

Good example of effect of cortisol stress hormone to the body essay

[Health & Medicine](#), [Stress](#)



Introduction

Cortisol is a steroid hormone produced in the adrenal glands located on top of kidneys and is usually released in response to particular circumstances and events, including acute stress and waking up in the morning. It significantly affects the body's processes and helps its effort to maintain homeostasis (Aronson, 2009). It also plays a major role in human nutrition, as it helps regulate energy by determining which type of substrate (and which amount), protein, fat, or carbohydrate, the body needs to meet its demand efficiently. If cortisol stress hormone is increased for long periods of time and becomes chronically elevated, it can have harmful effects on the function of the immune system and weight, while it can also increase the risk of a chronic disease (Aronson, 2009).

First and foremost, stress can be best defined as “ the nonspecific response of the body to any demand made upon it” (Jones, 2001). People have different ways to react to a stressor. At initial stages, the fight hormone norepinephrine is predominantly released, and if the stress increases and the individual senses he/she loses control, then another stress-fighter hormone, called epinephrine, is released. If stress becomes a prolonged situation the individual feels hopeless, which activates the brain's hypothalamus. This, in turns, activates a cascade of hormonal pathways that result in the release of cortisol that will be further discussed.

Cortisol is known for its so-called “ fight-to-flight” response. In fight-to-flight, or stress response, the senses perceive stress coming from the environment as a threat or danger, and push the endocrine, and nervous system cells to work closely together, so to prepare the entire body, through a series of

simultaneous and instantaneous responses to act towards that threat or danger (Margionis and Tsatsanis, 2002). The cells in the hypothalamus send chemical and nerve signals to the adrenal glands, which in turns help in the activation of the release of epinephrine in the bloodstream and the production of cortisol. The later initiates a series of signalling cascades which increase both the glucose (blood sugar) levels and blood pressure, which help boost the system's energy, and suppress the body's immune system (Margionis and Tsatsanis, 2002). With a temporary increased energy production, the body puts aside other processes that are not necessary for its survival, before it finally reaches a point distinguished by hormonal and biochemical imbalances (Aronson, 2009). In short, when an individual has to cope with a stressor, a hormonal cascade initiates to make sure the adrenal glands secrete cortisol, which increases the glucose levels to supply energy to the body muscles and prepare the body for the fight or flight response. Then, as an attempt to prevent glucose from being stored in the body, cortisol makes sure insulin is produced. Right after, the arteries narrow, due to cortisol release, and the heart rate is increased, forcing the blood to pump faster and harder, until the individual resolves the stressful situation and hormone levels get back to normal.

Body Effects of Increased Cortisol

The problem in the aforementioned procedure is that the modern lifestyle forces people to live under stress almost constantly, and, pumping out cortisol so often can practically cause chaos to one's health. The following are only a few of the most harmful effects of cortisol stress hormone release:

- Diabetes and Blood Sugar Imbalance

Although the causative factor that associates with elevated cortisol is still not fully identified, the particular mechanism that is triggered under stressful conditions is believed to increase the risk for Type 2 diabetes, as cortisol forces the body to produce glucose, so to fight a stressor (Andrews et al, 2002). When for long term, the production of glucose leads to increased blood sugar levels; hence, the risk for developing Type 2 diabetes becomes more likely. This occurs because cortisol, in fact, renders the insulin-resistant cells and forces the body to remain in an insulin-resistance state for as long as cortisol is produced in the system, which could be for extended time periods, if not constantly. This puts the pancreas under a lot of -and prolonged- stress, as it struggles to keep up with the high insulin demand; the blood glucose levels remain in high levels, and the cells are unable to get the sugar they require for their functions (Andrews et al, 2002). And, this is an ongoing cycle.

- Obesity and Weight Gain

Elevated cortisol can also lead to weight gain. Triglycerides are stored in the body and cortisol can make them relocate in the fat cells located under the muscle (visceral fat cells). The visceral fat cells have far more cortisol receptors compared to subcutaneous fat. What is more, cortisol is also held responsible for developing adipocytes into fat cells through a specific biochemical process (Aronson, 2009).

Cortisol also affects appetite and contributes to high-calorie food cravings, especially among women. This is attributed to the cortisol's binding to the

brain's hypothalamus receptors. However, there is an indirect connection between cortisol and appetite and has to do with the effect cortisol has on other hormones, whose modification can also stimulate appetite (Aronson, 2009).

Finally, with constantly elevated cortisol in the system, the cells starve of glucose, because of the high glucose levels in the blood, alongside the body's overall insulin suppression. But, starved cells also starve for energy, which is why they send hunger signals to the brain. This is a process that could easily lead to gain weight, as individuals may tend to overeat.

Needless to say, glucose that is not used becomes body fat (Aronson, 2009).

Other than that increased cortisol levels have been linked to hypertension, hyperlipidemia, and hyperglycemia, which is high blood pressure, increased lipids, and elevated glucose respectively (Andrews et al, 2002). Of course, individuals with visceral obesity, are at greater risk for developing diseases such as Type 2 diabetes, cerebrovascular disease and cardiovascular disease.

- Cardiovascular Disease

As previously mentioned, in fight or flight response, cortisol increases the blood pressure and restricts the blood vessels, so oxygen in the blood can be better delivered. Although this is effective, it is not a process that could have eternal benefits to the body, mainly because high blood pressure and constriction of the arteries may damage the blood vessels. If this occurs, the risk of a heart attack is more probable than ever before and explains the fact that people with elevated stress levels are more prone to experiencing a heart attack, compared to more relaxed personalities (Aronson, 2009).

That being said; cortisol is the primary stress response hormone, which is expressed at its highest levels in the morning, and its principle role is to restore homeostasis after the body is exposed to a stressor (Randall, 2011). The effects are felt from the entire body and despite all the other mentioned effects, it can even affect memory. The latter occurs because there are many cortisol receptors in the hypothalamus, the brain's region where all memories are stored and processed. When cortisol is produced in excessive amounts, the hypothalamus is overwhelmed and becomes atrophic. Any damage to the hypothalamus is directly linked to memory loss, though the exact age group at risk is still unidentified (Randall, 2011). Good news, though, is that the damage done is usually reversible.

According to research, sleep deprivation, caffeine and alcohol are all factors that increase cortisol and call the body for immediate stress response. For starts, it is evidenced that the plasma cortisol levels are increased after sleep deprivation, by as much as 45 percent (Randall, 2011). This increase has effects on the immune response and also the metabolism. As for caffeine, when consumed in repeated doses within a day, it can remarkably increase the secretion of cortisol. When multiple stressors are introduced, cortisol levels are dramatically high at the presence of caffeine intake. Last, but not least, alcohol consumption, especially in large quantities over a short time frame, stimulates cortisol release (Randall, 2011).

Other than the psychosocial stressors, fasting, awakening, exercising, and food intake can also cause cortisol release (Wallerius et al, 2003).

Conclusion

Cortisol stress hormone is a steroid hormone produced in the adrenal glands with an important function to the body, as it helps the body deal with any stressor the individual might perceive as a challenge or threat to his/her control. Through a series of cascades, cortisol is released in the body, to fight the stressor, which is initially positive. However, when released for prolonged time frames, it can cause damage to the body, and lead to weight gain, type 2 diabetes and cardiovascular disease, among others. Also, caffeine intake and alcohol consumption, as well as sleep deprivation are also factors that stimulate the release of cortisol with all the already discussed effects. In order to cope with the harmful effects of cortisol release, an individual can apply various stress-management techniques that could help him/her control stress and live a better and healthier life.

References:

Andrews RC, Herlihy O, Livingstone DEW, Andrew R, Walker BR (2002), Abnormal cortisol metabolism and tissue sensitivity to cortisol in patients with glucose intolerance. *Journal of Clinical Endocrinology & Metabolism* 2002; 87(12): 5587-5593

Aronson, Dina (2009), Cortisol — Its Role in Stress, Inflammation, and Indications for Diet Therapy. *Today's Dietitian*. Vol. 11 No. 11 P. 38 Retrieved June 2, 2014 from: <http://www.todaysdietitian.com/newarchives/111609p38.shtml>

<https://assignbuster.com/good-example-of-effect-of-cortisol-stress-hormone-to-the-body-essay/>

Jones, T. L. (2001), Definition of stress. In J. J. Robert-McComb (Ed.), *Eating Disorders in Women and Children: Prevention, Stress Management, and Treatment* (pp. 89- 100). Boca Raton, FL: CRS Press.

Margioris, Andrew N., and Tsatsanis, Christos (2002), ACTH action on the adrenal. Retrieved June 2, 2014, from: [http://www. endotext. org/adrenal/adrenal5/adrenal5. htm](http://www.endotext.org/adrenal/adrenal5/adrenal5.htm)

Randall, Michael (2011), *The Physiology of Stress: Cortisol and the Hypothalamic-Pituitary-Adrenal Axis*. Dartmouth Undergraduate Journal of Science. Retrieved June 2, 2013 from: [http://dujs. dartmouth. edu/fall-2010/the-physiology-of-stress-cortisol-and-the-hypothalamic-pituitary-adrenal-axis#. U42AISg1rBI](http://dujs.dartmouth.edu/fall-2010/the-physiology-of-stress-cortisol-and-the-hypothalamic-pituitary-adrenal-axis#.U42AISg1rBI)

Wallerius, S. et al (2003), Rise in morning saliva cortisol is associated with abdominal obesity in men: a preliminary report. *Journal of Endocrinology Investigation* 26: 616-619, 2003.