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"The biggest change human beings have lived through in the last ten thousand years happened less than seventy years ago. Electricity and the widespread use of the light bulb qualify along with the discovery of fire, the advent of agriculture, and the discovery of antibiotic treatment as a point of no return in human history."
...T. S. Wiley, *Lights Out: Sleep, Sugar, and Survival*

December 2010: Stress, Sleep, and the Cortisol Connection: Honoring the Body's Cortisol Clock

Cortisol is a vital hormone that helps us deal with stress. Cortisol makes us active and mentally alert and, since it enters the brain to deliver glucose for energy, it also works to aid learning and memory. In times of stress, cortisol teams with adrenaline to balance our energy: It replenishes the body's energy stores depleted by the "adrenaline rush" and converts the foods that we eat into storage forms, such as fat and glycogen. We need cortisol. It helps us spring out of bed in the morning to be mentally alert after a good night's sleep. *But* to work well for us, we need cortisol to ebb and flow in its own natural rhythm—rising early in the morning, gradually diminishing throughout the day and evening to reach a low around midnight to allow us a full night of restful/restorative sleep.

Unfortunately, our modern lifestyle—of late-night eating and activity, as well as daytime multi-tasking and lack of exercise—throws off the body's natural cortisol clock. Eating and electronic stimulation from television and computers elevate cortisol. So, too, does chronic stress: Because the brain is linked to the endocrine system (through the HPA axis, the hypothalamus, pituitary, and adrenals) just *thinking* about a stressful situation, whether an important work deadline or the frustration of a traffic jam, elevates cortisol. Confined in an office or in the midst of a traffic jam, we have little opportunity to work off the energy mobilized by the stress response, so cortisol remains in our blood stream and tissues.

Cortisol does not work in a vacuum. It partners not only with adrenaline, but also with dopamine and a host of other hormones and neurotransmitters. Cortisol tends to diminish DHEA, growth hormone, and testosterone (an anabolic hormone that affects mood, skin, tendons, muscle mass, metabolism, and the immune system). It also reduces the effectiveness of insulin (which can lead to insulin resistance). These are some of factors that underpin why too much cortisol:

- Keeps us in a fat storage mode and keeps us hungry: Cortisol leads to excess storage of abdominal fat, since abdominal fat is particularly attuned to cortisol. [Abdominal fat also generates additional cortisol to keep us hungry and exacerbate insulin resistance];

- Prevents insulin from delivering glucose to muscles (a precursor of insulin resistance and diabetes);
- De-mineralizes bones and teeth (*stress* is an insidious factor in osteoporosis!);
- Accelerates the loss not only of bone mass but also of cartilage and muscle;
- Upsets the immune system and suppresses immune function over the long-term which can lead to a variety of diseases, as well as auto-immune issues; and
- Affects the brain and memory: Unlike adrenaline and insulin which do not cross the blood-brain barrier, cortisol can enter the brain where it delivers glucose for energy and aids memory by enhancing glutamate and promoting neuron “excitability”—but, too much leads to depression, exhaustion of nerve cells, and shrinking of the hippocampus (a key for memory).

The Cortisol Clock

Sleep is by far the best way to manage stress. It does more to restore the body than yoga, meditation, or other stress-relieving activities.¹ Sleep is the body’s natural way to meditate. We might think of sleep as “vitamin S”...as essential as any micronutrient for ensuring health. Just as our soil is overworked and depleted of nutrients like the food that it grows, our modern hectic lifestyle erodes our vitamin S: In 1910, the average adult was still sleeping nine to ten hours a night. Now, the typical adult barely gets seven hours of shut-eye. And, it is not just a question of quantity but also quality: If evening cortisol levels are abnormally high, either from a day of chronic stress and/or late-night stimulation and eating, then sleep may be light and interrupted, with little nighttime sleep of the deep-restorative kind.

When we do not get enough sleep or when our sleep is not coordinated with daylight, we throw off the natural timing and intricate balance of hormones, including serotonin, dopamine, and melatonin, as well as the neurotransmitters in the brain. While the intricacies of biochemistry are hard to follow, let alone to remember, we do not need to understand these concepts to learn how better to deal with stress.

Instead, we can simply focus on cortisol—the major hormone associated with stress—and the lifestyle factors that can help control it so it works for, and not against us. What I hope you will take away from this newsletter is the visual picture (below) of the natural daily ebb and flow of cortisol. We want to strive to adjust daily habits, to the degree that we are able, in order to encourage these natural cortisol rhythms.

Cortisol normally peaks in the early morning hours between 6 a.m. and 8 a.m., and it bottoms out around midnight. After reaching its early-morning peak, cortisol drops off sharply throughout the day, often leaving us with a dip in energy in late afternoon. The body is really programmed for a light dinner around 5 p.m., followed by an early bedtime about three hours later.²

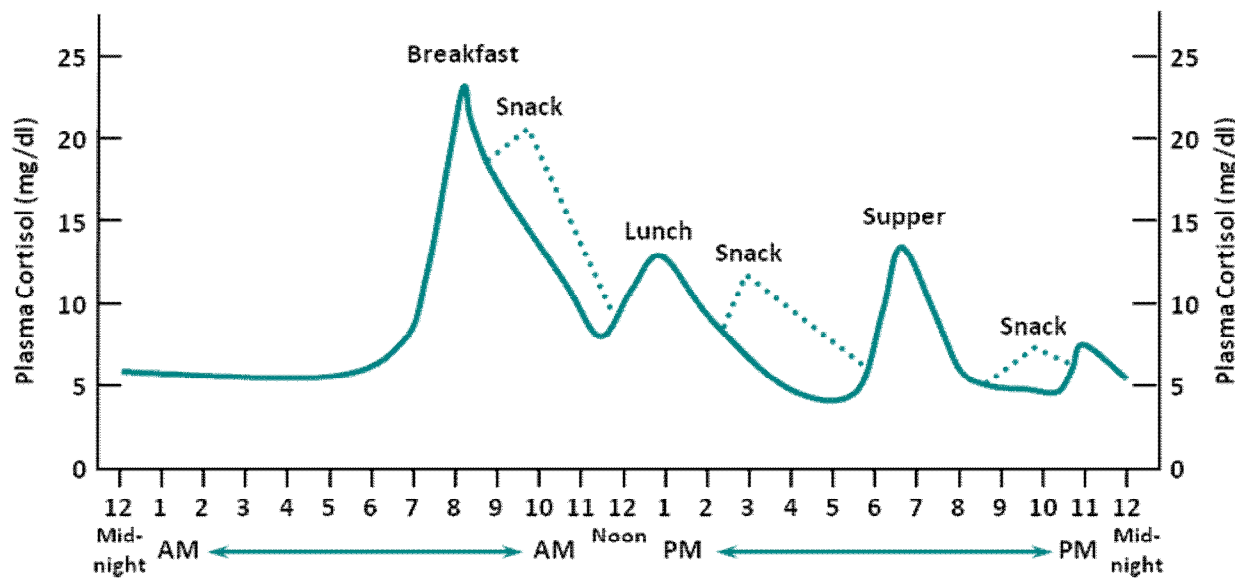
We can raise our cortisol and energy levels by eating meals (note the cortisol spikes around mealtime and snack breaks, which represent the impact of consuming food). Other factors that boost cortisol

¹ Shawn Talbott, Ph.D., *The Cortisol Connection*, 141.

² Talbott, 99.

include exercise; stimulants such as caffeine; and, of course, stress, which can include actual situations that are stressful/frustrating, as well as the times when we simply *think about* and *anticipate* them.

Circadian Rhythm And Cortisol (With & Without Snacks)



Source: James L. Wilson, Ph.D., *Adrenal Fatigue*

When I visualize this chart, I am inspired to eat a good breakfast, a hearty lunch and a lighter dinner. Regular meals and snacks help maintain cortisol levels throughout the day. The chart also suggests we might think twice about staying up late to finish emails or to watch the final exciting moments of a late-night sporting event. It also means trying to plan as many social times around breakfast and lunch rather than late dinners, since the body is best served by a light, early supper.

Strategies to Lower Stress

Sleep: Sleep is the best defense against stress. Sleep is also the best strategy against weight gain since sleep lowers cortisol and insulin (the fat storage hormone) and helps prevent insulin resistance. In addition, sleep boosts growth hormone (builds muscle mass) and leptin (curbs hunger and cravings for carbohydrates). Sleep is also important for immunity, fertility, and mood:

"The immune system that controls metabolism...wages a battle every night when you sleep against bacteria and viruses. Sleeping is actually 'thinning the herd' of bacteria...an adaptation that helps us get the jump on bacteria every planetary rotation." ...T.S. Wiley

Sleep researchers at the University of Chicago found that the cortisol levels of people averaging just 6.5 hours of sleep were 50 percent greater and their insulin function was 40% lower compared to subjects

getting 7.5-8.5 hours of sleep. Similarly, a Yale study of more than 1700 men living on fewer than 6 hours of sleep a night “doubled their risk of weight gain and diabetes because of excess cortisol exposure and its interference with insulin metabolism and blood sugar control.”³

Just following an early-to-bed policy for a week can reset cortisol levels. And, once you succeed in lowering cortisol, you have a greater chance of deep, restful nighttime sleep to help perpetuate early waking, daytime alertness, and future nights of restful sleep.

How much sleep do you need? Sleep researchers tell us that the typical person, if free to choose, will sleep 8 hours and 15 minutes. I need a solid 8 hours, but I have family members who seem to thrive on much less (though they often nap in their chairs!). How much sleep is optimal is a personal matter. Do you wake up in the morning eager to get out of bed? Do you need stimulants like coffee to get going? Do you rely on caffeine to get through the day? Do you feel mentally “off?” Do you rely on naps? If you answer in the affirmative, chances are good that you are not getting adequate sleep at night.

Strategies for sleep. Develop a relaxing bedtime routine and follow a regular bedtime schedule. Go to bed and get up at the same time (when possible). Try not to nap more than 20-30 minutes, and do not make napping a regular habit. Make sure the room is dark to help your body make melatonin. Avoid caffeine beyond lunch time and alcohol in the evening (it can awaken you between 1-3 a.m.). Because it takes energy to fall to sleep, a very light carbohydrate snack may help you drop off to sleep. Try to get some vigorous exercise each day, but not too close to bedtime; as well as exposure to the sun.

Exercise. Aerobic exercise and lifting weights can counter the effects of stress-related cortisol.

Enjoyable aerobic exercise helps burn off energy mobilized and stored in the muscles by stress. It helps reset the body clock from jet-lag. Exercise also heightens the body’s sensitivity to cortisol and insulin, so it can get by with less. Be sure to choose an activity you enjoy. Torturing yourself with exercise you dislike elevates cortisol and becomes self-defeating.

Weight training builds muscle mass, which is important for metabolism since a pound of new muscle is estimated to burn 50 additional calories a day. Weight training helps to counter the normal muscle loss associated with aging: While muscle strength can be sustained through age 50, it tends to decline by about 20 percent through age 70, and by 40 percent by age 80.⁴ Lost muscle impairs balance and means slower metabolism, reduced insulin resistance and hormone function, lowered immunity, weaker bones, decreased conditioning and aerobic fitness.

Massage; Yoga; Meditation; Prayer; Time Outdoors. These are all effective ways to lower cortisol, but only if they are activities that you enjoy. If trying to make time for a yoga class adds stress to your day

³ Talbott, 142.

⁴ J.E. Williams, *Prolonging Health*, 38.

and makes you feel guilty, sitting quietly in a chair listening to your favorite music might be a better choice. Whatever you choose should be fun, stress-free, and enjoyable.

Cook, Knit, Play Games. If you like kitchen arts, cooking can relieve stress and be empowering. Cooking, like knitting, can be creative and offers a sense of control at least over a small portion of life.

Eat Breakfast, Eat Lunch, and Enjoy Daytime Snacks. Breakfast is the most important meal of the day. We need food to meet the 6-8 a.m. cortisol crest of early morning.

Try Not to Diet. Studies show that dieting is stressful and therefore boosts cortisol levels. Eating at the right times of the day—breakfast, lunch, snacks, and an early dinner—helps keep cortisol on track.

Reading Resources:

Bruce McEwen, *The End of Stress as We Know It*

Shawn Talbott, *The Cortisol Connection*

T. S. Wiley, *Lights Out: Sleep, Sugar, and Survival*

J. E. Williams, *Prolonging Health*

James L. Wilson, *Adrenal Fatigue*

Anticipating the Holidays...

"When we do not sleep in sync with the seasonal variation in light exposure, we fundamentally alter a balance of nature that has been programmed into our physiology since Day One. This cosmic clock is embedded in the physiology of every living thing that exists." ...T.S. Wiley

We can look forward to the upcoming holiday season, filled with family, friends, and festive gatherings—memories to cherish that sustain us. In December, we may not want to be rigid about observing the cortisol clock, choosing fun over sleep. Still, in these, the shortest days of the year, we need to be aware that nature signals us with winter's darkness to rest, hibernate a bit, conserve our energy and allow it to move inward. At this time of year, nature invites man and beast, flora and fauna to reset temperatures, chemistry, and restore energy.

Perhaps understanding the cortisol clock will help you prioritize as you set your holiday social calendar. Or, if you are programmed already with heavy commitments, go with the flow each day and do not worry by looking too far ahead. We now know that just anticipating a heavy calendar can itself raise cortisol levels. Live in the moment...and enjoy!

Holiday Recipes: <http://pathways4health.org/2009/12/11/chanukah-and-christmas/>