

# MEET YOUR HORMONES

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## THE ENDOCRINE SYSTEM

## **Meet Your Hormones – The Endocrine System**

Many experts agree that your body's most important functional system is the endocrine system. It is composed of glands (the endocrine glands) that produce hormones that control everything happening in the body. So, you begin to read this eBook it is time to Meet Your Hormones. Or, as one of my favorite clients called them: her "hormones!"

In this eBook you will learn:

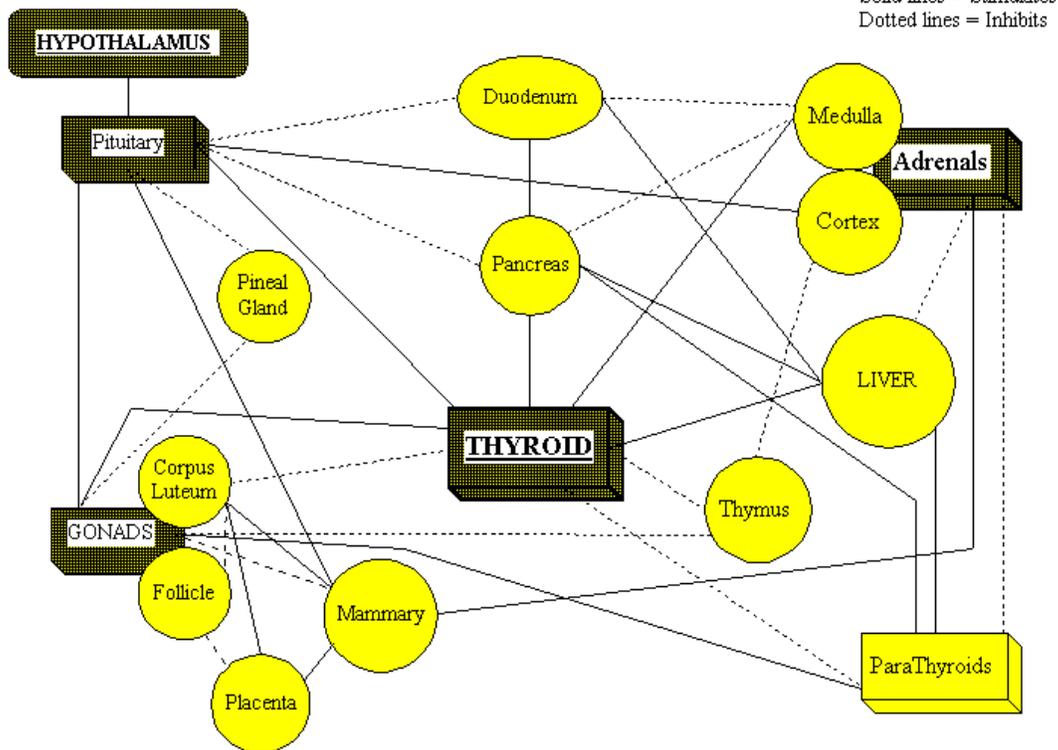
- An introduction to the purpose and function of hormones.
- An overview of the endocrine glands and the hormones they produce.
- The interrelationship of the endocrine glands.
- A more detailed look at the thyroid gland and the adrenal glands.
- A better understanding of the major steroid hormones – what they do and what happens when they are out of balance.

### **An Introduction to Hormones**

Hormones are very powerful biological chemicals produced in very small amounts by the endocrine glands. Hormone levels are precisely and carefully monitored and controlled by the body. They are released into the blood stream and carried to specific cells to initiate specific activities; regulating, controlling, and coordinating all body functions. Many hormones are made at additional tissue sites as well as their "parent" gland. You can think of this as your body's own inherent back-up system.

Hormones from the different endocrine glands interact with each other in complex ways. One of the best illustrations of this we have seen is from endocrinologist Dr. Henry Harrower.

## Relationship of the Endocrine Organs



Proper nutrition is critical for the endocrine glands. Each gland relies on a specific trace mineral to support its normal physiology and biochemistry. We consume these trace minerals when we eat real foods from both plant and animal sources. Without enough amounts of these minerals the glands will not function properly ultimately leading to a variety of symptoms in the body. We will discuss these symptoms in more detail later when we explore each gland.

The endocrine gland and its associated trace mineral are as follows: pituitary (manganese); thyroid (iodine); adrenal (copper); pancreas (chromium); prostate/uterus (zinc); and testes/ovaries (selenium). The other major endocrine glands are the hypothalamus, pineal, parathyroid, thymus, and believe it or not – your fat cells.

Here are a few more basics about hormones to provide you with additional background. Each human cell has receptor sites. You can think of these as ‘gates’ located on the cell membrane that control the entry of hormones and other bio-chemicals into the cells. These receptors determine if and how effectively a hormone message is received.

There are a variety of scenarios in which these sites are not functioning optimally. They can become “resistant” to the hormone meaning more of the hormone is required to deliver the message. You may have heard of “insulin resistance” a condition that often precedes diabetes. In other cases, an excess of one hormone may block the gate of another, or another substance may mimic a hormone and block a receptor site (this is called a xenohormone).

Hormones exist two ways in the blood stream. Protein-bound hormones are considered inactive (as they are bound to a protein). “Free” hormones are the active form that can bind to cell receptors and initiate the cellular response.

Hormones have a lag time from secretion to activation that ranges from seconds to hours. They are either amino acid based or steroid based (gonadal, adrenal). The liver and the kidney flush excess hormones out of the body.

The main control of the endocrine system rests in the hypothalamus-pituitary axis (or H-P axis). The hypothalamus is part of the limbic system, so it is in the brain and receives information which it relays to the pituitary. The pituitary is also known as “the master gland” because it sends information to other endocrine glands based on what it has learned from the hypothalamus.

## **Overview of The Endocrine Glands**

Following is a brief overview of the glands, the hormone(s) they produce, and the function of those hormones. Future articles will provide more details.

### **Pineal gland**

Melatonin – sleep regulation, internal clock.

### **Hypothalamus**

Produces several releasing hormones and inhibiting hormones. The releasing hormones stimulate the anterior pituitary to release hormones. The inhibiting hormones stop the anterior pituitary from secreting hormones. The major releasing hormones are:

Thyroid releasing hormone (TRH) – stimulates pituitary to release TSH.

Corticotropin releasing hormone (CRH) – stimulates pituitary to release ACTH.

Gonadotropin releasing hormone (GnRH) – stimulates pituitary to release FSH and LH.

### **Pituitary**

The pituitary gland produces different hormones from its anterior and posterior parts.

The anterior pituitary secretes hormones to stimulate additional hormones. It receives its instructions from the hypothalamus.

Thyroid stimulating hormone (TSH) – stimulates secretion of thyroid hormones.

Adrenocorticotrophic hormone (ACTH) - stimulates secretion of adrenal cortex hormones.

Follicle-stimulating hormone (FSH) – In females stimulates development of ovarian follicles and secretion of estrogen; in males stimulates testes to grow and produce sperm.

Luteinizing hormone (LH) – In females stimulates maturation of ovarian follicle and ovum; stimulates secretion of estrogen; triggers ovulation; and stimulates development of corpus luteum. In males stimulates interstitial cells of the testes to secrete testosterone.

Growth hormone (GH) - Stimulates growth in all organs; mobilizes food molecules, causing an increase in blood glucose concentration.

Prolactin (lactogenic hormone) - Stimulates breast development during pregnancy and milk secretion after pregnancy.

The posterior pituitary secretes ADH and oxytocin.

Antidiuretic hormone (ADH) - Stimulates retention of water by the kidneys.

Oxytocin - Stimulates uterine contractions at the end of pregnancy; stimulates the release of milk into the breast ducts; and plays a role in sexual arousal in males and non-nursing females (sometimes called the “cuddling hormone”).

### **Thyroid**

Thyroxine (T4) and Triiodothyronine (T3) – Stimulate the energy metabolism of all cells.

Calcitonin – Inhibits the breakdown of bone; causes a decrease in blood calcium concentration.

### **Parathyroid**

Parathyroid hormone (PTH) – Stimulates the breakdown of bone; causes an increase in blood calcium concentration.

### **Thymus**

Thymosin – Promotes development of immune system cells.

### **Pancreas**

Glucagon – Stimulates liver glycogenolysis, causing an increase in blood glucose concentration.

Insulin – Promotes glucose entry into all cells, causing a decrease in blood glucose concentration.

### **Adrenal**

Mineralocorticoids: aldosterone – Regulates electrolyte and fluid homeostasis.

Glucocorticoids: cortisol (hydrocortisone) - Stimulates gluconeogenesis, causing an increase in blood glucose concentration; also have anti-inflammatory and anti-immunity, anti-allergy effects.

Sex hormones - the adrenals produce “female” hormones in males (estrogen, progesterone) and “male” hormones in females (testosterone).

Epinephrine (adrenaline) and norepinephrine - Prolong and intensify the sympathetic nervous response during stress.

### **Ovary (Female)**

Estrogen – Promotes development and maintenance of female sexual characteristics.

Progesterone – Promotes conditions required for pregnancy.

Testosterone – Promotes development and maintenance of some sexual characteristics.

### **Testes (Male)**

Testosterone – Promotes development and maintenance of male sexual characteristics.

### **Fat Storing Cells**

Leptin – Controls how hungry or full we feel.

## **The Thyroid Gland**

Perhaps of all the endocrine glands in the body, the thyroid gets the most attention. And it well should. Many of us know someone who has been told they are “hypothyroid” or are on medications for low thyroid. Why is the thyroid so important? Its main function is to control metabolism. Since all cells need this information, all cells in the body have receptor sites for thyroid hormones, thus it affects the operation of all body processes and internal organs.

The thyroid gland helps control body temperature. People who are experiencing cold hands and feet may have low thyroid function. In children it helps control of the body’s rate of growth. It also greatly influences mood and emotion through its action on brain chemistry. One of its lesser known functions is to work in conjunction with the parathyroid gland to balance blood calcium levels and regulate the breakdown of bone tissue.

The thyroid receives the most extensive blood supply of all the endocrine glands. In fact, all your blood goes through the thyroid every 17 minutes!

The main hormones produced by the thyroid gland are thyroxine (better known as T4) and triiodothyroxine (T3). These hormones are based on iodine. T3 is the active form, yet the body produces more T4. Therefore, T4 needs to be converted into T3. Seventy five percent of this conversion is done in the liver and kidneys. Selenium, Zinc, Vitamin C, Vitamin B12, and Vitamin E are required for this process. So, from a nutritional perspective the thyroid is dependent upon the trace minerals iodine, zinc, and selenium; Vitamins C, B12, and E; and having healthy livers and kidneys.

Many of us know people who have been told they have low thyroid function. Following is a simple quiz to help you self-assess the state of your thyroid. Please note these are only some of the symptoms of low thyroid function (hypothyroidism). If you have answered yes to 3 or more of these questions, consider having your thyroid function tested. This is often done with a blood test.

- Do you have severe fatigue and find it hard to get up in the mornings?
- Do you have generalized low energy?
- Do you need caffeine and/or other stimulants to get you going?
- Do you have family history of thyroid disease?
- Is it easy for you to gain weight?
- Do you have difficulty losing weight?
- Do you have dry skin?
- Do you have constipation?
- For women, are your menstrual cycles irregular?
- Do you suffer from mood swings?
- Is your hair thinning?
- Is the outer third of your eyebrows missing or thinning?
- Is your hair dry/brittle?
- Do you have low sex drive?
- Do you note any forgetfulness?
- Do you have high cholesterol?
- Do you have low blood pressure?
- Do you suffer from depression?
- Is your skin yellow?

Of course, the big question is what the underlying cause of the above conditions may be. There are four common types of hypothyroid problems. One or more of these may apply.

The first is functional hypothyroidism from weakened adrenal glands due to prolonged stress. Our adrenal glands are very important, and the stress response is critical to our survival. When the body is under constant stress the adrenal glands are over working. To protect the adrenal glands (and our survival) the pituitary gland directs the thyroid to slow down all processes. In this case it is the adrenal glands that need support rather than the thyroid.

Second is functional hypothyroidism caused by Estrogen Dominance – an imbalance of levels of estrogen and progesterone. We will go into this in more detail when we discuss these hormones. For purposes here it is enough to say that estrogen and progesterone work together and are most effective when within a specific ratio to each other. When this ratio is out of balance (which can occur in a variety of ways) in favor of estrogen this is estrogen dominance. This is a common condition today and it is just not women, it occurs in men too. The high levels of estrogen cause a reaction in the body where thyroid hormones are reduced. So, as with the adrenal glands above, the solution here is to figure out why estrogen and progesterone are out of balance.

Third is a deficiency of nutrients required for normal thyroid hormone synthesis, release, and function. This is generally an iodine deficiency but can be other nutrients as well. Without enough iodine the thyroid will not function optimally. This too is a common condition in today's world given prevailing diets.

Fourth is thyroid disease (primary hypothyroidism). There are several different thyroid diseases, such as goiter, nodules, Grave's Disease or Hashimoto's Disease (an autoimmune disease). In many cases thyroid disease is an outcome of not resolving the first three underlying causes discussed above.

While thyroid function is often tested via the blood there are two self-tests that can be performed. When thyroid malfunction is suspected these tests can assist in early identification. Often it takes longer for signs to show in the blood. These tests show a gland under stress. A blood test shows when it has impacted the hormones.

The first is the Barnes Thyroid Test which measures body temperature. You need a basal thermometer (goes from 96 to 100 degrees) to perform the test. The basal thermometer is also called an ovulation thermometer. To perform the test, you take your temperature every morning before getting out of bed. Keep the thermometer by your bed. When you wake up put the thermometer under your armpit for 10 minutes (skin to skin). This should be done for five days. Take the average of the five days. Normal is between 97.8 and 98.2 degrees. Hyperthyroid is greater than 98.2 degrees. Hypothyroid is less than 97.8 degrees. For women it is best to do this test early in their menstrual cycle and not near ovulation as temperature is naturally higher.

The second test is the Iodine Patch Test. This is because the thyroid needs iodine to function correctly. To do this test you will need colored iodine tincture which is available in any drugstore. You will paint 3" x 3" spot on your inner thigh, inner arm, or stomach. It is best to paint during the evening and go to sleep. When you wake up record any color changes. With normal thyroid function you should see no color change. A deficient thyroid gland body will absorb the iodine and you will have no color left on the spot you painted. If the spot fades completely within 12 hours that is indicative of low thyroid function. Ideally the spot will remain for at least 24 hours. The quicker the spot fades, the more thyroid support is likely needed.

Many people are treated with the medication Synthroid or Levothyroxine for hypothyroidism. It is important to know that this and many similar medications are only T4. Therefore, they still need to be converted into T3 for your body to use them. If long standing nutritional deficiencies are at the root of the low functioning thyroid this may continue to contribute to the body not being able to make this important conversion. Some practitioners will prescribe Armour Thyroid, a product containing both T4 and T3 which has been found to be more effective for some people.

Natural solutions for low thyroid function include dietary changes, animal glandular extracts without hormones, specific nutrients, and herbal remedies. The nutrients will be targeted at the specific underlying cause. For example, where iodine is deficient it will be supplemented.

The purpose of the natural solution is to provide the nutrition the thyroid gland needs to resume and support proper function. Just providing hormones does not address the underlying deficiencies and ultimately the health of the gland. In the long run it may make things worse. The negative feedback loop employed by the body tells it there is enough hormone in the blood stream, so the thyroid does not receive any signals to make

hormone. As the thyroid is not utilized further deterioration may occur and the person becomes completely dependent on external sources of the hormone. This deterioration may also lead to autoimmune diseases of the thyroid.

It is important to know that some people also suffer from an over-active thyroid or hyperthyroidism. Often this precedes hypothyroidism. Typical symptoms include: insomnia, nervousness, cannot gain weight, intolerance to heat, highly emotional, flush easily, night sweats, heart palpitations, increased appetite without weight gain, pulse fast at rest, eyelids and face twitch, irritable and restless, or cannot work under pressure.

## **The Adrenal Glands**

There is an old saying that how well you live depends to a large extent upon how well your adrenal glands function. We have two adrenal glands, each about the size of a walnut, that sit on top of each kidney. The adrenals are best known as our stress handling glands, mobilizing us for survival via our “fight or flight” reaction, but have other important functions as well.

The adrenal glands produce a variety of steroid hormones that are responsible for stress handling; reproduction; sex hormones; energy production; body repair and regeneration; healthy brain function, mood, cognition, and memory; controlling fluid balance; and stabilizing blood sugar.

Let us start with stress. The ability to handle stress is critical to our survival. Our body was designed to deal with stress and the adrenal glands have that primary responsibility. This is better known as our “fight or flight” response – or simply explained – see the tiger and we need to run. It is important to recognize that this response is to all types of stress - be they physical, mental, or emotional.

Stress comes from a variety of sources. There are the ones that we plainly see such as our work and our personal relationships. Other stressors that affect us but are not as obvious include the general environment; the chemicals we are exposed to daily in our food and personal care products; air and water pollution; electromagnetic pollution; and this list goes on.

While our body was designed to handle stress, it was not designed to handle the constant stress that many people experience. Often people do not recognize their own stress level as they erroneously believe they are handling the stress, or it is how they always feel and do not notice a difference. Yet, their body is under constant stress from both conscious and unintended lifestyle and diet choices.

The key hormone you hear about regarding stress is cortisol. When we are stressed it causes an increase in cortisol. Cortisol is made in the adrenal glands. If our body is constantly calling for cortisol production this puts an extra burden on the adrenal glands. In the long run this can lead to adrenal fatigue.

The key action of the stress response (the cortisol surge) is to run from the tiger. To run we need energy and to get energy we need an increase in our blood sugar levels. Cortisol causes blood sugar levels to rise. But, if there is no tiger, we are not running, and we now have excess blood sugar. The body does not like extra sugar in the blood. This causes the body to release the hormone insulin to move the sugar back out of the blood.

We are familiar with insulin from our previous carbohydrate discussions as contained in the Foundation of Nutrition ebook. As you remember excess insulin promotes fat storage. Insulin and cortisol move together. If one increases, the other does so as well. This puts the body in a fat storing mode. At the same time, the adrenals are under stress to keep up the cortisol production. Again, the body responds to protect the adrenals from overwork through lowering metabolism. Lowered metabolism also puts the body in a fat storing mode. You get the picture and can see the dynamic relationship between all the hormones as was previously outlined in Harrower's Chart in the introductory article about hormones.

Following is a simple quiz to help you self-assess the state of your adrenals. Please note these are only some of the symptoms of low adrenal function. You will also note that many of them overlap with the symptoms we saw for low thyroid function. If you answer yes to a significant number of these questions, you may be suffering from adrenal fatigue.

- Do you have difficulty getting up in the morning?
- Do you have continuing fatigue, not relieved by sleep or rest?
- Do you feel lethargic and not have the energy to do daily activities?
- Do you have sugar cravings?
- Do you have salt cravings?
- Do you have allergies?
- Do you have digestion problems?
- Do you have a decreased interest in sex?
- Do you have a decreased ability to handle stress?
- Does it take you longer to recover from illness, injury, or trauma?
- Do you get lightheaded or dizzy when you stand up quickly?
- Do you have a low mood?
- Do you have less enjoyment or happiness in life?
- For women, is your PMS worse?
- Are your thoughts less focused? Do you have brain fog?
- Is your memory poorer?
- Do you not really wake up until after 10:00 AM?
- Do you have an afternoon low between 3:00 and 4:00 PM?
- Do you feel better after dinner?
- Do you get a "second wind" in the evening and stay up late?
- Are you less productive?
- Do you feel overwhelmed by all that has to be done?
- Does it take all your energy to do what you must do and then have none left over for anything else?

Like the thyroid there is a self-test you can do at home which can indicate weakened adrenal glands. It is the inguinal ligament test. The inguinal ligament attaches to the sartorius (which functions to hold the pelvis downward and forward). If the muscle goes weak the pelvis will tilt backwards pulling on the inguinal ligament on that side causing tenderness. If the muscle is tense or tender it indicates weak adrenals. The way to determine this is to palpate the muscle in its upper and lower sections for tenderness. The inguinal ligament goes from the point of the hip bone (ASIS) to the pubic bone along what I call the “crease” where the leg meets the torso. Be willing to use some force when palpating. There will be a difference to feel if push hard enough.

The next logical question is what can you do to improve the health of my adrenal glands? The simple answer is to look at your diet and lifestyle and make the necessary changes.

- Are you getting enough sleep?
- Are you getting enough exercise? Are you getting too much exercise? (Believe it or not there are quite a few people out there who over-exercise or engage in exercises that are increasing their stress response.)
- Do you know stress management techniques you can use to relax yourself and provide relief from the stress response?
- How is my diet influencing my blood sugar and insulin levels? (Remember insulin and cortisol move together, so too much sugar puts additional stress on the adrenal glands.)

In addition to dietary modifications and implementing stress reduction techniques natural solutions to adrenal fatigue are like that of the thyroid (and in fact a similar methodology is used for all endocrine issues). Natural solutions for low adrenal function include animal glandular extracts without hormones, specific nutrients, and herbal remedies. The nutrients will be targeted at the specific underlying cause. For example, where Vitamin C or copper is deficient it will be supplemented.

The purpose of the natural solution is to provide the nutrition the adrenal gland needs to resume and support proper function. Just providing hormones does not address the underlying deficiencies and ultimately the health of the gland. In the long run it may make things worse. The negative feedback loop employed by the body tells it there is sufficient hormone in the blood stream, so the adrenal glands do not receive any signals to make hormones.

It is important to remember that the adrenal gland is producing a wide variety of hormones, so supplementing with specific hormones may throw the entire system even more out of balance, by creating additional communications challenges for the endocrine system. Therefore, except for extreme cases, it may be best to start with glandular and nutrient support and allow the body to bring itself back into balance naturally.

# **The Major Steroid Hormones**

## **Introduction**

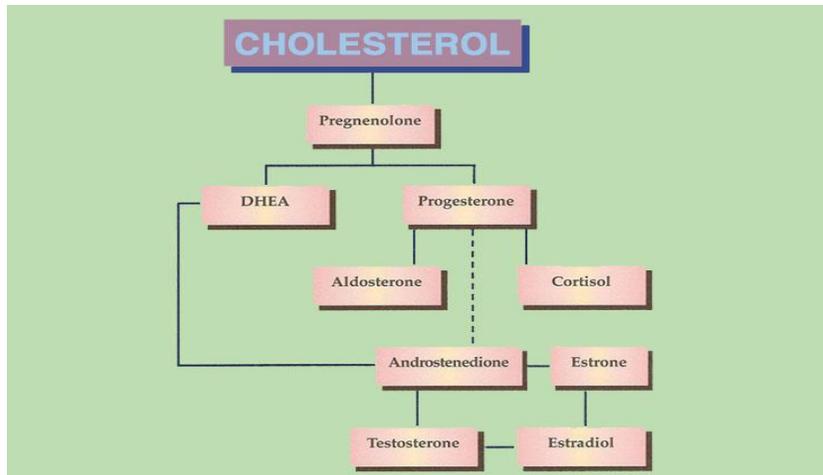
We now turn our attention to the steroid hormones, and particularly the sex hormones (a subset of the steroids). These hormones are made in a variety of organs and their production is linked with sex and life cycle. We will briefly discuss Pregnenolone, DHEA, and Cortisol, while our main emphasis will be on Estrogen, Progesterone, and Testosterone (the sex hormones). We will learn how these hormones are impacted through both the male and female life cycle. And we will better understand the involvement of the ovaries, testicles, and adrenal glands in producing these hormones.

These hormones will work together and in opposition. One hormone may turn something “on” while another may turn that same function “off.” Some hormones may have what appear to us as similar functions, yet at the end of the day there is some interaction or synergistic effect that we experience, but not completely understand. (Perhaps this is where we get into trouble - when we think we know a little bit more about what is going on than we really do!)

The steroid hormones have a variety of roles. While we will get into more specific details later, at a high level this includes stress handling (which includes physical, mental, emotional, and spiritual stress); reproduction (both cellular and sexual); the production of energy; body repair and regeneration; healthy brain function (including mood, cognition, and memory); regulating blood sugar levels (which relates to energy production); supporting the immune system; and managing inflammation.

## **Cholesterol**

When discussing the steroid hormones, we must return to this very important chart and remember it all starts with cholesterol. Yes, the substance that so many supposed experts are telling us is deadly. We do not have the time or space to have that discussion here, so you will have to take my word for it – we need cholesterol!



As illustrated above the key steroid hormones include: Pregnenolone, DHEA, Progesterone, Aldosterone, Androstenedione, Cortisol, Estrone, and Estradiol.

### **Pregnenolone**

Pregnenolone is made from cholesterol mainly in the adrenal glands, but also in the liver, skin, brain, testicles, ovaries, and retina of the eyes. It is the precursor hormone for the entire steroid family. Pregnenolone has many functions of its own, but for our present discussion we need to be aware that it is converted to DHEA or progesterone for downstream functionality. Since we will be focusing mostly on the downstream sex hormones, we will limit our discussion of pregnenolone.

How does the body decide between DHEA and progesterone? This is the native intelligence of the body and the entire endocrine system at work. The glands and the brain are communicating and setting priorities. However, the key factor to remember is that blood sugar and stress handling get top prioritization. If the body is under stress this favors conversion to progesterone which will be converted to cortisol.

What is the implication of this? It is common for a test result to show low DHEA. One accepted approach is to then supplement with DHEA. Guess what happens often on the next test? Yes – the person is still low on DHEA. This is likely because the person is not suffering from a DHEA shortage! They are more likely under constant stress and the body is prioritizing cortisol.

## **DHEA**

DHEA is made primarily in adrenal glands. Its main functions are to support blood sugar regulation; reduce fat; increase muscle mass; stimulate the immune system; enhance bone deposition and remodeling; reduce breast proliferation; improve libido; and decrease PMS. You will soon see that it is not alone in any of these functions.

## **Cortisol, Stress, and the Nervous System**

Cortisol is made in the adrenal cortex. It is primarily known for its role in our stress response by engaging the sympathetic nervous system (better known as “fight or flight”). Here is the basic mechanism: We see a tiger. We need to run. To run we need energy. To have energy we need blood sugar. This is one of the functions of cortisol. It gets sugar into the blood stream so we can run from the tiger. The problem is when there really is not a tiger and no running is happening.

If we are constantly under stress, we keep getting the “run signal.” This pumps sugar into the blood stream. On the other side of the equation is insulin. Insulin’s job is to move sugar out of the blood and into cells, primarily to be used to produce energy. However, when there is not the need for energy the sugar needs to go into “storage.” We know that as fat. So, at the end of the day, and particularly when in excess both cortisol and insulin are fat storing hormones. They follow a simple rule. When cortisol goes up in your body, insulin will rise. When insulin rises, cortisol will go up with it. The same concept works the other way.

Therefore, stress management is so critical and why constant stress will lead to weight gain. It is also important to know that constant increases in cortisol will also cause decreases in thyroid hormone production and increases in estrogen production (more on that later).

To summarize the main activities of cortisol:

For the nervous system it manages our sympathetic response and plays a role in healthy mood and emotions.

For blood sugar management it recognizes when we need energy. When blood sugar levels become low through our normal activities it is role of cortisol to act. It happens all day long. The problem becomes when we remain in a stress response. This ongoing excess can ultimately contribute to insulin resistance.

For the immune system in a normal mode it supports a healthy anti-inflammatory response. However, at high levels it can be immunosuppressive while at low levels the immune system may be unable to engage effectively.

It is interesting that as a steroid hormone cortisol has catabolic (state of breakdown); anabolic (rebuilding); and anti-inflammatory functions.

It is clear from the above discussion there are many adverse effects of high and prolonged stress. We will discuss some of these later in more detail, but for a quick short list consider the following implications of increased cortisol:

- Reduces fertility by lowering luteinizing hormone which impacts ovulation in females and testosterone production in males.
- Reduces the active thyroid hormone T3 as increased cortisol increases rT3 which suppresses T3.
- Creates estrogen dominance (to be discussed in more detail later in females and males).
- Decreases DHEA.
- Suppresses the immune system.

## **Testosterone**

Testosterone is the main male and androgen hormone. It is produced in the testes (males) and in the ovaries and adrenal glands (females). It is also produced by the conversion of androstenedione and at times DHEA. It is a steroid, anabolic, body building hormone.

In both sexes testosterone on a physical level is known to: enhance libido and improve sexual response; protect against heart disease and stroke; increase and enhance energy and stamina; build strong bones; build strong muscles and maintain muscle tone; assist in balance and coordination; normalize weight; improve insulin sensitivity; and help maintain a healthy cholesterol balance. On a mental level it protects against depression, age-related mental decline, and helps to improve memory.

In men testosterone is also needed to achieve and sustain erections and may protect against prostate problems and cancer.

In women testosterone helps to reduce breast tenderness; reverses estrogen-induced breast proliferation; and decreases hot flashes and night sweats.

## **Estrogen**

Did you know that there is more than one “estrogen?” While we use the generic term “estrogen” in fact there are several types of estrogen. It is made by the ovaries in women, and to a lesser degree, the testes in men. Estrogen is also made in fat cells (which is the primary site of production for both menopausal women and men.) Estrogens are steroids.

The three major estrogens are estrone (E1), estradiol (E2), and estriol (E3). Estrone is typically 5-10% of total estrogen. It is considered a “strong” estrogen because of its

ability to cause cell proliferation. Estradiol is also typically 5-10% of total estrogen. It is considered the “strongest” estrogen because of its ability to cause cell proliferation.

Estriol is typically 80-90% of total estrogen. It is considered the “weak” estrogen because it does not cause cell proliferation. It appears to balance the cell proliferating effects of estrone and estradiol, thus protecting against their cancer-causing ability.

Following are some of the main functions of estrogen. This is by no means a complete list and there are many still unknown functions of estrogen as well.

Estrogen is known for promoting the female secondary sex characteristics. (Thus, you can now understand how overweight men will develop breasts. Their fat cells are producing excess estrogen!) Estrogen plays a key role in reproduction. It promotes cell proliferation, especially of the uterine lining and breast tissue and is part of the hormone signaling sequence that induces ovulation. It also maintains vaginal lubrication.

It also plays a key role in how we feel as it interacts with the nervous system. It stimulates brain function thereby impacting cognition, memory, emotions, mood, stamina, ambition, pain perception, and sleep.

Estrogen’s emergence at puberty stops the growth of long bones in both females and males and slows bone loss. It can increase body fat, especially in the breasts, hips, abdomen, and thighs.

Estrogen helps keep our skin healthy and smooth. It increases production of type III collagen which helps skin heal faster and remain soft and pliable. It promotes the hydration of body tissues.

From a heart health perspective estrogen increases HDLs, lowers LDLs and total cholesterol. It also helps maintain the endothelial lining of the blood vessels.

## **Progesterone**

Progesterone is a steroid hormone produced in the ovaries and adrenal glands during the follicular phase of the cycle and in the corpus luteum during the luteal phase of the cycle in women and in the adrenal glands in men. One of its primary roles is to work with and balance estrogen. It is also produced by the brain and peripheral nerves, and possibly other locations.

Many of progesterone’s functions are highlighted below. However, like estrogen, there are still many unknown functions.

Progesterone functions as a precursor for other steroid hormones, most importantly cortisol. It is important to understand that stress and blood sugar handling take priority in

the body. Therefore, it is common to see progesterone deficiencies created as it is converted to cortisol to handle the stress response.

It is also critical to understand that progesterone is still needed in healthy amounts in menopausal women. Although ovarian progesterone is no longer produced, the adrenals of menopausal women must continue to make enough progesterone to balance the effects of menopausal estrogen levels. This is where the medical world got in trouble with estrogen only hormone replacement therapy by supplying unopposed estrogen and not its balancing partner progesterone.

Progesterone plays an important role in reproduction. While estrogen causes cells in the endometrium to multiply, progesterone balances this effect by stopping cell division and signaling the process of cell maturation, differentiation, and apoptosis (cell death). Thus, it prevents excessive production of the uterine lining. The production of progesterone in the second half of the cycle after ovulation helps signal other developing follicles to stop developing (and thus stop producing estrogen). By maintaining the secretory endometrium, it “ripens” the uterine lining for possible pregnancy. If there is pregnancy progesterone maintains and protects the developing fetus; prepares the breasts; and promotes the development of the brain and nervous system.

Progesterone interacts with the nervous system and regulates how we feel. It helps calm the mind, focus the brain, increases libido, and is a natural antidepressant (when in balance with estrogen).

It not only interacts with estrogen, but other hormones as well. It facilitates thyroid hormone function and helps normalize androgen levels (keeps testosterone from getting too high). It has been found to be preventative against breast, uterine, prostate, and other forms of estrogen related cancers.

Some of the other functions of progesterone include stimulates new bone growth; helps burn fat for energy; a diuretic; and a muscle relaxant.

**ONE FINAL IMPORTANT POINT:** It is critical to understand that progesterone only functions correctly when it is in the right proportion with estrogen. These two hormones are designed to work together. In a cycling woman these proportions change throughout the cycle. In menopausal women the proportion of progesterone to estrogen will remain relatively constant. When these are out of balance a condition known as “estrogen dominance” is present. More on that later.

## **Female and Male Life Cycles**

Before we look at hormonal imbalances, let us get a quick understanding of the hormonal stages of the typical female and male life cycles.

## **Female Life Cycle**

Once the female reaches puberty, she has entered her reproductive years. To reach full reproductive maturity can take up to four years. It is also common for the initial menstrual cycles to be irregular for several months or years. The reproductive years last for approximately 30 plus years.

The next stage is called perimenopause. It marks beginning of the transition to menopause. This can be one of the more difficult stages for the modern female as things begin to change. Cycles and hormones now fluctuate creating more mood swings and fatigue. In addition, there are more cycles without ovulation. Perimenopause officially ends with menopause which is 12 consecutive months with no cycle.

The biological wiring of the human female is for this process to take 2-3 years. However, it has become common for this transition to take 8-12 years in the modern female.

Menopause is the permanent cessation of menstruation due to loss of most ovarian function. There is another common misperception here. While it is true that ovarian estrogen and progesterone production have stopped, there can still be testosterone production. Therefore, the ovaries still do serve a purpose after menopause. The average age for menopause is 51. Smoking has been shown to accelerate the process by two years.

Menopause is known for some unpleasant symptoms, some of which are also experienced during perimenopause. Most of these originate with hormonal imbalances which we will discuss later. Menopause symptoms affect both the physical, mental, and emotional bodies.

General physical symptoms include: hot flashes; night sweats; insomnia; dry skin, eyes, and sinuses; headaches; migraines; water retention and bloating; weight gain; liver and gall bladder congestion (leading to constipation); cold hands and feet; increased sugar cravings; muscle tension; increased risk of osteoporosis and cardiovascular disease; and loss of subcutaneous fat and increased wrinkling.

Symptoms affecting the reproductive system include cystic or lumpy breasts; vaginal dryness, vaginal dysplasia and atrophy; more frequent urinary tract infections; and incontinence.

General mental and emotional symptoms include poor memory and foggy thinking; mood swings; depression; decreased ambition; irritability; anxiety; anger; and decreased libido.

A variety of factors have been identified that affect these symptoms. Positive factors which reduce the symptoms include being in general good health and having a low stress

lifestyle as the transition begins. These women typically have strong adrenals, a healthy thyroid, have a good balance of minerals, and normal cholesterol levels (220-240).

Factors associated with a greater likelihood of experiencing these symptoms include obesity; chronic stress; adrenal fatigue; estrogen dominance; liver congestion; thyroid imbalance; and insulin resistance.

### **Male Life Cycle**

Yes, there is such a thing as the “grumpy old man.” This is called andropause. While it does not receive all the attention of its female counterpart menopause, it is just as real and disruptive to the person experiencing it. The “official” definition of andropause is the loss of androgen dominance in men.

Andropause is different than menopause in that its onset is often gradual. The symptoms are often missed or treated as separate issues without recognizing the underlying change in male hormone status. The key hormone is testosterone. Once men reach around 40 years old their free testosterone levels (the active form) begin to decline 1-2% each year. You can see that it starts out slow, but 10-15 years or more down the road it is a significant drop from where the man was at age 20, 25, or 30!

Andropause impacts men on physical, mental, and emotional levels. Typical physical signs and symptoms include: loss of energy, strength, and stamina; gradually increasing fatigue; loss of libido, fewer spontaneous morning erections, and erectile dysfunction (ED); muscle soreness, weakness, and decreased muscle mass; thinning and dry skin; sleep problems; blood sugar problems, insulin resistance, and increased risk for diabetes; weight gain; increased fat in hips and breasts; increased risk for cardiovascular disease (increased cholesterol, triglycerides, and blood pressure); increased risk for osteoporosis; and increased prostate and urinary tract problems.

Typical mental and emotional symptoms include low mood; irritability; depression; discouragement; pessimism; withdrawal from activities and relationships; concentration and memory difficulties; less productive, decreased initiative, motivation, and drive; and loss of libido.

Positive and negative factors affecting a man’s experience during andropause are like those described above impacting menopause.

It is important to note from our earlier discussion testosterone is made from cholesterol and plays an important role in maintaining healthy levels of cholesterol and triglycerides. Statin medications have been shown to lower testosterone levels.

## **Hormonal Imbalances**

At the core of many symptoms suffered by both men and women are hormonal imbalances. Imbalances occur several ways. There are deficiencies, there are excess, and there are relational imbalances. We have previously mentioned “estrogen dominance” which is an example of a relational imbalance. Relational imbalances are challenging as they can be a combination of deficiencies and excesses.

To begin our understanding let us start with some basic lists. Estrogen imbalances include estrogen deficiency and estrogen excess.

### **Symptoms of Estrogen Deficiency**

- Hot flashes
- Night sweats
- Insomnia
- Mood swings
- Mental fogginess, poor memory
- Dry eyes, nose, sinuses
- Vaginal dryness, dry skin
- Vaginal wall thinness, vaginal dysplasia
- Vaginal and/or bladder infections
- Incontinence, urethral irritations, urinary frequency
- Headaches, migraines
- Decreased sexual response
- Loss of ambition or drive
- Depression
- Lack of stamina
- Decreased breast size
- Wrinkling of skin
- Osteoporosis
- Loss of subcutaneous fat
- Increased risk of cardiovascular disease

### **Symptoms of Estrogen Excess**

- Heavy bleeding
- Clotting, cramping
- Water retention, bloating
- Breast tenderness, lumpiness, cystic breasts, enlarged breasts, fibrocystic breasts
- Weight gain
- Headaches, migraines
- Emotional hypersensitivity
- Depression, irritability, anxiety, anger, agitation
- Decreased sexual response
- Thyroid dysfunction (resembling hypothyroidism)
- Cold hands and feet
- Blood sugar instability, sweet cravings
- Insomnia
- Gall bladder dysfunction (coagulated bile)
- Acne

Progesterone imbalances include progesterone deficiency and progesterone excess.

## **Symptoms of Progesterone Deficiency**

- PMS
- Heavy bleeding
- Clotting, cramping
- Inability to concentrate
- Short term memory impairment
- Muscle tension, spasm, Fibromyalgia
- Water retention, bloating
- Insomnia
- Breast tenderness, lumpiness, cystic breasts
- Weight gain
- Thyroid dysfunction (resembling hypothyroidism)
- Acne
- Headaches, migraines
- Anxiety, irritability, nervousness, moodiness
- Hot flashes
- Depression
- Decreased sexual response
- Osteoporosis
- Amenorrhea (no periods at all)
- Oligomenorrhea (infrequent periods)
- Spotting
- Endometriosis, adenomyosis (uterine endometriosis)
- Fibroids

**Symptoms of Progesterone Excess** (usually from overdose resulting from progesterone replacement therapy)

- Sleepiness
- Bloating or constipation (excess progesterone slows the digestive tract)
- Candida (excess progesterone can inhibit anti-candida immune system response)
- Depression
- Ligament laxity which can cause persistent back pain; other joint pains and problems; incontinence; or mitral valve prolapse.
- Progressive progesterone deficiency symptoms (Progesterone overdose, especially with creams and gels down-regulates and eventually shuts down progesterone receptors.)
- High levels of free (unbound) cortisol which can lead to high blood sugar; insulin resistance; weight gain; low thyroid function; sleep problems; osteoporosis; immune system dysfunction; and GI system problems. (Progesterone and cortisol compete for the same binding protein. When free progesterone floods the system long enough, it can compete with cortisol for the binding protein and release excessive amounts of cortisol into the system.)
- Loss of hormonal feedback loop coordination which disrupts multiple other hormones balances.

Testosterone imbalances can occur in both men and women.

## **Symptoms of Testosterone Deficiency**

- Decreased stamina and energy.
- Low or absent libido.
- Poor muscle tone.
- Weakened, osteoporotic bones.

- Trouble with balance and coordination.
- Decreased sense of well-being.
- Decreased armpit and body hair.

### **Symptoms of Testosterone Excess**

- Acne, oily skin.
- Loss of head hair (male patterned baldness).
- Excess facial hair, excess body hair.
- Mood disturbance, excessive aggressiveness, irritability.
- Deepened voice.

### **Estrogen Dominance**

Estrogen dominance is a condition in which a woman or man can have deficient, normal, or excessive levels of estrogen, but has too little progesterone to balance the estrogen level. Estrogen Dominance has become common in both cycling and menopausal women, and men. So, why is this?

Estrogen dominance has become so predominant due to many of our modern lifestyle choices. One of the main causes is stress which sets off a whole range of hormonal chain reactions. The increased need for cortisol to handle the stress response causes more progesterone to be converted to cortisol. This may cause a shortage of progesterone to balance estrogen.

As cortisol rises insulin rises increasing fat storage. As cortisol rises thyroid hormones decrease, thus slowing metabolism and leading to fat storage. Fat cells make estrogen, exacerbating the imbalance.

Weakened glands are another reason. The adrenals may be fatigued from cortisol production and slow down progesterone production. The ovaries may not produce enough progesterone during the luteal phase of the cycle. Or there may be anovulatory cycles (cycles where menstruation occurs, but no ovulation) resulting in no ovarian progesterone being produced. Low thyroid function may slow down the adrenals and the ovaries as well. All these activities can create a shortage of progesterone to balance estrogen.

The use of oral or injected contraceptives by its very nature is disruptive to the production of progesterone. Remember contraceptives to not “regulate” the cycle, they “suppress” it. Their usage can have both short term and longer-term impacts on progesterone production.

For menopausal women conventional hormone replacement therapy has been to provide estrogen. As we have seen, progesterone is also needed in menopause. Therefore, an unbalanced replacement approach may lead to estrogen dominance.

There are also dietary and nutritional deficiency concerns. The typical American diet: usually high in carbohydrates, low in good fats, high in trans-fats, and low in vegetables and healthy sources of protein leads to nutritional deficiencies and obesity. Deficiencies in magnesium, zinc, copper, iodine, and B complex vitamins play a major role in the health of the endocrine glands and their production of hormones. Obesity is a concern as estrogen is made in fat cells and excess fat cells make excess estrogen.

Last, but certainly not least is exposure to external hormones. This includes xenohormone exposure and plant and animal hormones. The animal hormones are found in our food supply while other hormones are typically found in health and beauty products (a small amount does not have to be labeled!). Xenohormones are chemicals that disrupt our hormonal balance. These are found in health and beauty products, cleaning products, plastics, and many other unsuspecting places as well as pesticides, fungicides, and medications.

### **Symptoms of Estrogen Dominance**

- Anxiety, irritability, anger, agitation
- Cramps, heavy or prolonged bleeding, clots
- Water retention/weight gain, bloating
- Breast tenderness, lumpiness, enlargement, fibrocystic breasts
- Mood swings, depression
- Headaches/migraines
- Carbohydrate cravings, sweet cravings, chocolate cravings
- Muscle pains, joint pains, back pain
- Acne
- Foggy thinking, memory difficulties
- Fat gain, especially in abdomen, hips, and thighs
- Cold hands and feet (low thyroid function because estrogen blocks thyroid hormones)
- Blood sugar instability, Insulin Resistance
- Irregular periods
- Decreased sex drive
- Gall bladder problems (bile becomes thick and sluggish)
- Infertility
- Insomnia
- Osteoporosis
- Endometriosis, Adenomyosis
- Functional ovarian cysts; Polycystic ovaries
- Uterine fibroids
- Cervical dysplasia
- Allergic tendencies
- Autoimmune disorder
- Breast, uterine, cervical, or ovarian cancer

Natural solutions for estrogen dominance include dietary modifications, stress reduction techniques, animal glandular extracts without hormones, specific nutrients, and herbal remedies. As you can see, estrogen dominance is even more complex than the previous hormonal imbalance issues we have discussed. It is multi-faceted as it includes multiple organs and hormones. We can use the symptom lists as guides to identify which hormones are in excess or deficient, yet for long term health and healing we want to support all the affected glands.

There are times when a form of hormone replacement therapy is needed. At those times, the more natural solution is “bioidentical” hormones. Here too, just providing hormones does not address the underlying deficiencies and ultimately the health of the glands. We are dealing with multiple glands and hormones so supplementing with specific hormones may throw the entire system even more out of balance, by creating additional communications challenges for the endocrine system. Therefore, except for extreme cases, it may be best to start with glandular and nutrient support and allow the body to bring itself back into balance naturally.

## **Disclaimer**

This eBook is designed to educate people about diet, a lifestyle approach to health and well-being, natural remedies, options, and dietary supplements. None of this should be construed as a substitute for medical attention. Rather, individuals with specific medical concerns or symptoms should seek advice from a physician.

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