Recent Research into A Possible Psychophysiology of the Yogic Chakra System.

S.M. Roney - Dougal, PhD,

Psi Research Centre,

Glastonbury, Somerset, Britain.

Abstract

Recent theoretical research by myself into the pineal gland as the physical locus of ajna chakra, conceived in yogic tradition as being the psychic centre of our being, is extended here to explore the yogic idea of ajna chakra as the command chakra, in command over all the other chakra centres. I have come across multiple references to the importance of melatonin as the off-switch for the endocrine glands' output of hormones, working together with the pituitary gland which is considered to be the on-switch. I am suggesting that the pineal gland is the physical aspect of ajna chakra; the thyroid of vishuddhi; the breasts of anahata; the adrenals of manipura; and the gonads of swadhistana and muladhara. These endocrine glands are all positioned at the traditional points of the chakras and their functions are remarkably equivalent to the traditional descriptions of the chakra functions. I am therefore proposing that the endocrine system is the physiological aspect of the yogic spiritual tradition of the chakras, and that the autonomic nervous system can be equated with the yogic nadis.

Introduction

Over the past few years there has been increasing interest in "translating" the knowledge of one system into the language of another, for example, 20th century Western scientists, especially physicists, have been comparing quantum mechanics with mystical knowledge as exemplified by Fritjof Capra in "The Tao of Physics" (1975). This same process has been occurring in psychology, for example Tart's "Transpersonal Psychologies" (1975), Paranjpe's

"Theoretical Psychology" (1984), both examining Eastern philosophies and religions from a Western psychological standpoint, and research exploring a neurological basis for Near-Death Experiences and their similarity with the kundalini experience (Wile, 1994; Jourdan, 1994).

Much of this translation has, of necessity, been in very general terms, since we have to clarify the overall picture first. I seem to be involved in this process from a rather different perspective. I have been researching a specific topic, the pineal as a psi-conducive gland, which has generalized to the endocrine system as the physical aspect of the yogic chakra system. I must stress that what follows is still in a speculative and exploratory stage.

The Yogic Chakra System

The yogic chakra system as explained by Swami Satyananda Saraswati (1972), consists of seven chakras which are normally depicted as a sort of "spinal column" with three channels called nadis (ida, pingala and sushumna) which interweave, the crossing-points being the sites of the chakras (See figure 1). In western terms this can be readily understood as the central nervous system (sushumna) in the spinal cord around which, on either side, runs the autonomic nervous system which has two aspects, the parasympathetic which can be readily correlated with ida, and the sympathetic with pingala, the sympathetic and pingala being the activating aspect of the system and the parasympathetic and ida the relaxing. Where these two cross they form plexuses, or nodes, from which nerves go out to, for example, the heart, lungs, diaphragm, digestive system and the endocrine organs. Satyananda connects this nervous system with the chakras as follows in Figure 1.

These chakras are considered to be important points for the channelling of consciousness, energy nodes linking the physical with the spiritual. They have been adopted quite widely into popular usage in the West, partly through the Theosophists at the turn of the century, and partly because of the intense interest in Eastern spirituality birthed during the sixties. There are at present so many differing correspondences and attributes linked to them and therefore this research is presented with the aim of achieving greater clarity.

Table 1: Different Correspondences Popularly Linked with the Chakras

1)SwamiSatyananda'scorrespondence

chakra	physiology	body	function	petals	colour	sense	motor	element	psychic experience
Sahasrara	crown	pituitary, brain	mind	1000	red	mind	mind	mind	red
Ajna	third eye	pineal	psychic awareness, command	2	clear, grey	mind	mind	mind	golden egg, drowsy
Vishuddhi	throat	laryngeal plexus	expression	16	pure blue	ears/ hearing	vocal cords	ether	cold, nectar
Anahata	heart	cardiac plexus	love	12	vermilion	skin/ touch	hands	air	blue
Manipura	navel	solar plexus	digestion, assimilation temperature	10	dark blue	eyes/ sight	feet	fire	yellow
Swadhistana	sacral	prostatic plexus	the unconscious	6	vermilion	tongue/ taste	sex organs kidneys	water	unconscious
Muladhara	perineum	sacrococ-cygeal plexus	excretory, secretory, sexual.	4	red	nose/ smell	anus	earth	red

2)For Comparison I Show An Alternative Set of Correspondences As Outlined by John Davidson (1989)

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Tattwa	Chakra	Gland	State	Sense	Organ	Function	Motororgan	emotion
Akash	Throat	Thyroid	Space	Hearing	Ears	Speech	Throat	ego,pride,
Air	Heart	Thymus	Gas	Touch	Skin	Manipula	Hands	greed
Fire	Navel	Pancreas	Fire	Sight	Eyes	Walking	Legs	anger,
Water	Genital	Gonad	Liquid	Taste	tongue	Procreat	Sex	self-indulgence
EArth	Rectal	Adrenal	Solid	Smell	Nose	Eliminat	Rectum	attachment

The Pineal Gland: Ajna Chakra

As a parapsychologist I am interested in the Indian lore surrounding ajna chakra which is held to be the psychic centre. This corresponds very closely with our Western lore which considers the pineal gland to be the "third eye" or the “seat of the soul.” For example, Swami Satyananda (1972) states that: "The name Ajna comes from the root "to know" and "to obey and to follow". Literally the word Ajna means "command" . . . . Yogis, who are scientists of the subtle mind, have spoken of telepathy as a "siddhi", a psychic power for thought communication and clair-audience etc. The medium of such siddhis is Ajna chakra, and its physical terminus is the pineal gland." I have found that his concept of the pineal gland as the psychic chakra and as the command chakra has a sound psychoneuroendocrinological basis.

The pineal gland is situated in the centre of the brain and its main function is to make neurohormones which affect both the brain and the body. The pineal works together with the pituitary through the hypothalamus controlling the endocrine system. Basically it is one of the regulators of our circadian rhythm, is implicated in our emotional state, reproductive function, possibly dream sleep and in certain psychoses. Melatonin is the best studied of the pineal neurohormones and was first isolated from cattle in 1963. Before this the pineal was generally considered in the West to be vestigial. Amphibians and reptiles have light sensitive cells in the pineal gland which for them is literally a light sensitive third eye at the top of their brain just below their skull. In humans fibres from the inferior accessory optic tract go to the pineal; these are separate from the main optic tract bundle, which suggests that the light sensitivity of the pineal is not necessarily related to sight (Eichler, 1985).

Most people have heard of the pituitary gland, which is often known as the "master gland" in that the hormones it makes exert a controlling effect on the endocrine organs. Well, we can think of the pituitary as being an "on switch" and the pineal as being an "off switch" (the mistress gland) in that it works with the pituitary by switching off the endocrine organs. The form of ajna chakra is traditionally depicted as bilobed and we can understand this to be the joining of the two glands, pituitary and pineal, which makes very good sense from a neuro-endocrinological point of view. To me this makes much better sense than assigning the pituitary to sahasrara, the crown chakra, as

some systems do, since sahasrara is better understood as the culmination of everything, the whole rather than any of the parts. Just as muladhara is considered by Satyananda to be the top chakra of animals and the bottom of humans, so sahasrara can be understood as the top chakra of humanity and the bottom chakra of the next order of being, whatever that may be.

The Psychic Chakra: Pinoline

There is a large body of neurochemical and anthropological evidence which suggests that the pineal gland may produce a neuro-modulator that enhances a psi-conducive state of consciousness. An abstract of this research was presented at the Parapsychological Association Convention in 1985 (Roney - Dougal, 1986). For full details of this research please see Roney-Dougal (1988, 1989, 1990, 1991, 1993). In brief, the pineal gland has been found to synthesise various beta-carbolines and peptides, and to contain enzymes that produce psychoactive compounds such as 5-methoxy dimethyltryptamine (5MeODMT) “The two precursors that are most likely to be involved in the synthesis of such compounds are serotonin (5-hydroxytryptamine, 5HT) and tryptamine” (Strassman, 1990). These have wide-ranging effects throughout our brain and body, affecting the gonads, adrenals, pancreas, thyroid, and other emotional and endocrine activities.

Of most interest here are the neuromodulators called beta-carbolines which are MAO inhibitors that prevent, amongst other effects, the breakdown of serotonin. This results in an accumulation of physiologically active amines (tryptamines) within the neuronal synapses which may lead to hallucinations, depression or mania depending on the amines being affected (Strassman, 1990). Beta-carbolines are also found in the retina of the eyes, in the adrenal glands and in the gut. The pineal contains the greatest concentration of serotonin in the brain, this being accentuated in those who suffer from psychoses. The pineal also contains enzymes that inhibit synthesis of these compounds, thus suggesting a regulating mechanism within this gland. There is a suggestion that it is the action of the pineal beta-carbolines, in particular 6-Methoxytetrahydro-betacarboline (6MeOTHBC, now being called pinoline), on serotonin that triggers dreaming (Callaway, 1988). Spontaneous case collection studies (e.g. Rhine, 1969) have found that most (more than 60%) spontaneous psi experiences occur during the sleeping and dreaming state of consciousness, which suggests that the dream state is a state of consciousness wherebey we are most likely to have psi expereinces, and pinoline is suggested to be the neurochemical that triggers this particular state of consiousness.

Further, there is now a considerable body of research into the action of serotonin and melatonin in relation to psychiatric disorders such as manic-depression (Halaris, 1987) and schizophrenia (Miles & Philbrick, 1988). "At a psychopharmacological level, carbolines are central nervous system inhibitors via the gamma-aminobutyric acid (GABA, a neurotransmitter) system. This action is similar to that of benzodiazepines, (e.g. diazepam or "Valium"), which relieve anxiety, have anticonvulsant action, are hypnotic and muscle relaxants and are used for all these CNS pharmacological actions. Thus pinoline may also act as a physiological tranquilliser and hypnotic, and the latter effect would be in keeping with the nocturnal secretion pattern of pineal activity."[1]

Anthropological data also suggest that these beta-carbolines are psi-conducive because their chemical structure is very similar to a naturally occurring group of chemicals called harmala alkaloids which occur in an Amazonian vine, Banisteriopsis caapi, used by Amazonian tribes for psychic purposes (Roney - Dougal, 1986 & 1989) (See Figure 2). The Amazon has a huge variety of psychotropic plants, yet all the tribes throughout that vast area use this same vine mixed with Psychotria viridis (Nai kawa) which contains dimethyltryptamine (DMT) (Ott, 1993 & 1994), for healing, out-of-body experiences, clairvoyance and precognition. It is traditionally used only when psi experiences are desired, though nowadays it is also used for general initiatory purposes. Thus the tribal people make a mixture of harmala alkaloids and DMT which mimics the tryptamine-pinoline mixture ascribed to the night time output of the pineal gland. My speculation is that when the pineal gland is stimulated to produce pinoline we are more likely to enter an altered state of consciousness which is psi-conducive.

In the 1960's a Chilean psychotherapist, Claudio Naranjo (1973, 1978) used a variety of hallucinogens including harmaline (one of the harmala alkaloids) in the psychotherapeutic setting, and came to the conclusion that: "Harmaline may be said to be more hallucinogenic than mescaline . . . both in terms of the number of images reported and their realistic quality. In fact some subjects felt that certain scenes which they saw had really happened and that they had been as disembodied witnesses of them in a different time and place. This matches the experience of South American shamans." (Naranjo, 1967). Ott (1993) considers that the harmala alkaloids are not actually hallucinogenic in their own right but that they permit the DMT in the ayahuasca mixture to be absorbed into the blood stream so that these create the entheogenic effects. This is still a matter of debate. There is extensive evidence from many anthropologists which suggests that the Banisteriopsis vine together with Psychotria Viridis is a psi-conducive drug, particularly with regard to remote viewing, clairvoyance and precognition but so far there has been no experimental

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[1] Personal communication from Ian Pearson

test of these claims (Kensinger, 1973). Ayahuasca has recently been investigated by Don et al (1996) who suggest that its action is consistent with their other research into brain function and psi experience.

Thus, the anthropological evidence suggests that harmala alkaloids mixed with DMT stimulate a psi-conducive state of consciousness; the neurochemical evidence suggests that the harmala alkaloids are an analogue of pinoline which is produced in the pineal gland, noting that in the comparison between the action of the harmala alkaloids and pinoline it must be remembered that a one-position change in methoxy grouping can be profound in its action. The Yogic and occult teachings and common folk lore all say that the pineal gland is the psychic centre and I suggest that the pinoline made by the pineal gland at night time, through its action on serotonin, stimulates a dream type state of consciousness which is psi-conducive.

The Command Chakra: Melatonin

However, the yogic lore not only equates ajna chakra with the psychic centre of our being, but also as the command chakra. For an understanding of the pineal gland as command chakra we have to look to its main action which is the production of the neurohormone melatonin. Melatonin is found in protozoans, suggesting that it dates back a thousand million years, and is found in all animals. It is important in bird migration cycles, dogs' moult cycles, and frog colour change. In this article I refer both to research with humans and with animals in order to obtain as full a picture as possible of the relationship between the pineal gland and the endocrine organs since there has been relatively little research with humans, whilst being very aware that one should not extrapolate too much from animal data as is the tendency so often these days in biological and psychological research. Therefore, as far as possible whenever the data come from animal studies I state this explicitly.

The most important function of the pineal gland is maintaining the *biological clock,* both on a daily basis according to the sun, on an annual basis according to length of day, and on a lunar basis as well. The study of the biological rhythm is called chronobiology and it has been found that there is a genetic connection, a basic inner clock, and an environmental connection through the retina: light stimulates the monosynaptic retinohypothalamic pathway which leads directly to the anterior hypothalamic suprachiasmic nucleus (SCN), pineal and hypothalamus.

Within the pineal the circadian rhythm regulation is achieved through the actions of serotonin and melatonin. Serotonin is made during the day and melatonin at night. Acute exposure to light at night suppresses melatonin production. The intensity of light required to suppress production varies between species and in humans is 2000 lux. It

has been suggested that perhaps rhodopsin is the photopigment that mediates the suppressive effect of light on pineal. Blue light seems to be maximally inhibitory (500 - 520 nm). Acute exposure to nonvisible, non-ionising radiation, e.g extra low frequency (ELF) 60 Hz electric and magnetic fields also suppresses melatonin production as does pulsed static magnetic field exposure. There is speculation that these effects are also mediated via the eyes (Wetterberg, 1995, Reiter & Richardson, 1992).

Serotonin is a very important neurotransmitter in the brain and its action has been linked with mental states such as psychosis, with entheogenic plants, with our mood circuits and therefore with illnesses such as appetite disorders (anorexia and bulimia). It is a very complex neurotransmitter with 5 or 6 different receptor sites, which means it has many different modes of action.

Melatonin is made from serotonin through the action of two enzymes, serotonin n-acetyl transferase (NAT) and hydroxy-indole-O-methyltransferase (HIOMT). Melatonin production is determined primarily by neural activity from the hypothalamic suprachiasmic nucleus (SCN) and there is a feedback relationship with the endocrine glands. Gonadal steroids, pituitary gonadotrophins, thyroxine, prolactin and the adrenal hormones intervene in the mechanisms governing meltonin synthesis.

All humans have a circadian rhythm though the magnitude of NAT production varies greatly. In general there is good correlation between pineal NAT activity and pineal and plasma melatonin rhythms. The rhythm at birth is linked to that of the mother; maturation of the cycle accompanies growth of sympathetic nerve fibres into the gland; melatonin production peaks just prior to puberty at which time there is a sudden and dramatic drop, and from then on it gradually decreases into old age. In people who suffer from depression the circadian rhythm is disrupted.

The most important neuronal function of melatonin is as a *sleep inducer.* It has been found to ease insomnia because it causes drowsiness, and also to combat jet lag because it helps to reset the biological clock: 5mgs per day helps induce sleep and helps airline workers adjust to new time zones. (Cowley, 1995) Is there a genetic component in early or late risers? Hypophysectomy (loss of the pituitary gland), which causes depressed metabolic activity, and bilateral adrenalectomy blunt the nocturnal melatonin rise though the rhythm stays the same.

Being forced to *exercise (swim) at night* causes a rapid drop in pineal melatonin levels in rats, but not in NAT or HIOMT activity. Melatonin production stays as normal, and blood levels rise dramatically suggesting it is being rapidly released from the gland into the blood system. Removal of adrenals doesn't change this so normal stress hormones are not implicated. This finding has profound implications for the health of night workers (Reiter &

Richardson, 1992) because melatonin also modulates release of *stress hormones,* thereby controlling heart attacks and stomach ulcers.

Jogging or other exercise is a mood enhancer since it stimulates endorphins. Exogenous opiates increase melatonin levels, and beta-endorphin levels decrease when melatonin is administered. Opiates stimulate basal prolactin secretion. Opioid receptor antagonists also decrease prolactin concentrations although continuous administration does not affect circadian rhythm of prolactin, which is related to melatonin levels.

Recent research suggests that melatonin is involved in the *aging process* and that giving 19 month old mice melatonin each evening in their water improved their weight, their vigour, their activity levels and their posture when compared with the untreated mice and they lived almost 200 days longer on average (20%) (Maestroni et al, 1989). Touitou et al (1989) measured melatonin levels in people in February, March and June and found that old people have half the amount of melatonin that young men do (we make half as much by age 45 as we do when children), that senile people show far less circadian rhythm, with elderly women showing least variation. For all groups, all through the year melatonin production peaks between 2 - 3am with the largest amplitude in January. Inter-individual variations are large in all groups. Since pinealocytes and enzyme activity are not altered in the pineal of the elderly, the decline of plasma melatonin levels may well be related to a modification in the release of the hormone and/or to an increase in its metabolism or excretion. An increased sensitivity to light could also explain the relatively low levels of plasma melatonin in the elderly.

Melatonin production decreases as we age, the thymus gland shrinks and we produce fewer antibodies and T-cells. There are special melatonin receptors on cells and glands of the *immune system.* A recent controversial speculation is that nightly melatonin supplement boosts the immune system thereby preventing cancer and extending life. Research has suggested that melatonin protects cells from oxidation by free-radicals, which contribute to at least 60 degenerative diseases, including cancer, heart disease, cataract and Alzheimers. In this respect melatonin differs from other natural antioxidants, B-Carotene, vitamin E and vitamin D in that melatonin is absorbed into target cells and exerts its action from that intracellular position with much greater effect (Reiter, 95). Melatonin reduction is linked to the calcification process that starts at puberty. People taking chlorpromazine, an anti-psychotic medication that raises melatonin and prolactin levels have low rates of breast cancer. Prolonged exposure to high oestrogen levels raises breast cancer levels and melatonin inhibits oestrogen release.

It thereby also helps to *prevent pregnancy* because of its interaction with the reproductive system as a hormone inhibitor. This inhibitory action means that melatonin controls puberty; without it we would be sexually active

at 4 - 5 years old. Parapineal tumours, those that lie next to the pineal, stop the pineal from functioning and lead to percocious puberty and progeria (accelerate aging); while pinealomas, tumours of the pineal gland itself, produce excess melatonin secretion and delayed puberty.

Thus melatonin is related to functions which are traditionally connected with yogis: living for many years longer than normal, being relaxed and stress-free, able to control many of their physical functions, such as heart rate which is linked with our biological clock and our metabolic rate; celibacy is linked to the religious life, though within yoga there is also the tantric path; enjoy excellent health. Through the light sensitivity of the pineal gland and its primary role within the biological clock system, regulating the rise and fall of the metabolic system and switching off the endocrine glands, which I am going to expand on next, we can see that the concept of the pineal as the command chakra is as strong as the concept of the pineal as the psychic chakra.

The Thyroid Glands: Vishuddhi Chakra

According to Satyananda (1972), vishuddhi chakra is located in the throat and is the centre of "the nectar of immortality." It is connected with the sense of hearing and thus with the ears, and of course with the vocal cords and with self-expression.

The thyroid makes thyroxine which regulates the metabolic rate of the body, i.e., it controls how fast the body runs: an overactive thyroid means that the heart beats fast, one becomes thin, sexual desire increases, and the mind works overtime; whilst an underactive thyroid has the opposite effect. Neurochemically, the thyroid is under the inhibitory control of the pineal gland, removal of the pineal resulting in thyroid enlargement and increased hormonal secretion rate. The pineal is also under feedback control by the glands which it influences. Pineal cells respond to thyroxine, the response being particularly strong at night.

Synthetic melatonin has the effect of inhibiting iodine uptake and the secretion of thyroxine, and, given at the correct times, can reproduce the daily and annual circadian rhythms since iodine uptake naturally decreases during the night. Thus, evening injections of melatonin are more effective than morning ones, showing that the time of day when hormone supplementation is given is a significant factor, the influence of the circadian rhythm once again. (Johnson, 1982). The effect of synthetic melatonin on the secretion of thyroxine decreases after puberty.

The hypothalamus makes thyroid releasing hormone (TRH), which stimulates the pituitary to make thyrotropin (TSH), which stimulates the thyroid to make thyroxine[2]. There is a circadian variation in human TSH levels, TSH beginning to rise several hours before the onset of sleep, reaching maximum levels between 11.00pm and 4.00am, declining gradually with a minimum at 11.00am. People with hypothyroidism also show a seasonal variation and circadian changes in plasma TSH, which suggests that the circadian rhythm of TSH is not related to the negative feedback control exerted by thyroid hormones under normal conditions: serum thyroxine levels show maximum concentration in late morning and minimum concentration in early morning.

Sleep deprivation results in larger and broader TSH peaks. Pinealectomy does not result in changes in serum TSH or hypothalamic TRH content, nor does it produce alterations on the diurnal rhythms of hypothalamic TRH - so there is little firm evidence for significant interactions between melatonin and rhythmicity of TSH secretion, yet chronic melatonin treatment decreases pituitary TSH content and increases plasma TSH concentration.

TSH is, together with melatonin and the adrenals, involved in coping with long term stress. Alpha-adrenergic pathways play a role in the stimulatory control of TSH release. Circadian changes in cortisol levels follow an opposite pattern to those of TSH. Glucocorticoid administration has an inhibitory effect on TSH secretion and rhythmicity, but there does not seem to be a close relationship between the daily profiles of each hormone and abolition of the circulation rhythm of cortisol does not disrupt the TSH rhythm. Glucocorticoids inhibit TSH release, and so the circadian rhythm of TSH is abolished in patients with hypercortisolism (Johnson, 1982).

Stress is intimately connected with metabolic rate, heart rate, an overactive mind, and also with age as an older person cannot cope with stress as well as a younger person. Long term stress is very different from short term stress (which is dealt with by the adrenals) and it is interesting that ajna, vishuddhi and manipura are all concerned with stress - which also affects the heart - when the mind just won't stop going in circles around the problem (the beta-rhythm mental chatter), which is one of the worst aspects of long term stress. These are all the negative aspects of vishuddhi and we learn through meditation to overcome these aspects and so to become peaceful, still, calm and to live to a ripe old age which is another way of saying that the thyroid is connected with immortality. Relaxation is the first step in meditation; slowing down, letting go, releasing the stress, stilling the endless internal chatter as is exemplified so well by the Chinese symbol of immortality, the tortoise; the slower you go, the longer you live. Yogic lore states that it is perfectly possible to regulate the functioning of the endocrine system, thus learning how to control

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[2] The smallest dose of TRH capable of inducing a rise in circulating TSH also causes prolactin release, prolactin being linked with melatonin and also possibly with anahata chakra (Salvador, 1988) - see next section.

ones metabolic rate. It is feasible that yogic exercises designed for the ajna chakra do physically regulate the pineal gland and so influence the functioning of the other endocrine organs.

The Heart Centre: Anahata chakra

According to Satyananda, anahata chakra is concerned with will and with feeling, touch, the skin especially the hands, manifesting in such arts as painting, poetry and music, which are aspects of heart.

The Thymus

As a result of the writings by Theosophists, many people consider that anahata chakra is connected with the thymus gland, which physiologically is most active in children and is concerned with the immune system. Recent research suggests that there is a connection between the pineal gland and the thymus because of its interaction with the immune system, as mentioned in the section on the pineal gland as command chakra. Functional connections between the immune and the neuroendocrine systems are being increasingly recognized. Thus stressful effects, distress, from psychological or neuro-endocrinological causes may adversely affect the immune system and vice versa.

Circadian synthesis and release of melatonin exerts an important immunomodulatory role, in that it appears to be a physiological up-regulator of the immune system and to operate via the endogenous opioid system on antigen activated cells. When given in the evening to mice it increases the primary antibody response to T-dependent antigens, buffers the depression of antibody production and thymus weight induced by the acute restraint of mice innoculated with sheep red blood cells, and confers resistance against injections of a virus, not by protecting the thymus cortex but because it enlarges the thymus medulla. The anti-stress action of melatonin appears to be antagonized by administration of the opioid antagonist naltrexone, suggesting that melatonin operates via the endogenous opioid system (EOS) even though the opioid system is not itself involved in the immunological effect of acute stress. When administered in the morning no effect on the immune system was found (Maestroni et al, 1989). Thus, it is possible to see melatonin as an anti-stress hormone since melatonin reverses the depression of antibody production induced by corticosterone in drinking water. Failure to cope with distress may be dependent on an exhausted EOS and melatonin may restore the EOS.

So there is some connection between the pineal and the thymus in animals, and yet whilst there is a certain link between keeping healthy and the normal concept of the emotional aspect of heart in our culture, there is another hormone connected with this region in humans which expresses heart emotion much more strongly: the hormone prolactin which is connected with lactation in the breasts.

Prolactin

I have noticed in my research into the pineal that melatonin is the off-switch for a hormone called prolactin which is made by the pituitary, is involved with pregnancy and stimulates lactation, and is implicated in manic-depression. Most of the research with prolactin has been with animals, but there has been some research with humans showing once again the link with the pineal gland.

In seasonally breeding species in which both hormones show a seasonal variation, melatonin mediates the influence of light on prolactin release. All ruminants (e.g. cows, sheep) show a marked seasonal fluctuation in plasma prolactin concentration, i.e. high in summer and low in winter, and certain animals become impregnated in autumn at the end of the long day light hours (Wurtman, 1979), this fluctuation being controlled by melatonin. This inhibition of prolactin secretion in ruminants inhibits implantation of the blastocyst during the winter, so that the foetus does not implant into the womb until spring time, even though mating and fertilisation occurred in autumn.

Prolactin secretion in women is also controlled by the ovarian steroids, its level being modified by the fluctuating oestradiol levels of the menstrual cycle. Whilst few clinicians would accept a seasonal basis for reproduction in humans, older epidemiological data, and data more recently derived from conditions of borderline fertility, both support a seasonal change. The exact link to melatonin is as yet unestablished but seasonal changes in plasma melatonin have been described (Matthews, 1981) for women, but not for men. Martikuinen et al (1985) found peaks in both summer and winter, and Touitou et al (1984) found differences between young and old people (see Vishuddhi chakra).

Webley (1988) worked with 11 young men intermittently over a 9 month period. He found that, like melatonin, prolactin shows a night time peak around 3 - 4.00 am. and that, whilst inter-individual variations are large, there are no changes in the amplitude of the peaks across the February, March and June samplings. This significant positive correlation between melatonin and prolactin concentrations is greatest at night and strongest in June. Melatonin

concentrations decrease earlier than prolactin in the morning and increase before prolactin in the evening (see Figure 3).

Prolactin concentration increases with sleep. The dependence on sleep is independent of time of day, so night workers will make some of their prolactin during the day, but prolactin also shows a circadian pattern of high levels at night. There were inconsistent changes in the circadian pattern of melatonin for the individuals, which suggests that environmental factors other than the light/dark cycle can influence the circadian pattern in men, and as I am suggesting here, stress/relaxation is one of these factors - other factors may be sleep/activity pattern, different social cues and physical exertion.

Webley found that melatonin doses given both morning and evening stimulated a significant increase in prolactin concentrations. There is a diurnal rhythm in sensitivity to melatonin: melatonin given in the morning stimulates a constant increase in prolactin concentration across the sampling period, whereas in the evening a peak in prolactin was evident after 90 -120 mins.

This leads to the conclusion that it is possible that melatonin may control directly the nocturnal increase in prolactin, but in some cases if melatonin concentration is increased, prolactin concentration is decreased; for example, a decrease in melatonin by pinealectomy results in an increase in prolactin release and the nocturnal increase in prolactin is absent in a pinealectomised human who had no nocturnal increase in melatonin. The observed stimulation of prolactin after melatonin injection in the human is also at odds with the inhibition of prolactin release in seasonally breeding animals - this may be indicative of a difference between the response to acute and chronic melatonin administration as is also seen with thyroxine, or may be indicative of the different responses to the hormones between humans and animals. In rats acute administration of melatonin stimulates prolactin, whereas prolactin is inhibited with chronic melatonin. Melatonin can inhibit dopamine release from the rat hypothalamus, the degree of response showing circadian variation. Since dopamine is known to inhibit prolactin release, the influence of melatonin on prolactin may therefore be via a dopaminergic mechanism. Such a mechanism would provide a central site of action for melatonin on human reproduction (Webley,1988).

Like TRH, prolactin secretion during the day follows the opposite pattern to that of cortisol. Glucocorticoid administration reduces pituitary prolactin content and release as well as prolactin responses to TRH, but does not affect circadian rhythm.

Oestrogens stimulate prolactin secretion, so women have higher basal levels, particularly during reproductive years and pregnancy. There is a close parallel between plasma oestradiol and prolactin. Women have higher sleep-

related prolactin elevations. Further hypersecretion of prolactin and the related pituitary hormones, luteinising hormone (LH) and human growth hormone (HGH)[3] may be associated with affective (mood) disorders such as manic depression and recurrent depression - here we see clearly the link between emotional, physical and psychological state of being through its disturbance. Further, dopamine antagonism is a feature of major tranquillisers which may cause high prolactin levels; dopamine neurotransmitter dysfunction is associated with schizophrenic disorder and Salvador (1988) considers that dopamine is the most important inhibitory regulator of prolactin and TSH synthesis.

I am suggesting that the hormones are the physical aspect of the chakras. Every hormone appears to have a physical component which affects the workings of the body. They also appear to have an emotional component, and I am suggesting that prolactin is the hormone of the emotion we associate with love, which most cultures associate with the heart. Prolactin is made in men as well as women and children, for all of our lives, and has functions other than the primary one of lactation. It is intimately connected with melatonin and hence ajna chakra, with TRH and hence with vishuddhi chakra, with glucocorticoids and our stress levels and with oestrogen and hence female sexuality. As the hormone of love this makes perfect sense.

The Solar Plexus: Manipura Chakra

Satyananda says that manipura chakra is located behind the navel and causes old age, decay and emaciation by burning up the nectar of immortality. It is also connected with the sense of sight and the eyes and it is the organ of action and hence is also connected with walking, the legs and the feet. The solar plexus is the locus for our "gut feelings" about people and situations, and is connected with digestion and assimilation. It has also been linked with ambition, will, self-assertion, vital energy, power struggles, anger and jealousy. Manipura is the uppermost of the "earthly" or base chakras.

There are two possible endocrine organs in the gut which could be linked with manipura: the pancreas and the adrenals.

[3] Melatonin suppresses HGH secretion (Wilson & Foster, 1992)

The Adrenals

The adrenals are the endocrine glands I consider are most strongly related to manipura. Most people know these as the "fight or flight" glands in that adrenaline is produced when we are in a stressful situation and we burn up our body energy in order to cope with a crisis; adrenaline is the hormone of action. We feel the fire in our belly.

The pineal is connected with the adrenals, and in particular with adrenaline and the corticosteroids in many ways. The adrenals comprise two parts: the cortex and the medulla. The cortex secretes glucocorticoids such as corticosterone, on a rhythmic light-dark cycle linked with hormones from the pituitary and the hypothalamus. The glucocorticoids are involved with sugar metabolism and as stress protectors;

The cortex also secretes mineralocorticoids which are involved in mineral balance, and also anxiety;

The third sort of hormones produced by the cortex are the androgenic steroids which include testosterone, are involved in body building and anger; there is a steroid surge in the morning to help wake up.

These are the stress-related hormones.

The adrenal medulla secretes adrenaline. The pineal inhibits release of all of these hormones, thus controlling our physical level of immediate short-term stress - as it does with the thyroids on a long-term basis. Melatonin is actually found in the gut as are the beta-carbolines. Beta-carbolines interact with adrenaline and noradrenaline uptake and outputs as well as with corticosterone secretion, thus interacting closely with the adrenal functions. Constant administration of small doses of beta-carbolines causes the weight of the adrenals to increase, whilst removal of the pineal gland causes enlarged adrenals. The significance of this enlargement of adrenals, as with the thyroids, when for some reason or other there is no pineal, is that the inhibitory effect on these glands has been removed so that they work overtime. And, as a result, one burns up. This can be understood in the spiritual as well as in the physical sense.

The Pancreas

Some systems consider that the pancreas, which is involved in digestion and the input of energy and energy maintenance (the Islets of Langerhans within the pancreas make insulin, a glucose using hormone, and glucagon, a glucose saving hormone), is the endocrine organ of manipura chakra. This would make very good sense in terms of our Western concept of the solar plexus, and is certainly to be considered. Davidson (1989) mentions insulin and glucagon in this connection as the food factory of the body, that which gives us our physical energy.

However, there is a connection with the adrenals because the pancreas is turned off by adrenaline and noradrenaline, and adrenaline regulates the uptake of glucose. Therefore the pineal is connected with the pancreas via the adrenals.

The Root of the Spinal Cord: Swadhistana Chakra

Swami Satyananda states that swadhistana is connected with all "the phases of the unconscious", the subliminal mind. "Swadhistana is made up of all the rubbish which you never wanted, which you never needed, which you never desired but which got in." (Satyananda, 1972). Traditionally it has also been linked with sexuality, sensory pleasure, liquid, taste, procreation, self-indulgence, the kidneys and the prostate gland.

I think that swadhistana is connected with the generative aspect of sexuality embodied by the womb in women, with follicle stimulating hormone and luteinising hormone, oestrogen and androsterones as the hormones of this chakra. These hormones are central to the development of the secondary sexual characteristics - that which makes a man a man and a woman a woman - they define our gender, our selves as sexual people, the pitch of our voice, the shape and strength of our body, whether or not we have a beard, and the differing emotional characteristics related to oestrogen and testosterone - that which is the essence of man or woman.

There is a strong link between the pineal gland and the generative aspect of sexuality. Melatonin levels in the mother are exceptionally high during pregnancy reaching a peak at birth. The diurnal rise in plasma melatonin appears enhanced as pregnancy progresses, supporting the idea of a role for the maternal pineal in entraining foetal body rhythms.

In animals, there is a biological clock oscillating in the SCN during foetal life before circadian rhythms are overtly expressed and before the retino-hypothalamic pathway has innervated the SCN. (i.e. A unique form of maternal communication coordinates the phase of a developing circadian clock until the developing mammal can respond to light directly through its own eyes.) The foetal SCN shows circadian variation in metabolic activity that is in time with the rhythm in the mother and with the external lighting cycle. Research by Reppert et al (1988) has found that this foetal circadian rhythm can be detected in rats as early as the 19th day of gestation. Pineal NAT is the first measurable circadian rhythm evident, accurately reflecting circadian output from the SCN. Pups reared in an environment with no light cues express a NAT rhythm that is in phase with the circadian time of the mother.

In humans circadian rhythms are not obvious until well into the postnatal period. Human SCN neurons are formed by the 28th week. A significant fraction of incident light is transmitted into the uterus of a pregnant woman. It is

possible that direct photic entrainment augments or even replaces maternal-foetal coordination of circadian phase since the foetus can synthesise and store melatonin. Also after birth social cues are very important in entrainment of sleep-wake cycle. (Reppert, 1988)

Vasopressin mRNA can also be used as an intrinsic marker of the oscillatory activity of the SCN during foetal life since a circadian rhythm of vasopressin levels in cerebrospinal fluid originates in the SCN. Vasopressin messenger ribonuclease acid (mRNA) levels exhibit a prominent day-night variation in adult rats, which begins in the foetal SCN on day 21 of gestation in phase with the mothers rhythm. In mothers whose SCN has been destroyed on day 7 of gestation, the entraining signal for the foetus no longer works, and the foetal SCN metabolic activity has no day-night rhythm. Also the pineal NAT activity for 10 day old pups born to SCN-lesioned mothers and reared in constant darkness is completely disrupted and they have no daily rhythm. But, if the mothers SCN is lesioned after foetal neurogenesis of SCN then foetal synchronization is not disrupted. Destruction of the maternal SCN also eliminates a circadian rhythm to birthing. Possibly also the developing circadian clock is involved in initiating parturition, as different species have different times of day when birth is more likely to happen.

When pups are fostered with a mother whose circadian rhythm is opposite to that of their natural mother, their rhythms change to become synchronous to that of the foster mother. In these cases entrainment of rhythm is possibly linked with feeding activity which occurs on a rhythmic basis. One needs to have the pup entrained so that its feeding cycle is in tune with the mother and the other pups. This ensures that its activity cycle is such that it emerges from the burrow at a safe time of day. When litters with many pups are born they need to all be synchronised in their activity.

Thus the strong connection between the pineal gland and the gonadal system is very apparent in connection with pregnancy and birth. The glandular connection of swadhistana is with the gonads and related systems so that to some extent it overlaps with muladhara chakra, and so I look to other aspects of our sexuality - puberty and the menstrual cycle - in the discussion of muladhara.

The Coccygeal Plexus: Muladhara Chakra

According to Satyananda, muladhara chakra is the root chakra, intimately connected in the male with the testes, and in the female with the cervix, and with the perineum and anus for both sexes. This chakra is connected with the sense of smell, the nose and the earth element, with passion, the animal instincts, anger, greed, excretory functions, secretory and sexual aspects, attachment, material security, survival and materialism. Working on this

chakra releases suppressed emotions and unconscious memories, and causes extreme swings in mood. It is the seat of kundalini, and has obvious and direct connections with sexual energy in its most earthy aspect.

Some systems link the root chakra with the adrenal glands even though the adrenals are located above the kidneys back of the navel. The only information I have come across which justifies this idea is that in embryology the gonads and suprarenals all start in the same place, and the adrenal cortex makes small amounts of androsterones. However, I consider that the yogic description of muladhara chakra and particularly its connection with kundalini suggests sexuality as its primary physical manifestation and therefore I link this chakra with the gonads, with testosterone in men which is primarily made by the testes (Wilson & Foster, 1992), and with oestrogen and progesterone in women.

As we have already seen the pineal and the gonadal system interact extensively. Satyananda considers that there is a special connection between ajna chakra and muladhara, and there are certainly extensive connections between the pineal gland and the gonads. The pineal synthesises antigonadotropic peptides. In their turn the gonadal hormones, inhibit the biosynthesis of the pineal hormone melatonin, although gonadectomy has little influence on magnitude of melatonin increase or on phasing of the rhythm, and prolactin secretion is inhibited by ovarian steroids, suggesting that there is a physical as well as spiritual, mental and emotional links between mind, heart and sex.

Melatonin inhibits gonadal development in children and regulates the onset of sexuality at puberty for humans. There is a fall in plasma melatonin associated with male human pubertal development. The pineal normally becomes calcified at puberty (Ng & Wong, 1986; Vaughan & Reiter, 1986), and there is a sharp decrease in melatonin production at this time.

The pineal nighttime melatonin concentration decreases progressively during the menstural cycle, with an increase at ovulation and peak values during menstruation. Melatonin seems to be "taken up" by the ovaries, testes and uterus. Thus women show a 28 day melatonin rhythm, though many women have a menstrual cycle that is more closely correlated with the 29.5 day lunar cycle and menstruate every full moon. Those using the contraceptive pill have less melatonin since there is a positive relationship between melatonin and progesterone. Melatonin secretion is significantly higher during the late luteal phase than during the preovulatory phase and melatonin levels fall before ovulation: this could be the determinant of the menstrual cycle. The onset of the LH surge is in the early morning when melatonin levels are falling (Brzezinski & Wurtman, 1988). Continuous light, which causes a decrease in melatonin production, also causes a decrease in ovarian melatonin concentration, whilst injections of melatonin result in smaller testes.

I consider that these studies linking the pineal gland with the gonadal endocrines aids understanding of the lore surrounding sexuality and psychic functioning. Children and celibates were almost universally those chosen as temple seers and prophets, the oracle at Delphi being an excellent example of this. Some research suggests that children are more psychic when they are younger, and much of the research into poltergeists suggests that adolescents are often the focus for this wild uncontrolled psychokinetic storm.

Conclusions

Our knowledge of the endocrine system, the chemistry of our body-mind and emotional system, is still meagre. The neurochemists have only just isolated pinoline from the pineal and are still learning about melatonin and serotonin. However, partial as our knowledge may be, it does fit together with what the yogis, "scientists of the subtle mind," tell us about the yogic chakra system. Our disciplines, apparently so different in language and method, appear to corroborate each other.

In conclusion, pinoline can be seen as the physical aspect of ajna chakra as the psychic chakra, and melatonin as the neurohormone of ajna chakra as the command chakra in that it has an inhibitory role for the endocrine organs, many of which are found physically at the traditional places where the chakras are located. Thus vishuddi at the throat links with the thyroid which is the metabolic regulator, anahata at the heart with the breasts, manipura at the navel with the adrenal glands involved with our reactions to stress, and swadhistana and muladhara at the root of the spinal cord with different aspects of the genital system. There are a bewildering number of versions of the yogic chakra system: attempts to correlate the chakras with Western physiological models may not only help us understand physiology, but also help us find the version of the chakra system that makes the most sense physiologically. Perhaps by linking this spiritual system with Western psychoneuroendocrinology we can create a deeper understanding of the links between mind, body and spirit for the benefit of all of us.

References

Airaksinen, M.M. & Kari, I. (1981). Beta-carbolines, psychoactive compounds in the mammalian body, *Medical Biology*, 59, 22 - 33 & 190 - 211.

Arendt, J. (1978) Melatonin Assays in Body Fluids. *J. Neural. Trans. Suppl.*, 13, 265 - 278.

Barker, S.A. et al. (1981) Identification of various beta-carbolines as in vivo constituents of rat brain and adrenal glands. *Biochemical Pharmacology,* 30, 9 - 17.

Bilger, B.(1995). Forever Young, *The Sciences,* 35(5), 26-31

Brzezinski, A. & Wurtman, R.J. (1988). The Pineal Gland: Its possible roles in human reproduction. *Obstetrical & Gynaecological Survey,* 43 (4), 197 - 207.

Callaway, J.C. (1988). "A proposed mechanism for the visions of dream sleep," *Medical Hypotheses,* 26, 119 - 124.

Capra, F. (!975). *The Tao of Physics,* Wildwood House, Britain.

Cowley, G. (1995). Melatonin, *Newsweek,* Aug.7, 46 - 49

Davidson, J. (1989). *Subtle Biology: The Web of Life*, J. Davidson, Cambridge.

Don, N.S. et al (1996). Psi, Brain Function and “Ayahuasca,” Proceedings of Presented Papers. Parapsychological Association 39th Annual Convention, San Diego, August 1996.

Eichler, V. (1985). The Pineal: Modern View of an Ancient Gland, *The Theosophical Research Journal,* 11(3).

Halaris, A. (ed.) (1987). *Chronobiology and Psychiatric Disorders,* Elsevier, NY.

Johnson, L.Y (1982). The Pineal as a modulator of the Adrenal and Thyroid Axes. In Reiter, R.J., *The Pineal Gland, Vol. III: Extra-reproductive Effects*. C.R.C. Press Inc., Boca Raton, Florida, USA.

Jourdan, J-P. (1994). Near-Death and Transcendental Experiences: Neurophysiological Correlates of Mystical Traditions. *J. Near-Death Studies,* 12(3), 177 -200.

Kensinger, K.M. (1978). Banisteriopsis Usage Among the Peruvian Cashinahua, In Harner, M. J. (ed.), *Hallucinogens and Shamanism.* Oxford Univ. Press.

Leaton, B.R., Malin, S.R. & Finch, H. F. (1962). The Solar and Luni-Solar Daily Variation of the Geomagnetic Field at Greenwich and Abinger 1916-1957, *Royal Observatory Bulletin,* 63.

Maestroni, G.J.M. et al (1989). Pineal Melatonin, its fundamental immunoregulatory role in aging and cancer. *Annals New York Academy of Sciences,* 140 - 148.

Martikuinen, H. et al (1985). Circannual concentrations of melatonin, gonadotrophins, prolactin and gonadal steroids in males in a geographical area with a large annual variation in daylight. *Acta Endocrinol.(Copenh)* 109, 446-450.

Matthews, C.D. et al (1981). Melatonin in Humans. In Biran N. & Schloot, W. (eds.), *Melatonin: Its current status and perspectives. Advances in the Biosciences,* 29, Pergamon Press.

Miles, A. & Philbrick, D.R.S. (1988). Melatonin and Psychiatry. *Biol. Psychiatry*, 23,405-425.

Naranjo, C. (1967). Psychotropic properties of the harmala alkaloids. In Effron et al.(eds.), *Ethnopharmacologic search for psychoactive drugs.* NIMH, US Dept. for Health, Education and Welfare.

Naranjo, C. (1973). *The Healing Journey: New approaches to consciousness.* Ballantine Books, NY.

Naranjo, C. (1978). Psychological aspects of the yage experience in an experimental setting. In Harner, M.J. (ed.), *Hallucinogens and Shamanism.* Oxford Univ. Press.

Ng, T.B. & Wong, C.M. (1986). Pineal lipid metabolism, *J. Pineal Res.,* 3, 55-66.

Nishchalanda, Swami (1992). The Chakras. *Satyananda Ashram Newsletter,* 9.

Ott, J. (1993). *Pharmacotheon: Entheogenic drugs, their plant sources and history,* Natural Products Co., WA, USA.

Ott, J. (1994). *Ayahuasca Analogues: Pangæan Antheogens,* Natural Products Co., WA, USA.

Paranjpe, A.C. (1984). *Theoretical Psychology: The Meeting of East and West*, Plenum Press.

Reiter, R.J. (1995). Intracellular actions of melatonin with a summary of its interactions with reactive oxygen species. In Fraschini, F. et al (eds.), *The Pineal Gland and Its Hormones,* Plenum Press, NY.

Reiter, R.J. and Richardson, B.A. (1992). Some Perturbations that disturb the Circadian Melatonin Rhythm. *Chronobiol. Int.,* 9(4), 314-321.

Reiter, R.J. (1981). *The Pineal, Vol. 6. Annual Research Reviews.* Eden Press, USA.

Reppert, S.M. et al. (1988). Maternal Communication of Circadian Phase to the Developing Mammal, *Psychoneuroendocrinol.,* 13, 63-78.

Rhine, L.E. (1969). Case Study Review. *J. Parapsychology,* 33, 228 - 266.

Roney - Dougal, S.M. (1986). Some speculations on a possible psychic effect of harmaline. In Weiner, D.H. & Radin, D.I. (eds.), *Research in Parapsychology 1985,* Scarecrow Press, Metuchen, NJ, p.120 - 123.

Roney - Dougal, S.M. (1988). The pineal gland's possible role as a psi-conducive neuromodulator. In *Proceedings of Int. Conf. on Paranormal Res.*, Colorado State Univ., Colorado, USA.

Roney - Dougal, S.M. (1989). Recent Findings relating to the possible role of the Pineal Gland in affecting Psychic Abilities. *J. Soc. Psych. Res.,* 56, 313-328.

Roney - Dougal, S.M. (1990). Geomagnetism and the Pineal Gland: Some Speculations. In Henkel, L.A. & Palmer, J. (eds.) *Research in Parapsychology 1989,* Scarecrow Press, Metuchen, NJ, USA.

Roney - Dougal, S.M. (1991). *Where Science and Magic Meet,* Element Books, Britain.

Roney - Dougal, S.M. (1993). Some Speculations on the Effect of Geomagnetism on the Pineal Gland, *J. Soc. Psych. Res.,* 59, 1 - 15.

Salvador, J. et al. (1988). Circadian rhythms of thyroptropin and prolactin secretion. *Chronobiol. Int.,* 5(1), 85 - 93.

Satyananda, Swami Saraswati. (1972). *The Pineal Gland (Ajna Chakra).* Bihar School of Yoga, Bihar, India.

Satyananda, Swami Saraswati. (1972). *Kundalini Yoga.* Bihar School of Yoga, Bihar, India.

Strassman, R.J. (1990). The Pineal Gland: Current Evidence for its Role in Consciousness. In Lyttle, T. (ed.), *Psychedelic Monographs and Essays. Vol. 5.* PM&E Pub., Boynton Beach, Florida.

Tart, C.T. (1977). *Transpersonal Psychologies.* Routledge & Kegan Paul.

Touitou, Y. et al. (1984). Patterns of plasma melatonin with aging and mental condition: stability of nyctohemeral rhythms and differences in seasonal variation. *Acta Endocrinol,* 106, 145-151.

Vaughan, G.M. & Reiter, R.J. (1986). Pineal dependence of the Syrian hamster's nocturnal serum melatonin surge, *J. Pineal Res.,* 3, 9-14.

Webley, G.E. et al. (1988). Positive Relationship between the nocturnal concentration of melatonin and Prolactin, and a stimulation of Prolactin after Melatonin administration in young men. *J. Pin. Res.,* 5, 19 - 33.

Wetterberg, L. (1995). Seasonal Affective Disorder, Melatonin and Light. In Fraschini, F. et al. *(*ed.), *The Pineal Gland and its Hormones,* Plenum Press, N.Y.

Wever, R.A. (1979). *The Circadian System of Man,* Springer-Verlag, Germany.

Wile, L.C. (1994). Near -Death Experiences: A Speculative Neural Model. *J. Near-Death Studies,* 12(3), 133 - 142.

Wilson, J.D. & Foster, D.W. (eds.) (1992) *Williams Text book of Endocrinology, 8th ed.,* W.B. Saunders, USA.

Wurtman, R.J. (1979). Rhythms in Melatonin Secretion: Their possible role in reproductive function. In Zichella, L. & Pancheri P. (eds.), *Psychoneuroendocrinology in Reproduction,* Elsevier, North Holland Biomedical Press.

Acknowledgements

Thanks are due to all those people who have helped me collect and amass this body of knowledge, most particularly to Anne Silk for searching Medline for me; to Ian Pearson for a fascinating afternoon's conversation, for correcting my errors in the first draft of this paper, for assistance in the details of the second draft, and for the gift of a valuable book; to Elizabeth Whitehouse for her eternal supply of interesting information and ideas; to Ellis Snitcher for sharing his expertise in neuroendocrinology with me.

4

Endocrine Hormones	11am	3pm	8pm	11pm	1am	3am	8am
pineal (melatonin)	2	1	4	7	10	10	5
thyroid (TSH)	1	2	6	9	10	9	3
mammary (prolactin)	4	2	2	5	9	10	7

Figure 3: Circadian Rhythms of Melatonin, TSH and Prolactin

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4 Address for reprint requests etc.: Dr. S.M.Roney - Dougal, 14, Selwood Rd., Glastonbury, Somerset BA6 8HN, Britain.

Figure 1: Traditional Representation of the Chakra System (from Roney - Dougal, 1991; illustration by Taurus Graphics)

Figure 2: Chemical formulae of pinoline (6MeOTHBC) and two harmala alkaloids (from Roney - Dougal, 1991)

Figure 3: Circadian Rhythms of Melatonin, TSH and Prolactin