

Female & Male Hormone Profiles in Serum



While minimally-invasive testing has been the hallmark of ZRT Laboratory for 20 years, the option to test in serum gives health care practitioners maximum choice and flexibility, allowing them to choose the best method to suit an individual patient's needs. There are some analytes, e.g., ferritin, that can only be tested in serum, while hormones can be tested in different media (dried blood spot, urine or saliva) but results are dependent on bodily processes involved in distributing or metabolizing them. Serum tests have the advantage of being considered the clinical norm and it can be easier to get insurance reimbursement.

Serum testing of sex hormones can be used to determine circulating endogenous hormone levels in women who are not using topical or vaginal hormone supplementation, and it is not suitable for monitoring such therapy, whereas dried blood spot or saliva testing are. ZRT has a number of resources explaining the differences between testing media when hormones are used in supplementation by a variety of routes of administration – please see the Provider Data Sheet on Female Hormone Profiles in Saliva and DBS and the list of resources regarding testing with supplementation at the end of this document.

For the assessment of analytes offered in our serum hormone profiles, the patient should ideally go to the phlebotomist first thing in the morning since hormones have peak values early in the day.

Available Tests

Female Serum Hormones – Basic Profile

Tests included: Estradiol, Progesterone, Testosterone, DHEA-S, Cortisol, SHBG, TSH

Male Serum Hormones – Basic Profile

Tests included: Estradiol, Testosterone, DHEA-S, Cortisol, SHBG, PSA, TSH

Female Serum Hormones – Advanced Profile

Tests included: Estradiol, Progesterone, Testosterone, DHEA-S, Cortisol, SHBG, TSH, Free T3, Free T4, TPOab, FSH, LH, Ferritin

Male Serum Hormones – Advanced Profile

Tests included: Estradiol, Testosterone, DHEA-S, Cortisol, SHBG, PSA, TSH, Free T3, Free T4, TPOab, LH, Prolactin, Ferritin

Note: Any of the serum tests listed above can be ordered in any combination, or as individual tests added on to an existing serum profile.

Female and Male Serum Hormone Profile Options

PROFILE ▼	Sex & Adrenal Hormones						Prostate Marker	Thyroid Tests				Pituitary Hormones			Iron Status
	E2	Pg	T	DS	C	SHBG	PSA	TSH	fT3	fT4	TPOab	FSH	LH	PRL	FER
Female Basic	•	•	•	•	•	•		•							
Female Advanced	•	•	•	•	•	•		•	•	•	•	•	•		•
Male Basic	•		•	•	•	•	•	•							
Male Advanced	•		•	•	•	•	•	•	•	•	•		•	•	•

Basic profiles are a good start for understanding if your sex hormones, adrenal hormones, and thyroid hormone marker (TSH) are well balanced. Advanced profiles provide a broader overview of the health and balance of your sex and thyroid hormones, and include pituitary hormones that control ovarian production of the sex hormones and help define menopausal status. Iron status, important for thyroid health, is included. PSA and prolactin are included in the Male Profiles as a prescreen for testosterone therapy to exclude prostate issues and pituitary prolactinoma.

Analytes Tested in the Female and Male Hormone Profiles

Sex and Adrenal Hormones

In women, estradiol and progesterone levels and their ratio are an index of estrogen/progesterone balance. An excess of estradiol, relative to progesterone, can explain many symptoms in reproductive age women including endometrial hyperplasia, pre-menstrual syndrome, fibrocystic breasts, and uterine fibroids. In older women using estrogen supplements alone, a deficiency in progesterone can also result in symptoms of estrogen dominance, which include weight gain in the hips and thighs, fibrocystic and tender breasts, uterine fibroids, irritability, water retention, and thyroid problems. These symptoms are also seen in some women approaching menopause, whose estrogen levels swing from high to low without the balancing effects of progesterone. With the onset of menopause, when ovarian estrogen and progesterone production declines, a new subset of symptoms can result from low estradiol levels, including hot flashes, night sweats, vaginal dryness, sleep disturbances, foggy thinking, more rapid skin aging, and bone loss. Maintaining appropriate levels of estradiol, adequately balanced with progesterone, at any age is essential for optimal health.

In men, too much estradiol, relative to testosterone, suppresses testosterone receptors in target tissues and eventually leads to feminizing effects such as breast enlargement. In healthy young men, testosterone is at its highest level and estradiol is very low. However, as men age, this shifts to a higher estradiol/testosterone ratio. Even if testosterone levels are normal, symptoms can indicate a functional testosterone deficiency because of the effects of higher than normal estradiol levels.

There are several mechanisms by which relative levels of estradiol and testosterone can change. Weight gain, whether or not this results from low testosterone, results in increased production of aromatase in fat cells, which converts

testosterone to estradiol. Rising estradiol levels also cause the liver to produce more SHBG, which has a greater affinity for testosterone than estradiol. This acts to suppress further the amount of circulating free testosterone. High estradiol levels can be controlled by weight reduction to decrease the amount of aromatase-producing adipose tissue. There are nutritional and pharmaceutical approaches to aromatase inhibition.

In men, testosterone is the primary indicator of male hypogonadism and andropause. Many things can contribute to low testosterone levels, including high cortisol levels and high estrogen levels. Testosterone production in the testes is controlled by the hypothalamic-pituitary-testicular axis, and so dysfunctions of the hypothalamus or pituitary can affect levels. Estradiol also decreases luteinizing hormone (LH) production by negative feedback on the pituitary gland, which in turn acts to decrease testicular testosterone production.

Excess testosterone in women, seen for example with polycystic ovarian syndrome (PCOS), leads to conditions such as excessive facial and body hair, acne, and oily skin and hair. Too little testosterone is often caused by excessive stress, medications, contraceptives, and surgical removal of the ovaries. This leads to symptoms of androgen deficiency including loss of libido, thinning skin, vaginal dryness, loss of bone and muscle mass, depression, and memory lapses.

SHBG is a protein produced by the liver in response to exposure to any type of estrogen, whether produced naturally by the body, consumed as a synthetic oral contraceptive estrogen, estrogen therapy, or as foods or herbs (phytoestrogens). Thyroid hormone increases SHBG production, whereas insulin, on the other hand, decreases SHBG levels. The SHBG level gives a good index of the extent of the body's overall exposure to estrogens. Released from the liver into the bloodstream, SHBG binds and transports both testosterone and estrogens, thereby regulating the relative amounts of free and bound hormone and consequently their bioavailability to target tissues. The SHBG level is also used to calculate free (unbound) testosterone levels. Testosterone binds about three times more tightly to SHBG than does estradiol, so the increase in SHBG as a result of estrogen exposure causes the relative proportion of bioavailable testosterone to estradiol to decrease, exacerbating the symptoms of testosterone deficiency in men.

DHEA, mostly found in the circulation in its conjugated form, DHEA sulfate (DHEA-S), is a hormone produced by the adrenal glands, and levels generally reflect adrenal gland function. It is a precursor for the production of estrogens and testosterone and is therefore normally present in greater quantities than all

the other steroid hormones. Its production is highest in the late teens to early 20s and declines gradually with age. Like cortisol, it is involved with immune function and a balance between the two is essential. Low DHEA can result in reduced libido and general malaise, while high DHEA can have masculinizing effects on women because it metabolizes to androgens, including testosterone. Because of its conversion to estrogens and androgens, it is important to monitor levels of these hormones, as well as levels of DHEA, during supplementation.

Cortisol is an indicator of adrenal function and exposure to stressors. Under normal circumstances, adrenal cortisol production shows a diurnal variation and is highest early in the morning, soon after waking, falling to lower levels in the evening. Normal cortisol production shows a healthy ability to respond to stress. Low cortisol levels can indicate adrenal fatigue (a reduced ability to respond to stressors) and can leave the body more vulnerable to poor blood sugar regulation and immune system dysfunction. Chronically high cortisol is a consequence of high, constant exposure to stressors, and this has serious implications for long-term health, including an increased risk of cancer, osteoporosis, and possibly Alzheimer's disease.

PSA

PSA is a measure of prostate health and high levels can indicate the presence of BPH or advancing prostate cancer. As prostate cells start to become crowded, they produce PSA, which acts to suppress angiogenesis and therefore reduce the blood supply to the surrounding tissue to prevent it from further growth. High levels are therefore seen only as a result of growth that is fairly rapid. It is important to test PSA levels prior to starting testosterone therapy, as a sharp increase in PSA can indicate prostate problems.

Thyroid Tests

Free T4, free T3, TSH, and TPOab tests can indicate the presence of an imbalance in thyroid function, which can cause a wide variety of symptoms, including feeling cold all the time, low stamina, fatigue (particularly in the evening), depression, low sex drive, weight gain, and high cholesterol. For more information on Thyroid tests, see our Provider Data Sheet on Thyroid Profiles.

Pituitary Hormones

Follicle-stimulating hormone (FSH) and luteinizing hormone (LH) levels are used to assess testicular and ovarian function and are particularly important for assessing fertility and menopausal status. Low levels of LH and FSH can indicate excessive hormone supplementation: in men supplementing with testosterone, low LH and FSH indicate too much testosterone is being used which converts to estrogens, suppressing pituitary

LH and FSH production. In women, estrogen supplementation lowers pituitary FSH production. High levels of LH and FSH in women are associated with infertility as a result of low ovarian egg reserve, and very high FSH is diagnostic of menopause.

Prolactin is a hormone produced by the pituitary gland under the regulation of dopamine¹. It acts on the milk-producing tissues in the breasts to stimulate milk production in breastfeeding mothers, so levels rise in pregnancy and after birth of a child. High prolactin levels in the absence of pregnancy or childbirth can indicate a pituitary tumor, and moderate elevations are also associated with female infertility and menstrual disturbances². Low prolactin levels in men are linked with sexual dysfunction and infertility³.

Ferritin

Circulating ferritin is important for the storage and transport of iron in the body, thereby maintaining a stable supply of iron for hemoglobin synthesis. Elevated serum ferritin, representing iron excess, closely correlates with cardiovascular disease risk factors such as triglyceride and HDL-cholesterol levels, insulin resistance, and high BMI⁴. Iron metabolism is associated with oxidative stress and lipid peroxidation, contributing to dyslipidemia. It is an important emerging biomarker for cardiovascular disease risk, particularly when combined with cardiometabolic markers such as lipid profiles and fasting insulin; it has been found to relate to a clustering of metabolic disorders in non-diabetic elderly individuals⁵. Ferritin is also an acute phase reactant protein and is elevated in chronic inflammatory illness and acute infections⁶, as well as in people with liver damage⁷. On the other hand, iron deficiency anemia is associated with both overt and subclinical hypothyroidism⁸. The iron-containing enzyme thyroid peroxidase is required for synthesis of thyroid hormones. Iron is also an important cofactor in the synthesis of the neurotransmitters dopamine and serotonin. A low serum ferritin level indicates low iron stores and is diagnostic of iron-deficiency anemia.

Relevant ZRT Provider Data Sheets

- ▶ Thyroid Profiles
- ▶ Fertility Profile
- ▶ Female Hormone Profiles in Saliva & Dried Blood Spot

Hormone Testing with Supplementation Guidelines

- ▶ Guide to Steroid Hormone Testing in Different Body Fluids Following Different Routes of Hormone Administration
- ▶ Unraveling the Confusion over Testing in Serum, Saliva, Urine, and Capillary Whole Blood

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