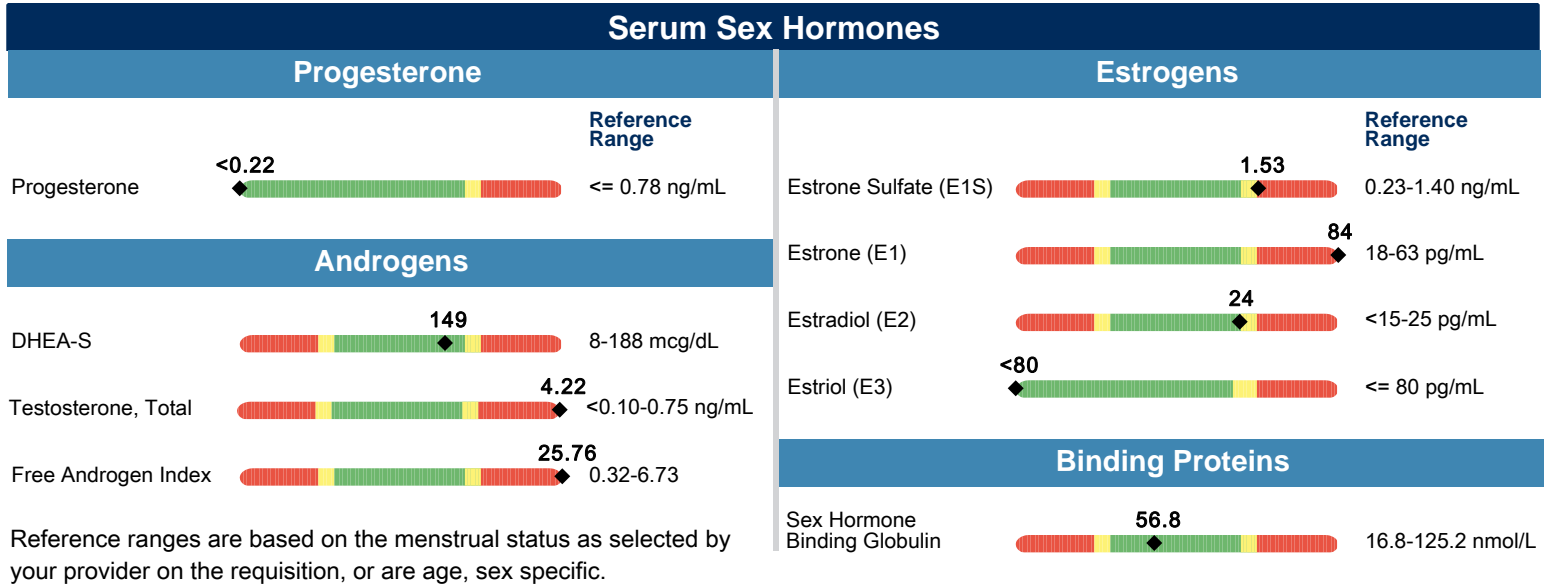




4000 Hormonal Health - Serum

Methodology: Chemiluminescent, RIA



Reference ranges are based on the menstrual status as selected by your provider on the requisition, or are age, sex specific.

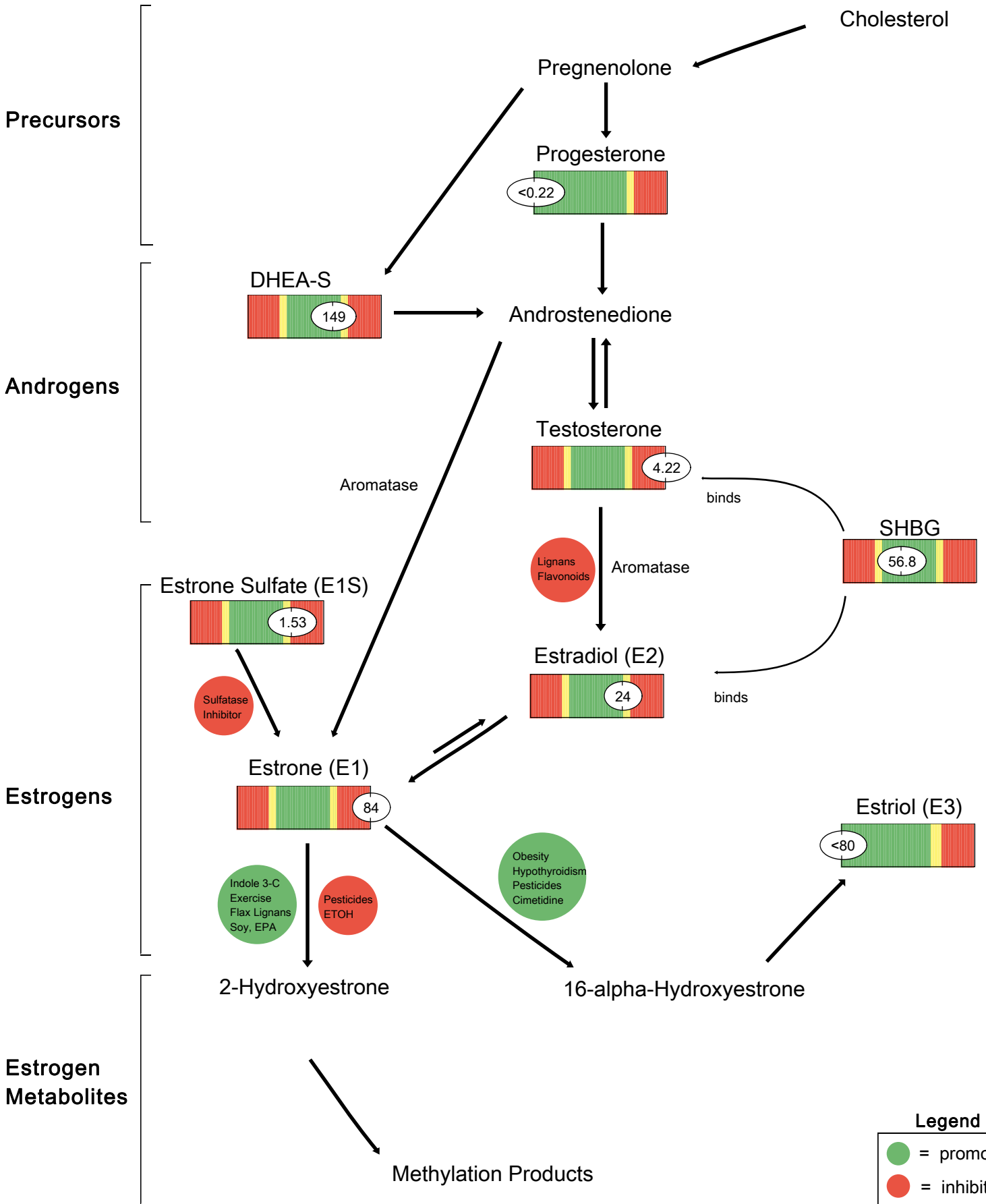
Additional reference range info for other menstrual phases or sex

	Premenopause Luteal	Unsupplemented Menopause	Unsupplemented Male	Patient Result
Estrone Sulfate (ng/mL)	0.75 - 4.28	0.23 - 1.40	Not Established	1.53
Estrone (pg/mL)	43 - 250	18 - 63	46 - 143	84
Estradiol (pg/mL)	37 - 246	<15 - 25	<15 - 32	24
Estriol (pg/mL)	<=80	<=80	<=80	<80
Progesterone (ng/mL)	1.21 - 19.47	<=0.78	<=2.06	<0.22
Testosterone (ng/mL)	<0.10 - 0.75	<0.10 - 0.75	1.75 - 7.81	4.22

The testosterone reference range is based on the manufacturer's range determined from women ages 21-73. Other reference ranges were determined with luteal serum samples from premenopause women. These ranges serve as clinical guidelines. However, each individual is unique and evaluation of hormone status should be within the context of the patient's clinical picture.



Steroidogenic Pathway





Additional Tests

Hormone		Reference Range
Follicle Stimulating Hormone *	<p>21.1</p>	25.8-134.8 mIU/mL
Prolactin (serum)	<p>9.67</p>	2.74-19.64 ng/mL
Androstenedione (serum) *	<p>66</p>	20-75 ng/dL

* Please see commentary section for relevant testing location and reference range details.

Analyte	Premenopause Luteal	Unsupplemented Menopause	Patient Results
FSH (mIU/mL)	1.7 - 7.7	25.8 - 134.8	21.1
Prolactin (ng/mL)	3.34 - 26.72	2.74 - 19.64	9.67
Androstenedione (ng/dL)	73 - 184	20 - 75	66



Commentary

Please note that the reference ranges for Prolactin, Sex Hormone Binding Globulin (SHBG), Progesterone, Testosterone, and DHEA-S have been updated.

The Prolactin and Androstenedione reference ranges were determined with serum samples from adult women.

Reference ranges for Follicle Stimulating Hormone are provided by LabCorp.

Testing for Follicle Stimulating Hormone performed by LabCorp - Regional Lab and Center for Esoteric Testing (CET), 1447 York Court, Burlington, NC 27215. The reference ranges shown are Menopausal.

Androstenedione testing is performed by Quest Diagnostics, Nichols Institute 33608 Ortega Highway, San Juan Capistrano, CA 92675.

Follicle Stimulating Hormone Testing Methodology: Electrochemiluminescence immunoassay (ECLIA)

Prolactin Testing Methodology: Chemiluminescent

Androstenedione Testing Methodology: Chromatography/Mass Spectrometry

Reference ranges are for patients ≥ 18 years of age.

The performance characteristics have been verified for assays performed by Genova Diagnostics, Inc. Those assays have been cleared by the U.S. Food and Drug Administration.

Commentary is provided to the practitioner for educational purposes, and should not be interpreted as diagnostic or as treatment recommendations. Diagnosis and treatment decisions are the practitioner's responsibility.

Progesterone

Progesterone is within the reference range. Progesterone is a steroid hormone that is produced primarily by the corpus luteum in premenopausal women. In menopause, the adrenal glands become the primary source of progesterone, which may fluctuate in response to ACTH secretion by the pituitary. This hormone generally reduces the endometrial proliferative effects of the estrogens.

Binding Proteins

Sex hormone-binding globulin (SHBG) is within the reference range. SHBG serves as a protein carrier for steroid hormones, with a binding affinity in the order of dihydrotestosterone > testosterone > estradiol. The biologic effects of these steroid hormones (especially testosterone) are largely determined by the unbound portion. Thus, SHBG exerts a major regulatory effect on circulating levels of these steroids.

Androgens

Commentary

Dehydroepiandrosterone sulfate (DHEA-S) is within the reference range. DHEA-S circulates in a higher concentration than any other steroid, is derived from the adrenal gland in response to ACTH, and is the storage form for DHEA. This hormone serves as a precursor to other androgens, which may in turn be enzymatically converted to estrogens via aromatase activity in various tissues, particularly adipose, skin, and bone. Since much of the bone-protective effect of estrogen appears to be dependent on aromatization from androgens within bone tissue itself, DHEA-S may be particularly important in the menopausal woman. DHEA-S also plays an important role in thyroid function, immune regulation, maintenance of libido and lean body mass, insulin sensitivity, and balancing the body's stress response.

DHEA-S levels peak between the ages of 20 and 30 years, thereafter decreasing markedly, along with downstream androgens and estrogens. This decline may be as much as 5% per year, so that a 70-year old woman's DHEA-S level is only 20% of her normal young adult value. Low normal levels of DHEA-S have been observed in numerous conditions including chronic stress, depression, obesity, impaired immunity, rheumatoid arthritis, lupus, and cardiovascular disease. In light of such correlations, it may be prudent to regard low normal levels as clinically significant in patients whose clinical picture supports it.

Testosterone is above the reference range. In the menopausal woman, testosterone is derived from both adrenal and ovarian activity, although production in the latter decreases in comparison to premenopausal years. In peripheral tissues, particularly adipose, testosterone is converted into estradiol via the aromatase enzyme. Elevated testosterone in women may be related to conditions such as hyperandrogenism (e.g. hirsutism, acne, or deepening of the voice), polycystic ovary syndrome (PCOS), adrenal hyperplasia, breast cancer, and insulin resistance. While normal levels provide protection against osteoporosis, and help maintain libido and lean muscle mass, the elevated level may be problematic. Efforts to normalize insulin resistance, if relevant, may improve elevated levels in some women, particularly those with PCOS.

The **Free Androgen Index** is described in the literature and provides a calculated indicator of unbound (bioavailable) testosterone. While not representing ALL of the androgenic effects present, the FAI is a reasonable means to determine the effects of androgens in women. This value is calculated by multiplying the testosterone value by a unit conversion factor, dividing by the SHBG value, and multiplying by 100. The FAI may be particularly significant in relation to PCOS, hirsutism, acne, and breast cancer.

Estrogens

Estrone sulfate (E1-S) is above the reference range. Estrone sulfate is the most abundant circulating estrogen in non-pregnant women. Because E1-S is unable to bind to the estrogen receptor, it is biologically inactive. However, E1-S serves as an important reservoir for active estrogens, especially after menopause when the ovary is no longer the primary source of estrogens. E1-S is converted to estrone within estrogen target tissues such as ovary, placenta, skin, brain, endometrium, bone, and blood. Estrone can then be converted to the more potent estradiol, or be re-sulfated to inactive E1-S.

High circulating E1-S suggests efficient sulfation of E1 in peripheral tissues. Elevated levels are associated with increased risk of breast- and endometrial cancer, presumably due to its conversion to active E1 and E2, and are positively correlated with body mass index, alcohol ingestion, and saturated fat intake. Together, E1-S, E1, and E2 provide an approximation of total estrogenicity in the body.

Estrone (E1) is above the reference range. Estrone is the second most potent estrogen after estradiol and is derived from either adrenal androstenedione via aromatization in peripheral tissues such as adipose, or from estradiol (reversible reaction). Although total estrogens decline in menopause, estrone becomes the predominant circulating estrogen. Estrone is bound primarily to albumin rather than SHBG. Elevated estrone may reflect increased adrenal production of androgens or increased aromatase activity in adipose tissue, or a peri-menopausal state in which all estrogens may still be on the higher side.

Commentary

Estrone may be processed via either the 2- or 16alpha-hydroxylation pathways to form 2-hydroxyestrone or 16alpha-hydroxyestrone, respectively. These pathways are modifiable via dietary and lifestyle factors and can significantly influence risk of breast cancer and other estrogen-dependent conditions. A high estrogen level makes attention to the hydroxylation pathways even more important. (See the "Estrogen Metabolism" section of the report).

Estradiol (E2) is within the reference range. Estradiol is the most potent estrogen and is the major estrogen secreted by the ovaries in a premenopausal woman. In the postmenopausal woman, estradiol arises either from estrone (reversible reaction) or from testosterone via aromatization in peripheral tissues such as adipose. Although more potent than estrone, estradiol is the less plentiful of the two estrogens in postmenopausal women.

Estrogens stimulate growth and development of tissues related to female reproduction such as the breasts, vagina and uterus. Estrogens in postmenopausal women assist with maintenance of bone integrity and vascular smooth muscle tone, collagen production, brain activity, and the maintenance of normal vaginal epithelial function.

Estriol (E3) is within the reference range. The least potent of the estrogens, E3 levels are traditionally used clinically to gauge the viability of pregnancies. In the context of this profile, estriol is least likely to be associated with high-estrogen problems (e.g. breast cancer), and is generally viewed as a "protective" estrogen. Estriol originates from conversion of estrone via 16alpha-hydroxyestrone; thus E3 represents a terminal point along estrogen metabolism. Normal levels imply relative balance in enzyme conversion among its sources.



Vitamin D

Methodology: Chemiluminescent

	Inside Range	Reference Range:
25-Hydroxyvitamin D ♦	62	30-100 ng/mL

Deficiency:	<20 ng/mL
Insufficiency:	20-29 ng/mL
Sufficient:	30-100 ng/mL
Recommended:	50-80 ng/mL
Excessive:	>100 ng/mL

There is no consensus in the literature regarding optimal levels of 25-Hydroxyvitamin D. Higher levels of 25-Hydroxyvitamin D may be concerning in patients with renal failure. Levels below 30 ng/mL are considered insufficient by most medical associations.

Holick MF, et al. *J Clin Endocrinol Metab.* 2011;96(7):1911-1930.
Vitamin D Council: <https://www.vitamindcouncil.org/>

Commentary

The performance characteristics of all assays have been verified by Genova Diagnostics, Inc. Unless otherwise noted with ♦, the assay has not been cleared by the U.S. Food and Drug Administration.

Commentary is provided to the practitioner for educational purposes, and should not be interpreted as diagnostic or as treatment recommendations. Diagnosis and treatment decisions are the practitioner's responsibility.

Sufficient levels:

Vitamin D is a hormone produced in the skin during exposure to sunlight or consumed in the diet, and converted to its active form, calcitriol, in the liver and kidneys. Vitamin D helps regulate serum calcium and phosphorus levels by increasing intestinal absorption of calcium and stimulating tubular reabsorption of calcium. Vitamin D also affects numerous other functions in the body.

Recommended levels are protective against osteoporosis as well as infection, autoimmune disease, hypertension, arteriosclerosis, diabetes and insulin resistance, musculoskeletal pain, epilepsy, and migraine.