

CORTISOL NOTES

Cortisol, also known as hydrocortisone, is a hormone from the adrenal cortex; it is the principal glucocorticoid. A synthetic preparation is used for its anti-inflammatory actions.

Glucocorticoids are essential to life. They enable us to adapt to external changes and stress. They also maintain fairly consistent plasma glucose levels even when we go for long periods without ingesting food. Cortisol is the major corticosteroid. It is responsible for about 95% of all glucocorticoid activity in the body. Cortisol is known to:

- stimulate gluconeogenesis (creation of glucose) to ensure an adequate fuel supply;
- increase mobilization of free fatty acids, making them a more available energy source;
- decrease glucose utilization, sparing it for the brain;
- stimulate protein catabolism to release amino acids for use in repair, enzyme synthesis, and energy production;
- act as an anti-inflammatory agent;
- depress immune reactions; and
- increase the vasoconstriction caused by epinephrine.

As you can see, cortisol is not necessarily a bad thing. In fact, without it we would not at all get along very well. Some elite level endurance athletes have even experimented with cortisol-like drugs to enhance performance. Understandably, blocking that debilitating achiness that comes on late in long endurance events would certainly provide an advantage. There really is nothing wrong with having elevated cortisol during exercise; however, if it stays elevated after exercise, then it may be a problem.

Lots of worries in life, a stressful job, and risk taking can all elevate cortisol and keep it up. This may prevent the endurance athlete from recovering adequately. Cortisol is a so-called catabolic (breakdown) hormone, the opposite of an anabolic hormone. Having cortisol elevated at other times other than exercise may prevent the athlete from recovering at an optimal rate.

One of the best ways to control elevated cortisol levels is to keep well hydrated. There is some recent science showing that dehydration causes cortisol levels to increase.

Consume plenty of carbohydrates and good quality protein to potentially deflect the ill effects of elevated cortisol.

There are also some fancy supplements available in health food stores that have been suggestion to reduce cortisol production. They are acetyl-L-carnitine and phosphatidylserine. They are expensive supplements, but if cost isn't a concern then they may be something to experiment with. Watch for more on these two supplements in EndurePlus.

1: *J Endocrinol Invest.* 2008 Jul;31(7):587-91.

[Hill EE](#), [Zack E](#), [Battaglini C](#), [Virus M](#), [Virus A](#), [Hackney AC](#).

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This study examined the influence of exercise intensity upon the cortisol response of the hypothalamic-pituitary-adrenal (HPA) axis. Specifically, we examined exercise at intensities of 40, 60, and 80% maximal oxygen uptake (VO₂max) in an attempt to determine the intensity necessary to provoke an increase in circulating cortisol. Twelve active moderately trained men performed 30 min of exercise at intensities of 40, 60, and 80% of their VO₂max, as well as a 30-min resting-control session involving no exercise on separate days. Confounding factors such as time of day--circadian rhythms, prior diet--activity patterns, psychological stress, and levels of exercise training were controlled. Cortisol and ACTH were assessed in blood collected immediately before (pre-) and after (post-) each experimental session. Statistical analysis involved repeated measures analysis of variance and Tukey post-hoc testing. The percent change in cortisol from pre- to post-sampling at each session was: resting-control, 40, 60, and 80% sessions (mean±SD) = -6.6±3.5%, +5.7±11.0%, +39.9±11.8%, and +83.1±18.5%, respectively. The 60% and 80% intensity magnitude of change was significantly greater than in the other sessions, as well as from one to another. The ACTH responses mirrored those of cortisol, but only the 80% exercise provoked a significant (p<0.05) increase pre- to post-exercise. The calculated changes in plasma volume for the resting-control, 40%, 60%, and 80% sessions were: +2.2±3.0%, -9.9±5.0%, -15.6±3.5%, and -17.2±3.3%, respectively. Collectively, the cortisol findings support the view that moderate to high intensity exercise provokes increases in circulating cortisol levels. These increases seem due to a combination of hemoconcentration and HPA axis stimulus (ACTH). In contrast, low intensity exercise (40%) does not result in significant increases in cortisol levels, but, once corrections for plasma volume reduction occurred and circadian factors were examined, low intensity exercise actually resulted in a reduction in circulating cortisol levels.

Source:

[http://www.ncbi.nlm.nih.gov/pubmed/18787373?ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DefaultReportPanel.Pubmed_TitleSearch&linkpos=2&log\\$=pmtitlesearch4](http://www.ncbi.nlm.nih.gov/pubmed/18787373?ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DefaultReportPanel.Pubmed_TitleSearch&linkpos=2&log$=pmtitlesearch4)

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“If you do strength training, never do more than 45 minutes, because beyond that point, cortisol levels begin to rise and testosterone levels drop. Extended strength training beyond this timeframe in a single session will accelerate the aging process”.

The Anti-Aging Zone

Barry Sears, Ph.D

Glucose Metabolism

Cortisol has a profound influence on glucose regulation, causing greater plasma concentrations. While inducing the liver to create glucose it negatively influences the effects of insulin. Since the brain primarily relies on glucose for fuel this may insure that it has ample amounts in times of increased activity.

Inflammation Suppression

Inflammation is a process instigated by the immune system that normally addresses wounds and infection. When unchecked, this reaction may do more damage than the initial offense. Cortisol powerfully suppresses immune function and modified forms have historically been used in the treatment of inflammation, autoimmunity, and organ transplant resistance.

Cortisol suppresses inflammation in several ways:

- Inhibits the release of proteolytic enzymes from damaged cells
- Inhibits the production of pro-inflammatory eicosanoids like prostaglandins and leukotrienes
- Inhibits the ability of white blood cells to proliferate and respond to Interleukin-1 and 2.

Source: <http://anatomyphysiology.suite101.com/article.cfm/cortisol>

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- **Take Fish Oil** - Omega 3s will keep you building muscle and keep cortisol levels at bay. Also improves insulin sensitivity (see below) of muscles.

Less Cardio - Too much too often will just waste muscle, lower T-levels and hamper any attempt you have at building muscle. If you want to do something, make it short and intense to keep GH levels high and cortisol levels low. This is why you will never see a chronic jogger with alot (if any) muscle...unless they are eating 5000 cal a day or taking some other type of cortisol suppressing hormone "supplement". Here's a good read on danger of the cardio obsession so many people have nowadays.

Source:

<http://lexingtonathleticclub.blogspot.com/2008/12/building-muscle-101-master-basics.html>

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Is cortisol involved in upper-body obesity?**Rivera MP, Svec F.**

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Obesity is a major health problem that can be defined as an excess of body fat, associated with hypertension, diabetes and coronary heart disease. Several groups have evaluated the clinical significance of variations in fat cell distribution on these complications. A frequently used index of fat cell distribution is the waist to hips ratio (W/H). A high W/H ratio is said to reflect upper body fat cell distribution while a low waist to hips ratio reflects a lower body type fat cell distribution. Studies have shown that those whose W/H ratio indicate upper body fat cell distribution had a higher prevalence of diabetes and hypertension than those with the lower type. Over the years cortisol has attracted considerable interest as a possible factor in the development and maintenance of obesity. The clinical findings associated with upper body type of obesity are in many ways similar to those of the hypercortisol state. Our hypothesis is that upper body obesity forms a unique subgroup of the obese population and their regional fat distribution is associated with mild cortisol excess. In humans, studies have reported that some obese subjects hypersecrete cortisol and have an increase in the cortisol production rate. Although recent studies would tend to discount any influence of cortisol in human obesity, several factors should be taken into consideration. It is difficult to measure cortisol economy in obese subjects because among other things the measurements are less than precise; and cortisol secretion changes during the day and in response to outside stimuli. Further, obesity is a heterogeneous disorder and not all obese subjects may have the same disorder. (ABSTRACT TRUNCATED AT 250 WORDS)

PMID: 2682149 [PubMed - indexed for MEDLINE]

Source:

http://www.ncbi.nlm.nih.gov/pubmed/2682149?ordinalpos=10&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DefaultReportPanel.Pubmed_RVDocSum

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Bottom Line on Cortisol:

-From the literature above, it appears that exercising too long and too intense may elevate cortisol levels.

-The literature is not conclusive in regards to whether excess cortisol levels contribute to obesity. I have included an abstract from a well respected journal (see page 5) that does discuss the possibility, but measuring cortisol levels is difficult. In addition, cortisol levels change throughout the day. In my opinion, the verdict is not in regarding excess cortisol levels and obesity.

What I have seen, from the literature above, and the literature I reviewed in the past, is that excess cortisol levels can accelerate aging.

Although the literature above is not exhaustive regarding cortisol, it does provide the basics. Keep in mind, some of the sources may not be backed by science. Never the less, here are some suggestions:

- Strength training should not exceed 45 minutes/session.

-Cardio should be done at a low intensity to keep cortisol levels low. If you are to do cardio in a high intensity fashion, limit it to 2x /week. You could also engage in a low intensity workout for the remaining 3x/week, if your goal is to exercise 5x/week.

These are only suggestions, I'm not totally confident on this topic as it relies on an extensive background in endocrinology.

--Michael A. Sylvester, B.S., L.P.T.A., C.P.T

Additional Reading:

The Cortisol Connection Diet by Shawn Talbott, Ph.D
You can read this online. Visit the website below:

http://books.google.com/books?id=tKsZA1bm8YkC&pg=PA84&lpg=PA84&dq=CORTISOL,+EXERCISE,+AND+WEIGHT+CONTROL&source=bl&ots=cVdecXBwHl&sig=U5HU_fnh2iGOVhYtpxj8k6NgIiA&hl=en&ei=pMVOSn9FJaJtgeWmrW1BA&sa=X&oi=book_result&ct=result&resnum=1

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