



Best of Naturopathy

"Melatonin, Menstruation, and the Moon"

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Introduction

The relationship between the moon's cycles and menses is so fundamental that the two phenomena are related linguistically. The terms 'moon' and 'menstruation' share the same Latin or Greek root, *m-*, meaning 'to measure.' Various world religions and cultures have acknowledged the bond between women and the moon. Traditional Chinese Medicine links the moon with the feminine, or *yin* principle. Jewish tradition dictates that women should celebrate *Rosh Chodesh*, the new moon. Many cultures have assigned the moon a goddess, from Babylonian Ishtar to Greek Artemis. This connection endures today with religious, spiritual, and even health practices. Herbalist Rosemary Gladstar writes that "all the fluid energy of the earth responds to the moon cycles" and advises her amenorrheic patients to pay attention to the lunar cycle as an adjunct to herbal therapy to regulate menstruation.¹ Although it is clear that the menstrual cycle lasts more or less as long as the lunar cycle, the reason why such a relationship should exist is not so obvious.

The pineal gland may provide one possible connection between the lunar and menstrual cycles. The pineal gland and its main secretory hormone, melatonin, are shrouded in mystery. The exact role of this gland has eluded scientists to this day. The ancient Greeks and later Rene Descartes, the 17th century French philosopher and mathematician, described the pineal as "the seat of the soul." The "third eye" of Eastern religions is associated with the pineal gland. Greenspan and Gardner, in their textbook *Basic and Clinical Endocrinology* write that "the physiologic roles of the pineal remain to be elucidated, but they involve regulation of

gonadal function and development and chronobiologic rhythms."²

The pineal gland secretes melatonin and also contains TRH, somatostatin, GnRH, and norepinephrine. Melatonin, also called N-Acetyl-5-methoxytryptamine, is a derivative of tryptophan. The pineal releases melatonin into cerebrospinal fluid and into general circulation. Melatonin secretion increases in response to darkness and hypoglycemia. This primarily nocturnal hormone is well known for its sleep-inducing abilities and its role in the circadian rhythm. Murray and Pizzorno report that it also possesses antioxidant effects.³ Other important functions include anti-tumor and anti-aging activity.

Less understood is melatonin's role in reproductive function, namely its actions on the menstrual cycle. This paper will explore the intricate relationship between melatonin, the female sex hormones, prolactin, and the lunar cycle. We know that the menstrual cycle and lunar cycle coincide and that the pineal gland is sensitive to light exposure and is related to gonadal function. Are these processes linked in some way? In a preliminary search of scientific literature for research and articles on the pineal gland, melatonin, menstruation, and lunar cycles, a number of intriguing facts surface. Analysis of this data leads me to propose that the moon influences the menstrual cycle through (possibly vestigial) interactions between lunar light exposure and melatonin release. These propositions are not explicitly proven in studies due to the lack of research in this area. The aim of this paper is simply to point out the potential implications of various research studies, combining physiology, folk wisdom, and common sense to explain and explore the moon's effects on the menstrual cycle.

Melatonin and Menses

There is a direct correlation between melatonin and the menstrual cycle. Three

studies report that melatonin reaches its zenith during menstruation and its nadir during ovulation.⁴ Research by Cagnacci et al. found that melatonin enhances LH in the luteal phase and acts with progesterone to attenuate the core body temperature.⁵ In their paper "Melatonin and its role in human reproduction," Wojtowicz and Jakiel state that melatonin is likely essential in both folliculogenesis and spermatogenesis.⁶ Melatonin may affect the female hormones and thereby help regulate the menstrual cycle via its relationship with prolactin. The nightly melatonin surge is followed by a surge in prolactin.⁷ Prolactin is one of six hormones secreted by the anterior pituitary. Prolactin stimulates lactation in postpartum women and breast development in pregnant women, but otherwise its role in physiologic gonadal function is unclear. The pathological state of hyperprolactinemia is associated with suppressed gonadal function: anovulation, amenorrhea, and infertility. Prolactin appears to decrease the pulsatile secretion of FSH and LH without affecting these hormones' basal levels. Prolactin also suppresses the midcycle surge of LH.⁸ This suppression would effectively inhibit ovulation. In one Japanese study by Miyauchi et al., women in the follicular phase of their cycles were exposed to light during various hours of the night and their serum levels of melatonin, prolactin, FSH, and LH were then measured. Melatonin and prolactin were decreased while FSH levels increased.⁹ These levels mirror the findings mentioned previously, that melatonin is higher in the follicular phase and decreased in the luteal phase of the menstrual cycle. The role of melatonin in the menstrual cycle may therefore be an indirect one: melatonin is linked with prolactin release, which then acts on female sex hormones.

Although the mechanism of action is unclear, melatonin's modulatory effects on the reproductive cycle is undisputed.

Using melatonin combined with progesterone as a contraceptive agent (Beta Oval) has been explored for over a decade.¹⁰ Puberty and menopause are also associated with a dramatic reduction in melatonin levels, though again, the mechanism and significance of this correlation are as yet undetermined.¹¹

The regulation of the reproductive cycle by melatonin has been studied in both animals and humans and appears to allow for photoperiodic control of reproduction. Seasonal fertility in animals allows for optimal food availability and climate to ensure survival of offspring. The continuous ovulation currently seen in humans is the exception rather than the rule among mammals. Photoperiodicity of fertility in humans is thought to be largely an evolutionary relic. In their paper "Hypotheses: melatonin/steroid combination contraceptives will prevent breast cancer," Cohen et al. note that the evolutionary period during which female humans began continuous ovulatory cycles coincides with the phylogenetic point at which women became sensitive to breast cancer. The more ovulatory cycles experienced by a woman, the greater the stimulation of breast tissue and therefore, the greater the risk of breast cell proliferation. They propose that a "melatonin/ovarian-steroid contraceptive will restore the lost mechanism of endogenous anovulation," thereby reducing the continuous proliferation of epithelial breast cells.¹²

Investigation shows that while seasonal fertility in humans is not accepted as the dominant paradigm, at least one group of women does exhibit photoperiodicity in their reproductive cycles. A study in Finland by Kivela et al. examined the seasonal variations of melatonin, prolactin, FSH and LH in women. The authors discovered that nighttime melatonin levels were higher in winter than in summer, and that mid-cycle LH levels were higher in summer than in winter. They concluded that, "it is possible that in winter the high levels of melatonin in the follicular phase have an inhibitory effect on the serum LH levels. In summer the melatonin levels are lower and perhaps less inhibitory on the secretion of LH, resulting in the stimulation of the reproductive competence in human females."¹³ The higher level of melatonin secretion in the winter is due to the decreased light exposure in the winter months in Scandinavia, during which time the average daylight is 5 hours, compared to 22 hours in the summer. In another

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study considering seasonal variations in human reproduction, Wojtowicz and Jakiel also report an increase in the number of irregular anovulatory cycles in winter compared to summer.¹⁴

Melatonin and the Moon

If pineal activity and melatonin secretion is affected by seasonal light changes, it stands to reason that lunar light changes may also exert an effect on this gland. Scientific literature addressing the relationship between lunar cycles and melatonin is sparse. One paper by Law, "The Study of Menstrual Cycle and its Relationship to the Moon," noted that the majority of subjects menstruated at the new moon, with a correlation between melatonin levels and moon phase. However, these researchers only measured melatonin levels in a few subjects, not the entire cohort. Another study examining melatonin secretion in birds concluded that secretion of this hormone was highest at the new moon and lowest during the full moon.¹⁵ Since melatonin release is stimulated by darkness, it is not surprising that zenith melatonin levels were recorded during the dark phase of the moon. The logical conclusion is that melatonin could be modulated not only by diurnal and seasonal variations in light, but also by monthly variations in lunar illumination in places where lunar light is still markedly visible. More research on the effects of moonlight on melatonin in humans is clearly necessary to further the ideas presented in this section.

Menstrual cycle and Lunar cycle

The lunar cycle influences reproductive activity of several species. In her fascinating book *Lunaception*, Louise Lacey cites numerous research articles on the moon's effects on reproduction. She found many studies that demonstrated lunar periodicity in the reproductive cycles of sea scallops, grunions, sea worms, mussels, some algae, insects, rodents, lemurs, and lorisooids. Many cross-cultural sources associate the new moon with menstruation and the full moon with ovulation in humans. For example, herbalist Susun S. Weed, whose work is informed by ancient goddess-centered spirituality, writes in her book *Menopausal Years* about the woman "moved to passionate sex when the moon was full

and her egg was ripe."¹⁶ She also guides women with cessation of menses to renew their menstrual cycle with emmenagogue herbs given "for the three days of the new moon, to stimulate menstrual bleeding and restore normal cycling."¹⁷ The Native American Lakota tradition reinforces this, teaching that when Grandmother Moon covers her face (i.e., the new moon), women go into a quiet, dark place and bleed. This topic is explored by current religious and women's groups embracing goddess-centered spirituality, as well as by feminist groups trying to rekindle the elevation of menstruation to more than an embarrassing inconvenience.¹⁸

Research studies conflict, however, regarding modern trends of women menstruating with the new moon and ovulating with the full moon. In support of this theory is a study by Criss and Marcum suggesting that "the period of decreasing illumination immediately after full moon may precipitate ovulation."¹⁹ Another study looking at effects of light on the menstrual cycle concluded that photic influences stimulate ovulation.²⁰ However, in a few other studies, the majority of women bled in the light phase and ovulated in the dark phase of the moon.²¹ Perhaps this discrepancy would be rectified in areas with less artificial light and light pollution.

Despite modern science's inability to provide corroborating evidence, ample cultural and historical references associate ovulation with the full moon. Perhaps it is not surprising that women may tend to sleep less at this time of the month. In a Japanese study, researchers noted that time in bed and time asleep increased in the menstrual and follicular phases, while women were more likely to be awake in the early luteal phase. Although these results were not statistically significant, the authors concluded, "It is possible that the menstrual cycle [affects] the plasma melatonin level and sleep-wake rhythm."²² If our ultimate biological aim is the propagation of the species, surely we should be more awake and active (and therefore more likely to engage in sexual activity) during the times when conception is most likely. In fact, several studies have examined how frequency of sexual activity varies with the menstrual cycle. Many women report heightened sexual



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desire at both menstruation and at ovulation, but sexual activity increases at ovulation.²³

Summary

In this paper I have attempted to clarify the connection between melatonin, the lunar cycle, and the menstrual cycle, theorizing that the basis of lunar 'control' of the menstrual cycle is due to lunar light effects on melatonin secretion. Science provides ample evidence that the pineal gland exerts neuroendocrine effects on human reproductive activity via prolactin and melatonin. Additionally, melatonin is related to light exposure and seasonal changes. Melatonin's relationship with the lunar cycle is less well established. Melatonin, which is suppressive to gonadal function, seems to have its highest secretion during the new moon. Many women tend to menstruate with the new moon and sleep more during this time as well. The converse is true at the full moon: melatonin secretion is low, gonadal function is intact, ovulation occurs more frequently, and sleep is decreased. These factors all serve to increase the likelihood of conception.

This model describes the way that the female body would function in a world with fewer external factors to confound natural biorhythms. Perhaps the strictly biological control of our menstrual cycles has been usurped by the effects of exogenous hormones (HRT, birth control pills, xenoestrogens in plastics and pesticides, hormones in meat and dairy) and the mitigating influence of light pollution on the pineal gland. For instance, oral contraceptives have been proven to alter the circadian rhythm of melatonin and reduce women's sensitivity to light.²⁴ Also, working the night shift (i.e., nocturnal exposure to artificial light) suppresses ovarian function by altering the circadian rhythm of prolactin and melatonin, leading to irregular menses in women working at night.²⁵ These are just two examples of the derangement of natural cycles by external influences, which are likely to have profound effects on fertility, longevity, and general health.

With scant scientific evidence to corroborate our biological legacy and vastly different environmental conditions compared to even 30 years ago, one might wonder why we should bother to examine the interactions between the moon and hormonal cycles. The

spectrum of menstrual disorders, infertility, and female reproductive cancers prevalent in the industrial world may very likely be related to the widespread interruption of natural biological rhythms, including the relationship between the lunar cycle and the menstrual cycle. The link between melatonin and breast cancer may be due to the mitigating effects of light pollution on melatonin release. This theory has been investigated for years and the debate remains unsettled. Stevens and Rea summarize the theory as follows: "...if electric lighting as currently employed contributes to 'circadian disruption' it may be an important cause of 'endocrine disruption' and thereby contribute to a high risk of breast cancer in industrialized societies."²⁶ Glickman et al. note that this theory of light pollution having a causal relationship with breast cancer is supported by epidemiological data showing that blind women have decreased rates of breast cancer, and that female night-shift workers have higher rates of breast cancer.²⁷ These authors point to the need for lighting strategies to take into account neuroendocrine rhythms and not simply visual performance requirements. Besides direct endocrine disruption, decreased melatonin levels may affect cancer because melatonin possesses oncostatic activity. Schernhammer and Schulmeister propose that lowered melatonin levels due to nocturnal light exposure enhance general tumor development because melatonin is cancer-protective.²⁸ Allocating more resources to studying the evolution of our reproductive cycle and our biological legacy may address some of the grave health concerns affecting women, and therefore, the health of the human race. The entire medical community should be aware of the links between infertility, hormonal cancers, and environmental concerns such as light, air, and water pollution.

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