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PARA-PSYCHOLOGY, N,N-DIMETHYLTRYPTAMINE AND THE PINEAL GLAND

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Abstract

In the last decades, one of the psychedelic substances which has gained high attention for its implications in several para-psychological phenomena (including out-of-body states, deep changes in sensory perception, mood, and thought, travels in “hyperspace”, and meetings with disincarnate entities, as well as other “breakthrough experiences”) is dimethyltryptamine (N,N-DMT, or simply DMT). High dose DMT-containing plants (like *Psychotria viridis*, in Quechua language Chacruna or Chacrona) are one of the two principal ingredients of the Ayahuasca, the visionary Amazonian brew reported to induce a range of paranormal experiences, but it can be found as well in a huge number of different natural sources, even some of animal origin - e.g., the Sonoran desert toad, in the form of 5-methoxy-N,N-dimethyltryptamine or 5-MeO-DMT. It was Rick Strassmann (born 1952), a medical doctor, psychiatrist and clinical psycho-pharmacologist, who had the virtue of giving a second birth to the academic interest in scientific research of psychedelics after the post-70's age of obscurantism lead by the American prohibitionist position on this field. Strassman is also the person who named this compound “the spirit molecule”, in order to suggest the deeply psycho-spiritual implications concerning this substance. Here, we overview the scientific basis and evidences supporting the association between DMT and the pineal gland.

KEYWORDS: psychoactive drugs; N,N-dimethyltryptamine; pineal gland; para-psychological phenomena; pineal-DMT hypothesis

In the last decades, one of the psychedelic substances which has gained high attention for its implications in several para-psychological phenomena (including out-of-body states, deep changes in sensory perception, mood, and thought, travels in “hyperspace”, and meetings with disincarnate entities, as well as other “breakthrough experiences”) is dimethyltryptamine (N,N-DMT, or simply DMT) (Fantegrossi et al., 2008; Nichols, 2016; St John, 2018).

High dose DMT-containing plants (like *Psychotria viridis*, in Quechua language Chacruna or Chacrona) are one of the two principal ingredients of the Ayahuasca, the visionary Amazonian brew reported to induce a range of paranormal experiences, but it can be found as well in a huge number of different natural sources, even some of animal origin - e.g., the Sonoran desert toad, in the form of 5-methoxy-N,N-dimethyltryptamine or 5-MeO-DMT (Orsolini et al., 2018; Rudgley, 2000; St John, 2015; St John, 2018).

The psychedelic alchemist Alexander Shulgin devotes an entire chapter to DMT (Shulgin & Shulgin, 1997): “Tryptamines I Have Known and Loved”. He entitles this chapter "DMT Is Everywhere" and maintains that: "*DMT is ... in this flower here, in that tree over there, and in yonder animal. [It] is, most simply, almost everywhere you choose to look*". Indeed, it is getting to the point where one should report where DMT is not found, rather than where it is, as declared by Strassman (2001).

The first scientific studies on the psychotropic effects of N,N-Dimethyltryptamine (DMT) began to be carried out in the mid-1950s. These studies were conducted by the Hungarian psychiatrist and chemist Stephen Szára (born 1923), who became the first person to discover and recognize the psychedelic/entheogenic properties of DMT when he injected it into himself, and his subsequent research would divulge DMT’s properties to the rest of the world.

But it was Rick Strassmann (born 1952), a medical doctor, psychiatrist and clinical psycho-pharmacologist, who had the virtue of giving a second birth to the academic interest in scientific research of psychedelics after the post-70's age of obscurantism lead by the American prohibitionist position on this field. Strassman is also the person who named this compound “*the spirit molecule*”,

in order to suggest the deeply psycho-spiritual implications concerning this substance (Bragazzi et al., 2018).

After a body of extensive researches investigating the effects of administering intravenous injections of DMT carried out with a (neuro-)phenomenological lens, Strassman reached the conclusion that the altered states of consciousness induced by this drug could be compared to the highly mystical experiences which can lead to "spiritual realms". "*Such a substance may lead us to an acceptance of the coexistence of opposites, such as life and death, good and evil; a knowledge that consciousness continues after death; a deep understanding of the basic unity of all phenomena; and a sense of wisdom or love pervading all existence*" (Strassman, 2001).

He also aptly noted that the near-death experience (NDE) can be characterized by psychedelic and mystical qualities, and that the DMT experience often shares the same features as the NDE. Many of the participants in his DMT studies, indeed, reported contacts with sentient and disincarnate beings during the experience, often described as elves, spirits, aliens or other extra-dimensional creatures (Krippner & Friedman, 2009; Strassman, 2001). Such prevalent encounter experiences with DMT use (Luke, 2011; Luke, 2012) are seemingly so unique and reliable (e.g., Meyer, 1994; St John, 2015; Winkelman, 1992; Winkelman, 2018) and have been popularly dubbed as the "self-transforming machine elves" (McKenna, 1991). In the last years, the features of this apparently "tangible reality" has been hotly debated by other DMT-experience researchers (Carpenter, 2006; Kent, 2005; Kent, 2010; Luke, 2012; Pickover, 2005).

In particular, Strassman (2001) has suggested that fluctuations in endogenous DMT levels could be also responsible for the frequent reports of alien abduction, "*which share the newfound fearlessness of death and visions of energy tunnels, or cylinders of light, in common with DMT experiences*" (Krippner & Friedman, 2009).

But which are the characteristics of this powerful molecule? According to Strassman's opinion (2001), DMT can be considered as the simplest of the tryptamine psychedelics. From a molecular standpoint, it is closely related to serotonin, the neurotransmitter that psychedelics affect so widely.

Its pharmacology is similar to that of other well-known psychedelics, as far as it affects receptor sites for serotonin in much the same way that other substances such as lysergic acid diethylamide (LSD), psilocybin, and mescaline do. The serotonin receptors are widespread throughout the human body and can be found in various tissues and organs, including blood vessels, muscle, glands, and skin (Szabo, 2015). For such a simple and widespread molecule, DMT has done a remarkably good job in the promotion of a huge body of research, stimulating debates and evoking suggestions among scientists (Dubay, 2012).

In 1965, a research team from Germany published a paper in the prestigious journal "*Nature*" announcing the isolation of DMT from human blood and urine (Franzen & Gross, 1965). In 1972 the Nobel-prize winning scientist Julius Axelrod (1912-2004) reported finding it in human brain tissue (Saavedra & Axelrod, 1972). Additional research has shown that DMT could also be found in the cerebrospinal fluid bathing the brain (Barker et al., 2012; Smythies et al., 1979).

Jacob & Presti (2005) also noted that DMT is virtually unique among the various endogenous neuro-transmitters and neuro-hormones in that it is a molecule small enough to have blood-brain barrier permeability (Krippner & Friedman, 2009).

The pineal gland is often claimed to be the human body's DMT factory, and Strassman (2001) has popularized the notion that the brain releases large amounts of this compound when we dream and during death, thus explaining the visions we may experience when we sleep and, supposedly, when we enter the white light (Kraehenmann, 2017).

According to Strassman (2001), although tissues and organs like the lungs, liver, blood, and eyes all have the enzymes and the biochemical machinery necessary to convert tryptamine to DMT, the pineal gland is particularly rich in them and also has a high amount of serotonin ready to convert to tryptamine: the so-called pineal-DMT hypothesis (Cardeña et al., 2015). Strassman (2001) has further speculated that the pineal gland might continue to produce *post-mortem* DMT for a few hours.

Recently, Dr Ede Frecska, Chairman of Psychiatry at the Faculty of Medicine of the University of

Debrecen, Hungary, has discovered that DMT can bind to the sigma-1 receptor (σ1R), a trans-membrane protein which can be commonly found throughout the body and, especially, in some regions of the central nervous system. This receptor plays a key role in protecting cells from apoptosis when oxygen concentration is critically low (in other words, in condition of hypoxia), making room for the fascinating argument that DMT may indeed be produced and released in large quantities during death in a last-gasp attempt to maintain human cells alive (Szabo et al., 2016).

Following this path it is tempting to speculate that this sudden surge of DMT production and release may provoke the mystical experiences and encounters on the border between life and death that are often reported during NDE or death-rebirth experiences (Cardeña et al., 2015).

Moreover, adding to this body of scientific evidences already produced, in 2013, DMT has been found in the pineal gland of rats, further corroborating the hypothesis of the "third eye" as endogenous source of DMT (Barker et al., 2013). However, we are yet to uncover any evidence of DMT actually being produced in the pineal gland of humans (Nichols, 2018).

Leaving aside for a while DMT, the pineal gland is considered central in several religious and mystical practices all over the world, and has played a major role in the theories of Galen (circa 130-210 CE) and René Descartes (1596–1650) (López-Muñoz & Alamo, 2011).

Recently, Roney-Dougal (1989; 1991; 2001) has suggested that the pineal gland and its neurochemistry and neuro-anatomy may be of crucial importance in the occurrence of the so-called "*psi phenomena*" (Rogo, 1975; Rogo, 1976) and points to the association made by *yogis* between the pineal gland and the *ajna chakra*, the *yogic* psychic center that controls psi-experiences in those with awakened *kundalini* (Luke, 2012; Miller, 1978; Satyananda, 1972).

As brilliantly reviewed by David Luke (2012) it is possible that pineal gland activity can be stimulated by certain esoteric *yogic* practices, such as *kechari*, which involves pressing the tongue into the far rear roof of the mouth in order to stimulate the production of *amrit*, a *yogic* nectar that reputedly causes DMT-like and mystical ecstasies, which is supposedly secreted in the brain following prolonged, expert practice (Motoyama, 2001; Satyananda, 1996).

Some support for this speculation comes from Strassman's observation (2001) that, from an embryological point of view, the pineal gland is formed *in utero* from the tissue of the roof of the mouth rather than in the brain, and, later, during the different steps of human development, migrates to its unique ventricle position just outside the blood-brain barrier, directly above a critical cerebrospinal fluid byway (Kaur & Ling, 2017; Luke, 2012). This seems to suggest that pineal stimulation *via* the roof of the mouth may be possible (Luke, 2012).

Furthermore, manifestation of very specific body vibrations said to be the classic *kundalini* symptoms (*kundalini* is a form of primal energy located at the base of the spine) are supposedly quite reliably induced with substances such as DPT (N,N-dipropyltryptamine) and 4-Acetoxy-DIPT (N,N-diisopropyl4-acetoxy-tryptamine), which are even more obscure psychedelic tryptamines than DMT (Cardeña et al., 2015), but, at the molecular level, close relatives of it (Toad, 1999a; Toad, 1999b).

On the study of pineal gland activity between a correct, rigorous scientific method and a mystical and theological attitude, the work of the Italian doctor Paolo Lissoni, oncologist and a pioneer in the psycho-neuro-endocrino-immunology (PNEI) approach to medicine is really precious and fundamental (Lissoni, 1999).

According to a recent work (Lissoni et al, 2001) one of the main advances in the knowledge of the neuro-chemical mediation of the psycho-spiritual life was the discovery of the fundamental role of the pineal gland in the regulation of the immune system, namely the anti-cancer immunity, in relation to both psychological/spiritual status and universal environmental information through the light/dark circadian release of various indole neuro-hormones (Brzezinski, 1997; Duffy & Czeisler, 2009; Lissoni, 1999).

In Lissoni's mystical vision of Man as image of the triune God in his biochemical, psychological and spiritual nature, the pineal gland can be considered as the physical/neuro-anatomic bridge between these multi-dimensional aspects (Lissoni, 1999; Lissoni et al., 2001).

Going further with his strongly spiritual view of the healing process, Lissoni found that the different

neuro-hormones produced by the pineal gland could help oncologic patients to restore the natural immune-biological resistance against tumor growth, through the regularization of the rhythm of production of four main pineal indoles produced and released at very specific time-points: namely, i) 5-methoxytryptophol (5-MLT) at midday, ii) 5-methoxytryptamine (5-MT) at sunset, iii) melatonin (MLT) during the night, and iv) 5-methoxy-3-indole acetic acid (5-MIAA) on the early morning.

This finely tuned regularization is able to help the patient to reconnect to his spiritual dimension in order to heal from his disease. In Lissoni's words (1999), the apical hierarchy of the pineal gland in the human psychobiology is proven by the fact that it represents the only structure of the human body being able to transduce the light and the magnetism of the universe in a biological/biochemical response, modulating the functionality of the organism in full harmony with the surrounding environment (Lissoni, 1999).

It is following this suggestive image that the Authors (Lissoni et al., 2001) start their personal considerations on the bio-informative and vibrational properties of the human nervous system, still far from an exhaustive and concrete scientific explanation, with the aim to plant speculative seeds that maybe in the future will flourish in a discussion based on some concrete experimental results.

The earliest evidence for the existence of "deep encephalic photoreceptors" was provided in the first half of the last century. Young (1935) described that blinded and pinealectomised larval lampreys can surprisingly react to illumination of the head, a result that may be explained by the presence of some photosensitive brain areas (Vigh et al., 2002).

According to the comprehensive review of Vigh and colleagues (2002) which compares data collected from different hundred papers on non-visual photoreceptors studied in different animal species, humans included, the pineal organs (mainly called pineal "glands") represent a differentiated form of encephalic photoreceptors.

Extra-cranial pineal organs of sub-mammalians are cone-dominated photoreceptors sensitive to different wavelengths of light, while intracranial pineal organs predominantly contain rod-like

photoreceptor cells and thus scotopic light receptors. In spite of expressing photo-transduction cascade molecules and forming outer segment-like *cilia* in some species, the mammalian pineal can be considered as a light-insensitive organ.

This hypothesis is supported by the evidence that blind humans with some degree of light perception mainly have normally entrained circadian rhythms, whilst, on the contrary, individuals without a conscious light perception are more likely to suffer from disturbed circadian rhythms. Light-induced suppression of melatonin level in human is intensity- and wavelength-dependent (Souman et al., 2018). In contrast to extra-ocular light, ocular light exposure is able to suppress the night-time level of melatonin (Thapan et al., 2001; Zeitzer et al., 1997). Furthermore, bilaterally enucleated patients show free-running melatonin rhythms, and, as such, ocular light appears to be the major determinant of circadian rhythm in adult subjects (Skene et al., 1999).

However, the identity and the precise function of these deep brain photoreceptors still remain a mystery to uncover (Nichols, 2018; Peirson et al., 2009). It has been suggested that non-visual photoreception may influence developmental processes in mammals (Rao et al., 2013), and there are findings suggesting that in mammals, melanopsin (a family of light-sensitive proteins) expressing cells are primarily located at the level of the retina, but have been able to maintain their functional connection with neuro-endocrine cells for the control of mood, as melanopsin gene variants and polymorphisms correlate to increased risk of developing seasonal affective disorder (SAD) (Roecklein et al., 2013).

This connection may be related to the existence of an ancestral state where deep brain photoreceptors were closely associated with neuro-hormonal systems (Fernandes et al., 2013; Macchi & Bruce, 2004). Futher research on this direction is needed in order to better understand the properties of tryptamines like DMT and their biophysical effects and implications on human perception and brain communication.

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