Autism Viewed as a Consequence of Pineal Gland Malfunction

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Abstract

Autism has proven to be a difficult condition to understand. Because autistic individuals react to their surroundings in ways that are very different from others, it is often described as being a condition that affects the proper functioning of information processing mechanisms. Although the existence of a number of biochemical abnormalities have been postulated as being characteristic of autism, research has not determined the causes of those abnormalities nor how those conditions can disrupt information processing.

The author's experience gained in therapeutic work with more than one hundred autistic children, coupled with a study of pineal gland research, has led to the hypothesis that the problems of autism stem from an impairment of pineal gland functioning. This paper will argue for that hypothesis by proposing that specific dysfunctional conditions of the pineal gland are the cause of particular symptoms of autism. It will also report on a successful therapeutic strategy that involves the application of bodywork techniques such as Craniosacral Therapy, Polarity Therapy and the Metamorphic Technique in conjunction with the administration of supplemental melatonin.

Introduction

Autism is a condition that severely limits the functioning of many individuals. The definition of autism used by the Autism Society of America describes it as: "a life-long brain disorder that prevents proper understanding of what a person sees, hears and otherwise senses. It causes severe problems in learning, communication and behavior. Nothing psychological has been shown to cause autism."

Autism Research Review International [Rimland, 1991] lists 47 treatment approaches to autism. Suggested biological and neurological causes of autism include: an imbalance in the neurotransmitter system, anatomical malformations in the cerebellum, unusual brain activity, etc. The treatment methods cited in the report include, among others: megavitamin therapy using vitamin B_6 and magnesium [Rimland, 1978, 1987], methods aimed at balancing opiates [Recasens, 1990], drugs [Ritvo, 1986], and Upledger's craniosacral techniques [Upledger, 1983]. Although these approaches have produced positive results with certain individuals, none has been recognized as having universal application.

If there is a fundamental cause of autism, it has not been addressed by any of the currently practised treatment modalities. The checklists used to diagnose autism, such as the DSM II criteria and Rimland's checklist [Rimland, 1980], are complex. Moreover, symptoms of autism such as severe problems with interpersonal communication and social skills are identifiable but not readily quantifiable. For these reasons, methods that can precisely measure the "degree" of autistic characteristics in an individual have not been developed, and the efficacy of the treatment strategies in use cannot be accurately assessed.

This paper will report on the author's 20 years of study in this area, including experimental clinical work with approximately one hundred children. A presentation of the practical treatment modalities that were applied, clinical observations, and literature research will be given to support the author's hypothesis that the problems of autism stem from the malfunctioning of the pineal gland. Ten children have been treated with exogenous melatonin in conjunction with bodywork techniques. Some of the results will be discussed. The treatment approaches aim at restoring the functioning of the pineal gland and the bioenergetic and biochemical balance in the body.

This paper will bring together the points of view of scientific researchers, clinical workers, and bioenergy workers.

The Pineal Gland and its secretions

The human pineal organ is a minute gland (approximately 150 mg) that projects from the diencephalon into the third ventricle. Being in that ventricle, the pineal gland is in direct contact with the cerebrospinal fluid [Welsh, et al., 1989]. The

cerebrospinal fluid is considered by bioenergy workers to be the carrier of information and life energy that is received by the organism and is then distributed throughout the body [Still, 1902; Stone, 1987; Sutherland, 1990]. The pineal gland is located in the exact center of the brain. It is the first gland to be formed in the body and, according to Reiter [Reiter, 1995], it is clearly distinguishable at three weeks after conception. Other sources place the creation of the pineal gland at five to seven weeks [Strassman, 1990].

The pineal gland has received attention from prominent philosophers and mystics for more than 2,000 years.

In the Oriental world, where there has long existed a deep interest in and understanding of the connection between psychic phenomena and a person's physical state, it is believed that all psychic systems have a corresponding organ in the physical body where activity in the psychic system is reflected [Roney-Dougal, 1991]. The physical equivalent of both the "third eye" energy center (brow chakra) and the crown energy center is the pineal gland. The pineal gland, according to the Oriental mystics, is said to be the receptor and sender of subtle vibrations which carry thoughts and psychic phenomena throughout the body and which connect us to universal, "cosmic" energy. Ryerson [Davidson, 1988] describes the pineal gland as "a crystalline structure that is an integral controlling part of the interface between the body and higher subtle energies". There is a state of vibratory resonance along the length of the spinal column, from the medulla oblongata to the coccyx. Information received from subtle energy fields via the pineal gland is encoded and transmitted along the spinal column as a resonating vibration. The information travels to other parts of the body through energy pathways, bioelectrical fields, nerve fibers, and circulatory systems.

In the Western world, the 17th Century philosopher, Rene Descartes, in his religious, philosophical, and psychological works, noted the that the pineal gland is the only unpaired organ in the brain, and that it is located in brain's center. Descartes described the psychological function of the pineal gland to be analogous to a valve that controls the flow of thought to consciousness. He saw the cerebrospinal fluid as the carrier of thought. On an esoteric level, Descartes identified the pineal gland as an organ through which the soul operates in the body. He also hypothesized that, in addition to using the cerebrospinal fluid, the pineal gland sent its messages through nerves and the blood [Wheelbright, ed., 1954]. These conjectures were made by Descartes three centuries before the identification of melatonin!

After the work of Descartes, the pineal gland received little attention until the mid-20th Century. The modern renewal of interest in pineal science was marked by the work of Mark D. Altschule in the early 1940s. He had uncovered and called attention to 17 papers, all published since 1880, that described the use of pineal gland extracts in the treatment of mental illnesses [Kitay and Altschule, 1954; Brainard, 1978]. The discovery of melatonin by Lerner in 1958 [Reiter, 1995] identified the pineal's primary hormonal agent. This opened the door to scientific study of the physiological effects that had been signaled by Altschule. The scientific view of the pineal gland changed from its being a functionless vestigial organ to an actively functioning neuroendocrine transducer—an organ that converts a neural signal conveying environmental information into an endocrine message [Brainard, 1978; Vollrath, 1984; Zawilska et al., 1992, 1996; Nowak and Zawilska, 1996, 1997].

It is now clear to scientists that the pineal gland (by means of its neurohormone messengers) has a profound effect on many aspects of human functioning and plays a key role in enabling people to live in harmony with environmental rhythms.

Melatonin is the principal hormone secreted by the pineal gland, its "biochemical messenger", a "three billion year-old molecule" [Reiter, 1995]. It appeared very early in the course of evolution [Reiter, 1995; Turlejski, 1996]. It can be found in a great variety of life forms, including algae. The most notable feature of the melatonin generating system is that it follows a circadian rhythm.

The recent research that studies the pineal gland and melatonin synthesis is extensively presented in scientific journals. For that reason, only those aspects of the melatonin generating system that are pertinent to the author's research in autism will be described here, and that will be done very briefly.

The pathway for the creation of melatonin is as follows:

light → retina → retinohypothalamic track → suprachiasmic nucleus → paraventicular nucleus → midbrain → spinal cord → superior cervical ganglion (SCG) → postsympathetic fibers → pineal

The SCG sends fibers containing the neurotransmitter norepinephrine to stimulate noradrinergic receptors on the pineolocytes. It is the activation of these receptors that begins the enzymatic process which leads to the synthesis of melatonin, the main pineal secretion.

Melatonin is synthesized from dietary L-tryptophan which enters the pineolocytes and is converted to melatonin through the following pathway:

L-tryptophan → 5-hydroxytryptophan → serotonin → N-acetyl-serotonin → melatonin

The enzyme serotonin N-acetyl-transferase [NAT] which converts serotonin to N-acetyl-serotonin is the rate limiting enzyme in this process. HIOMT is the enzyme which converts N-acetyl-serotonin to melatonin.

For the proper functioning of the melatonin generating system, an intact neuronal pathway must be present as well as a properly functioning pineal gland. The pineal gland has a weak regenerative system due to its neuronal derivation [Grad, et al., 1993]. The number of pineolocytes is genetically determined, and the ones that are destroyed cannot ordinarily be replaced in post-natal life. With a continuing loss of pineolocytes, a state of pineal failure will eventually be reached [Reuss et al., 1986; Reuss, 1990]. Studies carried out on humans indicate that the ability of the pineal gland to produce melatonin decreases with age [Grad et al., 1993; Reiter et al., 1980; Pang et al., 1984; Waldhauser et al., 1988; Nowak and Zawilska, 1996, 1997]. Calcifications in the pineal have been shown to occur throughout life [Welsh, 1985]. Stress has been shown to have an effect on pineal hormonal functioning [Grad et al., 1957; Miline et al., 1970; Korn, 1997].

Generally speaking, disturbances in pineal metabolism and a decline in the output of melatonin can be caused by reduced sympathetic, parasympathetic, and CNS innervation, vascular atrophy, and replacement of functional with nonfunctional tissue in the pineal. Malfunctioning of the pineal gland and restrictions in the SCG pathway will be discussed later in this paper as possible causes of autism.

Of the many functions performed by and connected with the pineal gland and its neurochemical messenger, melatonin, only a few will be discussed here, i.e. those believed to be related to malfunctioning systems in autism.

Connections to the nervous system: innervation of the pineal gland

The two general patterns of peripheral neural pineal innervation are as follows:

1) The postganglionic sympathetic axons arising in the superior cervical ganglia. Their terminals lie in close proximity to pinealocyte processes in the pericapillary spaces of the pineal [Arstila, 1967; Moore, 1978]
2) The second pattern is a combination of the sympathetic innervation and parasympathetic innervation [Ariens-Kappers, 1976]. The distribution of the postganglionic parasympathetic fibers is similar to that of the sympathetic.

The sympathetic innervation of the pineal seems to regulate the indoleamine metabolism at two points: the conversion of serotonin to N-acetyl-serotonin by NAT, and the conversion of N-acetyl-serotonin to melatonin by HIOMT [Moore, 1978]. Thus the sympathetic nervous system regulates the pineal indoleamine metabolism.

Denervation of the pineal by superior cervical ganglionectomy or by decentralization of the superior cervical ganglion has been shown to eliminate the circadian rhythm in NAT activity [Klein et al., 1971]. Stimulation of the SCG has been shown to increase pineal secretions [Foa, 1935]. Many researchers have noted that the proper functioning of the pineal gland is dependent on the intact functioning of the superior cervical ganglia and connected neuronal pathways. [Brownstein, 1968; Lin et al., 1975; Ariens-Kapper et al., 1976; Reiter, 1976; Kneisley et al., 1978; Ralph, 1978; Cardinal, 1984; Axt, 1996]

The interrelationship of the pineal gland with the central nervous system has also been investigated [Nir, 1978]. It has been concluded that the pineal gland exerts a depressant effect on the CNS. Melatonin and other pineal indole compounds change brainwave activity as depicted by EEG's and depress the CNS, occasionally causing sedation and a hypnotic state [Anton-Tay, 1972; Feldsteiner et al., 1970]. Pinealectomies are followed by increased excitatory levels of the CNS [Behroozi et al., 1970] and by seizure-like discharges [Nir et al., 1969]. By contrast, melatonin exhibits anti-seizure activity [Anton-Tay et al., 1971; Lakin et al., 1981; Chamney et al., 1993, 1995; Molina-Carballo, 1994, 1997; Reiter, 1995; Pawlicki, 1996].

Cervical spinal cord lesions have been found to disrupt the rhythm of human melatonin secretion [Kneisley et al., 1978].

From the above discussion of research, it is clear that the normal functioning of the pineal gland requires an intact neural connecting system.

The pineal and sensory input

A connection between neurophysiological effects and the sensory system has been established [Burks et al., 1977; Strassman, 1990]. The pineal gland has been shown to respond significantly to acoustic [Burks et al., 1977] and to olfactory [Davidson, 1987, 1988] stimuli.

The pineal gland is generally linked to the central homeostasis mechanism.

The pineal, melatonin, and ambient lighting

The melatonin generating system is extremely sensitive to light. Light is the predominant envionmental factor regulating its production [Nowak and Zawilska, 1997; Strassman, 1990]. The melatonin production whose levels start to rise gradually at dusk and decline slowly during the second half of the night [Nowak and Zawilska, 1997] is inhibited by white light and has been shown to be also suppressed by moonlight as well [Brainard et al., 1984; Davidson, 1988; Axt, 1989, 1996]. Melatonin production has been shown to be effected differentially by various wavelengths of monochromatic light. The strongest effect has been found to result from green, blue-green light of 509 nm [Brainard et al., 1988, 1994; Strassman, 1990;

Korn, 1991; Reiter, 1994; Zawilska et al., 1995, 1996; Nowak and Zawilska, 1997]

The pineal gland and electromagnetic fields

The pineal gland has been shown to be sensitive to magnetic and electromagnetic fields [Foa et al., 1935; Evans, 1986; Davidson, 1987, 1988; Cremer-Bartles et al, 1990; Lerchl et al., 1991; Mishlove, 1993; Roney-Dougal, 1993; Reiter, 1995; Pawlicki, 1996]. It has also been shown to be sensitive to geomagnetic activity [Roney-Dougal, 1993; Spottiswoode, 1990]. Extremely low frequency electromagnetic fields have been shown to reduce nocturnal melatonin production [Reiter, 1994].

The sensitivity of the pineal gland to electromagnetic fields might explain the influence of energy bodywork techniques on the pineal system [Axt, 1989, 1996]. This subject will be discussed later in this paper.

The pineal gland and trauma

Emotional or physical trauma can cause disruption of the function of the pineal gland [Grad et al., 1970; Miline et al., 1970; Shaffi et al., 1990; Upledger, 1996; Korn, 1997]. Attachment traumas and abandonment issues in early life have been shown to result in low levels of melatonin production. As has been mentioned previously, the pineal gland and melatonin control the hormonal cues for touching and cuddling [Reiter, 1995].

The role of the pineal and melatonin in modifying behavior and their involvement in mental impairment

The pineal gland has been implicated as a possible factor in mental disease. As long ago as the 19th Century, pineal extracts were used to treat mental disorders [Altschule, 1975]. Since the pineal function in humans regulates homeostasis of the body and body rhythms, a dysfunction of the pineal gland could be associated with mental disorders presenting with disturbances of normal sleep patterns, seasonal affective disorders, bipolar disorder, and chronic schizophrenia [Kovacs, 1971; Altschule, 1975; Carman, 1976; Jimerson et al., 1977; Nir, 1978; Ferrier et al., 1982; Beck-Friiss et al., 1985; Rosenthal et al., 1986; Wetterberg, 1987; Strassman, 1990; Roney-Dougal, 1991].

Other pathways have been proposed by which the malfunctioning of the melatonin generating system could contribute to mental disease. Melatonin can undergo cyclic dehydration to form 10-methoxyharmalan, a powerful hallucinogenic substance [Nir, 1978]. Hallucinogenic indoleamines may be formed instead of melatonin because of faulty HIOMT activity [Hartley et al., 1973a, 1973b]. Roney-Dougal, while pointing to the pineal gland's involvement in altering our state of consciousness to a potentially psi state, discusses the presence of beta-carbolines, potent hallucinogens in the pineal gland [Ho et al., 1970; Quay, 1974; Langer et al., 1984; Roney-Douglas, 1991].

Strassman, in his discussion of the role of the pineal gland in consciousness [Strassman, 1990], proposes that the pineal gland, besides producing melatonin, is associated with unusual states of consciousness. It may synthesize and secrete hallucinogens in response to drugs or specific physical or mental states. These hallucinogens may be derivatives of the tryptamine or carboline family. 5-methoxy-tryptamine, which is a precursor of several of the compounds in question, has been found in pineal tissue [Bosin and Beck, 1979; Pevet, 1983] and in the cerebrospinal fluid [Koslow, 1976; Prozialeck et al., 1978]. [For examples of the chemical reactions leading to hallucinogenic substances that Starssman proposes may take place in the pineal, see the diagrams that are included after the text section of this paper.]

The psychoactive beta-carbolines, which may also be synthesized in the pineal, are formed from serotonin or tryptamine derivatives. As all beta-carbolines are strong MAOA inhibitors (the type that prevents the breakdown of serotonin), besides being psychoactive themselves they could contribute to the increase of activity of endogenous or exogenous tryptamine hallucinogens [Strassman, 1990].

In later parts of this paper, the author will discuss the relevance of the creation of hallucinogenic compounds in the pineal to the hypothesis that autism results from pineal gland imbalances.

The influence of melatonin on the immunoneuroendocrine system

The pineal gland has been shown to have a strong link with the immune system [Reiter, 1995; Maestroni, 1993]. Inhibited melatonin synthesis and secretion induces states of immunodeficiency. Such states are counteracted by exogenous melatonin. Pinealectomy will result in immunodeficiency and shrinking of the thymus gland [Csaba et al., 1965, 1975, 1976; Becker et al., 1988].

Immunoregulatory properties of melatonin and the pineal sensitivity to thymic hormones suggest that there exists a bidirectional flow of information between the pineal gland and the immune system. The thymus gland has the same superior cervical ganglia nerve connections as the pineal gland.

In the discussion of other interrelationships between the pineal gland and peripheral glands, its relationship to the thyroid gland is of interest as it will have relevance to the discussion of the autism-pineal connection. Publications have identified a depressant effect of the pineal gland on the thyroid [DeFronzo and Roth, 1972; Relkin, 1972], and the elimination of the pineal influence has been shown to bring about increased thyroid activity. The work of other researchers [Singh et al., 1969; Relkin, 1972; Mess and Peter, 1975] likewise demonstrated that

the pineal exercises control over the hypothalamus-pituitary-thyroid system.

The pineal gland affects the adrenal glands as it does the thyroid, acting as an inhibitory modulator of the adrenal cortex [Dickson et al., 1972; Nir, 1978].

The use of exogenous melatonin: physiology and pharmacology

The effects of exogenous melatonin on glandular activity and on sleep patterns has been discussed by many researchers [Anton-Tay et al., 1968; Freiner et al., 1975; Smith et al., 1975; Barrett et al., 1977; Ralph, 1978; Young et al., 1984; Nowak and Zawilska, 1997; Brzezinski, 1997].

Brzezinski [Brzezinski, 1997] discusses the high pharmacological doses of melatonin in comparison with the normal physiological levels. Strassman [Strassman, 1990] proposes a more "physiological' approach to studying the psychoneuroendocrine role of melatonin: removing it by some means; noting the changes that occur in the parameters under observation; and then replacing it with exogenous melatonin under the conditions of endogenous suppression.

The pineal gland and melatonin in children

On the basis of a literature search, it can be concluded that very little research has been conducted concerning the functioning of the pineal gland and the levels of melatonin secretions in children who exhibit abnormal development. In normally developing children, no circadian rhythm in melatonin production is observed in the first three months of life. From the fourth month, the levels of nocturnal melatonin secretions steadily increase until reaching a peak at age three to five. During the following 10-12 years, the levels gradually decrease, with a more rapid decrease at puberty [Arendt, 1995; Nowak and Zawilska, 1996]. Research on the role played by melatonin in children has principally focused on adolescents and the years of puberty [Kitay, 1954; Attanasio, 1983; Cavallo, 1992, 1993].

The level of melatonin secretions in depressed children have been found by some researchers to be lower than normal [Cavallo et al., 1987]. These findings, however, were not confirmed by other researchers [Shaffi et al., 1990]. Analyses of levels of melatonin metabolites excreted in urine in Downs syndrome children were also inconclusive [Reiter et al., 1996]. Melatonin has been used to control seizures in children [Champney et al., 1995; Axt, 1996; Molina-Carballo, 1997]. Sleep disorders in children have been treated with melatonin [Jan, 1994; Axt, 1996].

The pineal gland, melatonin, and autism

The present hypothesis that a malfunctioning pineal gland can be a factor in the cause of autism has been reported by this author [Axt, 1996, 1997]. Preliminary research into the lack in autistic children of a normal fluctuation of melatonin in response to changes in ambient light has been reported on the Internet [Kulman, 1997].

On the basis of the research that has been cited, together with the author's work with autistic children over a period of twenty years, it is proposed that the physiological and psychological symptoms that characterize autism are related to the malfunctioning of the pineal gland. Autistic individuals manifest all of the characteristics that are associated with a malfunctioning pineal gland. Table 1 summarizes the numerous concordant symptoms that are found in autistic individuals and that can be understood in terms of pineal malfunction.

Practical measures adopted by the author in the treatment of autistic individuals

The treatment approach for autism that will be discussed involves hands-on energy bodywork techniques—Craniosacral Therapy, Polarity Therapy, and the Metamorphic Technique—in conjunction with exogenous melatonin.

The bodywork techniques are elements of therapeutic approaches that work on the subtle energy systems. Clinicians have found these techniques to be effective in correcting distortions in the normal flow of bioenergy in the body. Practitioners in the field of holistic medicine have found that energy flow disruptions can cause dysfunction in the body's physical organs and physiological systems [St. John, 1980; Stone, 1985; Sills, 1989; Axt, 1989, 1996, 1997; Upledger, 1995; Korn, 1997]. Application of such techniques have been shown to decrease stress-related hormones and balance many of the neurotransmitters [Davidson, 1987, 1988; Gerber, 1988; Kiewe, 1997; Korn, 1997].

Craniosacral Therapy (CST) is a development of cranial osteopathy. It attends to the flow of the cerebrospinal fluid (CSF) that is produced in the lateral cerebral ventricles and third ventricle. The CSF bathes the brain and spinal cord and is in constant contact with the pineal gland. It is pumped throughout the body by the rhythmic cranial impulse. According to many who have considered the function of this system, from Descartes through to modern times, the CSF conveys energies of the mind throughout the body [Descartes in Wheelright, 1970; Still, 1902; Stone, 1985; Sills, 1989; Sutherland, 1990]. If the flow of the CSF is impeded, the flow of life energy is also impeded, and physiological imbalances arise as a consequence. By means of gentle hands-on techniques,

Craniosacral Therapy can be used to restore and strengthen the flow of CSF [Sutherland, 1990].

Polarity, a second technique that uses gentle touch, is used to balance and stimulate the electromagnetic fields that are associated with the human body. Based on the ancient Ayurvedic medical system with the addition of modern Western techniques, Polarity uses the knowledge of energy relationships in the body. The practitioner works with energy centers and the pathways along which life energy flows.

Specific Polarity and Craniosacral Therapy techniques have been used, for example, to balance the autonomic nervous system and to unblock the occipital base or the neck where impediments to the flow of CSF and energy may be found [Stone, 1985; Siegel. 1987; Upledger, 1983].

The Metamorphic Technique [St. John, 1980] has been described as prenatal therapy. It is based on the Chinese system of reflexology, and uses spinal reflexes on the feet, hands, and head to bring body systems into balance. It has been used with autistic individuals and, thanks to its simplicity, can be taught to parents and caregivers of autistic children.

In working with very young autistic children, some specific techniques were developed by the author. In some instances, sessions are conducted with the child being partially immersed in salt water. In the case of a child who is hyperactive or otherwise uncooperative, "off the body" techniques might be employed, or a session can be conducted while the child is asleep [Axt, 1996, 1997].

Melatonin supplements

In ten recent cases, supplemental melatonin was given to the children to enhance the results of bodywork techniques and improve the sleep patterns of the child. Achievement of the latter objective brought obvious benefits to the parents as well. Melatonin was given in capsules and in powder form in amounts that varied between 750 mcg and 3 mg. The supplement was given approximately one hour before the child went to sleep.

Table 1

Summary of possible links between the common symptoms of autism and a malfunctioning of the pineal gland

Common characteristics of autism	Author's postulated link to pineal malfunctioning	Some supporting references
Cognitive deficits: difficulties in comprehending and relating to the outside world. "Can't make sense of the world." Inappropriate social behavior.	Pineal gland transduces information received from the outside world. Possible lack of crystalline structure and abnormal physiology of the pineal gland in autistic children could impede that ability. Possible faulty synthesis of melatonin in pineal gland resulting in the creation of hallucinogenic substances that cause altered states and interfere with cognition. The pineal gland requires intact innervation pathways to function properly and transduce information.	Brownstein, 1968; Klein et al., 1971; Hartley et al., 1973; Ralph, 1978; Reiter, 1983; Welsh, 1985; Davidson 1987, 1988; Strassman, 1991; Roney-Dougal, 1991; Grad et al., 1993
Lack of speech, or delayed speech. In appropriate speech or echolalic speech.	As above. Also: With low melatonin levels and consequently high adrenaline, the autistic child is continuously "on survival". Language will not likely appear in such a condition.	Notkin, 1997; Nir, 1978, Reiter, 1983
Adverse reaction to change, including to environmental changes such as light, temperature, magnetic fields, electromagnetic fields	As above. Also: A malfunctioning pineal gland will not be able to regulate homeostasis of the body. Melatonin levels are affected by ambient light levels, even moonlight. The pineal gland and melatonin secretions are sensitive to electromagnetic, including ELF, fields. Magnetic fields have been shown to influence pineal physiology.	Brainard et al., 1984; Cremer-Bartles et al., 1984; Davidson, 1988; Spottiswoode, 1990; Mishlove, 1993; Reiter, 1994, 1995; Pawlicki, 1996; Nowak and Zawilska, 1997
Hypersensitivity of hearing, sight, touch and smell	Low melatonin secretions can cause hypersensitivity of the nervous system. Lesions in the SCG and to innervation of the pineal gland causing malfunctioning of the pineal gland can also be causing disturbances in the energy field and physical blockages in the area of the upper cervical vertebrae and occipital base. With physical and energetic blockages in the head, senses will be hypersensitive. Hypersensitivity of the senses can also be caused by the presence of hallucinogenic compounds in the pineal gland. The pineal gland has been found to react to acoustic stimuli.	Burks et al., 1977; Lin, 1975; Reiter et al., 1976; Ariens-Kappers, 1976; Kneisley et al., 1978; Davidson, 1987, 1988; Strassman, 1991; Axt, 1996, 1997
Hyperactivity. Sometimes child gives the impression of being "out of control".	A malfunctioning pineal gland and low melatonin secretions might result in high corticosteroid levels and high adrenaline. Beta-carbolines and other hallucinogenic substances in the pineal gland can be the cause of hyperactivity. Stress has been shown to have an effect on pineal hormonal functions.	Miline, 1970; Nir, 1978; Roney-Dougal, 1991; Strassman, 1991; Reiter, 1995
Stereotyped behaviors	A malfunctioning pineal gland and low melatonin levels can cause high levels of stress hormones (above). Stereotyped behavior can have hypnotic effects and lower the level of stress hormones, helping the child feel better.	Kaufman, 1976; Grandin, 1983, 1986
Disturbed sleep patterns	Related to the pineal-melatonin role in regulating sleep patterns. Inadequate levels of melatonin and consequent irregular sleep. Hallucinogenic substances in the pineal gland can also cause sleep disturbances.	Nir, 1978; Wetterberg, 1978; Roney-Dougal, 1991; Jan, 1994; Reiter, 1995; Nowak and Zawilska, 1996, 1997

Common characteristics of autism	Author's postulated link to pineal malfunctioning	Some supporting references
Problems with bonding, lack of close relationship with caregivers.	The pineal and melatonin control hormonal cues for touching and cuddling.	Reiter, 1995; Korn, 1997
Immune problems (and the thymus)	Strong link exists between the pineal and the immune system, with a bidirectional flow of information between them. Inhibited melatonin secretion induces state of immunodeficiency. Innervation of the pineal gland and thymus is connected to the superior cervical ganglia (SCG). Problems with innervation pathways will affect both the pineal and thymus.	Csaba et al., 1970, 1975; Nir, 1978; Warren, 1986, 1987; Becker et al., 1988; Yonk et al., 1990; Maestroni, 1993
Thyroid and adrenal gland imbalances	There is a reciprocal relationship between the functioning of the pineal gland and the thyroid and adrenal glands.	Singh et al., 1969; DeFronzo and Roth, 1972; Dickson et al., 1972; Relkin, 1972; Nir, 1978
Unusual electrical activity of brain, seizure activity, seizure activity that is specific to autistic adolescents	Melatonin possesses anti-seizure properties. Low levels of melatonin might be the cause of unusual brain electrical activity. Puberty is marked by a dramatic reduction in melatonin secretion levels.	Anton-Tay et al., 1971; Lakin, 1981; Reiter, 1983, 1995; Pawlicki, 1996; Molina-Carballo, 1997
Scoliosis	The pineal gland lets the body know which way is up. A malfunctioning pineal gland would not be able to convey body positioning data.	Upledger, 1996
Problems in the digestive system	One of melatonin's effects is to limit the speed of the digestive process, giving the body time to utilize nutrients. Low melatonin levels may lead to food allergies. (see immune problems)	Khan et al., 1990; Reiter, 1995
4:1 ratio of males to females affected by autism	Possible consequence of the smaller size of the male pineal gland. Males have been found to suffer more than females when the natural cycles related to melatonin levels are disrupted by exposure to magnetic fields or light.	Reiter, 1995
Sensitivity to "hands on" body work and energy techniques	The pineal gland and its melatonin secretions are sensitive to electromagnetic fields and, possibly, also to the energy involved in hands-on techniques. Tactile therapies have been found to regulate neurotransmitters and affect most of the problems listed in this table.	St. John, 1980; Stone, 1983; Davidson, 1987, 1988; Siegel, 1987; Gerber, 1988; Axt, 1989, 1996, 1997; Sills, 1989; Upledger, 1995; Kiewe, 1997; Korn, 1997
Sensitivity to exogenous melatonin	Exogenous melatonin may balance the effects of faulty pineal functioning and the faulty melatonin chemistry.	Brzezinski, 1997; Strassman, 1991; Anon-Tay, 1968; Nowak and Zawilska, 1997; Jan, 1994; Kulman, 1997

A few case histories

The case histories presented here include six children taken from more than 100 autistic children with whom the author has worked. One case of a cocaine-addicted baby who presented some autistic features has been included here, as it may lead to an interest in the use of supplemental melatonin to help such children.

Most of the autistic children were diagnosed by means of the Rimland E-2 checklist. All except one of the children showed improvement with the combination of melatonin and bodywork techniques. The exception was one girl who did not show typical characteristics of autism, although she had been diagnosed as such. Neither did she present disturbed sleep patterns. Her case history is not included in this paper.

Case 1

This twenty-seven-year-old man has been treated since the age of eight for autism with weekly sessions of Craniosacral Therapy, Polarity Therapy and a special anti-allergy dietary regime. He was diagnosed in early childhood with autism. It manifested as severe cognitive problems, very little speech, hyperactivity, hypersensitivity, serious immune problems, and general aloofness. He has now graduated from high school, lives in his own (sheltered) apartment, and works full time.

Three years ago, a nightly 2.4 mg supplement of melatonin was added to help deal with the residual hyperactivity and a hypersensitivity that made noisy places and crowds unbearable. He now enjoys going to concerts as he is no longer overwhelmed by crowds. He is now more alert, and his immune system has evidently strengthened, as his former food sensitivities are less pronunced, and a tendency to contract infections have decreased. He has recently discontinued the melatonin with no serious changes.

Case 2

This 10-year-old girl is severely autistic. She has no speech, is not toilet trained, and is hypersensitive to changes in her surroundings. She also has many food and environmental sensitivities. She is, in general, a happy child, but has periodic episodes of extreme hyperactivity. Her sleep patterns have been irregular since birth, and she has had seizures since early childhood. Bodywork techniques helped diminish the frequency and degree of hyperactive episodes, and, for short periods of time, she seemed to make real contact with the world around her, something she had not done before. More dramatic improvements were not obtained. Melatonin in the dosage of 750 mcg nightly improved her sleep patterns remarkably, and the frequency of her seizures diminished. Larger doses of melatonin led to apnea. The child has remained on melatonin for three years.

Case 3

This 3 ½-year-old boy had no functional language at the start of treatment six months ago. He was extremely hyperactive, not toilet-trained, hypersensitive to sounds and smells, environmental changes, and many foods. His sleep pattern had been irregular since infancy. It had been so fragmented that it was stressful for the whole family. The boy has received Craniosacral Therapy, Polarity Therapy for the last six months and the family was taught to apply the Metamorphic Technique every evening. 1.2 mg of melatonin was added to his nightly regime four months ago. The changes in this child have been so dramatic that a psychologist who recently evaluated him for placement in a special school could not believe that this was the same child who had been evaluated so differently in a previous assessment only four months ago. The boy now speaks fluently much of the time, with very little of his previous echolalic speech pattern remaining. He is now toilet trained. His various sensitivities remain, although in a less severe form. He is communicative and has become an alert, happy child. His supplemental melatonin has recently been increased to 2.4 mg with the hope of improving the sleep pattern further. The school psychologist has recently described him as “a bright, alert boy with mild autistic characteristics”.

Case 4

This ten-year-old boy is severely autistic, with very little language. Since early childhood he has been extremely hyperactive, with multiple sensitivities and very little communication with the outside world. His sleep pattern was very irregular. Since infancy, he did not fall asleep until long after bedtime. His sleep was fragmented and of short total duration. Sedatives did not help. Body work techniques were applied for two years. His hyperactivity subsided, and he became happier and more alert. 3 mg of melatonin administered each evening over the past two years have enabled him to fall asleep easily, although his sleep is still fragmented. His parents refer to melatonin as their “lifesaver”.

Unpredictable bouts of nighttime hyperactivity are characterized by the child giggling out of control and staggering around as if he were drunk. During these bouts, he passes urine very frequently—every ten minutes—until he calms down

Case 5

This ten-year-old boy had slightly delayed development since birth. At age four, he underwent a gradual, unexplained “withdrawal from life”. He stopped moving and eating, and lost all language. Medical examinations and EEG’s could turn up no physiological abnormalities. For six months he was tube-fed in the hospital, and the tube feeding was continued after he

returned home. Because the child lives in a country where Craniosacral Therapy is not available, the mother was taught to apply the Metamorphic Technique. 1.5 mg of melatonin was added five months ago. After two months of supplemental melatonin, the child started showing an interest in life. He is now moving his body, eating normally, and responding to and communicating with those around him.

Case 6

This three-year-old boy has been labeled autistic. He has serious cognitive deficits and very little responsiveness to the outside world. Because the boy lives in a different country, he has been able to receive Craniosacral Therapy only sporadically for the last two years. He is now receiving some body work from his mother and grandmother. Since he was started on 1.5 mg of melatonin five months ago, his cognitive skills have improved remarkably. He is more alert and has started to speak.

Case 7

This four-year-old boy is a victim of prenatal exposure to cocaine. At ten months of age he was still showing signs of cocaine withdrawal. His body trembled, and his development was delayed. His sleep was so disturbed that the life of his adoptive family was completely disrupted. With the application of body work and 3 mg of melatonin at bedtime, his tiny body developed remarkably. His sleep pattern has normalized, he speaks fluently, and he seems to be developing normally. When lower doses of melatonin were tried, his disturbed pattern of sleep returned.

Summary and conclusions

In order to understand the role and functioning of the pineal gland in the body from a number of different points of view, this paper has brought together the work and ideas of scientific researchers, clinical workers, and people who work in the filed of bioenergy. In the light of that composite picture, Table 1 summarizes the author's view of possible links between symptoms of autism and the malfunctioning of the pineal gland. The majority of the autistic population present with all, or at least a large percentage of, the characteristics of autism listed in the table. On the basis of literature research and many years of work with autistic children, it is postulated that the pineal gland in these individuals is malfunctioning, with melatonin secretion being significantly lower than is normal. Because it is the first gland to develop in the body, and because the pineal gland monitors and regulates many other systems in the body, its malfunctioning in a foetus or neonate will have a profound effect on the other systems, including the bioenergetic systems on all levels. Many different conditions could lead to a malfunctioning pineal gland. As has been presented in the cited literature, if it is to function properly a pineal gland must be served by intact efferent and afferent innervation systems. The melatonin generating system is complex, and any disturbance in its pathways could result in its faulty functioning. Two sites connected to innervation of the pineal that seem to be vulnerable to problematic conditions are the superior cervical ganglia and the upper cervical vertebrae. Lesions in those areas before, during, or soon after birth could result in a damaged functioning of the pineal gland. The postulated consequence is the development of autistic characteristics in children.

Disturbances in the aforementioned innervation pathways could also contribute to an altered pineal gland morphology marked by a "prematurely aged" organ that might lack the required crystalline structure. Such an altered pineal gland would not then be able to act as an efficient transducer of information that is received from outside of the body and that is communicated throughout the body via various pathways, including energy pathways. This deficient condition, that is postulated as being one of the causes of autism, would explain the problems that autistic children have in adapting to their surroundings. They are overly sensitive to sensory stimuli and they are unable to "make sense" of the world.

The author of this paper suggests, as well, that autism can stem from other disturbances in the melatonin generating system. The importance of normal levels of melatonin secretions has been discussed in the literature review. It was also shown that hallucinogenic indoleamines similar to those used by shamans to induce altered states of consciousness can be formed in the pineal gland instead of melatonin. Those hallucinogenic compounds, and other kinds that have been found in the pineal gland, could account for many of the characteristics of autism listed in the table. It is a common experience among those who work with autistic children to find some children, at certain times, to be so hyperactive that, in the words of their own parents, "they seem to be drunk or on drugs". In the words of an autistic individual, Temple Grandin, Ph.D., "Sometimes I heard and understood, and other times sounds or speech reached my brain like the unbearable noise of an onrushing freight train." She also said, "The autistic child is unable to bring order into his world. You must provide that order to his environment." [Grandin, 1983]

With melatonin supplements and bodywork techniques, we might be able to do just that: help restore some balance to the malfunctioning pineal gland and, by doing so, help provide order in the life of the autistic individual.

Implications for future research

To this point, the hypothesis that has been put forth in this paper has only been supported by the author's clinical experience. Experimental methods are available to scientific researchers to test the hypothesis empirically. One of the simplest clinical studies that could be conducted to test the fundamental hypothesis would employ an assay of the blood or saliva to measure melatonin levels, or an assay of melatonin metabolites in the urine. The measurements would be conducted on two groups of children. One group would be children who have been identified as being moderately to severely autistic, according to the checklists that are in current use. The other groups would be composed of children who present none of the behavioral, cognitive, or social development characteristics that are associated with autism.

An extension to the above tests would also measure endogenous substances that are known to have hallucinogenic properties, including tryptamines and beta-carbolines.

To examine the effects of body work techniques on the functioning of the pineal gland in an objective and measurable way, the above tests could be conducted before and after a series of sessions on the two groups of test subjects, with one group receiving Craniosacral Therapy and the other receiving placebo sessions that do not include any body work techniques.

The second area of interest is the morphology and size of the pineal gland in autistic children in comparison with non-autistic children. Those measures would require the use of NMRI or CAT techniques.

The theory that stimulation of the superior cervical ganglia by means of energy body work techniques can affect the morphology and structure of the pineal gland could be tested by examining the pineal gland in test subjects by NMRI and CAT techniques before and after a series of Craniosacral Therapy and Polarity Therapy sessions.

If a cause-and-effect relationship between pineal gland malfunction and autism can be empirically established, further efforts can be made to find the most practical, safe, and effective means of activating and balancing the pineal gland function.

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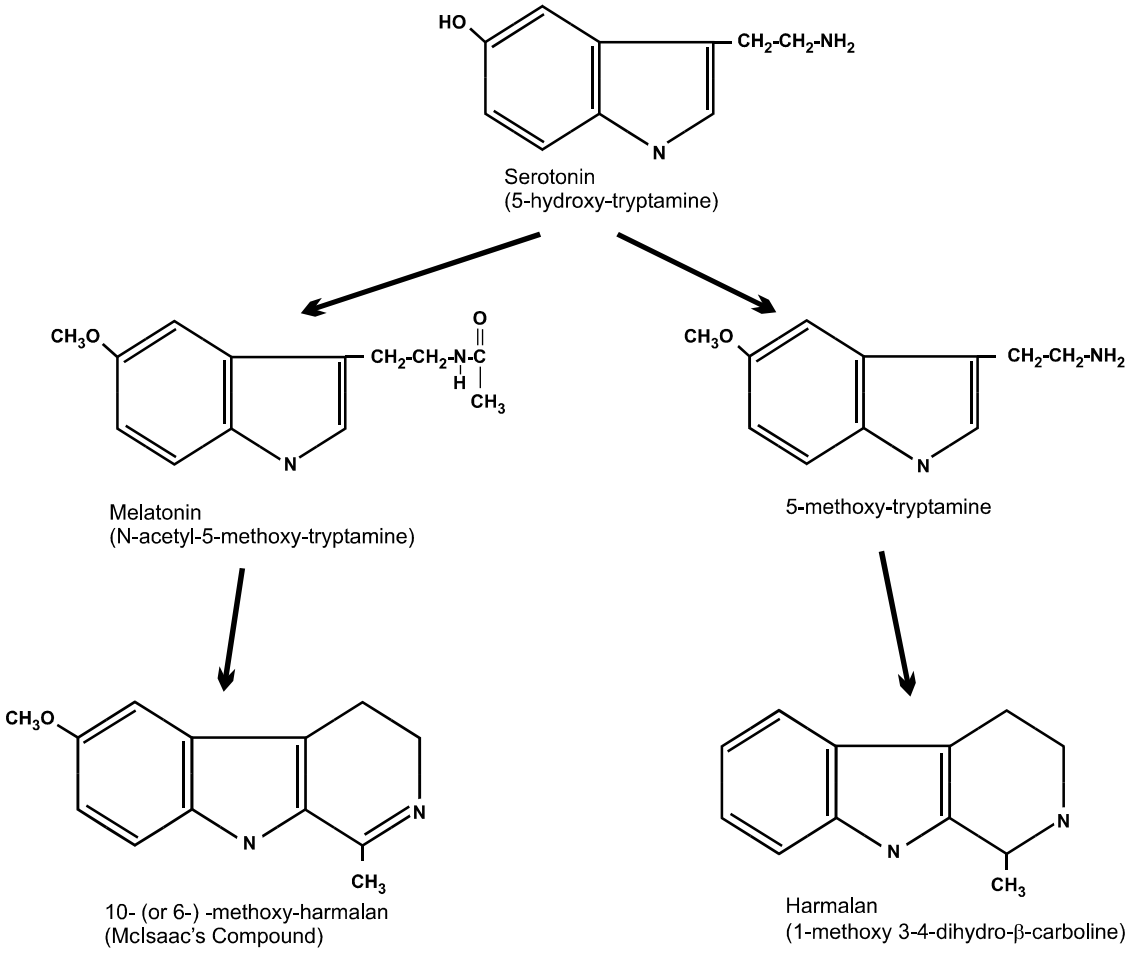
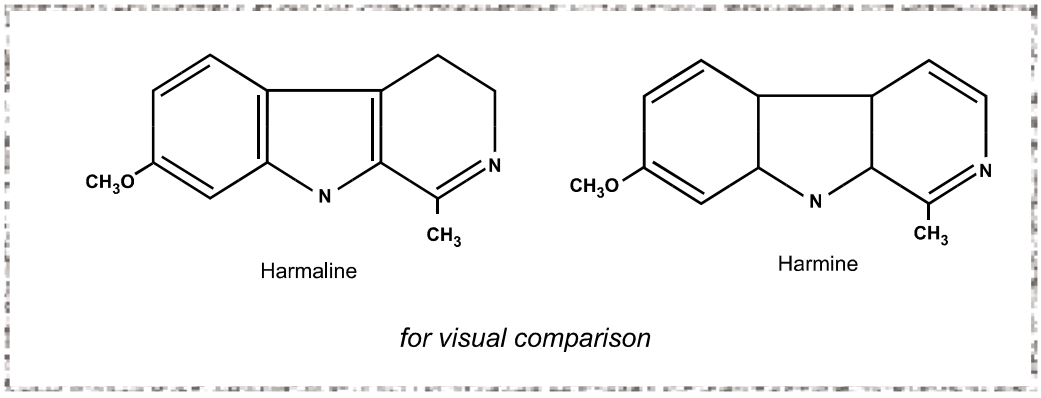
Serotonin conversion to possible β-Carboline-type hallucinogens in the body by the pineal gland

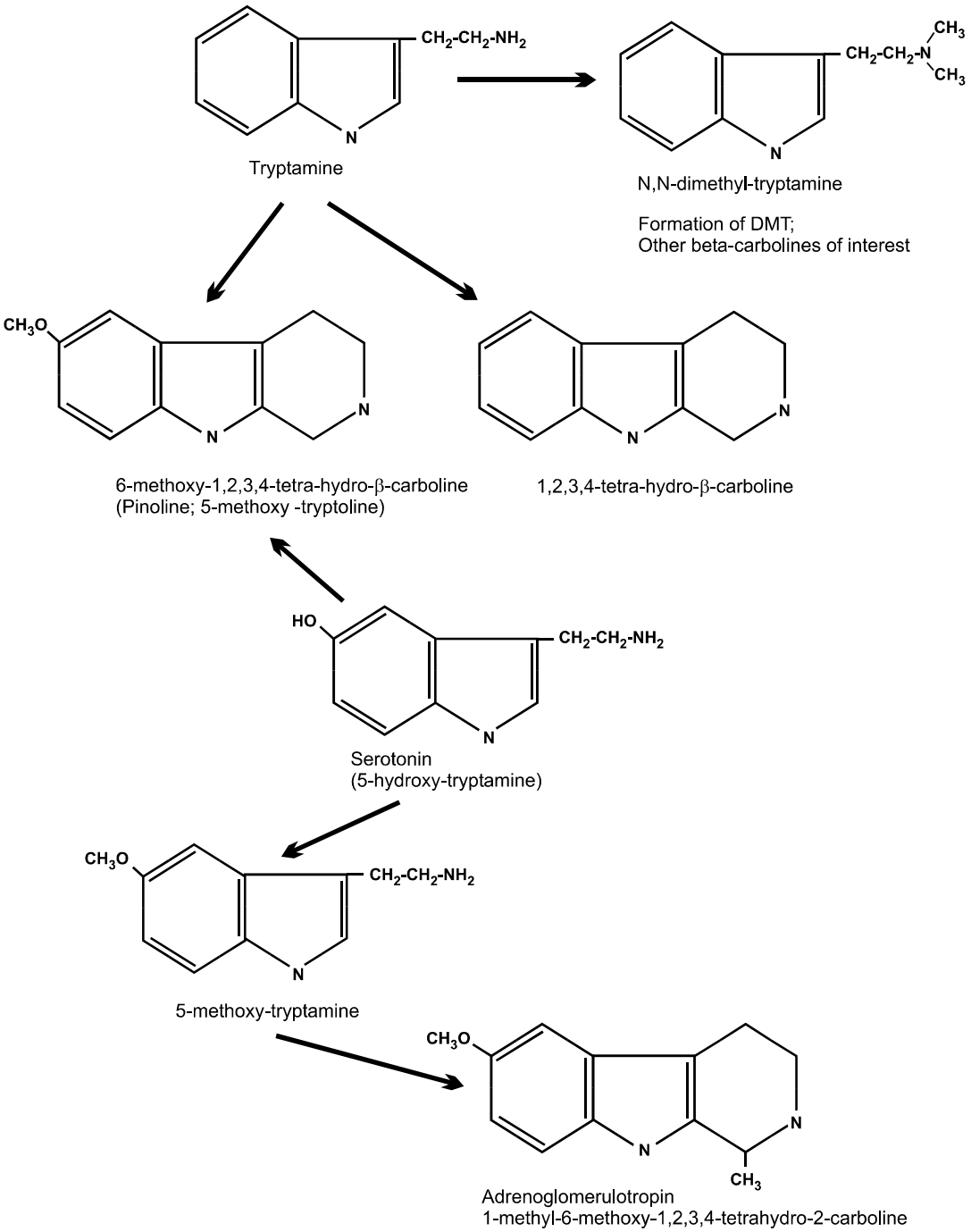
(adapted from a sketch by Rick Strassman, Ph.D.)





Serotonin conversion to possible Tryptamine-type hallucinogens in the body by the pineal gland
(first example)

(adapted from a sketch by Rick Strassman, Ph.D.)



Serotonin conversion to possible tryptamine-type hallucinogens in the body by the pineal gland
(second example)

(adapted from a sketch by Rick Strassman, Ph.D.)