

HOW CORTISOL LEVELS AFFECT THYROID FUNCTION AND AGING

Interview with David Zava, Ph.D.

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David Zava, Ph.D. is a biochemist, breast cancer researcher, a much-published author of professional research papers, and the laboratory director of ZRT Laboratory in Portland, OR, which does state-of-the-art saliva hormone assay and blood spot testing. He is also the co-author of *What Your Doctor May Not Tell You About Breast Cancer*, and a sought-after speaker on the topic of hormones and saliva hormone testing.

JLML: Cortisol is needed for nearly all dynamic processes in the body, from blood pressure regulation and kidney function, to glucose levels and fat building, muscle building, protein synthesis and immune function. You've been specifically studying the effects of cortisol on thyroid function.

DTZ: Yes, one of cortisol's more important functions is to act in concert or synergy with thyroid hormone at the receptor-gene level. Cortisol makes thyroid work more efficiently. A physiologic amount of cortisol—not too high and not too low—is very important for normal thyroid function, which is why a lot of people who have an imbalance in adrenal cortisol levels usually have thyroid-like symptoms but normal thyroid hormone levels..

JLML: Would you explain this thyroid-cortisol relationship in more detail?

DTZ: One way to understand the synergy of cortisol and thyroid is to think of trying to turn on a big round valve with one hand, as opposed to two hands where you can really grip it and turn it on. Both thyroid and cortisol have to be there in the cells, bound to their respective receptors at normal levels, to efficiently turn the valve on and get gene expression. So, when cortisol levels are low, caused by adrenal exhaustion, thyroid is less efficient at doing its job of increasing energy and metabolic activity.

Every cell in the body has receptors for both cortisol and thyroid and nearly every cellular process requires optimal functioning of thyroid.

JLML: And what happens when cortisol levels get too high?

DTZ: Too much cortisol, again caused by the adrenal glands' response to excessive stressors, causes the tissues to no longer respond to the thyroid hormone signal. It creates a condition of thyroid resistance, meaning that thyroid hormone levels can be normal, but tissues fail to respond as efficiently to the thyroid signal. This resistance to the thyroid hormone signal caused by high cortisol is not just restricted to thyroid hormone but applies to all other hormones such as insulin, progesterone, estrogens, testosterone, and even cortisol itself. When cortisol gets too high, you start getting resistance from the hormone receptors, and it requires more hormones to create the same effect. That's why chronic stress, which elevates cortisol levels, makes you feel so rotten—none of the hormones are allowed to work at optimal levels..

Insulin resistance is a classic example. It takes more insulin to drive glucose into the cells when cortisol is high. High cortisol and high insulin, resulting in insulin resistance, are going to cause you to gain weight around the waist because your body will store fat there rather than burn it.

JLML: This would certainly be a significant effect when it comes to creating balanced hormone levels.

DTZ: When cortisol is high the brain also is less sensitive to estrogens. That's why you can have a postmenopausal woman with reasonable amounts of estrogen, but when you put her under a stressor and her cortisol rises, she'll get hot flashes, which are a symptom of estrogen deficiency. She really doesn't have an estrogen deficiency, the brain sensors have just been altered. If you then drive the estrogen levels up with supplementation to treat the hot flashes, she'll start getting symptoms of estrogen dominance like weight gain in the hips, water retention, and moodiness. And the hot flashes usually don't go away.

This is why you often can't effectively treat someone with hormonal imbalance symptoms such as hot flashes by simply adding what seems to be the missing hormone, be it thyroid, progesterone, estrogen or testosterone. If your cortisol is chronically high you'll have overall resistance to your hormones.

JLML: What percentage of the saliva tests for cortisol are high?

DTZ: I'd say it's as high as ten to twenty percent, but you have to remember that the population that's sending in saliva hormone tests tends to have health problems. It also depends on the time of year and what's happening in the world. I saw a lot of high cortisol in the saliva samples that came in after 9/11. Around the winter holidays, cortisol skyrockets, and then after the holidays it takes a nosedive. The adrenals were keeping pace with the holiday stressors and then they collapse because they're exhausted. That's a very common pattern. It's no different with other stressors like exams or war. Most of us can remember how we made it through the stress of exams only to get sick shortly thereafter. Adequate levels of cortisol are necessary to acutely activate the immune system when we are exposed to viruses and when the adrenals are just too tired to make any more cortisol we are vulnerable to viral infections.

Stress is what both high and low cortisol have in common. Stress hits the adrenals and in response they either collapse in fatigue and do not produce enough stress hormones, resulting in a functional thyroid deficiency, or they can go in the other direction where they're pouring out cortisol and it's causing overall hormone resistance, including thyroid resistance. Either way, low or high cortisol, and thyroid hormones become inefficient.

JLML: Let's talk about the good and bad aspects of cortisol.

DTZ: Most people with cortisol problems, high or low, are in the gray zone, meaning that they are outside of a normal physiological range necessary for optimal health. Cortisol helps maintain blood glucose levels by activating gluconeogenesis, the breakdown of tissue protein to amino acids and then to glucose. That's a good thing, but not in excess. Too much cortisol, caused by

stressors, over a prolonged period of time, results in excessive breakdown of all structural tissues of the body including muscle, bone, skin and brain, causing accelerated aging.

In bones, high cortisol activates nearly every biochemical pathway involved in bone resorption. Cortisol specifically inhibits osteoblast activity, or bone building; it suppresses the production of androgens [male hormones] in the gonads [androgens build bone]; it activates osteoclasts which causes bone to be resorbed faster; it decreases mineral absorption in the gut, so you won't be absorbing the calcium and magnesium you need to build bone; and it increases renal [kidney] tubule spilling of calcium. Calcium supplementation and alendronate-type drugs used to inhibit bone resorption, such as Fosamax, will always fight a losing battle to high cortisol. I frequently see women reporting continued bone loss, despite use of pharmaceutical bone resorption inhibitors, when salivary cortisol levels are very high.

With saliva testing we see that when people have very high cortisol and low androgens they tend to have bone loss even when their progesterone and estrogen are normal. I see the most bone loss in women who have had a total hysterectomy.

JLML: What is the relationship between cortisol and melatonin, yet another hormone?

DTZ: Cortisol is released from the adrenal glands in a rhythmic pattern throughout the day. It's high in the morning, which energizes you. If you don't have enough cortisol in the morning you have a hard time getting out of bed. It's at its lowest levels at two a.m. when melatonin is high. Melatonin and cortisol are inversely related, so when cortisol is down and melatonin is up you're regenerating your body.

When your cortisol stays high you also won't produce enough growth hormone or thyroid-stimulating hormone, which are important anabolic [tissue building] hormones. This is why a good sleep is so important. People with high salivary night cortisol levels are usually complaining of sleep problems.

JLML: What are normal saliva cortisol levels for a perimenopausal woman?

DTZ: At ZRT Laboratory a normal morning saliva hormone level for cortisol for a perimenopausal woman is 3 to 8 ng/mL, and by 10 at night it's 0.5 to 1.5 ng/mL, which is a big drop. Very early in the morning when you're in a deep sleep it goes even lower, so if you're not sleeping properly and resting, your cortisol rhythms will be thrown out of balance. This is where progesterone plays an important role because it's the only natural hormone that actually competes with cortisol for the glucocorticoid receptors. It can counter the stimulating effects of cortisol at night when you need to be sleeping.

JLML: You're offering this new technology of blood spot testing which is available to the lay consumer—what is it and what can you test with it?

DTZ: It involves a nearly painless finger prick to get a very small amount of blood that is dried on filter paper and mailed back to us with a completed questionnaire. Right now we can test IGF-1, an index of growth hormone activity, a thyroid panel including TSH, free T3, free T4, and

thyroid peroxidase (TPO), FSH and LH. In the next month or so we will launch a male panel, which includes PSA, testosterone, and SHBG.

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Cortisol and the Stress Connection

In this article originally published in the John R. Lee, M.D. Medical Letter, Dr. John Lee and Virginia Hopkins explain how the adrenal hormone cortisol work in the body, and how too much or too little can affect your health.