

## Circadian Rhythms and Hormones

Hormones that are influenced by or have a role in regulating circadian rhythms:

**Melatonin:** Often referred to as the "sleep hormone," melatonin plays a crucial role in regulating sleep patterns. Its production increases in the evening to promote sleep and decreases in the morning to help wakefulness. Light exposure, particularly blue light, can suppress melatonin production, affecting sleep quality.

**Insulin:** This hormone, essential for regulating blood glucose levels, shows a circadian pattern in its secretion. Insulin sensitivity is higher in the morning and decreases throughout the day. This circadian influence can affect how the body processes glucose and may explain why eating late at night can lead to higher blood sugar levels and potentially increase the risk of type 2 diabetes.

**Glucagon:** Working in tandem with insulin, glucagon helps regulate blood glucose levels by stimulating the liver to release stored glucose. Its levels typically rise during fasting states (like sleep) to maintain blood glucose levels, and this release is influenced by the circadian rhythm.

**Cortisol:** Often called the "stress hormone," cortisol follows a circadian cycle, typically peaking in the early morning and gradually declining throughout the day. This hormone helps regulate metabolism, reduce inflammation, and assist in memory formulation. Disruptions in the circadian rhythm can lead to abnormal cortisol patterns, which may impact stress response and overall health.

**Estrogen:** This primary female sex hormone also displays circadian variation. Its levels can influence the regulation of sleep, mood, and metabolic processes. Estrogen interacts with circadian rhythms to regulate the timing of ovulation and menstrual cycles.

**Leptin:** This hormone is involved in regulating appetite and body weight. Leptin levels typically rise during the night and early morning, signaling satiety. Disruptions in circadian rhythms can affect leptin levels, potentially impacting appetite control and metabolism.

**Ghrelin:** Often referred to as the "hunger hormone," ghrelin stimulates appetite. It typically has an opposite circadian pattern to leptin, peaking before meals and decreasing after eating. Like leptin, its levels and function can be affected by sleep patterns and circadian rhythms.

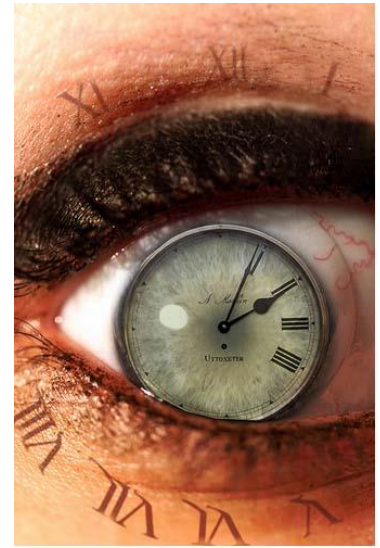
**Thyroid-Stimulating Hormone (TSH):** TSH regulates the production of thyroid hormones, which are critical for metabolism, growth, and development. TSH secretion itself is regulated by the circadian clock and typically peaks during the night.

**Growth Hormone:** This hormone, essential for growth and cell regeneration, is released in pulses, with the largest release typically occurring shortly after the onset of deep sleep. Its secretion pattern is closely tied to the sleep-wake cycle.

**Testosterone:** In men, testosterone levels exhibit a daily rhythm, peaking in the early morning and declining throughout the day. This circadian pattern can influence various physiological functions, including muscle growth and sexual health.

**Adrenocorticotrophic Hormone (ACTH):** ACTH stimulates the production and release of cortisol from the adrenal glands. Like cortisol, ACTH follows a circadian rhythm, with levels peaking in the early morning.

**Prolactin:** This hormone, which plays a role in lactation and fertility, shows a circadian rhythm, with levels typically rising during sleep.



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## Hormones Affecting Bowel Health

Hormones play a significant role in regulating gastrointestinal function and bowel health.

**Gastrin:** This hormone stimulates the secretion of gastric acid by the stomach, which is essential for digestion. Gastrin is released in response to eating and plays a role in the motility of the gastrointestinal tract.

**Secretin:** Released by the small intestine, secretin stimulates the pancreas to release bicarbonate, which neutralizes stomach acid entering the small intestine. It also influences water regulation in the intestines and can impact bowel movements.

**Cholecystokinin (CCK):** This hormone is released by the small intestine in response to the presence of fats and proteins. CCK stimulates the release of digestive enzymes from the pancreas and bile from the gallbladder. It also slows gastric emptying and can affect bowel motility.

**Motilin:** Known for its role in regulating intestinal motility, motilin is secreted by the small intestine. It's involved in the migrating motor complex, a pattern of electromechanical activity observed in the gastrointestinal tract between meals.

**Serotonin:** While commonly known as a neurotransmitter in the brain, a significant portion of the body's serotonin is actually located in the gut. It plays a crucial role in regulating intestinal movements.

**Ghrelin:** Beyond its role in appetite regulation, ghrelin also affects gastrointestinal motility. It may enhance intestinal motility and has been shown to stimulate the release of digestive enzymes.

**Peptide YY (PYY):** This hormone is released by the small intestine in response to feeding and has been shown to reduce appetite. PYY also slows down intestinal motility, allowing for more efficient absorption of nutrients.

**Glucagon-like Peptide-1 (GLP-1):** Released from the small intestine, GLP-1 slows gastric emptying and promotes insulin secretion. It also affects appetite and may influence bowel movements.

These hormones work together to ensure efficient digestion, nutrient absorption, and waste elimination. Imbalances in these hormones can lead to various gastrointestinal issues, such as irritable bowel syndrome (IBS), constipation, or diarrhea. Understanding these hormones and their interactions is crucial in managing bowel health effectively.

