

Understanding Hormone Excess and Deficiency

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CORTISOL

Cortisol is produced by the adrenal glands, which are controlled by parts of the brain called the hypothalamus and pituitary. Cortisol plays an important role in breaking down glycogen to glucose in liver and muscle tissue. It mobilizes glucose, so as to maintain normal blood sugar levels and is the primary energy source for the brain.

Cortisol levels are highest in the early morning (approximately 8 am) and reach the lowest level at about midnight-4 am, or three to five hours after the onset of sleep. Diurnal cycles of cortisol levels are found in human saliva.

Cortisol production comes in response to daily stress, as well as emotional upset, infections and surgery. It prevents the release of substances in the body that cause inflammation. It is used to treat conditions resulting from over activity of the B-cell-mediated antibody response. Examples include inflammatory and rheumatoid diseases, as well as allergies. Low-potency hydrocortisone, available as a non-prescription medicine in some countries, is used to treat skin problems such as rashes, and eczema.

Low Cortisol, especially if it remains so throughout the day, may indicate **Adrenal Exhaustion**, which is caused by stress, such as sleep deprivation, emotional stress, poor diet, nutrient deficiencies, and/or synthetic glucocorticoid medications that suppress cortisol production.

Chronic stress depletes cortisol and is associated with symptoms of morning and evening fatigue, aches and pains, fibromyalgia, cold body temperature, decreased stamina, slow pulse rate, low blood sugar (sugar craving) and low blood pressure. In addition one often encounters increased allergies (immune dysfunction), and sensitivity to chemicals. Symptoms of thyroid deficiency can also be due to low cortisol levels.

Exercise, more adequate sleep, a diet with adequate protein, 'bioidentical' progesterone, adrenal extracts and nutritional supplements are often helpful in correcting low cortisol.

High Cortisol. Although normal cortisol levels are essential for life, chronically elevated levels can be very detrimental. Increased cortisol production by the adrenals is a normal response to routine stress, but when stress is chronic and cortisol output remains high over a prolonged period (months/years), breakdown of normal tissues (muscle wasting, thinning of skin, bone loss) and immune suppression can result. Common symptoms of chronic high cortisol include sleep disturbances, fatigue, depression, weight gain in the waist and anxiety.

Stress and persistently elevated cortisol levels can contribute to premature aging and chronic illness.

ESTROGENS

Estrogens are the primary female sex hormones, and play important roles in stimulating growth of the reproductive tissues, maintaining healthy bones, increasing the levels of neurotransmitters in the brain, and helping keep the cardiovascular system healthy.

During menopause, estrone is the predominant circulating estrogen and during pregnancy it is estriol. Though estriol is the most plentiful of the three estrogens it is also the weakest, **whereas estradiol is the strongest, with a potency of approximately 80 times that of estriol.** Thus, estradiol is the most important estrogen in non-pregnant females who are between the first menstruation (menarche) and menopause stages of life. However, during pregnancy this role shifts to estriol, and in postmenopausal women estrone becomes the primary form of estrogen in the body. All of the different forms of estrogen are synthesized from androgens, specifically testosterone and androstenedione.

Low Estradiol is unusual in premenopausal women, unless they have no ovulation, or are taking birth control pills, since the latter can suppress ovarian estrogen production. It is much more common in post-menopausal women whose ovaries were removed, or those who have not had hormone replacement. Symptoms and signs of low estrogen levels include sleep disturbances, foggy thinking, hot flashes, night sweats, vaginal dryness, thinning skin, incontinence, and heart palpitations.

High Estradiol in premenopausal women is usually due to over production of androgens by the adrenal glands and ovaries (DHEA and testosterone), or by estrogen replacement therapy (ERT). In postmenopausal women high estradiol levels are usually due to estrogen supplements.

Excess estrogen levels, such as estradiol, even at normal premenopausal levels, when not balanced by adequate progesterone, may create what is referred to as "**Estrogen Dominance**". Symptoms may include irritability, anxiety, mood swings, weight gain at the hips, water retention, bleeding problems (due to uterine lining overgrowth and fibroids) and thyroid deficiency. Diet, nutritional supplements, vegetable extracts and herbs and foods that have bio-identical progesterone can help to reduce the symptoms.

PROGESTERONE is produced in the ovaries at about 10- 30 mg/day and is important for normal reproductive and menstrual function, especially during the latter half (luteal phase) of the menstrual cycle. It plays a role in the health of the heart, skin, bone, blood vessels and other body tissues. It is also important in breast development, maintaining pregnancy and the control of neurotransmitters in the brain. Although Progesterone is found in both females and males, its role in male physiology is not well understood.

Low Progesterone plays a role in abnormal uterine bleeding in females. It may also have an association with lowered neurological function and osteoporosis. Low progesterone is more common in postmenopausal women who are no longer ovulating, have had their ovaries removed, or are using contraceptives or hormone replacement therapy. Low Progesterone levels in males may play a role in male infertility.

High Progesterone is found in states of stress and anxiety in men and women. Symptoms can include excessive sleepiness, dizziness, bloating and susceptibility to yeast infections. In women it can also result in abnormalities in blood glucose levels (dysglycemia), hair loss or baldness (alopecia), acne and breast tenderness.

RATIO OF PROGESTERONE/ESTRADIOL (Pg : E2) - This ratio describes the relationship between progesterone and estradiol levels. It is used clinically to determine the dominance of one hormone over the other. The ideal Pg : E2 ratio is in the 100:1-300:1 range in premenopausal women and in postmenopausal women who have progesterone supplementation. This ratio is not useful when considering postmenopausal women who have low estrogen levels, or women on hormone replacement therapy (HRT) or oral contraceptives.

A low Pg : E2 ratio indicates an estrogen dominance, and women may experience many severe symptoms, such as anxiety, breast tenderness,

headaches or migraines, depression, digestive problems, fuzzy thinking, palpitations, irregular bleeding, water retention, weight gain and more. If estrogen levels stay unopposed, women may go on to develop infertility, skipped periods (amenorrhea), heavy bleeding (hypermenorrhea), fibroids, uterine cancer, heart disease and stroke, and decreased cognitive ability, among other conditions.

An elevated Pg :E2 ratio may indicate progesterone dominance and the symptoms will be those seen with high progesterone levels (see above).

ANDROGENS

The endocrine glands secrete 5 androgens through a similar pathway: Testosterone, dehydroepiandrosterone (DHEA) and its sulphated form (DHEA-S), androstenedione, and androstenediol. Testosterone, and its biologically active metabolite dihydrotestosterone (DHT), are the only androgens with direct androgenic activity. DHEA-S, DHEA, and androstenedione are all precursors of testosterone.

a) TESTOSTERONE is considered the “male hormone”. In men it is produced by the testes and in much smaller amounts by the ovaries in women. It is responsible for many of the secondary sex characteristics seen in men such as a deeper voice and hair on the chest, in addition to contributing to a healthy libido, regulating the immune system, maintaining optimal memory, building muscle mass, and maintaining energy levels. In both men and women testosterone levels are highest in the teens and then decline gradually with age, playing a role in the loss of bone density.

In women, premenopausal testosterone levels are usually within the high-normal range and postmenopausal levels at low-normal range.

Low Testosterone is most often a result of aging, testes or ovary removal, suppression of ovarian and testicular production by stress hormones (cortisol), the use of synthetic HRT and contraceptives, and/or damage to the testes, ovaries, and adrenal glands by medications, radiation therapies, or trauma. Chronically low testosterone, in both sexes, may cause fatigue or decreased energy as well as reduced sex drive or desire (libido). In addition it may cause reduced stamina and the loss of bone and/or muscle mass, loss of body hair, incontinence, aches and pains, memory lapse, cognitive decline and depression. In women, testosterone imbalance has been associated with coronary heart disease and heart attacks (myocardial infarcts), especially in post-menopausal women.

In men, testosterone levels decrease with age. While this decrease may not be noticeable in some men, others may experience significant changes starting in middle age, or more commonly at age 60 and above. This drop in testosterone levels is sometimes termed "male menopause", hypogonadism, or andropause. Low testosterone levels may result in a decline in physical energy, strength, stamina, and diminished mental aggressiveness. These men may experience more aches and pains in the bones and joints and they may also have a decline in libido and a greater incidence of erectile dysfunction.

High Testosterone is the result of excess production by the ovaries, testes and adrenal glands, or androgen supplementation (testosterone, DHEA).

In men high levels will manifest in increased scalp hair loss. The higher the levels the more likely these men will exhibit risky and aggressive behavior, whether sexual, injury risk, or criminal.

Symptoms of high testosterone levels in premenopausal women include loss of scalp hair, increased body and facial hair, acne, and oily skin. Supplementation with topical testosterone at doses in excess of levels produced by the ovaries

(0.3-1 mg) or testes (5-10 mg) can raise testosterone to levels beyond physiological range.

b) DHEA-S

(Dehydroepiandrosterone), a testosterone precursor, is the most abundant circulating steroid hormone. DHEA is produced predominately by the adrenal glands, the gonads, and the brain, where it functions predominantly as a metabolic intermediate in the biosynthesis of the androgen and estrogen sex steroids. DHEA-S is the sulfated form, and in blood it approaches levels 300 times that of free DHEA. Whereas DHEA levels are at a peak in the early morning, DHEA-S levels show no diurnal variation. From a practical point of view, measurement of DHEA-S is preferable to DHEA, as its levels are more stable. In the young the levels approach the high end of the range. They decrease with age and get to the lower end of normal in middle age.

Low DHEA-S can be caused by adrenal exhaustion and is commonly seen in accelerated aging and diseases such as cancer. High DHEA-S is associated with insulin resistance/PCOS (polycystic ovaries) or DHEA supplementation.

METABOLIC SYNDROME

Metabolic syndrome is a disorder of energy utilization and storage, diagnosed by a co-occurrence of three out of five of the following medical conditions: abdominal (central-waist) obesity, elevated blood pressure, elevated fasting plasma glucose, high serum triglycerides, and low high-density cholesterol (HDL) levels. Metabolic syndrome increases the risk of developing diabetes and cardiovascular disease, particularly heart failure. Some studies have shown the

prevalence in the USA to be an estimated **34% of the adult population**, and the prevalence increases with age.

Recent research indicates prolonged **chronic stress** can contribute to metabolic syndrome by disrupting the hormonal balance of the hypothalamic-pituitary-adrenal axis (HPA-axis)

The principal signs and symptoms of metabolic syndrome are central obesity, also known as visceral overweight (male-pattern or apple-shaped adiposity), with fat (adipose) tissue accumulation mainly around the **waist** and trunk. Other signs of metabolic syndrome include high blood pressure, with decreased fasting serum HDL cholesterol and elevated fasting serum triglyceride level (VLDL triglyceride). It is often accompanied by impaired fasting glucose and insulin resistance, or pre-diabetes, which can manifest by numbness in the feet or hands.

HYPOMETABOLISM

Hypometabolism is not an illness in itself. It would better be termed a "condition", encompassing a variety of illnesses. The characteristic of hypometabolism is that the biochemical processes of the body are functioning as fast as they should. Since the biochemical reactions of the body give off heat (exothermic), hypometabolism results in hypothermia, a lowered body temperature. While the enzymatic reactions of the body give off heat, the enzymes themselves are also dependent on body heat to have their most efficient action. When body temperature is below 98.2 degrees Fahrenheit, enzymes are not functioning at their best efficiency.

This enzymatic dysfunction produces a variety of signs and symptoms, which are common to all hypometabolic conditions. These include fatigue (AM and PM), cold and heat intolerance, migraines (headaches), depression and weight gain. Other symptoms include irritability, sleep disturbance such as insomnia, anxiety



(panic attacks), as well as poor memory and concentration (foggy thinking). Many individuals experience irregular periods, low sex drive, low ambition and motivation. This may be accompanied by fluid retention, irritable bowel, hair loss, dry skin and hair and generalized muscle aches and joint pain.