

Pineal Gland – References & Studies from the early 90s

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Wilson, B., C.W. Wright, J.E. Morris, R.L. Buschborn, D.P. Brown, D.L. Miller, R. Sommers-Flannigan und L.E. Anderson: Evidence for an effect of ELF electromagnetic fields on human pineal gland function, *J. Pineal Res.*, 9 (1990), S. 259-269

4.3.1. The Importance of the Pineal Gland (Reiter, R., "Handbook of Atmospheric Electrodynamics Volume II", Chapter 5, *Biological Effects of Electromagnetic Man-Made Noise, Atmospherics, and Small Ions*).

Very recently, unique observations and perceptions have opened doors to new concepts regarding neuroendocrine effects of ELF fields in tissues. This very rapid approach was perhaps initiated by two concerns. The first effort derived from U.S. congressional hearings on the large naval communication facility "Sanguine", later called "Seafarer". They were intended to use extremely large antenna systems, transmitting at ELF and high power levels to provide communication with submarines. However, it incidentally appeared that high power lines create fields with orders of magnitudes greater than the navy projects. Another was the "Moscow Signal" (Wilson 1990), when the U.S. State Department became aware of extreme microwave flux densities in the U.S. embassy in Moscow. Although microwave effects are not considered in this article, it must be pointed out that a microwave emission that is modulated with extremely low frequencies can act like a pure ELF field (Lyle et al., 1983, 1990), allowing a deep penetration into highly conductive materials.

Here two new main branches are to be considered, both possibly linked to some extent with Seafarer and Moscow Signal. One is the discovery of Wilson et al. (1981) that ELF fields influence the pineal gland function in such a way that the concentrations of neuroendocrines in the gland are altered. The other is the fascinating outcome that light cations in tissues undergo a cyclotron resonance when an ELF magnetic field is superimposed by a weak constant magnetic field such as the geomagnetic field. From intense work by R.J. Reiter (Reiter, 1973; Reiter et al., 1988) it became apparent that the pineal gland undergoes a series of environmental stresses whereby the melatonin synthesis is affected. This is of importance because the gland is a ubiquitously acting and active organ of internal secretion, and its function is to synchronize the physiology of the organisms with the prevailing environmental conditions. For example, the ambient-light intensity controls the highly important melatonin production of the gland. Consequently, Wilson et al. (1981, 1986) investigated whether the pineal gland reacts in an analogous way to ELF exposure and found that such fields do actually alter the neuroendocrine production in the gland significantly, a fact which was confirmed by Reiter et al. (1988). Nighttime levels of melatonin and associated neurohormones appeared to be significantly changed in rats which were exposed for one month to ambient E fields of 2 kV/m and higher. Melatonin and associated biosynthetic enzymes showed a dark-phase decrease in E-exposed animals (see also Wilson and Anderson, 1986; Wilson et al., 1990). It must be pointed out that (Blask, 1990) one hallmark of the pineal gland function is the pineal gland's ability to inhibit the growth of reproductive organs in prepubertal animals, as well as inducing a marked regression in the size of reproductive organs in adults (Blask, 1990). As an important consequence, investigators initiated an application of these principles to explore whether the pineal gland and its primary hormone, melatonin, influence the growth of malignant neoplasms (Blask, 1984; Blask and Hill, 1988). One of the many results is that breast cancer and melanoma are perhaps the most compelling with respect to pineal and melatonin influences. Further, recent work (Wilson et al., 1988) with healthy human subjects suggests that ELF exposure to electric and magnetic fields may alter the pineal function in certain individuals, and this is the case when the current density in the tissues is 0.1 to 0.37 $\mu\text{A}/\text{cm}^2$, a range which had been considered as safe by Bernhardt et al. (1983).

The hormones of the pineal gland

The following passage is from, *Die Öffnung des 3. Auges*, Chapter 2, Die Hormone der Zirbeldrüse. U. Warnke

The pineal gland is one of the organs with the highest blood supply. Its high blood flow is necessary because it has the highest production rate in the brain for the hormones Serotonin and Melatonin, which are also neurotransmitters. Thus, 61 nanograms of serotonin per gram of brain tissue were measured in the Thalamus, 56 nanograms in the hippocampus, 482 nanograms in the center of the diencephalon, but up to 3520 nanograms in the pineal gland.

Serotonin

Serotonin has very diverse functions. Together with other hormones, it regulates growth, reproduction, aging, bone metabolism, cardiovascular function and digestion. It has analgesic,

antianxiety, relaxing, antidepressant and sleep-inducing effects. Within the brain, it is involved in the process of learning and remembering. But most of all, it causes psychological well-being, including happiness. And it is the basic substance for Melatonin.

Even important spiritually active endogenous drugs are produced from Serotonin. The neurotransmitters Dimethyltryptamine (DMT), 5-methoxy-N, N-Dimethyl-Tryptamine (5-MeODMT) and 5-Hydroxy-N, N-Dimethyltryptamine (Bufotenin) are such drugs.

Within the brain, Serotonin is synthesized in several areas, however, the highest levels have been found within the pineal gland. It is also secreted in the Limbic System and in the Cortex of the frontal brain by projection neurons located in the so-called Nuclei-Raphe of the brain stem. These are located at the median line of the brainstem at the "seam" of the two halves of the brainstem (the Greek word raphe means "seam").

Although Serotonin is the hormone of our good mood, only 10 milligrams are circulating in the whole body. If this amount drops, the mood tips: The result is listlessness, dissatisfaction, a bad mood, irritability without reason, sleep disorders, anxiety or depression. Sensitivity to pain also increases. In total, about a hundred times more Serotonin is produced in the lungs, liver and digestive tract than in the brain. But this does not benefit the brain, because the Serotonin does not cross the blood-brain barrier. The brain must produce its own Serotonin. All Serotonin produced in the brain is dependent on L-tryptophan or 5-HT.

Melatonin

Melatonin belongs to the Indolamine family of neurotransmitters with the correct designation "N-acetyl-5-methoxy-tryptamine- or within urine as "6-sulfatoxymelatonin". Melanin, our protection against UV radiation, which as a pigment causes skin tanning, is also synthesized with the help of Melatonin. Melatonin was first discovered in humans in 1958 by the American dermatologist Aaron B. Lerner (1920-2007).

However, the pineal gland as a secretion source of hormones with properties that were later assigned to Melatonin was already known in earlier times. In humans, Melatonin secretion independent of the pineal gland is also found within the lungs, the entire digestive tract, and the retina of the eye. But the main source is the pineal gland in the interbrain. Melatonin is secreted cyclically in small amounts in the daily rhythm (circadian rhythm) only in darkness, so that the entire body is informed about the current light-dark phase position.

In addition, even the full and new moons appear to have an effect on the light-dependent release of Melatonin (Adey 1981). The pineal gland contains melatonin-producing cells that behave like some light-sensitive cells of the eyes. Therefore, it is not surprising that in vertebrates, low levels of Melatonin production also occur rhythmically in cells outside the pineal gland that have photoresponsive characteristics. However, what is surprising is that within all of these cells, production is made at a simultaneous clock rate (Tosini and Menaker 1998).

Melatonin is produced from Serotonin with the help of a series of enzymes. Serotonin is first converted to N-acetylserotonin by N-acetyltransferase (SNAT) and then to Melatonin by hydroxyindole-O methyltransferase (HIOMT). Both enzymes are sensitive to electric and magnetic fields and specific frequencies. Since both enzymes are also active within the pineal gland to synthesize Melatonin from Serotonin, the pineal gland is described as magneto- and electrosensitive. In this way, the pineal gland is not only able to detect the brain's electrical sum field (EEG) and use it for its own purposes, but studies also show its sensitivity to the earth's magnetic field. Unfortunately, also the technically generated electric mobile and

communication fields have corresponding effects. Again and again experiments have shown: If the technical frequencies are not adequate to the natural stimulation, the Melatonin production is inhibited.

Specifically, it is shown that for all effects of hormone activation or hormone inhibition, there must be a coupling of a magnetic DC field intensity (for example, earth magnetic field) with an associated specific frequency of an oscillating electric or magnetic field (of natural or technical origin). The coupling of such two fields often fulfills the condition of specific effect resonances on ions. The resonance precondition is also fulfilled for potassium ions, if the respective strength of the natural earth magnetic field is superimposed on the specific frequencies of the respective brain activity. At night, different resonance conditions occur from those of daytime due to the different brain activities. During deep relaxation and during deep sleep, for example, the nighttime conditions with the dominant theta frequencies (4 to 8 Hertz) induce a flow of the electrically positively charged potassium ions into the cells and, simultaneously, at the same time, an active retention of these potassium ions in the cell, for example by using glucose. This results in a lower cell membrane voltage (hypopolarization). Above a specific value, the membrane channels will be opened for calcium ions (voltage-dependent channels), and calcium will flow into that cell. Accumulated calcium ions within the cell will stimulate the enzymes SNAT and HIOMT, which again initiate the hormone production cascade for Melatonin.

Melatonin itself is not responsible for sleep, as you read everywhere. However, Melatonin triggers the efficient sleep hormone Arginine-Vasotocin, which already produces deep sleep in very small amounts, as well as the regeneration hormone Somatotropin. In this way, all the conditions for healthy natural and regenerative sleep and dream production are in place. However, these nocturnal conditions for healthy natural sleep and dream with stimulation of the pineal gland are largely prevented by technical interferences.

DMT (as an entheogen)

The term "entheogen" is taken from the Greek entheos for "godly" and the Latin generare for "to bring forth". The products of endogenous pineal gland secretion, in addition to Serotonin, Melatonin and Pinoline, are mainly Dimethyltryptamine (DMT), 5-Methoxy-N,N-Dimethyl-Tryptamine (5-MeO-DMT) and 5-Hydroxy-N,N-Dimethyl-Tryptamine (Bufotenine). These very interesting endogenous drugs also have vulgar names such as "Spiritonin- (from the Latin word for "spirit"), "Anavatoin" (from the Greek word for "ascension"), "Peratonin- (from the Greek word for "beyond") or "Endohuasca- ("inner Ayahuasca)." The latter name comes from Jonathan Ott, a well-known ethnobotanist and author in the U.S. who has written extensively on Ayahuasca and its analogs (Ott 1994).

Such substances are always synthesized with the help of enzymes. All enzymes need specific preconditions in order to work. If those conditions are not in place, there will be no endogenous drugs and also no spirituality. DMT and its derivatives are synthesized within the pineal gland by the enzyme Indolethylamine-N-Methyltransferase (INMT). The enzyme and its genetic RNA have already been detected within the pineal gland. DMT synthesized in this way is then released to the cerebral spinal fluid in the third ventricle and circulated within the brain.

DMT and 5-MeO-DMT are two of the most powerful entheogens we are aware of. The pineal gland is not the only source of DMT synthesis. Different amounts are also produced by the lungs, retina, thyroid gland, and many other body tissues. However, DMT produced by these organs quickly enters the bloodstream where it is immediately broken down by the enzyme Monoaminoxidase (MAO) unless we have ingested foods with MAOI properties (MAO

inhibitors).

Short overview:

- **Serotonin:** $C_{13}H_{16}N_2O_2$ / Belongs to the Tryptamine family.

- **Melatonin:** $C_{10}H_{12}N_2O$ / Belongs to the Methyltryptamine family. Serotonin plus one methyl molecule.

- **DMT:** $C_{12}H_{16}N_2$ / Belongs to the Dimethyltryptamine family. Melatonin plus one methyl molecule or Serotonin plus two methyl molecules.