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## Review Article

# Does the Universal Seven-Day Rhythm in the Function of the Pineal Gland, Have a Biblical Origin? A Review and a Hypothesis -

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## INTRODUCTION

The function of the Pineal Gland - a pea-sized portion of tissue situated in the centre of the brain, was always a mystery, until relatively recently (1958), when it was found to synthesize and release a hormone called Melatonin. Melatonin is secreted in the darkness of night and together with many other physiological functions, it has a calming or hypnotic effect on the body, in readiness for rest and sleep.

Recently, chronobiologists found seven-day weekly (circaseptan) rhythms in the physiological and biochemical behaviour of many organisms. This seven-day rhythm is now firmly established in the literature, but it is not as widely known that Melatonin has been found in rats to vary in concentration on different days of the week, starting to increase on Friday and peaking significantly on Saturday [1].

Therefore, the concept of TIME and its importance is indicated and suggests a biological origin of the week, rather than a social or cultural one, as posited by some authors [2]. In other words, Melatonin and its circaseptan production and its functions seem to be “hard-wired” into the genetic make-up (the DNA) of all living organisms [3].

If Melatonin with its anti-excitatory and mood enhancing effect increases on Friday and Saturday of each week, what could be the reason, and what could be the result of this? Could a genetic biochemical substance have been placed into all living organisms by a Creator God? Could this 7<sup>th</sup> day be demarcated by God as a day for REST or Spiritual Refreshment and Mental/Physical Regeneration? By uplifting our MOOD with Melatonin, could God be creating an environment in us as humans to interact with Him on a Sacred Seventh-day which He has called the Sabbath?

The following outlines some evidence that the Seventh-day of the seven-day week is rather special [4]. It is hypothesized that God conditions our moods to worship and to be in sync with His whole creation on that Day of REST.

## HISTORICAL BACKGROUND

Throughout ancient history, the pineal gland, situated in the “middle” of the brain, and only the size of a pea, had always been a mysterious organ, even being considered the “Seat of the Soul” by Descartes in the 17<sup>th</sup> century.

During the 18<sup>th</sup> century, interest in the gland waned to such an extent that it was only regarded as a “Vestigial Remnant of Evolution.” However, in the late 19<sup>th</sup> century, the gland’s histological structure and its photoreceptive role were discovered. This was followed in the early 20<sup>th</sup> century by the revelation of its endocrine glandular role, which was highlighted during the discovery of the relationship between pineal tumors and precocious puberty [2].

In 1958, Aaron B. Lerner and his team isolated the gland’s hormone-Melatonin. The pineal gland was then credited with the function of being a “neuroendocrine transducer,” responsible for transforming light cues from the retina of the eye into an endocrine response, manifested by the synthesis and release of the Melatonin hormone [2].

We now know that Melatonin, which is the principal hormone of the pineal gland, acts as a powerful neurotransmitter in the brain and the central nervous system. It is involved in circadian rhythms, and also has several other biological functions.

## CIRCADIAN RHYTHMS

In 1959, the scientist, Prof. Dr. Franz Halberg, first referred to endogenous biological rhythms occurring “about one day” (i.e. 24 hours) as “circadian”. Other endogenous rhythms have since been divided into “ultradian” for rhythms with periods shorter than 24 hours (< 24 hrs), “infradian” for rhythms longer than 24 hours (> 24 hrs), and “circannual” for seasonal rhythms having periods of approximately one year.

We will focus firstly on the circadian rhythm which is demonstrated by the pineal gland’s hormone - Melatonin (N-acetyl-5-methoxytryptamine), which is secreted under the control of the Central Nervous System (CNS) and the Supra-Chiasmatic Nucleus (SCN) of the hypothalamus.

Melatonin is synthesized by the pineal gland and secreted during the dark phase of the day (i.e., at night). The rhythm is endogenous, i.e. internally generated in man and in most animals [5].

Melatonin secretion is related to the length of the night; the longer the night, the longer the duration of secretion. Natural light to the eye serves to synchronize the Melatonin rhythm to 24 hours, suppressing its secretion during daylight hours and increasing its production at night in what is known as the “sleep-wake cycle” or “dark-light cycle.” Artificial light at night not only disrupts the circadian rhythm but also suppresses the production of Melatonin by the pineal gland. This “circadian” disruption and nocturnal Melatonin inhibition may have some negative consequences notably cancerous formation and cancer growth, especially in night-shift workers who perform their duties in artificially lighted rooms at night; or in persons with frequent jet lag e.g. pilots and flight attendants.

Melatonin rhythmicity is important in several metabolic functions as it acts as an anti-oxidant and as an anti-inflammatory agent. The hormone is successfully used as therapy for certain sleep disorders related to abnormalities of circadian rhythm and is also a mild hypnotic. By this latter action, it prepares the body for rest and sleep.

Melatonin in animals has been known to cause sedation, hypothermia, anxiolysis, muscle hypotonia, decrease in locomotor activity, slight analgesia, slight protection against ECT shock, constriction of cerebral arteries, calmness in readiness for sleep at night.

## CIRCASEPTAN RHYTHMS

Circaseptan literally means “about seven” and refers to a period of about seven days duration.

Approximately weekly rhythms known as “circaseptan rhythms” are some of the most fascinating findings of chronobiology - the science of biological rhythms.

On the surface it would appear that circaseptan rhythms are the result of the seven-day cultural week. However, plants, insects, and animals other than humans also have weekly cycles suggesting that Biology and not Culture, is probably at the source of circaseptan rhythms. Franz Halberg the world’s foremost authority on rhythms and the pioneer of the science of chronobiology proposes that body rhythms of about seven days, far from being passively driven by the social cycle of the calendar week, are innate, autonomous, and perhaps the reason why the calendar week arose in the first place [6].

We are mostly familiar with the daily rhythms of the sleep/wake cycle, the monthly menstrual cycle and many seasonal cycles. However, the new science of chronobiology has begun to make us aware that we live in a universe replete with circaseptan rhythms. A seven-day cycle has been found in many physiological fluctuations in blood pressure, heart rate, body temperature, and in the concentration of various body chemicals [3]. Many physiological variables are now known to have circaseptan rhythms. Halberg offers this intriguing insight into this new field of study [7].

Chronobiology is the eminently interdisciplinary science of interactions in time among metabolic, hormonal, and neuronal networks. It involves anatomy, biochemistry, microbiology, physiology, and pharmacology, at the molecular, intracellular, intercellular, and still higher levels of organization. The compounds coordinating a time structure proteins, steroids, and amino-acid derivatives provide for the scheduling of interactions among membrane, cytoplasmic, and nuclear events in a network involving rhythmic enzyme reactions and other intracellular mechanisms. The integrated temporal features of the processes of induction, repression, transcription, and translation of gene expression remain to be mapped.

It does appear that the body has a well-developed system for the timing and synchronization of its various metabolic activities. Biological systems are able to reset themselves each day to the twenty-four hour rhythm, thanks to many powerful time cues e.g. the day/night cycle. Chronobiologists call these cues zeitgebers, (German for 'time-givers'). Some of the cues are internal and others external to the systems. Our internal rhythms also help synchronize each other, for none of the myriad rhythms within our bodies works in isolation. The interrelationships between the rhythms are carefully choreographed.

If all the circaseptan cycles were to vary from a precise 7 day or 168 hour week, in time, the cycles would get intolerably out of sync. One would hypothesize then that there are zeitgebers synchronizing the circaseptan rhythms to the seven-day weekly cycle. In this regard, there are studies which show significant differences in the daily values of the pineal hormone Melatonin, which may be serving as an internal zeitgeber for the synchronization of the circaseptan rhythms.

### Some evidences of circaseptan (7 -day) rhythms

**Mammalian pineal gland:** 7-Day Rhythmic Activity In their research on rats at London University in 1975, Vollrath, et al. [1] confirmed the fact that the mammalian Pineal Gland undergoes prominent circadian changes in function, which are quite dependent on environmental lighting conditions. They reported that there are indications which suggest that the Pineal Gland of rats kept in their laboratories exhibited in addition to 24 hour cycles, characteristic 7-day cycles. It was unclear to them whether the rhythms were caused by internal or external factors and whether the rhythm was just a peculiarity of rats kept under environmental conditions of their laboratory. The finding that concerns us for the purposes of this discussion however, is that HIOMT enzyme activity under natural lighting conditions was HIGHEST on Saturdays and lowest on Thursdays; the Thursday values being six times lower than those on Saturdays. A gradual decrease in enzyme activity was noted between Saturdays and Thursdays. A striking increase occurred between Fridays and Saturdays.

The basic assumption here, is that "something significant" happens on Fridays and Saturdays to increase the concentration of

Melatonin, which we have postulated conditions the body for rest on Saturday.

**Seven day rhythms in primitive Giant Alga (*Acetabularia Mediterranea*):** Jeremy Campbell [6] reports that "Circaseptan rhythms are one of the major surprises turned up by modern Chronobiology". He further states that in recent times, few scientists expected that seven-day biological cycles would prove to be widespread and established in the living world. They are of ancient origin, appearing in primitive one-celled organisms and are thought to be present even in bacteria - the simplest form of life now existing".

Kenneth Westby, in his article entitled "The Amazing 7-Day cycle" highlighted one of Franz Halberg's amazing discoveries as an intrinsic seven-day rhythm occurring in some five million year old Giant Alga on the evolutionary timeline. Because this microscopic cell resembles a sparkling champagne glass, the alga (plant) is popularly known as Mermaid's Wineglass (*Acetabularia Mediterranea*) [6]. When the Alga, this single intact primitive cell is subjected to artificial schedules of alternating light and dark, spanning over many days, it is somehow able to transform the manipulation of light and darkness into a seven day week measurement" [6].

As Campbell [6] notes, "this inherent rhythm has to do with the internal logic of the human body rather than the world's external logic. In-depth experimentation with rats, faceflies, plants and other life forms have revealed circaseptan rhythms similar to that of the Mermaid's Wineglass".

If the seven-day week is an invention of culture and religion, as most historians would have us believe, how do we explain innate circaseptan rhythms in "primitive" algae, rats, plants and face flies?

**Seven day rhythms in so-called sabbath-keeping bees and seventh day beavers:** It is alleged that these two organisms have been imbued with 7th day wonders, however, further studies are needed in order to verify their actions. Apparently, Dr. Sang Lee, a frequent visitor to Brazil, noted that in the very remote areas of that country, there are stingless bees that are kept in tree stumps in the forest by the families of Bee-keepers. After keen observation, the families concluded that their bees never work on the 7<sup>th</sup> day Sabbath. The bees stay in their hives and rest for the whole 7<sup>th</sup> day i.e. Saturday, but on Sunday and the following days of the week, all the hives become actively engaged with their usual daily endeavours.

In a similar fashion Beavers in remote areas of northern California are usually very busy gathering sticks during the week. However as researcher Larren Cole has observed, the Beavers do not work on the 7<sup>th</sup> day, (Saturday) but resume daily activities from the following day (Sunday); hence they have been called seventh day (Saturday) Sabbath-keeping Beavers.

These observations remain subject to scientific studies however. Should the Brazilian Bees and Seventh-day Beavers assertions be proven, the evidence will serve to reinforce arguments presented in this article that not only do we have circaseptan rhythms in nature, but also the seventh day (Saturday) seems to be demarcated as a significant period of time. The Question is: Does this seventh day coincide with the Biblical Sabbath? That appears to be correct.

**Circaseptan rhythm in tooth enamel formation:** Some evolutionists argue that seven day rhythms are just social or religious customs and after several thousand years have simply been "bred" into our genes. The problem with such a "cultural" explanation is that

it cannot explain the presence of circaseptan rhythms in algae, mice, honeybees, beach beetles and face flies. As Campbell [6] reports, circaseptan rhythms are of very ancient origins, appearing even in primitive one-celled organisms. Clearly, these rhythms are ancient also because of the evidence seen in fossil teeth.

Other evidence suggests that while the human teeth are growing, approximately every seven days, small lines or ridges form on the dental enamel. According to scientific researchers growing teeth are said to exhibit a pattern of “weekly rest” as it leaves behind a dark marker just as trees show darker rings where their growth pauses during winter. In their book, “Investigation into the Relationship between Perikymata Counts and Crown Formation Times”, the above researchers referred to these lines (30-40 microns apart) as striae of Retzius. These striae, they claim are found even on the teeth of fossil hominids that lived before modern culture existed [8,9]. The seven day rhythm is incontrovertibly ancient as well as innate. Embedded in the primal genetic material of every living cell is a resonant frequency i.e. a clock of sorts with a beat that puts us in sync with the universe. This powerful beat revolves around the number 7.

The Question is: If four individual cycles vary from a precise 24-hour day or 168-hour seven day week, with time, wouldn't we get terribly out of sync? Perry and Dawson [3] have explained that “fortunately the human body is able to RESET itself each day to the 24 hour rhythm; thanks to the many powerful time-cues. Chronobiologists call these cues Zeitgebers - German for “time givers”. Zeitgebers can be found either outside or within our bodies while others form part of our daily lives”. Zeitgebers keep our bodies in sync with the world and our internal rhythms also help synchronize each other; that is, because the myriad of rhythms within our bodies does not work in isolation, the seven-day rhythm is therefore constantly being reset and resynchronized.

Circaseptans in geomagnetic pulsations and light/dark variations and their effects on the Pineal Gland [5,10,11] at the University of Minnesota Chronobiology Center, analyzed the data collected by a stand-alone magnetometer in the Antarctic where it remained free from societal contamination. About 7 day variations were detected in this data of geomagnetic pulsations.

The Geomagnetism in turn, activates the pineal gland Melatonin in Circadian and Circaseptan cycles.

In tandem with geomagnetic effects, bright light striking the eyes activates non-visual photo-receptors known as melanopsin-expressing Retinal Ganglion Cells (mRGC's) which then communicate with the Pineal Gland via neural pathways to establish non-photic circadian and circaseptan effects.

Consequently, information from the environment, reaches the Pineal Gland either through geomagnetism or by light/dark cycles.

Furthermore, the Pineal does not only communicate information to the rest of the body via Melatonin but also to the brain via thin nerve connections from Pineal cells to the Posterior Commissure and the Habenula. These regions in turn send signals to areas of the brain that influence MOOD [11,12] and SLEEP. Information from the cosmos also reaches the brain and body via the Pineal Gland. Because of the Pineal Gland's peculiar ability to transduce light photons to neural and chemical pathways, it can be dubbed the COMMUNICATION CONTROL CENTER of the body. This important center seems to be highly involved in a seven day cycle and is concerned with the demarcation of the Seventh-day of the week.

## THEOLOGICAL CONSIDERATIONS AND BIBLICAL IMPACT

### The basis for hypothesis #1

At the Halberg Chronobiology Center in the University of Minnesota, it has been repeatedly found that circaseptans can be amplified and re-synchronized by a single stimulus, i.e. in response to one-time event. This has been seen in:

- (a) Studies by Dr. G. Hildebrandt in his balneotherapy treatment of patients which showed an about-weekly rhythm phased by the start of the treatment.
- (b) The process of organ transplantation (done also in Minnesota and in Italy) evoked a similar response [7,13].
- (c) Also after a single stimulus of “being born” the blood pressure and heart rate of infants in the Neonatal Intensive Care Unit (NICU) in Minnesota displayed a circaseptan pattern [4,7,13]. It is important to note here that a process of growth and regeneration with immune system involvement is common to all three examples, and that circaseptans are at least partially endogenous.

### Hypothesis

In Genesis 2: 1-3,(KJV) God blessed and sanctified the seventh day of creation. It is proposed that this “blessing and sanctification” acted as a single stimulus which evoked a LITERAL physiological, endocrinological and immunological response in the body, particularly in the Pineal Gland with an increased melatonin output on that initial seventh day. This stimulus was repeated every seventh day thereafter.

As a consequence of these, a weekly seventh day (circaseptan) rhythm was induced and expressed as renewed growth and regeneration. On each subsequent seventh day, beyond physical regeneration, there is amplification and re-synchronization of bodily rhythms which give rise to mental tranquility/serenity and mood” on the seventh day.

This hypothesis is supported by the MOOD studies in which there is a marked enhancement of “positive affect” or “pleasant mood” on the seventh- day, accompanied by a decrease in “negative affect” [11,12,14] showed comparable results in their mood studies. Also in support of this is the behavior of the “Sabbath- keeping Bees”, and the “Seventh-day Beavers” and the marked increase of melatonin concentration in Vollrath's Rats on Saturday [1] which all suggest that “something significant” occurs on the Seventh-day. In other words, the biological origin of the week [4] suggests that the seven-day cycle with a marked 7th Day has been programmed into the DNA of living organisms [7,10].

These findings of elevated melatonin secretions [1,7,13] with its calming and hypnotic effects, along with the increase in “good mood” on Saturday [11,12,14] suggest that God has actually put a biochemical substance in our genetic make-up (DNA) to empower us and to put us in a mood to rest and worship on the seventh- day.

Our physiological and psychological condition on the seventh day, re-energizes and re-synchronizes our body rhythms, making them conducive for us to rest and to “Remember the Sabbath Day” as God has designed in Genesis 2: 2,3 KJV and commanded in Exodus 20:8-11 (KJV) The rhythms of nature are, therefore, in sync, not only with each other but are also in harmony with the Creator's design.



In general, TIME is being measured by the Pineal's reaction to light and darkness, as well as to geomagnetic pulsations which are cosmic realities, which were introduced at creation's week.

### Summary of hypothesis # 1

As discovered in scientific studies, certain physical/medical procedures having prominent expressions of growth and regeneration common to them, act as a single STIMULUS [3,5] for the amplification and re-synchronization of seven day (circaseptan) rhythms in humans.

In a similar process, it is proposed that, as stated below, God's blessing and sanctification of the seventh day (Saturday) at Creation as recorded in Genesis 2: 1-3, (KJV) acted as a single stimulus which evoked a LITERAL physiological, endocrinological and immunological response in the Pineal Gland with increased Melatonin output on that initial seventh day and is amplified at each subsequent seventh day as a "Time Marker" for the Seventh-Day Sabbath.

The question may be asked, as in [15,16]. Can we find any other evidence of the Origin of the seventh day Sabbath apart from the Bible?" This paper submits that another Origin of the seventh day Sabbath, previously unrecognized, does exist and has been "written" in our genes since Creation's week. Does this physical evidence "written" genetically [10] in our bodies correlate with the seventh day as recorded in the Bible? [Gen. 2:2&3][Ex.20:8-11] KJV.

It would seem so. As outlined in the previous pages of this paper, the Saturday or seventh (24-hour) day established physiologically and biochemically in living creatures, is the same seventh day recorded in the Bible (Saturday). Therefore, each line of evidence showing the importance and the uniqueness of the Seventh Day, agrees with, and supports the other.

In his book entitled "The Lost Meaning of the Seventh Day", Sigve K. Tonstad [16] makes the following observation: "Most remarkable, perhaps is the growing realization that the seventh day leans on nothing less than the Bible for its origin and meaning.

This may be called negative evidence – the silence of the other sources. Numerous attempts have been made to detect some kind of seventh day precursor in the language and ruins of the Near East but to no avail.

"On this point," he says, "there is an unusual degree of agreement among the vast majority of scholars" [16]. Tonstad goes on to quote the supporting statements of several of these scholars, including Andreassen NE [15], who affirmed that "so far, no Sabbath has been found in extra-Biblical sources." These statements act as a backdrop for the second hypothesis below.

### The basis and summary of hypothesis #2

Tonstad [16] asserts that there is no written evidence in ancient cultures of the seventh day Sabbath apart from that written in the Bible. However, this paper presents Hypothesis #2 i.e. the Seventh Day Sabbath is "written" genetically and inculcated physically within the bodies of all living creatures since the inception of time. Based on what has been postulated in hypothesis #1, this demarcation of Saturday as the Seventh Day, runs parallel to and is identical with the ancient Biblical Seventh Day Sabbath, and is therefore a "kind of seventh day precursor", which Tonstad and other scholars have been searching for.

The universal seven-day periodicity in nature with the increased activity of the Pineal Gland and its hormone melatonin on the seventh day [1,7], creates a physically and mentally conducive atmosphere with enhancement of Mood for the worship of God.

IN SUMMARY therefore, the previously unrecognized physical evidences genetically "written" and embodied in the Tissues of all living creatures, demarcates Saturday as a "special" seventh day which runs parallel to, and is identical with the Seventh-Day (Saturday) Sabbath worship day of the Bible. Therefore each line of evidence (both in Scripture and in Science) supporting the uniqueness of the seventh day Sabbath, reinforces the other in a very positive way.

### CONCLUSION

God has created in our bodies, a light-controlled biological clock called the Pineal Gland which produces a hormone named Melatonin. By creating in us an innate mechanism whereby Melatonin concentration PEAKS on Saturday, God, our Creator is emphasizing the importance of THAT day - the same day which the Bible espouses as God's Holy Day, and which we are commanded to remember (Exodus 20:8-11) KJV. On this day we communicate and interact with God, getting to know Him better and keeping in harmony with His entire Creation. This Creator God gives us irrefutable evidence (in our actual DNA), that Saturday - the 24-hour - seventh day of the seven-day week is SPECIAL, and additionally, it corresponds precisely with the Saturday- Seventh-day Sabbath worship day designed by Him in Genesis 2:1-3 KJV and commanded by Him in Exodus 20:8- 11. KJV.

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