogenic use within a socially-sanctioned, elder-facilitated and structured religious context.

Díaz, J. (2010). "Sacred plants and visionary consciousness." *Phenomenology and the Cognitive Sciences* **9**(2): 159-170.

Botanical preparations used by shamans in rituals for divination, prophecy, and ecstasy contain widely different psychoactive compounds, which are incorrectly classified under a single denomination such as "hallucinogens," "psychedelics," or "entheogens." Based on extensive ethnopharmacological search, I proposed a psychopharmacological classification of magic plants in 1979. This paper re-evaluates this taxonomy in the context of consciousness research. Several groups of psychodysleptic magic plants are proposed: (1) hallucinogens—psilocybin mushrooms, mescaline cacti, dimethyltryptamine snuffs, and the synthetic ergoline lysergic acid diethylamide induce strong perceptual changes, affective intensification, and cognitive enhancement. Their ethnobotanical uses include long lasting divination rituals, prophecy, and sacramental practice. (2) Trance-inducers—ergoline Convolvulaceae and South American Banisteriopsis produce quietness, abstraction, lethargy, mild sensorial and cognitive changes, and salient visual imagery changes used in trance rituals and specific divination practices. (3) Cognodysleptics—marijuana (tetrahydrocannabinol) and other terpene-containing plants induce changes in thought, imagination, and affective functions and are used in short-term divination or oneiromancy. (4) Deliriant—tropane-containing Solanaceae, wild tobacco, and Amanita muscaria (muscimol) induce a delirium characterized by dim and clouded consciousness, stupor, confusion, disorientation, perception distortion, difficulties in recollection, anxiety, irritability, excitation, and behavioral disorganization employed in sorcery, purification, or exorcism rituals. The core mental effects required for a drug to be used in shamanistic rituals include light-headedness, enhanced imagery, and experience intensification. This constellation was the reason why, in his classification of psychoactive compounds, the pioneer German psychopharmacologist Louis Lewin established in 1924 a group of drugs under the appropriate name of Phantastica.

Djamshidian, A., et al. (2015). "Banisteriopsis caapi, a Forgotten Potential Therapy for Parkinson's Disease?" *Movement Disorders Clinical Practice*: n/a-n/a.

Banisteriopsis caapi, a liana indigenous to the Amazon basin with metanomic properties and possible anti-depressant effects is one of the natural sources of harmala alkaloids. A summary of early trials with extracts of Banisteriopsis caapi and Peganum harmala (from which harmine was first isolated) in the 1920s and 1930s on various forms of parkinsonism is given as well as a brief overview of the known pharmacological properties of harmine. Despite its earlier abandonment because of perceived weaker efficacy than solanaceous alkaloids like scopolamine and hyoscyne we propose that harmine should be reconsidered as a potential rapidly acting anti-Parkinsonian agent.

Doering-Silveira, E., et al. (2005). "Report on psychoactive drug use among adolescents using ayahuasca within a religious context." *J Psychoactive Drugs* **37**(2): 141-144.

Ritual use of ayahuasca within the context of the Brazilian ayahuasca churches often starts during late childhood or early adolescence. Premature access to psychoactive drugs may represent a risk factor for drug misuse. Conversely, religious affiliation seems to play a protective role in terms of substance abuse. The objective of this study was to describe patterns of drug use in a sample of adolescents using ayahuasca within a religious setting. Forty-one adolescents from a Brazilian ayahuasca sect were compared with 43 adolescents who never drank ayahuasca. No significant differences were identified in terms of lifetime substance consumption. Throughout the previous year period, ayahuasca adolescents used less alcohol (46.31%) than the comparison group (74.4%). Recent use of alcohol was also more frequent among the latter group (65.1%) than among ayahuasca drinkers (32.5%). Although not statistically significant, slight differences in terms of patterns of drug use were definitely observed among groups. Despite their early exposure to a hallucinogenic substance, adolescents using ayahuasca in a controlled setting were mostly comparable to controls except for a considerably smaller proportion of alcohol users. Religious affiliation may have played a central role as a possible protective factor for alcohol use. Thus, ayahuasca seems to be a relatively safe substance as far as drug misuse is concerned.

Doering-Silveira, E., et al. (2005). "Ayahuasca in adolescence: a neuropsychological assessment." *J Psychoactive Drugs* **37**(2): 123-128.

The purpose of the study was to evaluate neuropsychologically adolescents who use ayahuasca in a religious context. A battery of neuropsychological tests was administered to adolescents who use ayahuasca. These subjects were compared to a matched control group of adolescents who did not use ayahuasca. The controls were matched with regards to sex, age, and education. The neuropsychological battery included tests of speeded attention, visual search, sequencing, psychomotor speed, verbal and visual abilities, memory, and mental flexibility. The statistical results for subjects from matched controls on neuropsychological measures were computed using independent t-tests. Overall, statistical findings suggested that there was no significant difference between the two groups on neuropsychological measures. Even though, the data overall supports that there was not a difference between ayahuasca users and matched controls on neuropsychological measures, further studies are necessary to support these findings.

dos Santos, R., et al. (2012). "Pharmacology of ayahuasca administered in two repeated doses." *Psychopharmacology* **219**(4): 1039-1053.

Rationale: Ayahuasca is an Amazonian tea containing the natural psychedelic 5-HT 2A/2C/1A agonist N, N -dimethyltryptamine (DMT). It is used in ceremonial contexts for its visionary properties. The human pharmacology of ayahuasca has been well characterized following its administration in single doses.

Objectives: To evaluate the human pharmacology of ayahuasca in repeated doses and assess the potential occurrence of acute tolerance or sensitization. Methods In a double-blind, crossover, placebo-controlled clinical trial, nine experienced psychedelic drug users received PO the two following treatment combinations at least 1 week apart: (a) a lactose placebo and then, 4 h later, an ayahuasca dose; and (b) two ayahuasca doses 4 h apart. All ayahuasca doses were freeze-dried Amazonian-sourced tea encapsulated to a standardized 0.75 mg DMT/kg bodyweight. Subjective, neurophysiological, cardiovascular, autonomic, neuroendocrine, and cell immunity measures were obtained before and at regular time intervals until 12 h after first dose administration.

Results: DMT plasma concentrations, scores in subjective and neurophysiological variables, and serum prolactin and cortisol were significantly higher after two consecutive doses. When effects were standardized by plasma DMT concentrations, no differences were observed for subjective, neurophysiological, autonomic, or immunological effects. However, we observed a trend to reduced systolic blood pressure and heart rate, and a significant decrease for growth hormone (GH) after the second ayahuasca dose.

Conclusions: Whereas there was no clear-cut tolerance or sensitization in the psychological sphere or most physiological variables, a trend to lower cardiovascular activation was observed, together with significant tolerance to GH secretion.

dos Santos, R., et al. (2011). "Autonomic, neuroendocrine, and immunological effects of ayahuasca: a comparative study with d-amphetamine." *J Clin Psychopharmacol* **31**(6): 717-726.

Ayahuasca is an Amazonian psychotropic plant tea combining the 5-HT_{2A} agonist N,N-dimethyltryptamine (DMT) and monoamine oxidase-inhibiting β -carboline alkaloids that render DMT orally active. The tea, obtained from *Banisteriopsis caapi* and *Psychotria viridis*, has traditionally been used for religious, ritual, and medicinal purposes by the indigenous peoples of the region. More recently, the syncretistic religious use of ayahuasca has expanded to the United States and Europe. Here we conducted a double-blind randomized crossover clinical trial to investigate the physiological impact of ayahuasca in terms of autonomic, neuroendocrine, and immunomodulatory effects. An oral dose of encapsulated freeze-dried ayahuasca (1.0 mg DMT/kg body weight) was compared versus a placebo and versus a positive control (20 mg d-amphetamine) in a group of 10 healthy volunteers. Ayahuasca led to measurable DMT plasma levels and distinct subjective and neurophysiological effects that were absent after amphetamine. Both drugs increased pupillary diameter, with ayahuasca showing milder effects. Prolactin levels were significantly increased by ayahuasca but not by amphetamine, and cortisol was increased by both, with ayahuasca leading to the higher peak values. Ayahuasca and amphetamine induced similar time-dependent modifications in lymphocyte subpopulations. Percent CD4 and CD3 were decreased, whereas natural killer cells were increased. Maximum changes occurred around 2 hours, returning to baseline levels at 24 hours. In conclusion, ayahuasca displayed moderate sympathomimetic effects, significant neuroendocrine stimulation, and a time-dependent modulatory effect on cell-mediated immunity. Future studies on the health

impact of long-term ayahuasca consumption should consider the assessment of immunological status in regular users.

dos Santos, R. G. (2013). "A critical evaluation of reports associating ayahuasca with life-threatening adverse reactions." *J Psychoactive Drugs* **45**(2): 179-188.

Ayahuasca is a botanical hallucinogenic preparation traditionally consumed by Northwestern Amazonian indigenous groups. Scientific evidence suggests good tolerability after acute administration of ayahuasca and also after years or even decades of its ritual consumption. Nevertheless, some scientific and media reports associate ayahuasca or some of its alkaloids with severe intoxications. The purpose of the present text is to do a critical evaluation of these reports. The evaluation of the cases highlights the fact that some lack accurate forensic/toxicological information, while others are not directly relevant to traditional ayahuasca preparations. These limitations reduce the possibility of an accurate risk assessment, which could indicate potential contraindications and susceptibilities for ayahuasca consumption. Nevertheless, even with these limitations, the cases suggest that previous cardiac and hepatic pathologies and current use of serotonergic drugs/medications are contraindications to ayahuasca use, and that caution should be taken when using different botanical species and extracted/synthetic alkaloids to prepare ayahuasca analogues.

dos Santos, R. G. (2013). "Safety and side effects of ayahuasca in humans--an overview focusing on developmental toxicology." *J Psychoactive Drugs* **45**(1): 68-78.

Despite being relatively well studied from a botanical, chemical, and (acute) pharmacological perspective, little is known about the possible toxic effects of ayahuasca (an hallucinogenic brew used for magico-ritual purposes) in pregnant women and in their children, and the potential toxicity of long-term ayahuasca consumption. It is the main objective of the present text to do an overview of the risks and possible toxic effects of ayahuasca in humans, reviewing studies on the acute ayahuasca administration to humans, on the possible risks associated with long-term consumption by adults and adolescents, and on the possible toxic effects on pregnant animals and in their offspring. Acute ayahuasca administration, as well as long-term consumption of this beverage, does not seem to be seriously toxic to humans. Although some nonhuman developmental studies suggested possible toxic effects of ayahuasca or of some of its alkaloids, the limited human literature on adolescents exposed to ayahuasca as early as in the uterus reports no serious toxic effects of the ritual consumption of the brew. Researchers must take caution when extrapolating nonhuman data to humans and more data are needed in basic and human research before a definite opinion can be made regarding the possible toxic effects of ayahuasca in pregnant women and in their children.

Doyle, R. (2012). "Healing with Plant Intelligence: A Report from Ayahuasca." *Anthropology of Consciousness* **23**(1): 28-43.

Numerous and diverse reports indicate the efficacy of shamanic plant adjuncts (e.g., iboga, ayahuasca, psilocybin) for the care and treatment of addiction, post-traumatic stress disorder, cancer, cluster headaches, and depression. This article reports on a first-person healing of lifelong asthma and atopic dermatitis in the shamanic context of the contemporary Peruvian Amazon and the sometimes digital ontology of online communities. The article suggests that emerging language, concepts, and data drawn from the sciences of plant signaling and behavior regarding "plant intelligence" provide a useful heuristic

framework for comprehending and actualizing the healing potentials of visionary plant “entheogens” (Wasson 1971) as represented both through first-person experience and online reports. Together with the paradigms and practices of plant signaling, biosemiotics provides a robust and coherent map for contextualizing the often reported experience of plant communication with ayahuasca and other entheogenic plants. The archetype of the “plant teachers” (called Doctores in the upper Amazon) is explored as a means for organizing and interacting with this data within an epistemology of the “hallucination/perception continuum (Fischer 1975). “Ecodelic” is offered as a new linguistic interface alongside “entheogen” (Wasson 1971).

Echenhofer, F. (2012). "The Creative Cycle Processes Model of Spontaneous Imagery Narratives Applied to the Ayahuasca Shamanic Journey." *Anthropology of Consciousness* **23**(1): 60-86.

Ayahuasca is an Amazonian psychoactive shamanic brew that often elicits spontaneous, intense, and meaningful imagery narratives related to psychological and physical healing, problem solving, knowledge acquisition, community cohesion, creativity, and spiritual development. My EEG and phenomenology ayahuasca research found it caused the greatest changes in EEG beta coherence from 25 to 30 cycles per second compared to a resting state before ayahuasca ingestion. Enhanced beta coherence indexes significantly greater information exchange between cortical regions and is congruent with the reported enhanced richness, complexity, and profundity of ayahuasca experiences. I developed the creative cycle processes model that identifies in ayahuasca reports distinct experiential change processes and describes how these processes, neuroscience, psychotherapy, mythological, and other transdisciplinary evidence can be coherently integrated to explain ayahuasca benefits. The model suggests three change process stages together underlie one emergent dynamic creative cycle process. The sequential stages are Form dismantling and healing processes, form creation processes, where novel forms spontaneously combine, and form expression processes, where emergent experiences are embodied. The model suggests that these three stages repeat cyclically in human development in an ongoing process of dismantling and generation producing more creative experiences and expressive forms.

Espinoza, Y. (2014). "Sexual healing with Amazonian plant teachers: a heuristic inquiry of women's spiritual-erotic awakenings." *Sexual & Relationship Therapy* **29**(1): 109.

This article explores how women's sexual/spiritual lives were transformed with sacred Amazonian plant teachers (i.e. plants believed to have spirits that communicate with humans). The research was guided by the belief that the practice of vegetalismo (a South American healing tradition that uses plant teachers for healing) holds important lessons for guiding women's sexual/spiritual lives and possibly for future plant-facilitated psychotherapy for women who have experienced sexual trauma. A heuristic research methodology was utilized involving interviews with seven North American women who participated in ayahuasca ceremonies and plant diets within the Shipibo vegetalista tradition of Peru. The findings highlighted that sexual trauma was healed through energetic purification and openings on the physical, emotional, mental, and spiritual levels. The core themes identified from the data analysis were: purification and support for reproductive health, increased sensory awareness, transforming relationship with self, empowered decision-making, enhanced intimacy with others, increased cognitive awareness, connecting with subtle energies, and connecting with God. [ABSTRACT FROM AUTHOR]

Fábregas, J. M., et al. (2010). "Assessment of addiction severity among ritual users of ayahuasca." *Drug and Alcohol Dependence* **111**(3): 257-261.

Ayahuasca is a psychoactive beverage used for magico-religious purposes in the Amazon. Recently, Brazilian syncretic churches have helped spread the ritual use of ayahuasca abroad. This trend has raised concerns that regular use of this N,N-dimethyltryptamine-containing tea may lead to the medical and psychosocial problems typically associated with drugs of abuse. Here we assess potential drug abuse-related problems in regular ayahuasca users. Addiction severity was assessed using the Addiction Severity Index (ASI), and history of alcohol and illicit drug use was recorded. In Study 1, jungle-based ayahuasca users (n = 56) were compared vs. rural controls (n = 56). In Study 2, urban-based ayahuasca users (n = 71) were compared vs. urban controls (n = 59). Follow-up studies were conducted 1 year later. In both studies, ayahuasca users showed significantly lower scores than controls on the ASI Alcohol Use, and Psychiatric Status subscales. The jungle-based ayahuasca users showed a significantly higher frequency of previous illicit drug use but this had ceased at the time of examination, except for cannabis. At follow-up, abstinence from illicit drug use was maintained in both groups except for cannabis in Study 1. However, differences on ASI scores were still significant in the jungle-based group but not in the urban group. Despite continuing ayahuasca use, a time-dependent worsening was only observed in one subscale (Family/Social relationships) in Study 2. Overall, the ritual use of ayahuasca, as assessed with the ASI in currently active users, does not appear to be associated with the deleterious psychosocial effects typically caused by other drugs of abuse.

Favaro, V. M., et al. (2015). "Effects of Long-Term Ayahuasca Administration on Memory and Anxiety in Rats." *PLoS ONE* **10**(12): 1-10.

Ayahuasca is a hallucinogenic beverage that combines the action of the 5-HT_{2A/2C} agonist N,N-dimethyltryptamine (DMT) from *Psychotria viridis* with the monoamine oxidase inhibitors (MAOIs) induced by beta-carbonyls from *Banisteriopsis caapi*. Previous investigations have highlighted the involvement of ayahuasca with the activation of brain regions known to be involved with episodic memory, contextual associations and emotional processing after ayahuasca ingestion. Moreover long term users show better performance in neuropsychological tests when tested in off-drug condition. This study evaluated the effects of long-term administration of ayahuasca on Morris water maze (MWM), fear conditioning and elevated plus maze (EPM) performance in rats. Behavior tests started 48h after the end of treatment. Freeze-dried ayahuasca doses of 120, 240 and 480 mg/kg were used, with water as the control. Long-term administration consisted of a daily oral dose for 30 days by gavage. The behavioral data indicated that long-term ayahuasca administration did not affect the performance of animals in MWM and EPM tasks. However the dose of 120 mg/kg increased the contextual conditioned fear response for both background and foreground fear conditioning. The tone conditioned response was not affected after long-term administration. In addition, the increase in the contextual fear response was maintained during the repeated sessions several weeks after training. Taken together, these data showed that long-term ayahuasca administration in rats can interfere with the contextual association of emotional events, which is in agreement with the fact that the beverage activates brain areas related to these processes. [ABSTRACT FROM AUTHOR]

Fortunato, J. J., et al. (2010). "Chronic administration of harmine elicits antidepressant-like effects and increases BDNF levels in rat hippocampus." *Journal of Neural Transmission*(10): 1131.

A growing body of evidence has pointed to the [beta]-carboline harmine as a potential therapeutic target for the treatment of major depression. The present study was aimed to evaluate behavioural and molecular effects of the chronic treatment with harmine and imipramine in rats. To this aim, rats were treated for 14 days once a day with harmine (5, 10 and 15 mg/kg) and imipramine (10, 20 and 30 mg/kg) and then subjected to the forced swimming and open-field tests. Harmine and imipramine, at all doses tested, reduced immobility time of rats compared with the saline group. Imipramine increased the swimming time at 20 and 30 mg/kg and harmine increased swimming time at all doses. The climbing time increased in rats treated with imipramine (10 and 30 mg/kg) and harmine (5 and 10 mg/kg), without affecting spontaneous locomotor activity. Brain-derived neurotrophic factor (BDNF) hippocampal levels were assessed in imipramine and harmine-treated rats by ELISA sandwich assay. Interestingly, chronic administration of harmine at the higher doses (10 and 15 mg/kg), but not imipramine, increased BDNF protein levels in rat hippocampus. Finally, these findings further support the hypothesis that harmine could bring about behavior and molecular effects, similar to antidepressants drugs.

Fotiou, E. (2012). "Working with "La Medicina": Elements of Healing in Contemporary Ayahuasca Rituals." *Anthropology of Consciousness* **23**(1): 6-27.

Healing is an essential aspect of Amazonian mestizo shamanism. Not only is it one of the most commonly quoted motives for Westerners for participating in ayahuasca ceremonies, but most elements of an ayahuasca ceremony are aimed to heal and protect. This article is purely ethnographic, and its purpose is to provide insight into the ways healing is conceived by both ayahuasqueros and Western participants in the context of shamanic tourism in Iquitos, Peru. I show that illness is perceived to have physical, psychological, and spiritual dimensions, and healing is a complex process that takes place in and outside of ceremony. I show that a multitude of elements in a ceremony converge to address all three dimensions of illness, one of the most important ones being the element of personal crisis. Often present in healing narratives, the element of crisis becomes the catalyst for positive transformation, including physical, psychological, and spiritual healing. Rather than being seen as a singular event, healing in this context is seen as a process, in which the patient carries the responsibility for their own healing.

Frecska, E. (2008). "Ayahuasca versus violence--a case report." *Neuropsychopharmacol Hung* **10**(2): 103-106.

We have limited resources available for the treatment and prevention of violent behavior. The usefulness of the most commonly used medications, namely the selective serotonin-reuptake inhibitor [SSRI] agents for the above purpose is a debated issue in the psychiatric literature. The aim of this case report is to add an ethnopharmacological perspective to the management of human aggression. Particularly, attention is called to the potential prosocial effect of the Amazonian beverage, ayahuasca--a decoctum, which has been used traditionally for multiple medico-religious purposes by numerous indigenous groups of the Upper Amazon--and has been found to be useful in crisis intervention, achieving redemption, as well as eliciting cathartic feelings with moral content.

Frecska, E., et al. (2012). "Enhancement of Creative Expression and Entoptic Phenomena as After-Effects of Repeated Ayahuasca Ceremonies." *J Psychoactive Drugs* **44**(3): 191-199.

Studying the effect of psychedelic substances on expression of creativity is a challenging problem. Our primary objective was to study the psychometric measures of creativity after a

series of ayahuasca ceremonies at a time when the acute effects have subsided. The secondary objective was to investigate how entoptic phenomena emerge during expression of creativity. Forty individuals who were self-motivated participants of ayahuasca rituals in Brazil completed the visual components of the Torrance Tests of Creative Thinking before and the second day after the end of a two-week long ceremony series. Twenty-one comparison subjects who did not participate in recent psychedelic use also took the Torrance tests twice, two weeks apart. Repeated ingestion of ayahuasca in the ritual setting significantly increased the number of highly original solutions and phosphenic responses. However, participants in the ayahuasca ceremonies exhibited more phosphenic solutions already at the baseline, probably due to the fact that they had more psychedelic experiences within six months prior to the study than the comparison subjects did. This naturalistic study supports the notion that some measures of visual creativity may increase after ritual use of ayahuasca, when the acute psychoactive effects are receded. It also demonstrates an increased entoptic activity after repeated ayahuasca ingestion.

Gable, R. S. (2007). "Risk assessment of ritual use of oral dimethyltryptamine (DMT) and harmala alkaloids." *Addiction* **102**(1): 24-34.

Aim To extend previous reviews by assessing the acute systemic toxicity and psychological hazards of a dimethyltryptamine and β -carboline brew (ayahuasca/hoasca) used in religious ceremonies. **Method** A systematic literature search, supplemented by interviews with ceremony participants. **Results** No laboratory animal models were located that tested the acute toxicity or the abuse potential of ayahuasca. Separate animal studies of the median lethal dose of dimethyltryptamine (DMT) and of several harmala alkaloids indicated that a lethal dose of these substances in humans is probably greater than 20 times the typical ceremonial dose. Adverse health effects may occur from casual use of ayahuasca, particularly when serotonergic substances are used in conjunction. DMT is capable of inducing aversive psychological reactions or transient psychotic episodes that resolve spontaneously in a few hours. There was no evidence that ayahuasca has substantial or persistent abuse potential. Long-term psychological benefits have been documented when ayahuasca is used in a well-established social context. **Conclusion** A decoction of DMT and harmala alkaloids used in religious ceremonies has a safety margin comparable to codeine, mescaline or methadone. The dependence potential of oral DMT and the risk of sustained psychological disturbance are minimal.

Gallimore, A. R. (2013). "Building Alien Worlds-- The Neuropsychological and Evolutionary Implications of the Astonishing Psychoactive Effects of N,N-Dimethyltryptamine (DMT)." *Journal of Scientific Exploration* **27**(3): 455-503.

Arguably the most remarkable property of the human brain is its ability to construct the world that appears to consciousness. The brain is capable of building worlds during waking life, but also in the complete absence of extrinsic sensory data, entirely from intrinsic thalamocortical activity, as during dreaming. DMT, an extraordinary psychedelic, perturbs brain activity such that indescribably bizarre and apparently alien worlds are built. This property of DMT continues to defy explanation. However, by regarding this unique molecule as equivalent to serotonin, an endogenous neuromodulator with a long-standing relationship with the brain, DMT's effects may be explained. Serotonin has evolved to hold the brain's thalamocortical system in a state in which the consensus world is built. When serotonin is replaced by DMT, the thalamocortical system shifts into an equivalent state, but one in which an apparently alien world is built. This suggests that DMT may be an ancestral neuromodulator, at one time secreted endogenously in psychedelic concentrations--a

function apparently now lost. However, DMT maintains a number of unique pharmacological characteristics and a peculiar affinity with the human brain that supports this model. Thus, the modern practice of ingesting exogenous DMT may be the reconstitution of an ancestral function. [ABSTRACT FROM AUTHOR]

Gastelumendi, E. (2010). Ayahuasca: current interest in an ancient ritual neuropsychiatric disorders. K. Miyoshi, Y. Morimura and K. Maeda, Springer Japan: 279-286.

The amazonic brew ayahuasca, with strong psychoactive properties, and which has been used probably for millennia by Amazon tribes as their main "medicine," is currently being used by some groups in cities in Latin America and abroad by people seeking curative effects or transcendent and meaningful experiences. At the same time, research on its effects in treating depression and in neuroimaging is being carried out. The brew is made of a blend of at least two different plants cooked together that potentiate each other: the stem of a vine, called ayahuasca proper (*Banisteropsis caapi*), and the leaves of a bush, chacruna (*Psychotria viridis*). In this chapter, the ritual is described and the pharmacodynamics of the brew are discussed, as well as some of its effects in the brain and in the subjective experience of the self. Two vignettes of patients in analytical psychotherapy are presented to illustrate its effects. Reflections on the risks and benefits of its use are then shared.

Gaujac, A., et al. (2013). "Determination of N,N-dimethyltryptamine in beverages consumed in religious practices by headspace solid-phase microextraction followed by gas chromatography ion trap mass spectrometry." *Talanta* **106**: 394-398.

A novel analytical approach combining solid-phase microextraction (SPME)/gas chromatography ion trap mass spectrometry (GC-IT-MS) was developed for the detection and quantification N,N-dimethyltryptamine (DMT), a powerful psychoactive indole alkaloid present in a variety of South American indigenous beverages, such as ayahuasca and vinho da jurema. These particular plant products, often used within a religious context, are increasingly consumed throughout the world following an expansion of religious groups and the availability of plant material over the Internet and high street shops. The method described in the present study included the use of SPME in headspace mode combined GC-IT-MS and included the optimization of the SPME procedure using multivariate techniques. The method was performed with a polydimethylsiloxane/divinylbenzene (PDMS/DVB) fiber in headspace mode (70 min at 60 degrees C) which resulted in good precision (RSD<8.6%) and accuracy values (71-109%). Detection and quantification limits obtained for DMT were 0.78 and 9.5 mg L⁻¹, respectively and good linearity (1.56-300 mg L⁻¹, r(2)=0.9975) was also observed. In addition, the proposed method showed good robustness and allowed for the minimization of sample manipulation. Five jurema beverage samples were prepared in the laboratory in order to study the impact of temperature, pH and ethanol on the ability to extract DMT into solution. The developed method was then applied to the analysis of twelve real ayahuasca and vinho da jurema samples, obtained from Brazilian religious groups, which revealed DMT concentration levels between 0.10 and 1.81 g L⁻¹.

Gearin, A. K. (2015). "'Whatever you want to believe' kaleidoscopic individualism and ayahuasca healing in Australia." *The Australian Journal of Anthropology*: 1-14.

Over the last fifteen years the use of the indigenous Amazonian psychoactive beverage ayahuasca has been reimagined in alternative healing circles of Western countries. This paper explores the practice of ayahuasca neoshamanism in Australia and examines ways in which acts of vomiting and ecstatic trance-visions involve heightened affective states and

moral projects of healing. Aspects of everyday life are purged, rearticulated, and reconstituted in rituals where codes of conduct and discursive exchange encourage practices of personal evaluation and reflexivity that appear to index ideologies of individualism. Through exploring social and discursive prohibitions and forms of sensory organisation, the practice of drinking ayahuasca in Australia is shown to be constituted by ritual conventions that define the individual as autonomous and responsible in relation to ecstatic trance and articulations of wellbeing.

Goodwin, F. (2015). "Healing with plant medicine." *Therapy Today* **26**(1): 24-27.

A personal narrative is presented which explores the author's experience of traveling into the Peruvian jungle to discover the therapeutic benefits of the plant medicine ayahuasca in treating anxiety and depression.

Gouzoulis-Mayfrank, E., et al. (2005). "Psychological Effects of (S)-Ketamine and N,N-Dimethyltryptamine (DMT): A Double-Blind, Cross-Over Study in Healthy Volunteers." *Pharmacopsychiatry* **38**(06): 301-311.

Introduction: Pharmacological challenges with hallucinogens are used as models for psychosis in experimental research. The state induced by glutamate antagonists such as phencyclidine (PCP) is often considered as a more appropriate model of psychosis than the state induced by serotonergic hallucinogens such as lysergic acid diethylamide (LSD), psilocybin and N,N-dimethyltryptamine (DMT). However, so far, the psychological profiles of the two types of hallucinogenic drugs have never been studied directly in an experimental within-subject design. Methods: Fifteen healthy volunteers were included in a double-blind, cross-over study with two doses of the serotonin 5-HT_{2A} agonist DMT and the glutamate N-methyl-d-aspartate (NMDA) antagonist (S)-ketamine. Results: Data are reported for nine subjects who completed both experimental days with both doses of the two drugs. The intensity of global psychological effects was similar for DMT and (S)-ketamine. However, phenomena resembling positive symptoms of schizophrenia, particularly positive formal thought disorder and inappropriate affect, were stronger after DMT. Phenomena resembling negative symptoms of schizophrenia, attention deficits, body perception disturbances and catatonia-like motor phenomena were stronger after (S)-ketamine. Discussion: The present study suggests that the NMDA antagonist model of psychosis is not overall superior to the serotonin 5-HT_{2A} agonist model. Rather, the two classes of drugs tend to model different aspects or types of schizophrenia. The NMDA antagonist state may be an appropriate model for psychoses with prominent negative and possibly also catatonic features, while the 5-HT_{2A} agonist state may be a better model for psychoses of the paranoid type.

Grob, C. S., et al. (1996). "Human psychopharmacology of hoasca, a plant hallucinogen used in ritual context in Brazil." *J Nerv Ment Dis* **184**(2): 86-94.

A multinational, collaborative, biomedical investigation of the effects of hoasca (ayahuasca), a potent concoction of plant hallucinogens, was conducted in the Brazilian Amazon during the summer of 1993. This report describes the psychological assessment of 15 long-term members of a syncretic church that utilizes hoasca as a legal, psychoactive sacrament as well as 15 matched controls with no prior history of hoasca ingestion. Measures administered to both groups included structured psychiatric diagnostic interviews, personality testing, and neuropsychological evaluation. Phenomenological assessment of the altered state experience as well as semistructured and open-ended life story interviews were conducted with the long-term use hoasca group, but not the hoasca-naive control group. Salient

findings included the remission of psychopathology following the initiation of hoasca use along with no evidence of personality or cognitive deterioration. Overall assessment revealed high functional status. Implications of this unusual phenomenon and need for further investigation are discussed.

Hagens, B. and S. Lansky (2012). "Personal Report: Significance of Community in an Ayahuasca Jungle Dieta." *Anthropology of Consciousness* **23**(1): 103-109.

What is the potential significance of community in a prolonged dieta (10-day restricted diet with regular ritual consumption of ayahuasca and other medicinal plants) in a remote jungle location in the Amazon basin of Peru? Pre-dieta experiences including how participants join the community, cleansing routines prior to departure to Peru, sharing with the shaman one's personal intentions and health history, and prior experience with medicinal and entheogenic plants are introduced. Dieta rituals such as tambo housing, meals, hygiene and maintenance, music, ceremony preparations, ceremonial and everyday dieta etiquette, and post-ceremony ritual and day of rest are considered. Bonding with the local support community and those who harvested and crafted the medicinal plant mixtures are evaluated in the context of both dieta and traditional indigenous goals of creating a spiritual practice community of love and trust that embraces people, plants, and all of earth and beyond.

Halberstadt, A. L. (2016). "Behavioral and pharmacokinetic interactions between monoamine oxidase inhibitors and the hallucinogen 5-methoxy-N,N-dimethyltryptamine." *Pharmacology Biochemistry and Behavior* **143**: 1-10.

Monoamine oxidase inhibitors (MAOIs) are often ingested together with tryptamine hallucinogens, but relatively little is known about the consequences of their combined use. We have shown previously that monoamine oxidase-A (MAO-A) inhibitors alter the locomotor profile of the hallucinogen 5-methoxy-N,N-dimethyltryptamine (5-MeO-DMT) in rats, and enhance its interaction with 5-HT_{2A} receptors. The goal of the present studies was to investigate the mechanism for the interaction between 5-MeO-DMT and MAOIs, and to determine whether other behavioral responses to 5-MeO-DMT are similarly affected. Hallucinogens disrupt prepulse inhibition (PPI) in rats, an effect typically mediated by 5-HT_{2A} activation. 5-MeO-DMT also disrupts PPI but the effect is primarily attributable to 5-HT_{1A} activation. The present studies examined whether an MAOI can alter the respective contributions of 5-HT_{1A} and 5-HT_{2A} receptors to the effects of 5-MeO-DMT on PPI. A series of interaction studies using the 5-HT_{1A} antagonist WAY-100,635 and the 5-HT_{2A} antagonist MDL 11,939 were performed to assess the respective contributions of these receptors to the behavioral effects of 5-MeO-DMT in rats pretreated with an MAOI. The effects of MAO-A inhibition on the pharmacokinetics of 5-MeO-DMT and its metabolism to bufotenine were assessed using liquid chromatography–electrospray ionization–selective reaction monitoring–tandem mass spectrometry (LC-ESI-SRM-MS/MS). 5-MeO-DMT (1 mg/kg) had no effect on PPI when tested 45-min post-injection but disrupted PPI in animals pretreated with the MAO-A inhibitor clorgyline or the MAO-A/B inhibitor pargyline. The combined effect of 5-MeO-DMT and pargyline on PPI was antagonized by pretreatment with either WAY-100,635 or MDL 11,939. Inhibition of MAO-A increased the level of 5-MeO-DMT in plasma and whole brain, but had no effect on the conversion of 5-MeO-DMT to bufotenine, which was found to be negligible. The present results confirm that 5-MeO-DMT can disrupt PPI by activating 5-HT_{2A}, and indicate that MAOIs alter 5-MeO-DMT pharmacodynamics by increasing its accumulation in the central nervous system.

Halpern, J. H., et al. (2008). "Evidence of health and safety in American members of a religion who use a hallucinogenic sacrament." **14**(8): SR15-SR22.

BACKGROUND: Ayahuasca is a South American hallucinogenic tea used as a sacrament by the Santo Daime Church, other religions, and traditional peoples. A recent U.S. Supreme Court decision indicates religious ayahuasca use is protected, but little is known about health consequences for Americans.

MATERIAL/METHODS: 32 (out of 40) American members of one branch of the Santo Daime Church were interviewed providing demographic information, physical exam, drug use timeline, a variety of psychological measures, and data about childhood conduct disorder. Subjects were asked about extent of Church participation, what is liked least and most about ayahuasca, and what health benefits or harms they attribute to ayahuasca.

RESULTS: Members usually attend services weekly (lifetime 269+/-314.7 ceremonies; range 20-1300). Physical exam and test scores revealed healthy subjects. Members claimed psychological and physical benefits from ayahuasca. 19 subjects met lifetime criteria for a psychiatric disorder, with 6 in partial remission, 13 in full remission, and 8 reporting induction of remission through Church participation. 24 subjects had drug or alcohol abuse or dependence histories with 22 in full remission, and all 5 with prior alcohol dependence describing Church participation as the turning point in their recovery.

CONCLUSIONS: Conclusions should not be extrapolated to hallucinogen abusers of the general public. For those who have religious need for ingesting ayahuasca, from a psychiatric and medical perspective, these pilot results substantiate some claims of benefit, especially if subjects interviewed fully reflect general membership. Further research is warranted with blinded raters, matched comparison groups, and other measures to overcome present study limitations.

Harris, R. and L. Gurel (2012). "A Study of Ayahuasca Use in North America." J Psychoactive Drugs **44**(3): 209-215.

Eighty-one subjects who used ayahuasca at least once in North America answered a lengthy set of open-ended questions and completed the 81-item After the Spiritual Experience Questionnaire. An additional 50 ayahuasca users were interviewed in person. The data for this study represent ayahuasca experience based on more than 2,267 ceremonies. A comparison group of 46 people attending a Catholic spiritual retreat weekend also completed the After the Spiritual Experience Questionnaire. A factor analysis of this questionnaire yielded three factors: Joy in Life, Relationship to the Sacred and Toxic Feelings. Although the ayahuasca users had significantly higher scores on the first two factors, the two groups had modest mean differences indicating a similar response to two very different spiritual experiences. This key finding strongly supports the view that ayahuasca users are engaged in an authentic process as spiritual in nature as that of the retreatants. The qualitative data revealed that ayahuasca users reduced their alcohol intake, ate healthier diets, enjoyed improved mood and greater self-acceptance and felt more loving and compassionate in their relationships. Seventy-four percent of the ayahuasca users said they had a relationship with and received ongoing guidance and support from the spirit of ayahuasca.

Hearn, K. (2013). "The Dark Side of Ayahuasca." Men's Journal **March**.

Every day, hundreds of tourists arrive in Iquitos, Peru, seeking spiritual catharsis or just to trip their heads off. But increasingly often their trip becomes a nightmare, and some of them don't go home at all.

Hoffmann, E., et al. (2001). "Effects of a psychedelic, tropical tea, ayahuasca, on the Electroencephalographic (EEG) activity of the human brain during a shamanistic ritual." MAPS Bulletin: 25-30.

EEG data from 12 volunteers participating in a workshop in Brazil were recorded under field conditions before and after a shamanistic ritual in which the psychoactive tea, ayahuasca, was consumed. Following three doses of the tea, the subjects showed strong and statistically significant increases of both EEG alpha (8-13Hz) and theta (4-8Hz) mean amplitudes compared to baseline while beta (13-20Hz) amplitudes were unchanged. The strongest increases of alpha activity were observed in the occipital lobes while alpha was unchanged in the frontal lobes. Theta amplitudes, on the other hand, were significantly increased in both occipital and frontal areas. Our data do not support previous findings of cortical activation with decreased alpha and increased beta activity caused by psychedelics (e.g. LSD, mescaline, psilocybin). They rather point to a similarity between the altered states produced by ayahuasca and marijuana which also stimulates the brain to produce more alpha waves. We suggest that these findings of increased EEG alpha and theta activity after drinking ayahuasca reflect an altered state of consciousness. In this state the subjects reported increased awareness of their subconscious processes. This is an altered state comparable to, however more profound than, the meditative state. Our results suggest that ingesting Ayahuasca may provide individuals with increased access to subconscious processes and feelings while in a wakeful, relaxed state. Thus, Ayahuasca has the potential to become a potent tool in the process of psychotherapy.

J, R., et al. (2004). "Effects of the South American Psychoactive Beverage Ayahuasca on Regional Brain Electrical Activity in Humans: A Functional Neuroimaging Study Using Low-Resolution Electromagnetic Tomography." *Neuropsychobiology* **50**(1): 89-101.

Ayahuasca, a South American psychotropic plant tea obtained from *Banisteriopsis caapi* and *Psychotria viridis*, combines monoamine oxidase-inhibiting β -carboline alkaloids with N,N-dimethyltryptamine (DMT), a psychedelic agent showing 5-HT_{2A} agonist activity. In a clinical research setting, ayahuasca has demonstrated a combined stimulatory and psychedelic effect profile, as measured by subjective effect self-assessment instruments and dose-dependent changes in spontaneous brain electrical activity, which parallel the time course of subjective effects. In the present study, the spatial distribution of ayahuasca-induced changes in brain electrical activity was investigated by means of low-resolution electromagnetic tomography (LORETA). Electroencephalography recordings were obtained from 18 volunteers after the administration of a dose of encapsulated freeze-dried ayahuasca containing 0.85 mg DMT/kg body weight and placebo. The intracerebral power density distribution was computed with LORETA from spectrally analyzed data, and subjective effects were measured by means of the Hallucinogen Rating Scale (HRS). Statistically significant differences compared to placebo were observed for LORETA power 60 and 90 min after dosing, together with increases in all six scales of the HRS. Ayahuasca decreased power density in the alpha-2, delta, theta and beta-1 frequency bands. Power decreases in the delta, alpha-2 and beta-1 bands were found predominantly over the

temporo-parieto-occipital junction, whereas theta power was reduced in the temporomedial cortex and in frontomedial regions. The present results suggest the involvement of unimodal and heteromodal association cortex and limbic structures in the psychological effects elicited by ayahuasca.

Kaufman, R. (2015). How might the Ayahuasca experience be a potential antidote to Western hegemony: A mixed methods study. Ann Arbor, Fielding Graduate University. **3714896**: 298.

This mixed-methods study researched people who have participated in traditional Indigenous Ayahuasca ceremonies to determine if the experience served as an antidote to dominant cultural hegemony. Forty-four participants completed the quantitative scaled questionnaire and 11 qualitative interviews were conducted for the study. Findings reveal five antidotal movements toward countering the uninvestigated assumptions dictated by hierarchical systems common to Western culture. These include self-determination; increased relationality; reduced anthropocentrism; reduced consumerism/materialism; movement toward more critical awareness of status-quo assumptions. The most profound transformations toward counter-hegemonic dispositions occurred in concert with certain dynamics I describe relating to several variables. I conclude that working with ayahuasca moves people toward Indigenous ways of understanding the world.

Kavenská, V., et al. (2015). "Ayahuasca Tourism: Participants in Shamanic Rituals and their Personality Styles, Motivation, Benefits and Risks." J Psychoactive Drugs **47**(5): 351-359.

Ayahuasca continues to attract tourists to South America, where there has been a growth in the number of centers offering hallucinogenic ayahuasca experiences. The aims of this study were to (1) discover the reasons foreigners seek this type of experience; (2) define what an ayahuasca experience entails; (3) discover subjective perceptions of ayahuasca's benefits and risks; and (4) describe personality styles of participants using the personality questionnaire (PSSI). Participants (N = 77) were persons who had travelled to South America to use ayahuasca. Among the most frequent motivations were curiosity, desire to treat mental health problems, need for self-knowledge, interest in psychedelic medicine, spiritual development, and finding direction in life. Frequently mentioned benefits included self-knowledge, change in the way one relates to oneself, spiritual development, improved interpersonal relations, overcoming mental and physical problems, and gaining a new perspective on life. Stated potential risks included lack of trust in the shaman or organizer, inaccurate information provided by the shaman or organizer, and exposure to dangerous situations. PSSI results showed that people using ayahuasca scored significantly above the norm on the scales of intuition, optimism, ambition, charm, and helpfulness and significantly lower on the scales of distrust and quietness. [ABSTRACT FROM PUBLISHER]

Krippner, S. and J. Sulla (2011). "Spiritual Content in Experiential Reports from Ayahuasca Sessions." NeuroQuantology **9**(2): 333-350.

There has been little rigorous research on the spiritual content of ayahuasca sessions, despite the tribal use of this herbal concoction and the existence of three Brazilian churches in which ayahuasca is considered a sacrament. The Casto Spirituality Scoring System, a reliable measure designed to identify spiritual content in dream reports, was utilized to answer the following question: "Is it possible to identify spiritual content in ayahuasca reports?" This system was found to be feasible in identifying "spiritual objects," "spiritual characters," "spiritual settings," "spiritual activities," "spiritual emotions," and "spiritual experiences" in ayahuasca reports taken from pertinent literature. The Casto system defines

"spiritual" as one's focus on, and/or reverence, openness, and connectedness to something of significance believed to be beyond one's full understanding and/or individual existence.

Labate, B. C. (2011). "Consumption of ayahuasca by children and pregnant women: medical controversies and religious perspectives." J Psychoactive Drugs **43**(1): 27-35.

In 2010, the Brazilian Government agency responsible for drug-related issues formulated official Resolutions that categorized the consumption of ayahuasca by pregnant women and children in the Santo Daime and Uniao do Vegetal ayahuasca-based religions as an "exercise of parental rights." Although ayahuasca groups do enjoy a relative degree of social legitimacy and formal legal recognition in Brazil, the participation of pregnant women and children nevertheless continues to provoke heated discussion. This article raises the main issues involved in the public debate over this subject. In the first part, a diverse group of biomedical and health specialists was consulted, and their opinions were briefly analyzed. In the second, a full interview with a follower of one branch of Santo Daime, mother of four children who took ayahuasca during all her pregnancies, and whose children all drink ayahuasca, is presented. Her interview reveals important cultural parameters of ayahuasca consumption. The article explores common themes and contradictions found between the biomedical, anthropological, and ayahuasca-users' discourses. It raises central issues regarding the limits of freedom of religion and the state's right to interfere in family matters. The following analysis also has implications regarding the role of science in influencing policy decisions on drug use.

Labate, B. C. (2012). "Ayahuasca Religions in Acre: Cultural Heritage in the Brazilian Borderlands." Anthropology of Consciousness **23**(1): 87-102.

The Brazilian ayahuasca religions, Santo Daime, Barquinha, and União do Vegetal, have increasingly sought formal recognition by government agencies in Brazil and other countries to guarantee their legal use of ayahuasca, which contains DMT, a substance that is listed. This article focuses on new alliances and rifts that have emerged between and among different ayahuasca groups as they have sought and in some cases achieved formal recognition and legitimacy at the state and national levels in Brazil and abroad. It presents a historical overview of the origin of the main ayahuasca religions, and their connections to the Amazon region and the state of Acre in particular, where the political environment has facilitated petitions seeking the elevation of ayahuasca as cultural and historical heritage in Acre and Brazil. This process has resulted in the active selection of certain symbolic, cultural, and historical elements and subtle changes in the ways various ayahuasca groups represent themselves in the public sphere. It also resulted in the reconfiguration of political alliances and a recasting of the historical facts regarding origins. The article reflects on notions of origin, place, authenticity, and tradition throughout the ongoing transformation of ayahuasca from 'dangerous drug' to state and national heritage.

Labate, B. C. (2012). "Paradoxes of ayahuasca expansion: The UDV-DEA agreement and the limits of freedom of religion." Drugs: Education, Prevention & Policy **19**(1): 19-26.

This article comments on the agreement signed in 2010 between a US branch of the Brazilian ayahuasca religion União do Vegetal (UDV) and the US Drug Enforcement Agency. This document settles a dispute regarding administrative issues involving ayahuasca, a psychoactive brew used by this group as a religious sacrament. The government originally confiscated this substance in 1999, and the matter went to the Supreme Court, which handed down a decision favourable to the UDV in 2006. Despite the fact that this group

prevailed, the agreement reveals that the Drug Enforcement Agency (DEA) views ayahuasca not as a religious sacrament, but as a toxic and hazardous compound. This article also contextualizes this agreement in relation to the history of the UDV, which has been expanding beyond the Amazon since the 1970s. This process entailed increasing levels of institutionalization, formalization and bureaucratization. In its search for social legitimacy and legal conformity, the group has gradually shifted from its popular Amazonian origins. This process reached its peak with the current agreement with the DEA. Nevertheless, the agreement surpassed the levels of control and interference that would be tolerated by these religions in Brazil. It raises serious concerns for all those interested in human rights, religious freedom and cognitive liberty.

Labate, B. C. and K. Feeney (2012). "Ayahuasca and the process of regulation in Brazil and internationally: implications and challenges." *Int J Drug Policy* **23**(2): 154-161.

BACKGROUND: This paper provides a summary and analysis of the regulation of ayahuasca in Brazil, from its prohibition in the mid-eighties to the recent adoption of CONAD's (Conselho Nacional de Políticas sobre Drogas) 2010 Resolution, which established a set of rules, norms and ethical principles to be applied to religious and ritual uses of ayahuasca. Brazil's regulatory process is used as a starting point to explore emerging international regulatory themes as various nations respond to the global expansion of the Santo Daime and UDV (Uniao do Vegetal) ayahuasca religions.

METHODS: The text reviews the primary legislative and court documents, academic literature, as well as solicited expert opinions.

RESULTS: Three prominent themes have emerged internationally. The first concerns the scope of international treaties regarding plant-based psychoactive substances, as well as the responsibilities of individual nations to adhere to said treaties. The second concerns the scope of religious liberty and how to determine religious legitimacy. The final theme addresses the potential dangers of ayahuasca to health and public safety.

CONCLUSION: Over the past 20 years the Brazilian ayahuasca religions have established a global presence, with congregations in the USA, Canada, Japan, South Africa, Australia, and throughout Europe and Latin America. As a result, many nations are faced with the predicament of balancing the interests of these religious minorities with the international "war on drugs." The regulatory process applied in Brazil exemplifies a progressive approach, one which considered issues of anthropology and involved representatives of ayahuasca religions, and which provided a degree of deference to the principle of religious liberty. The Brazilian process has influenced judicial and administrative decisions internationally, and stands as a model worthy of further consideration.

Labate, B. C. and H. Jungaberle (2011). The internationalization of ayahuasca / edited by Beatriz Caiuby Labate and Henrik Jungaberle, Zürich : Lit, c2011.

Section 1. Ayahuasca in South America and the world -- Section 2. Medical, psychological and pharmacological issues: how safe is the use of ayahuasca? -- Section 3. The development of a global debate on ethics and legalization.

Lanaro, R., et al. (2015). "Ritualistic Use of Ayahuasca versus Street Use of Similar Substances Seized by the Police: A Key Factor Involved in the Potential for Intoxications and Overdose?" *J Psychoactive Drugs* **47**(2): 132-139.

The ritualistic use of ayahuasca is becoming a global phenomenon. This beverage contains a combination of monoamine oxidase inhibitors (harmine, harmaline, and tetrahydroharmine) and N,N-dimethyltryptamine, the main substance responsible for its visionary effect. The recreational use of similar alkaloids and N,N-dimethyltryptamine has increased in recent years, mainly because of their hallucinogenic effects. In the present study, the concentrations of psychoactive alkaloids in three powder samples seized by the São Paulo State Police and nine ayahuasca aqueous extracts were analyzed by HPLC-DAD in an attempt to distinguish between illicit drugs and the religious beverage. The alkaloids detected ($\mu\text{g/mL}$) in the ayahuasca aqueous extracts were N,N-dimethyltryptamine (402-2070.3), harmaline (27.5-181.3), harmine (294.5-2893.8), and tetrahydroharmine (849.5-2052.5), whereas, of the three powder samples, one contained only N,N-dimethyltryptamine (82% and 2% w/w, respectively) while the other contained only harmaline (16%, w/w) and harmine (12%, w/w). The ritualistic use of ayahuasca involves oral intake and the probability of overdose is minimized by serotonergic stimulation of vagal pathways, leading to vomiting and diarrhea. In contrast, the recreational use of N,N-dimethyltryptamine involves consumption mainly by smoking or inhalation, both of which markedly increase its bioavailability and the potential for intoxications.;

Letheby, C. (2016). "Review article: The epistemic innocence of psychedelic states." *Consciousness and Cognition* **39**: 28-37.

- Recent research suggests psychedelic drugs can cause lasting psychological benefits.
- Psychedelic transformation often involves epistemically questionable 'mystical' states.
- Besides costs, psychedelic transformation can yield naturalistic epistemic benefits.
- In some cases, these benefits are significant and otherwise unavailable.
- In such cases, psychedelic states are 'epistemically innocent imperfect cognitions'.

One recent development in epistemology, the philosophical study of knowledge, is the notion of 'epistemic innocence' introduced by Bortolotti and colleagues. This concept expresses the idea that certain suboptimal cognitive processes may nonetheless have epistemic (knowledge-related) benefits. The idea that delusion or confabulation may have psychological benefits is familiar enough. What is novel and interesting is the idea that such conditions may also yield significant and otherwise unavailable epistemic benefits. I apply the notion of epistemic innocence to research on the transformative potential of psychedelic drugs. The popular epithet 'hallucinogen' exemplifies a view of these substances as fundamentally epistemically detrimental. I argue that the picture is more complicated and that some psychedelic states can be epistemically innocent. This conclusion is highly relevant to policy debates about psychedelic therapy. Moreover, analysing the case of psychedelics can shed further light on the concept of epistemic innocence itself.

Lewis, S. E. (2008). "Ayahuasca and Spiritual Crisis: Liminality as Space for Personal Growth." *Anthropology of Consciousness* **19**(2): 109-133.

There is an increased controversy surrounding Westerners' use of ayahuasca. One issue of importance is psychological resiliency of users and lack of screening by ayahuasca tourism groups in the Amazon. Given the powerful effects of ayahuasca coupled with lack of cultural support, Western users are at increased risk for psychological distress. Many Westerners who experience psychological distress following ayahuasca ceremonies report concurrently

profound spiritual experiences. Because of this, it may be helpful to consider these episodes “spiritual emergencies,” or crises resulting from intense and transformative spiritual experiences. Although the author warns readers to avoid romantic comparisons of Western ayahuasca users to shamans, ethnographic data on indigenous shamanic initiates along with theory on liminality may be of some use to understand difficult experiences that accompany ayahuasca use. Given that psychotherapy is culturally sanctioned, therapists trained in treating spiritual crises can help Western ayahuasca users make meaning of their distress. Three case studies are offered as examples of individuals working through various sorts of crises following ayahuasca ceremonies.

Liester, M. B. (2013). "Near-death experiences and ayahuasca-induced experiences - two unique pathways to a phenomenologically similar state of consciousness." *Journal of Transpersonal Psychology* **45**(1): 24.

Individuals who survive a close brush with death often experience a profound altered state of consciousness known as a "near-death experience." Individuals who drink a South American medicine, known as "ayahuasca," experience an altered state of consciousness with numerous similarities to near-death experiences. These similarities, which occur on perceptual, emotional, cognitive, and transcendent levels, suggest near-death experiences and ayahuasca-induced experiences may involve a similar state of consciousness. This article compares and contrasts the phenomena of near-death experiences and ayahuasca-induced experiences. Common features of these experiences suggest ayahuasca may be useful as a research tool in the investigation of near-death experience phenomena. Further research is suggested to expand our understanding of human consciousness and near-death experiences.

Liester, M. B. and J. I. Prickett (2012). "Hypotheses Regarding the Mechanisms of Ayahuasca in the Treatment of Addictions." *J Psychoactive Drugs* **44**(3): 200-208.

Ayahuasca is a medicinal plant mixture utilized by indigenous peoples throughout the Amazon River basin for healing purposes. The “vine of the soul” or “vine of death,” as it is known in South America, contains a combination of monoamine oxidase inhibitors and N,N-dimethyltryptamine (DMT). When ingested together, these medicines produce profound alterations in consciousness. Increasingly, ayahuasca is being utilized to treat addictions. However, the mechanism of action by which ayahuasca treats addictions remains unclear. We offer four hypotheses to explain possible biochemical, physiological, psychological, and transcendent mechanisms by which ayahuasca may exert its anti-addiction effects.

Loizaga-Velder, A. and R. Verres (2014). "Therapeutic effects of ritual ayahuasca use in the treatment of substance dependence--qualitative results." *J Psychoactive Drugs* **46**(1): 63-72.

This qualitative empirical study explores the ritual use of ayahuasca in the treatment of addictions. Ayahuasca is an Amazonian psychedelic plant compound created from an admixture of the vine *Banisteriopsis caapi* and the bush *Psychotria viridis*. The study included interviews with 13 therapists who apply ayahuasca professionally in the treatment of addictions (four indigenous healers and nine Western mental health professionals with university degrees), two expert researchers, and 14 individuals who had undergone ayahuasca-assisted therapy for addictions in diverse contexts in South America. The study provides empirically based hypotheses on therapeutic mechanisms of ayahuasca in substance dependence treatment. Findings indicate that ayahuasca can serve as a valuable therapeutic tool that, in carefully structured settings, can catalyze neurobiological and

psychological processes that support recovery from substance dependencies and the prevention of relapse. Treatment outcomes, however, can be influenced by a number of variables that are explained in this study. In addition, issues related to ritual transfer and strategies for minimizing undesired side-effects are discussed.

Lyon, W. S. (1993). "Spiritual Dimensions of Healing: From Native Shamanism to Contemporary Health Care." *Anthropology of Consciousness* **4**(4): 17-18.

Mabit, J. (2001). "L'alternative des savoirs autochtones au "tout ou rien" thérapeutique." *Psychotropes* **7**: 7-18.

Mabit, J., et al. (1996). Takiwasi: The Use of Amazonian Shamanism to Rehabilitate Drug Addicts Yearbook of Cross-Cultural Medicine and Psychotherapy. W. Andritzky. Berlin, International Institute of Cross-Cultural Therapy Research.

Takiwasi is a center for the treatment of drug addictions and research on traditional medicines. The therapeutic protocol of Takiwasi is based in traditional medicine's functions at three levels: organic, psychological and spiritual. The central plant in Takiwasi is the water extract from *Banisteriopsis caapi*, *Psychotria viridis*, and *Brugmansia* sp. Generally known in the jungle as ayahuasca it constitutes the central axis of curanderismo (shamanism), in the whole of the Amazon Western basin, due to its purgative and psychotropic effects. Anthropological, psychological, and phytochemical studies demonstrate that it can be effectively used in the treatment of chemical dependencies and psychopathology if it is properly administered. Treatment of patients also indicates that curative sessions are affected not only by the active ingredients (β -carbolines and tryptamines), but also by the therapist, the psychosomatic condition of the patient, environmental factors, and the interaction between the participants. The article includes details of the organization of Takiwasi and the therapeutic process.

McKenna, D. and J. Riba (2015). "New World Tryptamine Hallucinogens and the Neuroscience of Ayahuasca." *Current Topics In Behavioral Neurosciences*.

New World indigenous peoples are noted for their sophisticated use of psychedelic plants in shamanic and ethnomedical practices. The use of psychedelic plant preparations among New World tribes is far more prevalent than in the Old World. Yet, although these preparations are botanically diverse, almost all are chemically similar in that their active principles are tryptamine derivatives, either DMT or related constituents. Part 1 of this paper provides an ethnopharmacological overview of the major tryptamine-containing New World New World hallucinogens Hallucinogens .;

McKenna, D. J. (2004). "Clinical investigations of the therapeutic potential of ayahuasca: rationale and regulatory challenges." *Pharmacology & Therapeutics* **102**(2): 111-129.

Ayahuasca is a hallucinogenic beverage that is prominent in the ethnomedicine and shamanism of indigenous Amazonian tribes. Its unique pharmacology depends on the oral activity of the hallucinogen, N,N-dimethyltryptamine (DMT), which results from inhibition of monoamine oxidase (MAO) by β -carboline alkaloids. MAO is the enzyme that normally degrades DMT in the liver and gut. Ayahuasca has long been integrated into mestizo folk medicine in the northwest Amazon. In Brazil, it is used as a sacrament by several syncretic churches. Some of these organizations have incorporated in the United States. The

recreational and religious use of ayahuasca in the United States, as well as “ayahuasca tourism” in the Amazon, is increasing. The current legal status of ayahuasca or its source plants in the United States is unclear, although DMT is a Schedule I controlled substance. One ayahuasca church has received favorable rulings in 2 federal courts in response to its petition to the Department of Justice for the right to use ayahuasca under the Religious Freedom Restoration Act. A biomedical study of one of the churches, the União do Vegetal (UDV), indicated that ayahuasca may have therapeutic applications for the treatment of alcoholism, substance abuse, and possibly other disorders. Clinical studies conducted in Spain have demonstrated that ayahuasca can be used safely in normal healthy adults, but have done little to clarify its potential therapeutic uses. Because of ayahuasca's ill-defined legal status and variable botanical and chemical composition, clinical investigations in the United States, ideally under an approved Investigational New Drug (IND) protocol, are complicated by both regulatory and methodological issues. This article provides an overview of ayahuasca and discusses some of the challenges that must be overcome before it can be clinically investigated in the United States.

McKenna, D. J. (2005). "Ayahuasca and human destiny." *J Psychoactive Drugs* **37**(2): 231-234.

In this essay, the author shares his personal reflections gleaned from a lifetime of research with ayahuasca, and speculates on the societal, political, planetary, and evolutionary implications of humanity's aeons-old symbiosis with this shamanic plant. The thesis is developed that at this critical historical juncture, ayahuasca has developed a strategy to broadcast its message to a wider world--a reflection of the urgent need to avert global ecological catastrophe. While ayahuasca has much to teach us, the critical question is, will humanity hear it, and heed it, in time?

Mercante, M. S. (2013). "A ayahuasca e o tratamento da dependência." *Mana* **19**(3): 529-558.

Morris, B. (2014). *A Strong Cup of Tea*, The New York Times Company: 1.

On a recent Friday night, a dozen seekers in loosefitting attire, most in their 20s and 30s, climbed a flight of steps of a mixed-used community space in Bushwick, Brooklyn. [...]

Nielson, J. and J. Megler (2014). Ayahuasca as a Candidate Therapy for PTSD. The Therapeutic Use of Ayahuasca. B. C. Labate and C. Cavnar, Springer Berlin Heidelberg: 41-58.

Oliveira-Lima, A. J., et al. (2015). "Effects of ayahuasca on the development of ethanol-induced behavioral sensitization and on a post-sensitization treatment in mice." *Physiology & Behavior* **142**: 28-36.

Background Hallucinogenic drugs were used to treat alcoholic patients in the past, and recent developments in the study of hallucinogens led to a renewal of interest regarding the application of these drugs in the treatment of addiction. In this scenario, accumulating evidence suggests that the hallucinogenic brew ayahuasca (Aya) may have therapeutic effects on substance abuse problems.

Methods We investigated the effects of Aya on spontaneous locomotor activity and ethanol(Eth)-induced hyperlocomotion and subsequent locomotor sensitization by a two-injection protocol. Additionally, we tested the effect of Aya on an 8-day counter-sensitization protocol

to modify sensitized responses induced by a repeated treatment with Eth (1.8g/kg) for 8 alternate days.

Results Aya showed high sensitivity in preventing the development of Eth-induced behavioral sensitization, attenuating it at all doses (30, 100, 200, 300 or 500mg/kg) without modifying spontaneous locomotor activity. At the highest doses (300 and 500mg/kg), Aya also showed selectivity to both acute and sensitized Eth responses. Finally, a counter-sensitization strategy with 100 or 300mg/kg of Aya for 8 consecutive days after the establishment of Eth-induced behavioral sensitization was effective in blocking its subsequent expression on an Eth challenge.

Conclusions We demonstrated that Aya not only inhibits early behaviors associated with the initiation and development of Eth addiction, but also showed effectiveness in reversing long-term drug effects expression, inhibiting the reinstatement of Eth-induced behavioral sensitization when administered in the Eth-associated environment.

- Ayahuasca (Aya) did not exert effects on the spontaneous locomotor activity of mice.
- Aya prevented the development of ethanol(Eth)-induced behavioral sensitization (BS).
- At high doses, Aya also inhibited acute Eth-induced hyperlocomotion.
- An 8-day treatment with Aya in the open-field did not induce BS to this drug.
- Counter-sensitization with Aya blocked the reinstatement of Eth-induced BS.

Oliveira, C. D. R., et al. (2010). "Maternal and developmental toxicity of ayahuasca in Wistar rats." Birth Defects Research Part B: Developmental and Reproductive Toxicology **89**(3): 207-212.

INTRODUCTION: Ayahuasca is a psychotropic plant beverage initially used by shamans throughout the Amazon region during traditional religious cult. In recent years, ayahuasca has also been used in ceremonies of a number of modern syncretic religious groups, including pregnant women. However, no documented study has been performed to evaluate the risk of developmental toxicity of ayahuasca.

METHODS: In the present work, maternal and developmental toxicity was evaluated in Wistar rats. Ayahuasca was administered to pregnant rats in three different doses [the equivalent typical dose (TD) administered to humans, five-fold TD and 10-fold TD] during the gestational period (6–20 days).

RESULTS: Dams treated with the highest ayahuasca dose showed maternal toxicity with decrease of weight gain and food intake. Visceral fetal findings were observed in all treatment groups. Skeletal findings were observed in the intermediate- and high-dose groups. The fetuses deriving from the highest dose group also presented a decrease in body weight.

CONCLUSIONS: From these results, it is possible to conclude that there is a risk of maternal and developmental toxicity following ayahuasca exposure and that the level of toxicity appears to be dose-dependent. Birth Defects Res (Part B) 89:207–212, 2010.

Oliveira, C. D. R., et al. (2010). "The relevance of performing developmental toxicity studies about ayahuasca." Birth Defects Research Part B: Developmental and Reproductive Toxicology **89**(6): 531-532.

Palamar, J. J., et al. (2015). "Self-reported use of novel psychoactive substances in a US nationally representative survey: Prevalence, correlates, and a call for new survey methods to prevent underreporting." Drug and Alcohol Dependence: 112.

* 1.2% of individuals in the US, age 13-34, reported use of a novel psychoactive substance. * Use of tryptamines was most common, followed by psychedelic phenethylamines. * Use increased from 2009 through 2013 and use of other illicit drugs was common. * Males, whites and older or unmarried subjects were more likely to report use. * An adaptable survey tool would improve reporting as new drugs continue to emerge.

Palhano-Fontes, F., et al. (2014). The Therapeutic Potentials of Ayahuasca in the Treatment of Depression. The Therapeutic Use of Ayahuasca. B. C. Labate and C. Cavnar, Springer Berlin Heidelberg: 23-39.

Palhano-Fontes, F., et al. (2015). "The Psychedelic State Induced by Ayahuasca Modulates the Activity and Connectivity of the Default Mode Network." PLoS ONE **10**(2): 1-13.

The experiences induced by psychedelics share a wide variety of subjective features, related to the complex changes in perception and cognition induced by this class of drugs. A remarkable increase in introspection is at the core of these altered states of consciousness. Self-oriented mental activity has been consistently linked to the Default Mode Network (DMN), a set of brain regions more active during rest than during the execution of a goal-directed task. Here we used fMRI technique to inspect the DMN during the psychedelic state induced by Ayahuasca in ten experienced subjects. Ayahuasca is a potion traditionally used by Amazonian Amerindians composed by a mixture of compounds that increase monoaminergic transmission. In particular, we examined whether Ayahuasca changes the activity and connectivity of the DMN and the connection between the DMN and the task-positive network (TPN). Ayahuasca caused a significant decrease in activity through most parts of the DMN, including its most consistent hubs: the Posterior Cingulate Cortex (PCC)/Precuneus and the medial Prefrontal Cortex (mPFC). Functional connectivity within the PCC/Precuneus decreased after Ayahuasca intake. No significant change was observed in the DMN-TPN orthogonality. Altogether, our results support the notion that the altered state of consciousness induced by Ayahuasca, like those induced by psilocybin (another serotonergic psychedelic), meditation and sleep, is linked to the modulation of the activity and the connectivity of the DMN. [ABSTRACT FROM AUTHOR]

Pic-Taylor, A., et al. (2015). "Behavioural and neurotoxic effects of ayahuasca infusion (Banisteriopsis caapi and Psychotria viridis) in female Wistar rat." Behavioural Processes **118**: 102-110.

- Ayahuasca decreased locomotion of Wistar female rats in OF and EPM tests.
- Ayahuasca treated animals were more active than controls in FS test.
- Potential antidepressant properties of ayahuasca was shown.
- Ayahuasca increase neuronal activation in serotonergic brain areas.

Ayahuasca, a psychoactive beverage used by indigenous and religious groups, is generally prepared by the coction of *Psychotria viridis* and *Banisteriopsis caapi* plants containing N,N-dimethyltryptamine (DMT) and β -carboline alkaloids, respectively. To investigate the acute toxicity of ayahuasca, the infusion was administered by gavage to female Wistar rats at doses of 30X and 50X the dose taken during a religious ritual, and the animals observed for 14 days. Behavioural functions were investigated one hour after dosing at 15X and 30X using the open field, elevated plus maze, and forced swimming tests. Neuronal activation (c-fos marked neurons) and toxicity (Fluoro-Jade B and Nissl/Cresyl staining) were investigated in the dorsal raphe nuclei (DRN), amygdaloid nucleus, and hippocampal formation brain areas of rats treated with a 30X ayahuasca dose. The actual lethal oral dose in female Wistar rats could not be determined in this study, but was shown to be higher than the 50X (which corresponds to 15.1mg/kg bw DMT). The ayahuasca and fluoxetine treated groups showed a

significant decrease in locomotion in the open field and elevated plus-maze tests compared to controls. In the forced swimming test, ayahuasca treated animals swam more than controls, a behaviour that was not significant in the fluoxetine group. Treated animals showed higher neuronal activation in all brain areas involved in serotonergic neurotransmission. Although this led to some brain injury, no permanent damage was detected. These results suggest that ayahuasca has antidepressant properties in Wistar female at high doses, an effect that should be further investigated.

Pitol, D. L., et al. (2015). "Ayahuasca alters structural parameters of the rat aorta." *Journal Of Cardiovascular Pharmacology*.

Ayahuasca is a hallucinogenic brew traditionally used by Northwestern Amazonian indigenous groups for therapeutic purposes. It is prepared by the decoction of *Banisteriopsis caapi* with the leaves of *Psychotria viridis*. *B. caapi* contains β -carbolines that are inhibitors of monoamine oxidase and *P. viridis* is rich in dimethyltryptamine, a 5-HT_{1A/2A/2C} agonist. Acute ayahuasca administration produces moderate cardiovascular effects in healthy volunteers, but information regarding long-term use is lacking. The present study investigated the effects of ayahuasca (2-4 ml/kg) in the rat aorta after acute and chronic (14 days) administration. Ayahuasca caused flattening and stretching of vascular smooth muscle cells and changes in the arrangement and distribution of collagen and elastic fibers. Chronic treatment with the higher dose significantly increased media thickness and the ratio of media thickness to lumen diameter. More research is needed on the cardiovascular function of long-term ayahuasca consumers.;

Pomilio, A. B., et al. (1999). "Ayahuasca: an experimental psychosis that mirrors the transmethylation hypothesis of schizophrenia." *Journal of Ethnopharmacology* **65**(1): 29-51.

The experimental psychosis observed after drinking Ayahuasca, a South American hallucinogenic beverage from the Amazon Indians, reproduces the pathologic transmethylation theory of schizophrenia. This theory postulates a decrease in the monoamine oxidase (MAO) activity, which results in the accumulation of methylated indolealkylamines, such as bufotenin (5-hydroxy-N,N-dimethyltryptamine), N,N-dimethyltryptamine (DMT) and 5-methoxy-N,N-dimethyltryptamine. These substances are strong hallucinogens as has been previously confirmed experimentally. On the other hand, it is known that Ayahuasca is a beverage usually prepared by boiling two plants, one of them rich in β -carbolines, which are naturally occurring strong inhibitors of MAO, and the other with high quantities of DMT. This particular combination reproduces what is supposed to occur under pathologic conditions of different psychoses. The effects of Ayahuasca were studied in subjects, assessing urine levels of DMT by gas chromatography-mass spectrometry (GC-MS) before and after the intake of the beverage. The results of this study confirm that the hallucinogenic compounds detected in the healthy subjects' (post-Ayahuasca, but not before) urine samples are the same as those found in samples from acute psychotic unmedicated patients. The chemical composition of the Ayahuasca beverage, and of the plant material used for its preparation are also reported as well as psychometric and neuroendocrine subject parameters.

Prayag, G., et al. (2014). "Spirituality and tourism impacts: The Ayahuasca experience, *School of Tourism*, The University of Queensland: 496.

As tourism increases in the remote areas of Iquitos (Peru), so will tourism impacts. This study explores the relationship between spirituality and tourism impacts through the experiences

of ayahuasca tourists. Ayahuasca is a hallucinogenic beverage consumed by tourists and locals for spiritual and health purposes. Tourists perceive positive economic, environmental and socio-cultural impacts of ayahuasca tourism. Spirituality influences perceptions of sociocultural impacts through perceptions of 'others'. Spirituality influences perceptions of environmental impacts through tourists renewed relationship with nature. Spirituality impacts on psychological domains such as cognition and emotion that influence tourists' perceptions of authenticity. Ayahuasca also fosters ego-centrism that negatively impacts on perceptions of tourism but positively impacts on self-identity and tourist identity, which are at times contradictory.

Prayag, G., et al. (2015). "Drug or spirituality seekers? Consuming ayahuasca." *Annals of Tourism Research* **52**(0): 175-177.

Queiroz, M. M. F., et al. (2015). "LC-MS/MS Quantitative Determination of Tetraptyrys mucronata Alkaloids, a Plant Occasionally used in Ayahuasca Preparation." *Phytochemical Analysis: PCA* **26**(3): 183-188.

Introduction: *Tetraptyrys mucronata* Cav. (Malpighiaceae) is a plant used in some regions of Brazil in the preparation of ayahuasca.; Objective: To determine the content of the main tryptamine alkaloids in the stem bark of *T. mucronata* Cav. and assess their possible toxic and hallucinogenic properties based on the doses found in a water decoction that mimics the ayahuasca preparation.; Methods: Four alkaloids previously described for their toxic and hallucinogenic properties were quantitated by multiple reaction monitoring HPLC combined with electrospray ionisation and tandem MS (HPLC-ESI/MS/MS) in the water decoction and ethanolic extracts from the bark of *T. mucronata*.; Results: Exhaustive extraction of the stem barks with ethanol revealed the following alkaloid levels: bufotenine (1) 3.26 ± 0.31 mg/g, 5-methoxy-N-methyltryptamine (2) 0.88 ± 0.08 mg/g, 5-methoxy-bufotenine (3) 3.07 ± 0.22 mg/g and 2-methyl-6-methoxy-1,2,3,4-tetrahydro- β -carboline (4) 0.14 ± 0.004 mg/g. The water decoction presented slightly lower levels, ranging between 2.32 ± 0.14 , 0.50 ± 0.04 , 1.53 ± 0.09 and 0.10 ± 0.01 mg/g for (1), (2), (3) and (4) respectively.; Conclusions: The HPLC-ESI/MS/MS quantitation revealed significant alkaloid levels, in particular for bufotenine and 5-methoxy-bufotenine. As such compounds are known for their toxic and hallucinogenic properties, these results indicate that the consumption of this plant as an ingredient in ayahuasca preparations may present a risk to consumers. Copyright © 2015 John Wiley & Sons, Ltd.; Copyright © 2015 John Wiley & Sons, Ltd.

Riba, J., et al. (2002). "Topographic pharmaco-EEG mapping of the effects of the South American psychoactive beverage ayahuasca in healthy volunteers." *British Journal of Clinical Pharmacology* **53**(6): 613-628.

Aims: Ayahuasca is a traditional South American psychoactive beverage used in Amazonian shamanism, and in the religious ceremonies of Brazilian-based syncretic religious groups with followers in the US and several European countries. This tea contains measurable amounts of the psychotropic indole N,N-dimethyltryptamine (DMT), and β -carboline alkaloids with MAO-inhibiting properties. In a previous report we described a profile of stimulant and psychedelic effects for ayahuasca as measured by subjective report self-assessment instruments. In the present study the cerebral bioavailability and time-course of effects of ayahuasca were assessed in humans by means of topographic quantitative-electroencephalography (q-EEG), a noninvasive method measuring drug-induced variations in brain electrical activity.

Methods: Two doses (one low and one high) of encapsulated freeze-dried ayahuasca, equivalent to 0.6 and 0.85 mg DMT kg⁻¹ body weight, were administered to 18 healthy volunteers with previous experience in psychedelic drug use in a double-blind crossover placebo-controlled clinical trial. Nineteen-lead recordings were undertaken from baseline to 8 h after administration. Subjective effects were measured by means of the Hallucinogen Rating Scale (HRS).

Results: Ayahuasca induced a pattern of psychoactive effects which resulted in significant dose-dependent increases in all subscales of the HRS, and in significant and dose-dependent modifications of brain electrical activity. Absolute power decreased in all frequency bands, most prominently in the theta band. Mean absolute power decreases (95% CI) at a representative lead (P3) 90 min after the high dose were $-20.20 \pm 15.23 \mu\text{V}^2$ and $-2.70 \pm 2.21 \mu\text{V}^2$ for total power and theta power, respectively. Relative power decreased in the delta ($-1.20 \pm 1.31\%$ after 120 min at P3) and theta ($-3.30 \pm 2.59\%$ after 120 min at P3) bands, and increased in the beta band, most prominently in the faster beta-3 ($1.00 \pm 0.88\%$ after 90 min at P3) and beta-4 ($0.30 \pm 0.24\%$ after 90 min at P3) subbands. Finally, an increase was also seen for the centroid of the total activity and its deviation. EEG modifications began as early as 15–30 min, reached a peak between 45 and 120 min and decreased thereafter to return to baseline levels at 4–6 h after administration.

Conclusions: The central effects of ayahuasca could be objectively measured by means of q-EEG, showing a time pattern which closely paralleled that of previously reported subjective effects. The modifications seen for the individual q-EEG variables were in line with those previously described for other serotonergic psychedelics and share some features with the profile of effects shown by pro-serotonergic and pro-dopaminergic drugs. The q-EEG profile supports the role of 5-HT₂ and dopamine D₂-receptor agonism in mediating the effects of ayahuasca on the central nervous system.

Riba, J. and M. J. Barbanoj (2005). "Bringing ayahuasca to the clinical research laboratory." *J Psychoactive Drugs* **37**(2): 219-230.

Since the winter of 1999, the authors and their research team have been conducting clinical studies involving the administration of ayahuasca to healthy volunteers. The rationale for conducting this kind of research is twofold. First, the growing interest of many individuals for traditional indigenous practices involving the ingestion of natural psychotropic drugs such as ayahuasca demands the systematic study of their pharmacological profiles in the target species, i.e., human beings. The complex nature of ayahuasca brews combining a large number of pharmacologically active compounds requires that research be carried out to establish the safety and overall pharmacological profile of these products. Second, the authors believe that the study of psychedelics in general calls for renewed attention. Although the molecular and electrophysiological level effects of these drugs are relatively well characterized, current knowledge of the mechanisms by which these compounds modify the higher order cognitive processes in the way they do is still incomplete, to say the least. The present article describes the development of the research effort carried out at the Autonomous University of Barcelona, commenting on several methodological aspects and reviewing the basic clinical findings. It also describes the research currently underway in our laboratory, and briefly comments on two new studies we plan to undertake in order to further our knowledge of the pharmacology of ayahuasca.

Riba, J., et al. (2015). "Metabolism and urinary disposition of N,N-dimethyltryptamine after oral and smoked administration: a comparative study." *Drug Test Anal* **7**(5): 401-406.

N,N-dimethyltryptamine (DMT) is a widely distributed plant alkaloid that displays partial agonist activity at the 5-HT_{2A} receptor and induces intense psychedelic effects in humans when administered parenterally. However, self-administration studies have reported a total lack of activity following oral intake. This is thought to be due to extensive degradation by monoamine oxidase (MAO). Despite increased use of DMT and DMT-containing preparations, such as the plant tea ayahuasca, the biotransformation of DMT in humans when administered alone is relatively unknown. Here we used high performance liquid chromatography (HPLC)/electrospray ionization (ESI)/selected reaction monitoring (SRM)/tandem mass spectrometry (MS/MS) to characterize the metabolism and disposition of oral and smoked DMT. Twenty-four-hour urine samples were obtained from 6 DMT users before and after intake of 25 mg DMT doses on two separate sessions. In one session, DMT was taken orally and in another it was smoked. After oral ingestion, no psychotropic effects were experienced and no DMT was recovered in urine. MAO-dependent indole-3-acetic acid (IAA) represented 97% of the recovered compounds, whereas DMT-N-oxide (DMT-NO) accounted for only 3%. When the smoked route was used, the drug was fully psychoactive, unmetabolized DMT and DMT-NO rose to 10% and 28%, respectively, and IAA levels dropped to 63%. An inverse correlation was found between the IAA/DMT-NO ratio and subjective effects scores. These findings show that in the smoked route a shift from the highly efficient MAO-dependent to the less efficient CYP-dependent metabolism takes place. This shift leads to psychoactivity and is analogous to that observed in ayahuasca preparations combining DMT with MAO inhibitors.; Copyright © 2014 John Wiley & Sons, Ltd.

Riba, J., et al. (2012). "Metabolism and disposition of N,N-dimethyltryptamine and harmala alkaloids after oral administration of ayahuasca." *Drug Test Anal* **4**(7-8): 610-616.

Ayahuasca is an Amazonian psychotropic plant tea obtained from *Banisteriopsis caapi*, which contains β -carboline alkaloids, chiefly harmine, harmaline and tetrahydroharmine. The tea usually incorporates the leaves of *Psychotria viridis* or *Diplopterys cabrerana*, which are rich in N,N-dimethyltryptamine (DMT), a psychedelic 5-HT_{2A/1A/2C} agonist. The β -carbolines reversibly inhibit monoamine-oxidase (MAO), effectively preventing oxidative deamination of the orally labile DMT and allowing its absorption and access to the central nervous system. Despite increased use of the tea worldwide, the metabolism and excretion of DMT and the β -carbolines has not been studied systematically in humans following ingestion of ayahuasca. In the present work, we used an analytical method involving high performance liquid chromatography (HPLC)/electrospray ionization (ESI)/selected reaction monitoring (SRM)/tandem mass spectrometry (MS/MS) to characterize the metabolism and disposition of ayahuasca alkaloids in humans. Twenty-four-hour urine samples were obtained from 10 healthy male volunteers following administration of an oral dose of encapsulated freeze-dried ayahuasca (1.0 mg DMT/kg body weight). Results showed that less than 1% of the administered DMT dose was excreted unchanged. Around 50% was recovered as indole-3-acetic acid but also as DMT-N-oxide (10%) and other MAO-independent compounds. Recovery of DMT plus metabolites reached 68%. Harmol, harmalol, and tetrahydroharmol conjugates were abundant in urine. However, recoveries of each harmala alkaloid plus its O-demethylated metabolite varied greatly between 9 and 65%. The present results show the existence in humans of alternative metabolic routes for DMT other than biotransformation by MAO. Also that O-demethylation plus conjugation is an important but probably not the only metabolic route for the harmala alkaloids in humans.

Riba, J., et al. (2002). "Effects of ayahuasca on sensory and sensorimotor gating in humans as measured by P50 suppression and prepulse inhibition of the startle reflex, respectively." *Psychopharmacology* **165**(1): 18-28.

Rationale. Ayahuasca, a South American psychotropic plant tea, combines the psychedelic agent and 5-HT 2A/2C agonist N, N-dimethyltryptamine (DMT) with β -carboline alkaloids showing monoamine oxidase-inhibiting properties. Current human research with psychedelics and entactogens has explored the possibility that drugs displaying agonist activity at the 5-HT 2A/2C sites temporally disrupt inhibitory neural mechanisms thought to intervene in the normal filtering of information. Suppression of the P50 auditory evoked potential (AEP) and prepulse inhibition of startle (PPI) are considered operational measures of sensory (P50 suppression) and sensorimotor (PPI) gating. Contrary to findings in lower animals, unexpected increases in sensorimotor gating have been found in humans following the administration of the serotonergic psychedelic psilocybin and the serotonin releaser 3,4-methylenedioxymethamphetamine (MDMA). In addition, to our knowledge P50 suppression has not been assessed previously in humans following the administration of a 5-HT 2A/2C agonist. **Objectives.** To assess the effects of the acute administration of ayahuasca on P50 suppression and PPI in humans, in order to evaluate the drug's modulatory actions on these measures of sensory and sensorimotor gating. **Methods.** Eighteen healthy volunteers with prior experience of psychedelic drug use participated in a clinical trial in which placebo or ayahuasca doses (0.6 mg and 0.85 mg DMT/kg body weight) were administered according to a double-blind, cross-over balanced design. P50 and startle reflex (pulse-alone and 60 ms, 120 ms, 240 ms and 2000 ms prepulse-to-pulse intervals) recordings were undertaken at 1.5 h and 2 h after drug intake, respectively. **Results.** Ayahuasca produced diverging effects on each of the two gating measures evaluated. Whereas significant dose-dependent reductions of P50 suppression were observed after ayahuasca, no significant effects were found on the startle response, its habituation rate, or on PPI at any of the prepulse-to-pulse intervals studied. **Conclusion.** The present findings indicate, at the doses tested, a decremental effect of ayahuasca on sensory gating, as measured by P50 suppression, and no distinct effects on sensorimotor gating, as measured by PPI.

Riba, J., et al. (2001). "Subjective effects and tolerability of the South American psychoactive beverage Ayahuasca in healthy volunteers." *Psychopharmacology* **154**(1): 85-95.

Rationale: Ayahuasca is a South American psychoactive beverage that contains the naturally occurring psychedelic agent N, N-dimethyltryptamine (DMT). This "tea" has been used for centuries in religious and medicinal contexts in the rain forest areas of South America and is presently gaining the attention of psychedelic users in North America and Europe. **Objectives:** In the present study, the psychological effects and tolerability of ayahuasca were assessed. **Methods:** Three increasing doses of encapsulated freeze-dried ayahuasca (0.5, 0.75, and 1.0 mg DMT/kg body weight) were administered to six healthy male volunteers with prior experience in the use of this tea, in a single-blind crossover placebo-controlled clinical trial. **Results:** Ayahuasca produced significant dose-dependent increases in five of the six subscales of the Hallucinogen Rating Scale, in the LSD, MBG, and A scales of the Addiction Research Center Inventory, and in the "liking", "good effects" and "high" visual analogue scales. Psychological effects were first noted after 30–60 min, peaked between 60–120 min, and were resolved by 240 min. The tea was well tolerated from a cardiovascular point of view, with a trend toward increase for systolic blood pressure. Modified physical sensations and nausea were the most frequently reported somatic-dysphoric effects. The overall experience was regarded as pleasant and satisfactory by five of the six volunteers, while one volunteer experienced an intensely dysphoric reaction with transient disorientation and anxiety at the medium dose and voluntarily withdrew from the study. **Conclusions:**

Ayahuasca can be described as inducing changes in the perceptual, affective, cognitive, and somatic spheres, with a combination of stimulatory and visual psychoactive effects of longer duration and milder intensity than those previously reported for intravenously administered DMT.

Riba, J., et al. (2006). "Increased frontal and paralimbic activation following ayahuasca , the pan-amazonian inebriant." *Psychopharmacology* **186**(1): 93-98.

RATIONALE: Ayahuasca is a South American psychoactive plant tea which contains the serotonergic psychedelic N,N-dimethyltryptamine (DMT) and monoamine-oxidase inhibitors that render DMT orally active. Previous investigations with ayahuasca have highlighted a psychotropic effect profile characterized by enhanced introspective attention, with individuals reporting altered somatic perceptions and intense emotional modifications, frequently accompanied by visual imagery. Despite recent advances in the study of ayahuasca pharmacology, the neural correlates of acute ayahuasca intoxication remain largely unknown.

OBJECTIVES: To investigate the effects of ayahuasca administration on regional cerebral blood flow.

METHODS: Fifteen male volunteers with prior experience in the use of psychedelics received a single oral dose of encapsulated freeze-dried ayahuasca equivalent to 1.0 mg DMT/kg body weight and a placebo in a randomized double-blind clinical trial. Regional cerebral blood flow was measured 100-110 min after drug administration by means of single photon emission tomography (SPECT).

RESULTS: Ayahuasca administration led to significant activation of frontal and paralimbic brain regions. Increased blood perfusion was observed bilaterally in the anterior insula, with greater intensity in the right hemisphere, and in the anterior cingulate/frontomedial cortex of the right hemisphere, areas previously implicated in somatic awareness, subjective feeling states, and emotional arousal. Additional increases were observed in the left amygdala/parahippocampal gyrus, a structure also involved in emotional arousal.

CONCLUSIONS: The present results suggest that ayahuasca interacts with neural systems that are central to interoception and emotional processing and point to a modulatory role of serotonergic neurotransmission in these processes.

Riba, J., et al. (2003). "Human Pharmacology of Ayahuasca: Subjective and Cardiovascular Effects, Monoamine Metabolite Excretion, and Pharmacokinetics." *Journal of Pharmacology and Experimental Therapeutics* **306**(1): 73-83.

The effects of the South American psychotropic beverage ayahuasca on subjective and cardiovascular variables and urine monoamine metabolite excretion were evaluated, together with the drug's pharmacokinetic profile, in a double-blind placebo-controlled clinical trial. This pharmacologically complex tea, commonly obtained from *Banisteriopsis caapi* and *Psychotria viridis*, combines N,N-dimethyltryptamine (DMT), an orally labile psychedelic agent showing 5-hydroxytryptamine_{2A} agonist activity, with monoamine oxidase (MAO)-inhibiting β -carboline alkaloids (harmine, harmaline, and tetrahydroharmine). Eighteen volunteers with prior experience in the use of psychedelics received single oral doses of encapsulated freeze-dried ayahuasca (0.6 and 0.85 mg of DMT/kg of body weight) and placebo. Ayahuasca produced significant subjective effects, peaking between 1.5 and 2 h, involving perceptual modifications and increases in ratings of positive mood and activation. Diastolic blood pressure showed a significant increase at the high dose (9 mm Hg at 75 min), whereas systolic blood pressure and heart rate were

moderately and nonsignificantly increased. Cmax values for DMT after the low and high ayahuasca doses were 12.14 ng/ml and 17.44 ng/ml, respectively. Tmax (median) was observed at 1.5 h after both doses. The Tmax for DMT coincided with the peak of subjective effects. Drug administration increased urinary normetanephrine excretion, but, contrary to the typical MAO-inhibitor effect profile, deaminated monoamine metabolite levels were not decreased. This and the negligible harmine plasma levels found suggest a predominantly peripheral (gastrointestinal and liver) site of action for harmine. MAO inhibition at this level would suffice to prevent first-pass metabolism of DMT and allow its access to systemic circulation and the central nervous system.

Riga, M. S., et al. (2014). "The natural hallucinogen 5-MeO-DMT, component of Ayahuasca, disrupts cortical function in rats: reversal by antipsychotic drugs." *Int J Neuropsychopharmacol*: 1-14.

5-Methoxy-N,N-dimethyltryptamine (5-MeO-DMT) is a natural hallucinogen component of Ayahuasca, an Amazonian beverage traditionally used for ritual, religious and healing purposes that is being increasingly used for recreational purposes in US and Europe. 5-MeO-DMT is of potential interest for schizophrenia research owing to its hallucinogenic properties. Two other psychotomimetic agents, phencyclidine and 2,5-dimethoxy-4-iodo-phenylisopropylamine (DOI), markedly disrupt neuronal activity and reduce the power of low frequency cortical oscillations (<4 Hz, LFCO) in rodent medial prefrontal cortex (mPFC). Here we examined the effect of 5-MeO-DMT on cortical function and its potential reversal by antipsychotic drugs. Moreover, regional brain activity was assessed by blood-oxygen level dependent (BOLD) functional magnetic resonance imaging (fMRI). 5-MeO-DMT disrupted mPFC activity, increasing and decreasing the discharge of 51 and 35% of the recorded pyramidal neurons, and reducing (-31%) the power of LFCO. The latter effect depended on 5-HT1A and 5-HT2A receptor activation and was reversed by haloperidol, clozapine, risperidone, and the mGlu2/3 agonist LY379268. Likewise, 5-MeO-DMT decreased BOLD responses in visual cortex (V1) and mPFC. The disruption of cortical activity induced by 5-MeO-DMT resembles that produced by phencyclidine and DOI. This, together with the reversal by antipsychotic drugs, suggests that the observed cortical alterations are related to the psychotomimetic action of 5-MeO-DMT. Overall, the present model may help to understand the neurobiological basis of hallucinations and to identify new targets in antipsychotic drug development.

Rivier, L. and J.-E. Lindgren (1972). "“Ayahuasca,” the South American hallucinogenic drink: An ethnobotanical and chemical investigation." *Economic Botany* **26**(2): 101-129.

The Sharanahua and Culina, small Indian tribes located in the southwestern Amazon basin, use a hallucinogenic drink for medicinal and social purposes. This decoction, called “Ayahuasca” in Peru, is prepared from *Banisteriopsis Caapi* stems and *Psychotria sp.* leaves. These plants have been botanically identified on the basis of voucher herbarium specimens and investigated for alkaloid content by means of a gas chromatography-mass spectrometry technique. A list of other occasional plant admixtures is given. Harmine, Harmaline, Tetrahydroharmine, Harmol and 6-Methoxytryptamine have been found in *Banisteriopsis Caapi*. Dimethyltryptamine, Monomethyltryptamine and 2-methyl-1,2,3,4-tetrahydro- β -carboline have been found in *Psychotria viridis* and *Psychotria carthaginensis*. Harmine, Harmaline, Tetrahydroharmine and Dimethyltryptamine have been found in the drink. Quantitative calculations show the amount of each alkaloid administered in the Ayahuasca drink.

Roberts, T. B. (2003). "The Antipodes of the Mind: Charting the Phenomenology of the Ayahuasca Experience." *Anthropology of Consciousness* **14**(1): 75-79.

This is a pioneering cognitive psychological study of Ayahuasca, a plant-based Amazonian psychotropic brew. Benny Shanon presents a comprehensive charting of the various facets of the special state of mind induced by Ayahuasca, and analyzes them from a cognitive psychological perspective. He also presents some philosophical reflections. Empirically, the research presented in this book is based on the systematic recording of the author's extensive experiences with the brew and on the interviewing of a large number of informants: indigenous people, shamans, members of different religious sects using Ayahuasca, and travellers. In addition to its being the most thorough study of the Ayahuasca experience to date, the book lays the theoretical foundations for the psychological study of non-ordinary states of consciousness in general.

Rock, A. J., et al. (2008). "Ego Boundaries, Shamanic-Like Techniques, and Subjective Experience: An Experimental Study." *Anthropology of Consciousness* **19**(1): 60-83.

The subjective effects and therapeutic potential of the shamanic practice of journeying is well known. However, previous research has neglected to provide a comprehensive assessment of the subjective effects of shamanic-like journeying techniques on non-shamans. Shamanic-like techniques are those that demonstrate some similarity to shamanic practices and yet deviate from what may genuinely be considered shamanism. Furthermore, the personality traits that influence individual susceptibility to shamanic-like techniques are unclear. The aim of the present study was, thus, to investigate experimentally the effect of shamanic-like techniques and a personality trait referred to as "ego boundaries" on subjective experience including mood disturbance. Forty-three non-shamans were administered a composite questionnaire consisting of demographic items and a measure of ego boundaries (i.e., the Short Boundary Questionnaire; BQ-Sh). Participants were randomly assigned to one of three conditions: listening to monotonous drumming for 15 minutes coupled with one of two sets of journeying instructions; or sitting quietly with eyes closed for 15 minutes. Participants' subjective experience and mood disturbance were retrospectively assessed using the Phenomenology of Consciousness Inventory (PCI) and the Profile of Mood States-Short Form, respectively. The results indicated that there was a statistically significant difference between conditions with regard to the PCI major dimensions of visual imagery, attention and rationality, and minor dimensions of imagery amount and absorption. However, the shamanic-like conditions were not associated with a major reorganization of the pattern of subjective experience compared to the sitting quietly condition, suggesting that what is typically referred to as an altered state of consciousness effect was not evident. One shamanic-like condition and the BQ-Sh subscales need for order, childlikeness, and sensitivity were statistically significant predictors of total mood disturbance. Implications of the findings for the anthropology of consciousness are also considered.

Rodd, R. (2008). "Reassessing the cultural and psychopharmacological significance of Banisteriopsis caapi: preparation, classification and use among the Piaroa of Southern Venezuela." *J Psychoactive Drugs* **40**(3): 301-307.

Recent attention to the monoamine oxidase inhibiting properties of Banisteriopsis caapi's harmala alkaloids has precluded a balanced assessment of B. caapi's overall significance to indigenous South American societies. Relatively little attention has been paid to the cultural contexts, local meanings and patterns of use of B. caapi among snuff-using societies, such as

the Piaroa, who do not prepare decoctions containing N,N-dimethyltryptamine (DMT) admixtures. This article reviews the psychopharmacological literature on *B. caapi* in light of recent ethnographic work conducted among the Piaroa of southern Venezuela. Piaroa shamans use only *B. caapi*'s cambium, identify at least five distinct varieties of *B. caapi*, and emphasise the plant's importance for heightening empathy. Some Piaroa people also attribute a range of extra-shamanic uses to *B. caapi*, including as a stimulant and hunting aid. In light of the psychopharmacological complexity of harmala alkaloids, and ethnographic evidence for a wide range of *B. caapi* uses, future research should reconsider *B. caapi*'s cultural heritage and psychopharmacological potential as a stimulant and antidepressant-like substance.

Samoylenko, V., et al. (2010). "Banisteriopsis caapi, a unique combination of MAO inhibitory and antioxidative constituents for the activities relevant to neurodegenerative disorders and Parkinson's disease." *J Ethnopharmacol* **127**(2): 357-367.

AIM OF THE STUDY: Parkinson's disease is a neurological disorder mostly effecting the elder population of the world. Currently there is no definitive treatment or cure for this disease. Therefore, in this study the composition and constituents of the aqueous extract of *Banisteriopsis caapi* for monoamine oxidases (MAO) inhibitory and antioxidant activities were assessed, which are relevant to the prevention of neurological disorders, including Parkinsonism.

MATERIALS AND METHODS: The aqueous extract of *Banisteriopsis caapi* stems was standardized and then fractionated using reversed-phase (RP) chromatography. Pure compounds were isolated either by reversed-phase (RP) chromatography or centrifugal preparative TLC, using a Chromatotron. Structure elucidation was carried out by 1D and 2D NMR, Mass, IR and Circular Dichroism spectroscopy and chemical derivatization. Chemical profiling of the extract was carried out with RP-HPLC. The inhibitory activity of MAO-A, MAO-B, acetylcholinesterase, butyrylcholinesterase and catechol-O-methyl transferase enzymes, as well as antioxidant and cytotoxic activities of both *Banisteriopsis caapi* extract and isolated compounds was evaluated.

RESULTS: An examination of the aqueous extracts of *Banisteriopsis caapi* cultivar Da Vine yielded two new alkaloidal glycosides, named banistenoside A (1) and banistenoside B (2), containing "azepino[1,2-a]tetrahydro-beta-carboline" unique carbon framework. One additional new natural tetrahydronorharmine (4), four known beta-carbolines harmol (3), tetrahydroharmine (5), harmaline (6) and harmine (7), two known proanthocyanidines (-)-epicatechin (8) and (-)-procyanidin B2 (9), and a new disaccharide beta-d-fructofuranosyl-(2->5)-fructopyranose (14) together with known saccharose (15) and beta-d-glucose (16) were also isolated. In addition, the acetates of 1, 2, 8, 9, 14 and 15 (compounds 10-13, 17, 18) were also prepared. Harmaline (6) and harmine (7) showed potent in vitro inhibitory activity against recombinant human brain monoamine oxidase (MAO)-A and -B enzymes (IC₅₀) 2.5 and 2.0 nM, and 25 and 20 microM, respectively), and (-)-epicatechin (8) and (-)-procyanidin B2 (9) showed potent antioxidant and moderate MAO-B inhibitory activities (IC₅₀) <0.13 and 0.57 microg/mL, and 65 and 35 microM). HPLC analysis revealed that most of the dominant chemical and bioactive markers (1, 2, 5, 7-9) were present in high concentrations in dried bark of large branch. Analysis of regular/commercial *Banisteriopsis caapi* dried stems showed a similar qualitative HPLC pattern, but relatively low content of dominant markers 1, 2, 7, and 9, which led to decreased MAO inhibitory and antioxidant potency.

CONCLUSION: Collectively, these results give additional basis to the existing claim of *Banisteriopsis caapi* stem extract for the treatment of Parkinsonism, including other neurodegenerative disorders.

Sanches, R. F., et al. (2015). "Antidepressant Effects of a Single Dose of Ayahuasca in Patients With Recurrent Depression: A SPECT Study." *Journal Of Clinical Psychopharmacology*.

Ayahuasca is an Amazonian botanical hallucinogenic brew which contains dimethyltryptamine, a 5-HT_{2A} receptor agonist, and harmine, a monoamine-oxidase A inhibitor. Our group recently reported that ayahuasca administration was associated with fast-acting antidepressive effects in 6 depressive patients. The objective of the present work was to assess the antidepressive potentials of ayahuasca in a bigger sample and to investigate its effects on regional cerebral blood flow. In an open-label trial conducted in an inpatient psychiatric unit, 17 patients with recurrent depression received an oral dose of ayahuasca (2.2 mL/kg) and were evaluated with the Hamilton Rating Scale for Depression, the Montgomery-Åsberg Depression Rating Scale, the Brief Psychiatric Rating Scale, the Young Mania Rating Scale, and the Clinician Administered Dissociative States Scale during acute ayahuasca effects and 1, 7, 14, and 21 days after drug intake. Blood perfusion was assessed eight hours after drug administration by means of single photon emission tomography. Ayahuasca administration was associated with increased psychoactivity (Clinician Administered Dissociative States Scale) and significant score decreases in depression-related scales (Hamilton Rating Scale for Depression, Montgomery-Åsberg Depression Rating Scale, Brief Psychiatric Rating Scale) from 80 minutes to day 21. Increased blood perfusion in the left nucleus accumbens, right insula and left subgenual area, brain regions implicated in the regulation of mood and emotions, were observed after ayahuasca intake. Ayahuasca was well tolerated. Vomiting was the only adverse effect recorded, being reported by 47% of the volunteers. Our results suggest that ayahuasca may have fast-acting and sustained antidepressive properties. These results should be replicated in randomized, double-blind, placebo-controlled trials.;

Sánchez, C. and C. Bouso (2015). Ayahuasca: From the Amazon to the Global Village. Drug Policy Briefings#43. Barcelona, International Center for Ethnobotanical Education Research & Services.

Globalisation has facilitated cultural exchange between indigenous traditions and Western practices, which has led to a growing interest in the ritual, religious and therapeutic use of ayahuasca.

Santos, R. G., et al. (2007). "Effects of ayahuasca on psychometric measures of anxiety, panic-like and hopelessness in Santo Daime members." *Journal of Ethnopharmacology* **112**(3): 507-513.

The use of the hallucinogenic brew ayahuasca, obtained from infusing the shredded stalk of the malpighiaceae plant *Banisteriopsis caapi* with the leaves of other plants such as *Psychotria viridis*, is growing in urban centers of Europe, South and North America in the last several decades. Despite this diffusion, little is known about its effects on emotional states. The present study investigated the effects of ayahuasca on psychometric measures of anxiety, panic-like and hopelessness in members of the Santo Daime, an ayahuasca-using religion. Standard questionnaires were used to evaluate state-anxiety (STAI-state), trait-anxiety (STAI-trait), panic-like (ASI-R) and hopelessness (BHS) in participants that ingested ayahuasca for at least 10 consecutive years. The study was done in the Santo Daime church, where the questionnaires were administered 1 h after the ingestion of the brew, in a double-blind, placebo-controlled procedure. While under the acute effects of ayahuasca,

participants scored lower on the scales for panic and hopelessness related states. Ayahuasca ingestion did not modify state- or trait-anxiety. The results are discussed in terms of the possible use of ayahuasca in alleviating signs of hopelessness and panic-like related symptoms.

Sarris, J., et al. (2013). "Plant-based medicines for anxiety disorders, Part 1: a review of preclinical studies." *CNS Drugs* **27**(3): 207-219.

Research in the area of herbal psychopharmacology has revealed a variety of promising medicines that may provide benefit in the treatment of general anxiety and specific anxiety disorders. However, a comprehensive review of plant-based anxiolytics has been absent to date. This article (part 1) reviews herbal medicines for which only preclinical investigations for anxiolytic activity have been performed. In part 2, we review herbal medicines for which there have been clinical investigations for anxiolytic activity. An open-ended, language-restricted (English) search of MEDLINE (PubMed), CINAHL, Scopus and the Cochrane Library databases was conducted (up to 28 October 2012) using specific search criteria to identify herbal medicines that have been investigated for anxiolytic activity. This search of the literature revealed 1,525 papers, from which 53 herbal medicines were included in the full review (having at least one study using the whole plant extract). Of these plants, 21 had human clinical trial evidence (reviewed in part 2), with another 32 having solely preclinical studies (reviewed here in part 1). Preclinical evidence of anxiolytic activity (without human clinical trials) was found for *Albizia julibrissin*, *Sonchus oleraceus*, *Uncaria rhynchophylla*, *Stachys lavandulifolia*, *Cecropia glazioui*, *Magnolia* spp., *Eschscholzia californica*, *Erythrina* spp., *Annona* spp., *Rubus brasiliensis*, *Apocynum venetum*, *Nauclea latifolia*, *Equisetum arvense*, *Tilia* spp., *Securidaca longepedunculata*, *Achillea millefolium*, *Leea indica*, *Juncus effusus*, *Coriandrum sativum*, *Eurycoma longifolia*, *Turnera diffusa*, *Euphorbia hirta*, *Justicia* spp., *Crocus sativus*, *Aloysia polystachya*, *Albies pindrow*, *Casimiroa edulis*, *Davilla rugosa*, *Gastrodia elata*, *Sphaerathus indicus*, *Zizyphus jujuba* and *Panax ginseng*. Common mechanisms of action for the majority of botanicals reviewed primarily involve GABA, either via direct receptor binding or ionic channel or cell membrane modulation; GABA transaminase or glutamic acid decarboxylase inhibition; a range of monoaminergic effects; and potential cannabinoid receptor modulation. Future research should focus on conducting human clinical trials on the plants reviewed with promising anxiolytic activity.

Sarris, J., et al. (2013). "Plant-based medicines for anxiety disorders, part 2: a review of clinical studies with supporting preclinical evidence." *CNS Drugs* **27**(4): 301-319.

Research in the area of herbal psychopharmacology has revealed a variety of promising medicines that may provide benefit in the treatment of general anxiety and specific anxiety disorders. However, a comprehensive review of plant-based anxiolytics has been absent to date. Thus, our aim was to provide a comprehensive narrative review of plant-based medicines that have clinical and/or preclinical evidence of anxiolytic activity. We present the article in two parts. In part one, we reviewed herbal medicines for which only preclinical investigations for anxiolytic activity have been performed. In this current article (part two), we review herbal medicines for which there have been both preclinical and clinical investigations of anxiolytic activity. A search of MEDLINE (PubMed), CINAHL, Scopus and the Cochrane Library databases was conducted (up to 28 October 2012) for English language papers using the search terms 'anxiety' OR 'anxiety disorder' OR 'generalized anxiety disorder' OR 'social phobia' OR 'post-traumatic stress disorder' OR 'panic disorder' OR 'agoraphobia' OR 'obsessive compulsive disorder' in combination with the search terms 'Herb*' OR 'Medicinal Plants' OR 'Botanical Medicine' OR 'Chinese herb*', in addition to

individual herbal medicines. This search of the literature revealed 1,525 papers, of which 53 plants were included in the review (having at least one study using the whole plant extract). Of these plants, 21 had human clinical trial evidence (reviewed here in part two), with the other 32 having solely preclinical evidence (reviewed in part one). Support for efficacy was found for chronic use (i.e. greater than one day) of the following herbs in treating a range of anxiety disorders in human clinical trials: Piper methysticum, Matricaria recutita, Ginkgo biloba, Scutellaria lateriflora, Silybum marianum, Passiflora incarnata, Withania somniferum, Galphimia glauca, Centella asiatica, Rhodiola rosea, Echinacea spp., Melissa officinalis and Echinium amoenum. For several of the plants studied, conclusions need to be tempered due to methodological issues such as small sample sizes, brief intervention durations and non-replication. Current evidence does not support Hypericum perforatum or Valeriana spp. for any anxiety disorder. Acute anxiolytic activity was found for Centella asiatica, Salvia spp., Melissa officinalis, Passiflora incarnata and Citrus aurantium. Bacopa monnieri has shown anxiolytic effects in people with cognitive decline. The therapeutic application of psychotropic plant-based treatments for anxiety disorders is also discussed, specifically Psychotria viridis and Banisteriopsis caarti (ayahuasca), Psilocybe spp. and cannabidiol-enriched (low tetrahydrocannabinol (Delta(9)-THC)) Cannabis spp.

Schenberg, E. E. (2013). "Ayahuasca and cancer treatment." SAGE Open Medicine **1**.

Objectives: Comprehensively review the evidence regarding the use of ayahuasca, an Amerindian medicine traditionally used to treat many different illnesses and diseases, to treat some types of cancer. Methods: An in-depth review of the literature was conducted using PubMed, books, institutional magazines, conferences and online texts in nonprofessional sources regarding the biomedical knowledge about ayahuasca in general with a specific focus in its possible relations to the treatment of cancer. Results: At least nine case reports regarding the use of ayahuasca in the treatment of prostate, brain, ovarian, uterine, stomach, breast, and colon cancers were found. Several of these were considered improvements, one case was considered worse, and one case was rated as difficult to evaluate. A theoretical model is presented which explains these effects at the cellular, molecular, and psychosocial levels. Particular attention is given to ayahuasca's pharmacological effects through the activity of N,N-dimethyltryptamine at intracellular sigma-1 receptors. The effects of other components of ayahuasca, such as harmine, tetrahydroharmine, and harmaline, are also considered. Conclusion: The proposed model, based on the molecular and cellular biology of ayahuasca's known active components and the available clinical reports, suggests that these accounts may have consistent biological underpinnings. Further study of ayahuasca's possible antitumor effects is important because cancer patients continue to seek out this traditional medicine. Consequently, based on the social and anthropological observations of the use of this brew, suggestions are provided for further research into the safety and efficacy of ayahuasca as a possible medicinal aid in the treatment of cancer.

Schenberg, E. E., et al. (2015). "Acute Biphasic Effects of Ayahuasca." PLoS ONE **10**(9): e0137202.

Ritual use of ayahuasca, an amazonian Amerindian medicine turned sacrament in syncretic religions in Brazil, is rapidly growing around the world. Because of this internationalization, a comprehensive understanding of the pharmacological mechanisms of action of the brew and the neural correlates of the modified states of consciousness it induces is important. Employing a combination of electroencephalogram (EEG) recordings and quantification of ayahuasca's compounds and their metabolites in the systemic circulation we found ayahuasca to induce a biphasic effect in the brain. This effect was composed of reduced

power in the alpha band (8-13 Hz) after 50 minutes from ingestion of the brew and increased slow- and fast-gamma power (30-50 and 50-100 Hz, respectively) between 75 and 125 minutes. Alpha power reductions were mostly located at left parieto-occipital cortex, slow-gamma power increase was observed at left centro-parieto-occipital, left fronto-temporal and right frontal cortices while fast-gamma increases were significant at left centro-parieto-occipital, left fronto-temporal, right frontal and right parieto-occipital cortices. These effects were significantly associated with circulating levels of ayahuasca's chemical compounds, mostly N,N-dimethyltryptamine (DMT), harmine, harmaline and tetrahydroharmine and some of their metabolites. An interpretation based on a cognitive and emotional framework relevant to the ritual use of ayahuasca, as well as it's potential therapeutic effects is offered.

Schmid, J. T., et al. (2010). "Subjective Theories about (Self-)Treatment with Ayahuasca." *Anthropology of Consciousness* **21**(2): 188-204.

Ayahuasca is a psychoactive beverage that is mostly used in ritualized settings (Santo Daime rituals, neo-shamanic rituals, and even do-it-yourself-rituals). It is a common practice in the investigated socio-cultural field to call these settings "healing rituals." For this study, 15 people who underwent ayahuasca (self-)therapy for a particular disease like chronic pain, cancer, asthma, depression, alcohol abuse, or Hepatitis C were interviewed twice about their subjective concepts and beliefs on ayahuasca and healing. Qualitative data analysis revealed a variety of motivational patterns, subjective effects, and user types. Most participants were convinced that ayahuasca had influenced their illness positively or improved their coping with their illness. More importantly, it had enhanced their well being in general. As a result, we concluded that the effects of ayahuasca should not be reduced to a pharmacological model. The substance should be conceptualized as a psychological catalyst that unfolds within different fields of sociocultural ideas.

Shanon, B. (2000). "Ayahuasca and Creativity." *MAPS Bulletin* **10**(3): 18-19.

Abstract: As indicated in previous publications (Shanon, 1997, 1998a, 1999) I am a cognitive psychologist who is studying the phenomenology of the ayahuasca experience. My study is based on extended firsthand experience as well as on the interviewing of a great number of persons in different places and contexts. In the publications cited the reader can find background information about both ayahuasca and the program of my research; for further theoretical discussion, see my forthcoming book *The Antipodes of the Mind: Charting the Phenomenology of the Ayahuasca Experience*.

Shanon, B. (2002). The antipodes of the mind : charting the phenomenology of the Ayahuasca experience, Oxford : Oxford University Press, 2006.

Reprinted.

Pt. I. Preliminaries -- 1. General Background -- 2. Theoretical Foundations -- 3. Methodology and General Structure -- Pt. II. The Phenomenology of the Ayahuasca Experience -- 4. Atmosphere and General Effects -- 5. Open-Eye Visualizations -- 6. A Structural Typology of Ayahuasca Visualizations -- 7. Interaction and Narration -- 8. The Contents of Visions -- 9. The Themes of Visions -- 10. Ideas, Insights, and Reflections -- 11. Non-Visual Perceptions -- 12. Consciousness I -- 13. Transformations -- 14. Time -- 15. Meaning and Semantics -- 16. Consciousness II -- 17. Light -- Pt. III. Theoretical Issues -- 18. Stages and Order -- 19.

Contextual Considerations -- 20. Cognitive Parameters -- 21. Dynamics -- 22. A General Theoretical Perspective -- 23. Concluding Philosophical Reflections.

Shanon, B. (2008). "Biblical Entheogens: a Speculative Hypothesis." *Time and Mind* **1**(1): 51-74.

Abstract A speculative hypothesis is presented according to which the ancient Israelite religion was associated with the use of entheogens (mind-altering plants used in sacramental contexts). The hypothesis is based on a new look at texts of the Old Testament pertaining to the life of Moses. The ideas entertained here were primarily based on the fact that in the arid areas of the Sinai peninsula and Southern Israel there grow two plants containing the same psychoactive molecules found in the plants from which the powerful Amazonian hallucinogenic brew Ayahuasca is prepared. The two plants are species of Acacia tree and the bush *Peganum harmala*. The hypothesis is corroborated by comparative experiential-phenomenological observations, linguistic considerations, exegesis of old Jewish texts and other ancient Mideastern traditions, anthropological lore, and ethnobotanical data.

Shanon, B. (2010). "The epistemics of ayahuasca visions." *Phenomenology and the Cognitive Sciences* **9**(2): 263-280.

In this paper, I discuss substance-induced visions and consider their epistemic status, meaning, and modes of proper interpretation. I focus on the visions induced by ayahuasca, a powerful psychoactive plant-made brew that has had a central status and role in the indigenous tribal cultures of the upper Amazonian region. The brew is especially famous for the visions seen with it. These are often coupled with personal psychological insights, mentations concerning topics of special significance to one, intellectual (notably, philosophical and metaphysical) ideations, as well as powerful religious and spiritual sentiments. Thus, under the intoxication, people often feel that they gain significant knowledge and understanding. The present discussion takes a cognitive-phenomenological perspective coupled with a philosophical analysis of the various epistemological questions at hand.

Sklerov, J., et al. (2005). "A fatal intoxication following the ingestion of 5-methoxy-N,N-dimethyltryptamine in an ayahuasca preparation." *J Anal Toxicol* **29**(8): 838-841.

A case of a 25-year-old white male who was found dead the morning after consuming herbal extracts containing beta-carbolines and hallucinogenic tryptamines is presented. No anatomic cause of death was found at autopsy. Toxicologic analysis of the heart blood identified N,N-dimethyltryptamine (0.02 mg/L), 5-methoxy-N,N-dimethyltryptamine (1.88 mg/L), tetrahydroharmine (0.38 mg/L), harmaline (0.07 mg/L), and harmine (0.17 mg/L). All substances were extracted by a single-step n-butyl chloride extraction following alkalization with borate buffer. Detection and quantitation was performed using liquid chromatography-electrospray mass spectrometry. The medical examiner ruled that the cause of death was hallucinogenic amine intoxication, and the manner of death was undetermined.

Sobiecki, J.-F. (2013). "An Account of Healing Depression Using Ayahuasca Plant Teacher Medicine in a Santo Daime Ritual." *Indo-Pacific Journal of Phenomenology* **13**(1): 1.

Ayahuasca is a psychoactive traditional plant medicine preparation used by the indigenous tribes of the Upper Amazon in their shamanic traditions. Its use has become popular

amongst Westerners seeking alternative means of healing, and the medicine has now spread across the globe via syncretic spiritual healing traditions such as the Santo Daime Church. Despite the increased use of the medicine, little research exists on its effectiveness for healing depression. The existing literature does not contain a detailed self-reported phenomenological account of ayahuasca healing a case of depression. The aim of this paper is to share a personal account of healing depression using ayahuasca in a Santo Daime ritual in Johannesburg, South Africa. This experience was unplanned and unexpected and resulted in a profoundly transformative healing process. Based on my experience, I describe ayahuasca's ingestion as having created a powerful mind-body-spirit connection that resulted in what appeared and felt like a profound reconfiguration of the bio-electrical energy system in my body and a powerful anti-depressant action on my mind. These effects were catalyzed by a strong intention to heal and trust in and take responsibility for myself. Other South African Santo Daime members have reported healing of depression with ayahuasca, although in longer and different processes. It appears that the medicine engages the individual's unique collective self (life-history, physical and mental disposition, beliefs and intents) resulting in different outcomes for different individuals. Thus, from my own and others' experience, I describe ayahuasca as a spiritual medicine; one that promotes enhanced awareness and deeper connection to one's core self, to others and the greater universe, while facilitating the manifestation of one's intentions and beliefs. This encounter with ayahuasca provided me a first-hand experience of learning and healing from the medicine, making real to me the indigenous Amazonian description of plants as being teachers and doctors.

Soler, J., et al. (2015). "Exploring the therapeutic potential of Ayahuasca: acute intake increases mindfulness-related capacities." *Psychopharmacology* (Berl).

BACKGROUND: Ayahuasca is a psychotropic plant tea used for ritual purposes by the indigenous populations of the Amazon. In the last two decades, its use has expanded worldwide. The tea contains the psychedelic 5-HT_{2A} receptor agonist N,N-dimethyltryptamine (DMT), plus beta-carboline alkaloids with monoamine-oxidase-inhibiting properties. Acute administration induces an introspective dream-like experience characterized by visions and autobiographic and emotional memories. Studies of long-term users have suggested its therapeutic potential, reporting that its use has helped individuals abandon the consumption of addictive drugs. Furthermore, recent open-label studies in patients with treatment-resistant depression found that a single ayahuasca dose induced a rapid antidepressant effect that was maintained weeks after administration. Here, we conducted an exploratory study of the psychological mechanisms that could underlie the beneficial effects of ayahuasca. METHODS: We assessed a group of 25 individuals before and 24 h after an ayahuasca session using two instruments designed to measure mindfulness capacities: The Five Facets Mindfulness Questionnaire (FFMQ) and the Experiences Questionnaire (EQ). RESULTS: Ayahuasca intake led to significant increases in two facets of the FFMQ indicating a reduction in judgmental processing of experiences and in inner reactivity. It also led to a significant increase in decentering ability as measured by the EQ. These changes are classic goals of conventional mindfulness training, and the scores obtained are in the range of those observed after extensive mindfulness practice. CONCLUSIONS: The present findings support the claim that ayahuasca has therapeutic potential and suggest that this potential is due to an increase in mindfulness capacities.

Stanković, D., et al. (2015). "New electrochemical method for the determination of β -carboline alkaloids, harmalol and harmine, in human urine samples and in *Banisteriopsis caapi*." *Microchemical Journal* **118**: 95-100.

In this paper a new electrochemical method for determination of the β -carboline alkaloids, harmalol and harmine, using differential pulse voltammetry is presented. Experimental parameters such as pH, scan rate, pulse amplitude and pulse time were optimized to characterize their electrochemical behavior and to find best analytical conditions. Thus, in the presence of ascorbic acid, uric acid, dopamine, the developed method exhibits excellent performance for the determination of harmalol and harmine for a linear concentration range between 1–50 μ M and 1–75 μ M with a detection limit of 0.6 μ M and 0.2 μ M, respectively. The proposed method was successfully applied for the determination of these alkaloids in a sample of an Ayahuasca liana (*Banisteriopsis caapi*) and in model human urine samples with good recoveries.

- A novel, applicable technology for determination of β -carboline alkaloids was proposed.
- The method exhibits surprise reproducibility, selectivity and sensitivity.
- The detection limits of 0.6 and 0.2 μ M for harmalol and harmine, reached.

Strassman, R., et al. (1994). "Dose-response study of n,n-dimethyltryptamine in humans: li. subjective effects and preliminary results of a new rating scale." *Archives of General Psychiatry* **51**(2): 98-108.

Background: Validation of animal models of hallucinogenic drugs' subjective effects requires human data. Previous human studies used varied groups of subjects and assessment methods. Rating scales for hallucinogen effects emphasized psychodynamic principles or the drugs' dysphoric properties. We describe the subjective effects of graded doses of N,N-dimethyltryptamine (DMT), an endogenous hallucinogen and drug of abuse, in a group of experienced hallucinogen users. We also present preliminary data from a new rating scale for these effects.

Methods: Twelve highly motivated volunteers received two doses (0.04 and 0.4 mg/kg) of intravenous (IV) dimethyltryptamine fumarate "nonblind," before entering a doubleblind, saline placebo-controlled, randomized study using four doses of IV DMT. Subjects were carefully interviewed after resolution of drug effects, providing thorough and systematic descriptions of DMT's effects. They also were administered a new instrument, the Hallucinogen Rating Scale (HRS). The HRS was drafted from interviews obtained from an independent sample of 19 experienced DMT users, and modified during early stages of the study.

Results: Psychological effects of IV DMT began almost immediately after administration, peaked at 90 to 120 seconds, and were almost completely resolved by 30 minutes. This time course paralleled DMT blood levels previously described. Hallucinogenic effects were seen after 0.2 and 0.4 mg/kg of dimethyltryptamine fumarate, and included a rapidly moving, brightly colored visual display of images. Auditory effects were less common. "Loss of control," associated with a brief, but overwhelming "rush," led to a dissociated state, where euphoria alternated or coexisted with anxiety. These effects completely replaced subjects' previously ongoing mental experience and were more vivid and compelling than dreams or waking awareness. Lower doses, 0.1 and 0.05 mg/kg, were primarily affective and somaesthetic, while 0.1 mg/kg elicited the least desirable effects. Clustering of HRS items, using either a clinical, mental status method or principal components factor analysis provided better resolution of dose effects than did the biological variables described previously.

Conclusions: These clinical and preliminary quantitative data provide bases for further psychopharmacologic characterization of DMT's properties in humans. They also may be used to compare the effects of other agents affecting relevant brain receptors in volunteer and psychiatric populations.

Strassman, R. J. (1996). "Human psychopharmacology of N,N-dimethyltryptamine." Behav Brain Res **73**(1-2): 121-124.

We generated dose-response data for the endogenous and ultra-short-acting hallucinogen, N,N-dimethyltryptamine (DMT), in a cohort of experienced hallucinogen users, measuring multiple biological and psychological outcome measures. Subjective responses were quantified with a new rating scale, the HRS, which provided better resolution of dose effects than did the biological variables. A tolerance study then was performed, in which volunteers received four closely spaced hallucinogenic doses of DMT. Subjective responses demonstrated no tolerance, while biological measures were inconsistently reduced over the course of the sessions. Thus, DMT remains unique among classic hallucinogens in its inability to induce tolerance to its psychological effects. To assess the role of the 5-HT1A site in mediating DMT's effects, a pindolol pre-treatment study was performed. Pindolol significantly increased psychological responses to DMT, suggesting a buffering effect of 5-HT1A agonism on 5-HT2-mediated psychedelic effects. These data are opposite to those described in lower animal models of hallucinogens' mechanisms of action.

Strassman, R. J., et al. (1996). "Differential tolerance to biological and subjective effects of four closely spaced doses of N,N-dimethyltryptamine in humans." Biological psychiatry **39**(9): 784-795.

Tolerance to the behavioral effects of the short-acting, endogenous hallucinogen, N,N-dimethyltryptamine (DMT) is seen inconsistently in animals, and has not been produced in humans. The nature and time course of responses to repetitive, closely spaced administrations of an hallucinogenic dose of DMT were characterized. Thirteen experienced hallucinogen users received intravenous 0.3 mg/kg DMT fumarate, or saline placebo, four times, at 30 min intervals, on 2 separate days, in a randomized, double-blind, design. Tolerance to "psychedelic" subjective effects did not occur according to either clinical interview or Hallucinogen Rating Scale scores. Adrenocorticotrophic hormone (ACTH), prolactin, cortisol, and heart rate responses decreased with repeated DMT administration, although blood pressure did not. These data demonstrate the unique properties of DMT relative to other hallucinogens and underscore the differential regulation of the multiple processes mediating the effects of DMT.

Stuckey, D. E., et al. (2005). "EEG Gamma Coherence and Other Correlates of Subjective Reports During Ayahuasca Experiences." J Psychoactive Drugs **37**(2): 163-178.

Abstract The current study examined QEEG power and coherence of ayahuasca experiences with two experienced participants in a Brazilian jungle setting. An exploratory case series design was adopted for naturalistic field research. EEGs recorded during visual imagery was compared to eyesclosed baselines. The most important findings were increases in global EEG coherence in the 36-44 Hz and 50-64 Hz frequency bands for both subjects. Widely distributed cortical hyper-coherence seems reasonable given the intense synesthesia during ayahuasca experiences. Other findings include increased modal EEG alpha frequency and global power decreases across the cortex in most frequency bands, which concur with the EEG of psychedelics literature. Exploratory analysis revealed the usefulness of analyzing single Hz bins over the standard wide-band analysis. The discovery-oriented naturalistic approach developed for this study resulted in potentially important findings. We believe that finding increases in global gamma coherence during peak psychedelic experiences might contribute to the discussion of binding theory. Also, in light of recent research with gamma

coherence during advanced meditative conditions, our findings might further the comparison of shamanic psychedelic practices with meditation.

The current study examined QEEG power and coherence of ayahuasca experiences with two experienced participants in a Brazilian jungle setting. An exploratory case series design was adopted for naturalistic field research. EEGs recorded during visual imagery was compared to eyesclosed baselines. The most important findings were increases in global EEG coherence in the 36-44 Hz and 50-64 Hz frequency bands for both subjects. Widely distributed cortical hyper-coherence seems reasonable given the intense synesthesia during ayahuasca experiences. Other findings include increased modal EEG alpha frequency and global power decreases across the cortex in most frequency bands, which concur with the EEG of psychedelics literature. Exploratory analysis revealed the usefulness of analyzing single Hz bins over the standard wide-band analysis. The discovery-oriented naturalistic approach developed for this study resulted in potentially important findings. We believe that finding increases in global gamma coherence during peak psychedelic experiences might contribute to the discussion of binding theory. Also, in light of recent research with gamma coherence during advanced meditative conditions, our findings might further the comparison of shamanic psychedelic practices with meditation.

Szabo, A., et al. (2015). "[Psychedelics and quasi-psychedelics in the light of contemporary research: medical cannabis, MDMA, salvinorin A, ibogaine and ayahuasca]." *Neuropsychopharmacol Hung* **17**(3): 120-128.

In lack of professional research and appropriate concepts our scientific knowledge of psychedelic agents is limited. According to the long-held official view these drugs are entirely harmful and have no medical use. However, a recent surge of clinical and pharmacological studies in the field indicates that many psychedelic-like agents have therapeutic potentials under proper circumstances. In this paper, from a biomedical and psychological perspective, we provide a brief review of the general effects and promising treatment uses of medical cannabis, 3,4-methylenedioxy-methamphetamine (MDMA), salvinorin A, ibogaine and the dimethyltryptamine-(DMT)-containing ayahuasca. In Hungary - similarly to many other countries - these compounds are classified as "narcotic drugs" and their research is difficult due to strict regulations.

Szmulewicz, A. G., et al. (2015). "Switch to mania after ayahuasca consumption in a man with bipolar disorder: a case report." *International Journal Of Bipolar Disorders* **3**: 4-4.

Background: There is an increasing use of ayahuasca for recreational purposes. Furthermore, there is a growing evidence for the antidepressant properties of its components. However, there are no reports on the effects of this substance in the psychiatric setting. Harmaline, one of the main components of ayahuasca, is a selective and reversible MAO-A inhibitor and a serotonin reuptake inhibitor.; Case Report: We present the case of a man with bipolar disorder who had a manic episode after an ayahuasca consumption ritual. This patient had had at least one hypomanic episode in the past and is currently depressed. We discuss the diagnostic repercussion of this manic episode.; Conclusion: There is lack of specificity in the diagnosis of substance-induced mental disorder. The knowledge of the pharmacodynamic properties of ayahuasca consumption allows a more pathophysiological approach to the diagnosis of the patient.;

Thomas, G., et al. (2013). "Ayahuasca-assisted therapy for addiction: results from a preliminary observational study in Canada." *Curr Drug Abuse Rev* **6**(1): 30-42.

Introduction: This paper reports results from a preliminary observational study of ayahuasca-assisted treatment for problematic substance use and stress delivered in a rural First Nations community in British Columbia, Canada. Methods: The "Working with Addiction and Stress" retreats combined four days of group counselling with two expert-led ayahuasca ceremonies. This study collected pre-treatment and six months follow-up data from 12 participants on several psychological and behavioral factors related to problematic substance use, and qualitative data assessing the personal experiences of the participants six months after the retreat. Findings: Statistically significant ($p < 0.05$) improvements were demonstrated for scales assessing hopefulness, empowerment, mindfulness, and quality of life meaning and outlook subscales. Self-reported alcohol, tobacco and cocaine use declined, although cannabis and opiate use did not; reported reductions in problematic cocaine use were statistically significant. All study participants reported positive and lasting changes from participating in the retreats. Conclusions: This form of ayahuasca-assisted therapy appears to be associated with statistically significant improvements in several factors related to problematic substance use among a rural aboriginal population. These findings suggest participants may have experienced positive psychological and behavioral changes in response to this therapeutic approach, and that more rigorous research of ayahuasca-assisted therapy for problematic substance use is warranted.

Tindall, R. (2015). "Assessing a Quest to Heal HIV with Vegetalista Shamanism." *ReVision* **32**(2/3): 40-45.

In this article, the author examines the role of Vegetalista Shamanism, a practice that involves the use of vegetable and plants of the region by shamans to cure a disease, in healing HIV patients in Peru. He mentions that healers in the Amazon uses their own body as a research laboratory to diagnose and cure an illness through a link between themselves and nature. He also mentions the use of ayahuasca, an entheogenic brew made out of *Banisteriopsis caapi* vine in the healing.

Tittarelli, R., et al. (2015). "Recreational Use, Analysis and Toxicity of Tryptamines." *Current Neuropharmacology* **13**(1): 26-46.

The definition New psychoactive substances (NPS) refers to emerging drugs whose chemical structures are similar to other psychoactive compounds but not identical, representing a 'legal' alternative to internationally controlled drugs. There are many categories of NPS, such as synthetic cannabinoids, synthetic cathinones, phenylethylamines, piperazines, ketamine derivatives and tryptamines. Tryptamines are naturally occurring compounds, which can derive from the amino acid tryptophan by several biosynthetic pathways: their structure is a combination of a benzene ring and a pyrrole ring, with the addition of a 2-carbon side chain. Tryptamines include serotonin and melatonin as well as other compounds known for their hallucinogenic properties, such as psilocybin in 'Magic mushrooms' and dimethyltryptamine (DMT) in Ayahuasca brews. Aim: To review the scientific literature regarding tryptamines and their derivatives, providing a summary of all the available information about the structure of these compounds, their effects in relationship with the routes of administration, their pharmacology and toxicity, including articles reporting cases of death related to intake of these substances. Methods: A comprehensive review of the published scientific literature was performed, using also non peer-reviewed information sources, such as books, government publications and drug user web fora. Conclusions: Information from Internet and from published scientific literature, organized in the way we proposed in this review, provides an effective tool for specialists facing the emerging NPS threat to public health and

public security, including the personnel working in Emergency Department. [ABSTRACT FROM AUTHOR]

Tobin, B. (2001). "Redefining Perspectives in the Search for Protection of Traditional Knowledge: A Case Study from Peru." *Review of European Community & International Environmental Law* **10**(1): 47-64.

INTRODUCTION: Tensions existing between intellectual property rights (IPR) and human rights have, during the last 10 years or so, become ever more evident. A constant stream of high-profile conflicts involving claims of biopiracy, revelations of patents over life forms, human blood cells and traditional knowledge, have all dented the image of legal regimes, which dominate international trade relations. As these conflicts have grown so too have calls for the disbanding or redefinition of IPR regimes, as have calls for the development of legal mechanisms in order to recognize and protect traditional knowledge. However, although there is growing support for development of sui generis¹ legislation to protect the rights of indigenous and local communities over their traditional knowledge, to date there exists no comprehensive national or international

regime that recognizes and protects traditional knowledge. And consequently there has been a general reluctance on the part of national authorities to take the lead in preparing legislation in this area.

Tofoli, L. (2013). A survey of Quality of life and antidepressant use in Brazilian members of the União do Vegetal. *Psychedelic Science* 2013, Oakland, San Francisco.

Tracy, M. (2014). British backpacker dies after taking hallucinogenic brew in Colombia; Gap year teenager from Bristol, Henry Miller, suffered allergic reaction after taking part in tribal ritual: 13.

The body of a British teenager has been found by the road in a Colombian forest, after he took part in a "shaman experience" advertised for tourists. His family have said that Henry Miller, 19, from Kingsdown in Bristol, took part in a local tribal ritual, drinking a herbal concoction known as yagé and apparently suffering a fatal reaction to the hallucinogenic infusion...

Tramacchi, D. (2000). Field tripping: Psychedelic communitas and ritual in the Australian bush, *Carfax*, 2000-01-01.

In this paper, an emerging genre of psychedelic event known as doof is investigated and a definition is offered. The paper is based on fieldwork with psychedelic enthusiasts in Brisbane, Australia. An ethnographic description of a specific doof ('Stomping Monster Doof #3') is presented from an emic perspective, and the ritual techniques, processes and structures of doofs are discussed. The possible location of doof within a rich matrix of other religious, intellectual, and aesthetic/stylistic movements is explored, and a paradigm for a 'psychedelic morality' is outlined. The importance of 'earth-connection' and collective ecstasy as a source of meaning in the lives of 'post-seekers' is emphasised.

Trichter, S. (2010). "Ayahuasca beyond the amazon the benefits and risks of a spreading tradition." *Journal of Transpersonal Psychology* **42**(2): 131-148.

Ayahuasca, a hallucinogenic plant brew from the Amazon basin used as part of healing ceremonies by the region's indigenous people for centuries, is now consumed by growing

numbers of people throughout the world. Ayahuasca consumption has moved from strictly being part of indigenous shamanic healing ceremonies, to being a key component of the Brazilian syncretic churches formed in the last century, to most recently being part of "New Age" rituals conducted throughout the Western world. The discovery of ayahuasca by the Westerners, has resulted in a growing body of research suggesting that participants who take part in ayahuasca ceremonies experience significant spiritual and psychotherapeutic effects. Along with these potential benefits, however, the adoption of indigenous practices into Western cultures brings simultaneous challenges. As participation in ayahuasca ritual spreads into Western cultures, it becomes necessary to examine how to integrate these spiritual healing rituals into contemporary Western concepts of psychological health and ethical conduct.

Trichter, S., et al. (2009). "Changes in spirituality among ayahuasca ceremony novice participants." *J Psychoactive Drugs* **41**(2): 121-134.

Ayahuasca, a hallucinogenic plant brew from the Amazon basin used as part of healing ceremonies by the local indigenous people of the region for centuries, is now being consumed by growing numbers of people throughout the world. Anecdotal evidence and previous research suggest that there are spiritual effects experienced among participants who take part in ayahuasca ceremonies. The current study examined whether novice participants' spirituality was affected through participation in an ayahuasca ceremony, and if so, how. A mixed-design method was used, comparing those participating in an ayahuasca ceremony to those who did not participate. This investigation used the Peak Experience Profile, the Spiritual Well-being Scale, and the Mysticism Scale as quantitative measures. Participant interviews and written accounts of ceremony experiences were analyzed. Results showed that neither the SWB score nor the M-Scale score increased significantly after participating in an ayahuasca ceremony. However, it was found that the higher the PEP score, the greater the positive change in SWB and M-Scale scores. Qualitative data revealed common spiritual themes in many of the participants' interviews and written accounts. Experiential differences were displayed within the ayahuasca ceremony group, warranting continued investigation into, and identification of, various confounding variables that prompt reported changes in spirituality within some participants while not in others.

Tudela-Talavera, P. and M. d. I. Á. L. Torre-Cuadros "Cultural Importance and Use of Medicinal Plants in the Shipibo-Conibo Native Community of Vencedor (Loreto) Peru." *Ethnobotany Research & Applications*.

Tupper, K. W. (2002). "Entheogens and Existential Intelligence: The Use of Plant Teachers as Cognitive Tools." *Canadian Journal of Education* **27**(4): 499-516.

In light of recent specific liberalizations in drug laws in some countries, I have investigated the potential of entheogens (i.e., psychoactive plants used as spiritual sacraments) as tools to facilitate existential intelligence. "Plant teachers" from the Americas such as ayahuasca, psilocybin mushrooms, and peyote, and the Indo-Aryan soma of Eurasia are examples of entheogens that have been used in both the past and present. These have all been revered as spiritual or cognitive tools to provide a richer cosmological understanding of the world for both individuals and cultures. I used Gardner's (1999a) revised multiple intelligence theory and his postulation of an "existential" intelligence as a theoretical lens through which to account for the cognitive possibilities of entheogens and explore potential ramifications for education. (Contains 6 notes.) [Published September 2004.]

Tupper, K. W. (2003). "Entheogens & education: exploring the potential of psychoactives as educational tools." *Journal of Drug Education and Awareness* 1(2): 145-161.

Tupper, K. W. (2008). "The globalization of ayahuasca: harm reduction or benefit maximization?" *Int J Drug Policy* 19(4): 297-303.

Ayahuasca is a tea made from two plants native to the Amazon, *Banisteriopsis caapi* and *Psychotria viridis*, which, respectively, contain the psychoactive chemicals harmala alkaloids and dimethyltryptamine. The tea has been used by indigenous peoples in countries such as Brazil, Ecuador and Peru for medicinal, spiritual and cultural purposes since pre-Columbian times. In the 20th century, ayahuasca spread beyond its native habitat and has been incorporated into syncretistic practices that are being adopted by non-indigenous peoples in modern Western contexts. Ayahuasca's globalization in the past few decades has led to a number of legal cases which pit religious freedom against national drug control laws. This paper explores some of the philosophical and policy implications of contemporary ayahuasca use. It addresses the issue of the social construction of ayahuasca as a medicine, a sacrament and a "plant teacher." Issues of harm reduction with respect to ayahuasca use are explored, but so too is the corollary notion of "benefit maximization."

Tupper, K. W. (2009). "Ayahuasca healing beyond the Amazon: the globalization of a traditional indigenous entheogenic practice." *Global Networks* 9(1): 117-136.

Ayahuasca commonly refers to a psychoactive Amazonian indigenous brew traditionally used for spiritual and healing purposes (that is as an entheogen). Since the late twentieth century, ayahuasca has undergone a process of globalization through the uptake of different kinds of socio-cultural practices, including its sacramental use in some new Brazilian religious movements and its commodified use in cross-cultural vegetalismo practices, or indigenous-style rituals conducted primarily for non-indigenous participants. In this article, I explore the rise of such rituals beyond the Amazon region, and consider some philosophical and political concerns arising from this novel trend in ayahuasca use, including the status of traditional indigenous knowledge, cultural appropriation and intellectual property. I discuss a patent dispute in United States and allegations of biopiracy related to ayahuasca. I conclude the article with some reflections on the future of ayahuasca drinking as a transnational sociological phenomenon.

Tupper, K. W. (2010). Entheogenic healing: The spiritual effects and therapeutic potential of ceremonial ayahuasca use. *The healing power of spirituality: How faith helps humans thrive, Volume 3.* J. H. Ellens. Santa Barbara, Praeger: 269-282.

The overlap between the fields of health and spirituality is well illustrated by traditions of entheogenic healing, and in particular the transnational sociological trend of ceremonial ayahuasca drinking. Entheogenic healing is a concept that derives from the term "entheogen," coined by scholars to convey the sacramental nature of traditional shamanic practices using psychoactive plants (Ruck, Bigwood, Staples, Ott, & Wasson, 1979). Ayahuasca is a decoction characteristically prepared from a boiled mash of a jungle liana (*Banisteriopsis caapi*) and a common admixture leaf (*Psychotria viridis*). The unique pharmacological synergy between particular chemicals in these plants produces a profound altered state of consciousness in humans. Ayahuasca is most commonly consumed in ritual contexts, both in traditional Amazonian indigenous practices and, of late, in various (post)modern syncretistic spiritual or hybrid healing practices. This chapter briefly reviews

the renaissance of interest in the potential therapeutic value of substances known as psychedelics or entheogens¹, and explores the concept of entheogenic healing with examples from various forms of ayahuasca drinking. It covers traditional and modern practices of using ayahuasca in ritual contexts—including indigenous Amazonian traditions and more modern hybrid forms, such as syncretistic Brazilian ayahuasca churches—to diagnose and treat illnesses. It considers the importance of ritual, especially the element of music, for ayahuasca healing. Finally, it looks at addiction as a type of psychospiritual illness for which entheogenic healing with ayahuasca may be particularly well suited.

Tupper, K. W. (2011). Ayahuasca in Canada: Cultural phenomenon and policy issue. The internationalization of ayahuasca. B. C. Labate and H. Jungaberle. Zurich, Lit Verlag: 319-325.

The rise of interest in ayahuasca beyond the Amazon and South America in the late 20th and early 21st centuries is a trend that presents significant legal and policy challenges for governments in liberal democratic states that strive to balance competing interests of criminal justice, public health, economic welfare and human rights (Tupper, 2008). In this chapter, I review the legal status, increasing popularity, and types of ayahuasca uses in Canada, including psychonautic, cross-cultural vegetalismo, and Brazilian ayahuasca religions such as the Santo Daime (Labate, Rose & Santos, 2009). I summarize a 2001 legal action involving a visiting Ecuadorian shaman under whose care a Canadian woman died during an alleged “ayahuasca” ceremony, as well as the Canadian government’s consideration of the Santo Daime congregation’s request for a drug law exemption allowing its members legally to use its sacrament. Finally, I conclude with a few remarks on the significance of the Canadian government’s decision on the Santo Daime case with respect to the context of domestic and international drug control.

Tupper, K. W. (2011). Ayahuasca, entheogenic education & public policy, Unpublished Ph.D. dissertation, University of British Columbia. Vancouver, B.C., University of British Columbia, 2011.

Ayahuasca is an entheogenic decoction prepared from two Amazonian plants containing controlled substances, including dimethyltryptamine. Traditionally drunk ritually (and revered as a healing 'plant teacher') by Amazonian indigenous and mestizo peoples, in the 20th century ayahuasca became a sacrament for several new Brazilian religions. One of these, the Santo Daime, has expanded into Canada, where in 2001 a Montreal-based chapter applied for a federal legal exemption to allow drinking of the brew in its rituals. This dissertation undertakes a critical policy analysis of Health Canada’s decision on the Santo Daime request, using government documents obtained through an Access to Information request as data. My goals are to illustrate how modern stereotypes about 'drugs' and 'drug abuse' in dominant public and political discourses may hinder well-informed policy decision making about ayahuasca, and to consider how entheogenic practices such as ayahuasca drinking are traditional indigenous ways of knowing that should be valued, rather than reflexively demonized and criminalized. My research method is a critical discourse analysis approach to policy analysis, an eclectic means of demonstrating how language contributes to conceptual frames and political responses to public policy issues. I combine insights from recent research on language, discourse and public policy to show how ayahuasca has become an unexpected policy conundrum for liberal democratic states attempting to balance competing interests of criminal justice, public health, and human rights such as religious freedom. I trace ayahuasca’s trajectory as a contemporary policy concern by sketching histories of psychoactive substance use, today’s international drug control regime, and the discursive foundations of its underlying drug war paradigm. Regarding Health

Canada's 2006 decision 'in principle' to recommend exemption for the Daime brew, I critique how the government defined ayahuasca as a policy problem, w

Tupper, K. W. and B. C. Labate (2012). "Plants, Psychoactive Substances and the International Narcotics Control Board: The Control of Nature and the Nature of Control." *Human Rights and Drugs* **2**(1): 17-28.

This article reviews and critiques the International Narcotic Control Board's (INCB) 2010 Annual Report's recommendation about plant materials containing psychoactive substances. It first provides an overview of the United Nations drug control system, then contextualises the INCB's role in the UN system. Through a reading of the text of the INCB's 2010 Report and references to contemporary practices of ayahuasca drinking based in fieldwork, the article shows how this Report fits into the international paradigm of the war on drugs and its conflicts with human rights. It is argued that the Board's recommendation demonstrates an unwarranted attempt to extend the scope of its powers, conflates and thus misrepresents widely diverse plant materials and their effects, fails to distinguish between 'use' and 'abuse' of psychoactive substances and appears to assume that particular elements of culture—specifically, traditions involving psychoactive substance use—are, or should be, static, eternally frozen in time and place

Uzendoski, M. (2008). "Somatic Poetry in Amazonian Ecuador." *Anthropology and Humanism* **33**(1-2): 12-29.

In this article, I explore two healing experiences, one in Amazonian Ecuador and the other in Amazonian Peru. I argue that these experiences can be theorized through the idea of "somatic poetry," which I define as the process of making and experiencing beauty so that life and the story become part of the same thread. I discuss how somatic poetry involves drama and coauthoring with nonhuman natural beings, including spirits. I also explore how somatic poetry works textually in interconnecting past lives, history, myth, the body, and the myriad and various subjectivities of the Amazonian landscape.

Warren, J. M., et al. (2013). "Recreational use of naturally occurring dimethyltryptamine – contributing to psychosis?" *Australian and New Zealand Journal of Psychiatry* **47**(4): 398-399.

Introductory paragraph: The effect of substance abuse on mental health is a pressing issue in modern psychiatric practice, prompting legislation to limit the accessibility of naturally occurring psychoactive substances. In 2011 the Australian Attorney-General's Department submitted the discussion paper 'Implementation of model schedules for Commonwealth serious drug offences' (Australian Government, 2011). The document proposed that all plant species containing the substance N,N-Dimethyl tryptamine (DMT) be listed as controlled plants, provoking outcry from nurseries and gardening societies (Nankervis, 2011; Thompson, 2011). DMT is an endogenous hallucinogen present in many native plants. Interest in recreational DMT use is rising in Australia, and information forums on United States provide the Australia, particularly among users of other hallucinogens and cannabis (Cakic et al., 2010). Easily accessible Internet detailed acquisition, extraction and use of DMT. This is a concerning trend considering the limited awareness of DMT use among psychiatrists.

Wiltshire, P. E. J., et al. (2015). "Light microscopy can reveal the consumption of a mixture of psychotropic plant and fungal material in suspicious death." *Journal of Clinical Forensic and Legal Medicine: An International Journal of Forensic and Legal Medicine*: 73.

Light microscopical examination of plant and fungal remains in the post mortem gut may be capable of demonstrating the ingestion of unexpected natural psychotropic materials. This is demonstrated here in a case in which a 'shaman' was accused of causing the death of a young man. The deceased had participated in a ceremony which involved the drinking of ayahuasca in order to induce a psychotropic experience. Ayahuasca is an infusion of *Banisteriopsis caapi* (ayahuasca vine), which produces a monoamine oxidase inhibitor, and one or more additional tropical plants, generally *Psychotria viridis* (chacruna) which produces dimethyltryptamine (DMT). The monoamine oxidase inhibitor prevents DMT from being broken down in the gut, so enabling its passage into the bloodstream and across the blood/brain barrier. Toxicological tests for DMT demonstrated the presence of this compound in the body. The deceased was reported to be in the habit of using *Psilocybe semilanceata* (liberty cap). This fungus (popularly called magic mushroom) contains psilocybin which is hydrolysed in the gut to psilocin; this compound mimics a serotonin uptake inhibitor, and also invokes psychotropic experiences. Microscopical examination established that the ileum and colon contained spores of *Psilocybe* and, in addition, pollen of *Cannabis sativa* and seeds of *Papaver cf. somniferum* (opium poppy). Both the plant species yield psychotropic substances. Palynological and mycological analysis of containers from the deceased person's dwelling also yielded abundant trace evidence of pertinent pollen and spores. The police had requested analysis for DMT but there was no screening for other psychotropic substances. Investigators were surprised that a mixture of hallucinogenic materials had been consumed by the deceased. The charge was modified from manslaughter to possession of a 'Class A' drug as the deceased had been consuming psychotropic substances not administered by the 'shaman'. Where death involving drugs from plants or fungi is suspected, microscopical examination of samples from the gut can provide a rapid and effective method for assessing, in a temporal context, the presence of ingested materials that may not have been previously suspected. The example presented here also demonstrates the need for caution in interpreting toxicological results where screening for unusual compounds has been limited.

Winkelman, M. (2005). "Drug tourism or spiritual healing? Ayahuasca seekers in Amazonia." *J Psychoactive Drugs* **37**(2): 209-218.

This research addresses the question of whether Westerners who seek traditional spiritual medicine known as ayahuasca can be best characterized as "drug tourists" or as people pursuing spiritual and therapeutic opportunities. Participants in an ayahuasca retreat in Amazonia were interviewed regarding their motivations for participation and the benefits they felt that they received. These findings from the interviews were organized to reveal common motivations and benefits. Contrary to the characterization as "drug tourists", the principal motivations can be characterized as: seeking spiritual relations and personal spiritual development; emotional healing; and the development of personal self-awareness, including contact with a sacred nature, God, spirits and plant and natural energies produced by the ayahuasca. The motivation and perceived benefits both point to transpersonal concerns, with the principal perceived benefits involving increased self awareness, insights and access to deeper levels of the self that enhanced personal development and the higher self, providing personal direction in life.

Winkelman, M. (2011). "Singing to the Plants: A Guide to Mestizo Shamanism in the Upper Amazon by Stephan V. Beyer." *American Ethnologist* **38**(3): 605-606.

Winkelman, M. (2014). Therapeutic Applications of Ayahuasca and Other Sacred Medicines. The Therapeutic Use of Ayahuasca. B. C. Labate and C. Cavnar, Springer Berlin Heidelberg: 1-21.

Therapeutic applications of the psychedelics or hallucinogens found cross-culturally involve treatment of a variety of physical, psychological, and social maladies. Modern medicine has similarly found that a range of conditions may be successfully treated with these agents. The ability to treat a wide variety of conditions derives from variation in active ingredients, doses and modes of application, and factors of set and setting manipulated in ritual. Similarities in effects reported cross-culturally reflect biological mechanisms, while success in the treatment of a variety of specific psychological conditions points to the importance of ritual in eliciting their effects. Similar bases involve action on the serotonin and dopamine neurotransmitter systems that can be characterized as psychointegration: an elevation of ancient brain processes.

Winstock, A. R., et al. (2014). "Dimethyltryptamine (DMT): Prevalence, user characteristics and abuse liability in a large global sample." Journal of Psychopharmacology **28**(1): 49-54.

This paper presents original research on prevalence, user characteristics and effect profile of N,N-dimethyltryptamine (DMT), a potent hallucinogenic which acts primarily through the serotonergic system. Data were obtained from the Global Drug Survey (an anonymous online survey of people, many of whom have used drugs) conducted between November and December 2012 with 22,289 responses. Lifetime prevalence of DMT use was 8.9% (n=1980) and past year prevalence use was 5.0% (n=1123). We explored the effect profile of DMT in 472 participants who identified DMT as the last new drug they had tried for the first time and compared it with ratings provided by other respondents on psilocybin (magic mushrooms), LSD and ketamine. DMT was most often smoked and offered a strong, intense, short-lived psychedelic high with relatively few negative effects or "come down". It had a larger proportion of new users compared with the other substances (24%), suggesting its popularity may increase. Overall, DMT seems to have a very desirable effect profile indicating a high abuse liability that maybe offset by a low urge to use more.

Wolfson, P. E. (2015). "Psychedelic Experiential Pharmacology: Pioneering Clinical Explorations with Salvador Roquet." International Journal of Transpersonal Studies: 160-174.

Richard Yensen was a research fellow at the Maryland Psychiatric Research Center from 1972 to 1976. He studied psychedelic psychotherapy with Stanislav Grof, M.D. and other senior staff. During this time he treated patients with substance abuse disorders, cancer, neurosis, and other health professionals seeking a training experience. Dr. Yensen did his Ph.D. dissertation on the use of MDA in psychotherapy with neurotic outpatients and conducted his research at the MPRC. Through many years of experience in government-sanctioned psychedelic research, he has evolved a non-drug shamanistic psychotherapy called Perceptual Affective Therapy. In the 1990's Richard was co-holder of IND 3250, an investigational new drug permit issued by the U.S. Food and Drug Administration to study LSD and psychotherapy until 2006. He is currently a licensed psychologist in California and director of the Orenda Institute in Vancouver and Cortes Island, British Columbia, Canada and president of the Salvador Roquet Psychosynthesis Association. He has served on the faculties of Harvard Medical School, Johns Hopkins University and the University of Maryland Medical School in Baltimore. [ABSTRACT FROM AUTHOR]

Yritia, M., et al. (2002). "Determination of N,N-dimethyltryptamine and β -carboline alkaloids in human plasma following oral administration of Ayahuasca." *Journal of Chromatography B* **779**(2): 271-281.

Ayahuasca is a South American psychotropic beverage prepared from plants native to the Amazon River Basin. It combines the hallucinogenic agent and 5-HT_{2A/2C} agonist N,N-dimethyltryptamine (DMT) with β -carboline alkaloids showing monoamine oxidase-inhibiting properties. In the present paper, an analytical methodology for the plasma quantification of the four main alkaloids present in ayahuasca plus two major metabolites is described. DMT was extracted by liquid-liquid extraction with n-pentane and quantified by gas chromatography with nitrogen-phosphorus detection. Recovery was 74%, and precision and accuracy were better than 9.9%. The limit of quantification (LOQ) was 1.6 ng/ml. Harmine, harmaline, and tetrahydroharmine (THH), the three main β -carbolines present in ayahuasca, and harmol and harmalol (O-demethylation metabolites of harmine and harmaline, respectively) were measured in plasma by means of high-performance liquid chromatography (HPLC) with fluorescence detection. Sample preparation was accomplished by solid-phase extraction, which facilitated the automation of the process. All five β -carbolines were measured using a single detector by switching wavelengths. Separation of harmol and harmalol required only slight changes in the chromatographic conditions. Method validation demonstrated good recoveries, above 87%, and accuracy and precision better than 13.4%. The LOQ was 0.5 ng/ml for harmine, 0.3 ng/ml for harmaline, 1.0 ng/ml for THH, and 0.3 ng/ml for harmol and harmalol. Good linearity was observed in the concentration ranges evaluated for DMT (2.5–50 ng/ml) and the β -carbolines (0.3–100 ng/ml). The gas chromatography and HPLC methods described allowed adequate characterization of the pharmacokinetics of the four main alkaloids present in ayahuasca, and also of two major β -carboline metabolites not previously described in the literature.