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Cortisol Affords Immediate Action and Alertness



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Introduction

When an individual becomes “stressed,” the entire body reacts. A particular hormone, cortisol, is one of the many hormones that is released and utilized during that time. Cortisol can affect the body to aid in responding to that stressor. From sleep patterns to blood pressure, cortisol triggers the body to aid in preparedness.

Definition and Synonyms of Cortisol

Once in a “stressed” state, an individual will release a hormone called “cortisol.” Staufenbiel, Penninx, Spijker, Elzinga, and van Rossum describe cortisol as a glucocorticoid hormone. They define it as a regulator for many processes, such as: “fat and glucose metabolism, blood pressure, and inflammatory and immune responses” (2013, p. 1221). Generally, cortisol “awakens” the body to respond to an outside stimulus. Cortisol affects many systems of the body to put it into an alert state. One may feel an increased heart rate and respiration, muscle tension, and increased awareness to happenings around. Cortisol can stay at an increased level or can decrease to a baseline, depending on what the body senses. Any type of stressor can signal cortisol. An upcoming exam for a college student, a chronic illness, or excitement right before going on a roller coaster can trigger the release of cortisol, increasing an individual’s alertness.

How Cortisol Is Released

According to Chrousos (2009), change is detected by the peripheral nervous system and then within the central nervous system. Once within the brain, the hypothalamic-pituitary-adrenal axis, or HPA loop, is activated, and norepinephrine and epinephrine are released. Chrousos additionally mentions how stress activates the amygdala, nucleus accumbens, and the hippocampus. After the hormones are released, the hypothalamus is activated, which begins the loop. The hypothalamus signals the pituitary, which sends a signal to the adrenal glands, which release the cortisol into the bloodstream. Cortisol is released throughout the body and found “bound” and “unbound” or “free” (Lee et al. 2015). Cortisol is found in the bloodstream, but it can be released through urine and hair, which is how it is typically tested (Lee et al. 2015).

Effects on Immediate Alertness

Cortisol sets the body into a state which affects many bodily functions. It provides the key to help the body respond to whatever stimuli that was received from the peripheral nervous system. Each effect of this reaction plays a role in enhancing an individual's appropriate response.

Effects on Arousal

Cortisol typically coincides with the circadian rhythm. Cortisol is normally highest in the morning and decreases throughout the day. When presented with a stimulus, cortisol can increase. Researchers have found that an elevated cortisol level can affect sleep patterns, even after cortisol has decreased. Glucocorticoids typically have an "excitatory" effect on the amygdala, prefrontal cortex, and hippocampus. This effect not only affects sleep patterns but also emotion and memory (Russo et al. 2013). Decreasing mechanisms that lower or "inhibit" cortisol may change sleeping patterns. Chrousos explains, "Interestingly, sleep loss is also associated with elevated level of circulating Il6 in spite of the reduced stimulatory effect of catecholamines on Il6 secretion; this change possibly results from the currently decreased cortisolmediated inhibition" (2009, p. 376). Commonly, an individual often feels less lethargic when cortisol is present.

Researchers have found that certain types of memory and emotion are affected by cortisol. Elzinga, Bakker, and Bremner explain in their 2005 study that specific stress exposure affects long-term memory storing and aids in immediate recall too. Another researcher, McEwen, describes a study explaining how emotional memories aid in already increased memory state when cortisol is present (2008).

Effects on Other Systems

Cortisol alerts many of the body's other systems. An individual's metabolism changes with increased heart rate and blood pressure along with gluconeogenesis and hepatic glucose

secretion (i.e., producing sugar within the bloodstream). The body requires more energy during those states, so more sugar is released. Most thyroid and reproductive hormones have decreased, because energy is required elsewhere to keep one alert. The same is with the gastrointestinal function. It, too, decreases so energy can be used to attend to the stressor. An individual's immune system is affected by cortisol as well. Depending on how long a stressor is present and the condition that an individual's body is in, immunity could be enhanced or decreased (Chrousos 2009).

Conclusion

One hormone ignites an array of bodily processes that not only affect the neurological system but also the endocrine and many other systems. With cortisol's presence, an individual is more prepared for stressors. Without it, one would respond to outside stimuli at an inappropriate state.

Cross-References

► [Stress and Cortisol](#)

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