63 Zillicoa Street
Asheville, NC 28801

Patient: **SAMPLE PATIENT**
DOB:
Sex:
MRN:

4106 One Day Hormone Check - Saliva

Methodology: EIA and LIA

Therapeutic Cohort Results

Hormone	Result †	QUINTILE DISTRIBUTION (1st 2nd 3rd 4th 5th)	Therapeutic Range*
Estradiol (E2)	4.0		2.9-13.7 pmol/L
Estrone (E1)	50.0		36.6-253.2 pmol/L
Estriol (E3)	90		<=135 pmol/L
Testosterone	50		34-183 pmol/L
Progesterone	60		52-850 pmol/L
P/E2 Ratio	15		10-106

* The therapeutic ranges depicted are for informational purposes only, and were derived from a cohort of peri/menopausal women ranging in age from 37-62 years. All women were treated with bioidentical hormone therapy (HT) utilizing combinations of the following: Biest (transdermal); Progesterone (oral micronized); Testosterone (transdermal); and 7-keto-DHEA (oral).

† Patient results with Genova's standard reference ranges are reported on the following pages.

GENOVA DIAGNOSTICS

63 Zillicoa Street
Asheville, NC 28801

Comprehensive Hormonal Health Test

Patient: **SAMPLE PATIENT**
DOB:
Sex:
MRN:

4106 One Day Hormone Check - Saliva

Methodology: EIA and LIA

Hormone Results

Estradiol ♦ pmol/L	4.0

	Reference Range
Follicular	2.8-8.8 pmol/L
Peak *	4.5-19.1 pmol/L
Luteal	2.8-8.2 pmol/L
Menopausal	3.7-9.4 pmol/L
Male	3.1-7.4 pmol/L
* Peak = Days 11 and 12	

Testosterone ♦ pmol/L	50

	Reference Range
Premenopausal	34-148 pmol/L
Menopausal	34-148 pmol/L
Male	110-513 pmol/L

Estrone pmol/L	50.0

	Reference Range
Menopausal	31.9-183.4 pmol/L

Progesterone ♦ pmol/L	60

	Reference Range
Follicular	17-321 pmol/L
Peak *	151-829 pmol/L
Luteal	33-452 pmol/L
Menopausal	45-370 pmol/L
Male	31-280 pmol/L
* Peak = Days 18 and 20	

Estriol pmol/L	90

	Reference Range
Menopausal	<= 133 pmol/L

P/E2 Ratio	15

	Reference Range
Follicular	10-85
Luteal	8-80
Menopausal	12-62

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.

Estrogens play a critical role in female sexual development, menstrual function, protein synthesis, cardiovascular function, bone formation and remodeling, cognitive function, emotional balance and other important health factors. The estrogenic potency of estradiol is 12 times that of estrone and 80 times that of estriol. Estradiol is the primary estrogen in premenopausal women. Estrone is the second most potent estrogen compared to estradiol. After menopause, estrone becomes the primary estrogen as the ovary loses its ability to manufacture estradiol, and it is synthesized in the adrenal glands and fat cells. Estriol is considered to be the mildest and briefest-acting of the three estrogens. Estrogen metabolism and synthesis in men appear to remain relatively stable across the life course.

- In women, lower levels of estrogens have been associated with a variety of clinical symptoms: peri/menopausal symptoms (vasomotor symptoms; mood and memory alterations; atrophic vaginitis, a condition associated with decreased vaginal lubrication and thinner vaginal epithelial; lining diminished skin tone); altered lipid metabolism; accelerated rate of bone loss. Excessive estrogen levels have been associated with increased risk of some hormone-dependent cancers.
- In men, low levels of estrogen may be associated with decreased bone density, cognitive decline and cardiovascular disease. Excessive estradiol levels have been associated with greater risk of stroke and cardiovascular disease, as well as BPH, gynecomastia, decreased sexual function and weight gain. A source of elevated estrogen in men may be associated with men who have a higher body fat percentage, as increased aromatization of testosterone to estradiol can occur in adipose tissue.
- In a large, population based study of salivary sex hormone levels in older adults researchers found: Older men and women had similar estradiol concentrations. Estradiol concentrations have been associated with cognition, mood, and memory in women and, in combination with testosterone and other factors, preservation of memory and cognitive function in men.

Progesterone is important for normal reproductive and menstrual function, and influences the health of bone, blood vessels, heart, brain, skin, and many other tissues and organs. As a precursor, progesterone is used by the body to make other steroid hormones, including DHEA, cortisol, estrogen and testosterone. In addition, progesterone plays an important role in mood, blood sugar balance, libido, and thyroid function, as well as adrenal gland health. Progesterone is primarily produced in the ovaries in premenopausal women and in the adrenal cortex in postmenopausal women. Although progesterone is found in both women and men, the physiologic role in men is poorly understood.

- In women, lower levels of progesterone have been associated with dysfunctional uterine bleeding, and may play a role in osteoporosis and impaired neurological function. Excessive amounts can result in problems such as dysglycemia, alopecia, acne and breast tenderness.
- The clinical significance of elevated or low levels in men is poorly understood. Low progesterone levels may be involved in male infertility. Increased levels of progesterone have been found in states of stress and anxiety in men and women: this may relate to its sedative or stress countering effects.

Testosterone is an androgenic sex steroid/hormone that helps maintain libido, influences muscle mass and weight loss, and plays a role in the production of several other hormones. During the aging process, testosterone levels gradually decline in both sexes, which can lead to loss of bone density. Testosterone concentrations tend to be higher in men versus women.

- In women, imbalances of testosterone have been associated with various forms of coronary heart disease and

Commentary

cardiovascular events, including myocardial infarction in postmenopausal women. Low salivary testosterone levels have also been shown in women with breast cancer compared to age-matched controls. Obese women exhibit higher levels of free salivary testosterone. Excessive amounts are associated with PCOS, acne, oily skin and hirsutism.

- In men, lower levels of testosterone are associated with aortic, peripheral vascular, and cardiovascular disease in middle-aged and older men. In some but not all studies, lower levels of testosterone predict increased incidence of cardiovascular events and mortality. Additionally, elevated testosterone can be associated with CVD risk. Men with excessive testosterone may exhibit aggressive behavior or increased irritability, and hair loss (scalp).
- In men and women, low levels of testosterone have been associated with lower coital frequency and loss of sexual desire in men and women. Low levels are also associated with reduced stamina and lean muscle mass, anxiety, depression and cognitive decline in both men and women.

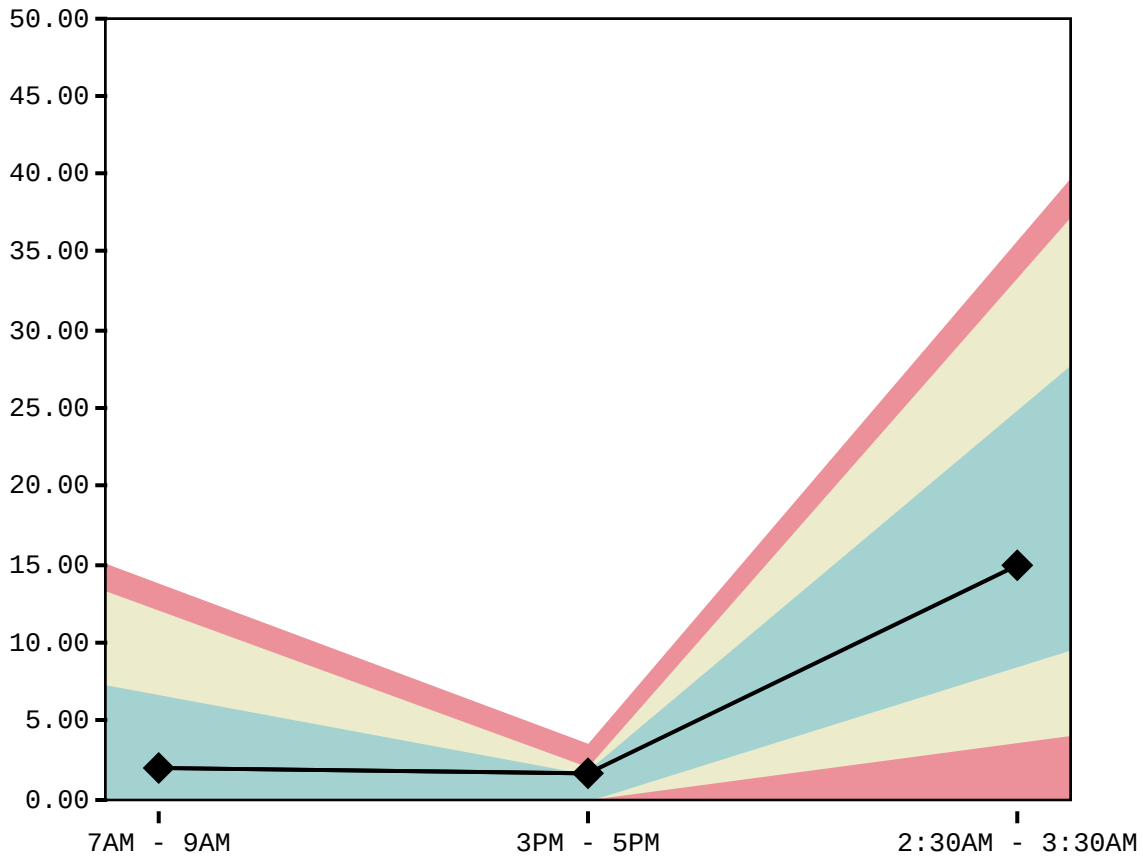
The P/E2 ratio describes the relationship between progesterone and estradiol levels, and is used clinically to ascertain dominance of one hormone compared to the other.

- An elevated ratio may indicate progesterone dominance, and symptoms may be consistent with progesterone excess.
- A low ratio may indicate estrogen dominance, and symptoms may be consistent with estrogen excess.

Comprehensive Melatonin Profile

Methodology: EIA

Salivary Melatonin



Results

	7AM-9AM*	3PM-5PM*	2:30AM - 3:30AM*
Patient Results (pg/mL) >>	**2.00**	**1.60**	**15.00**
Reference Range (pg/mL) *Based on Collection Times	<=12.12	<=1.97	3.71-33.38

Commentary

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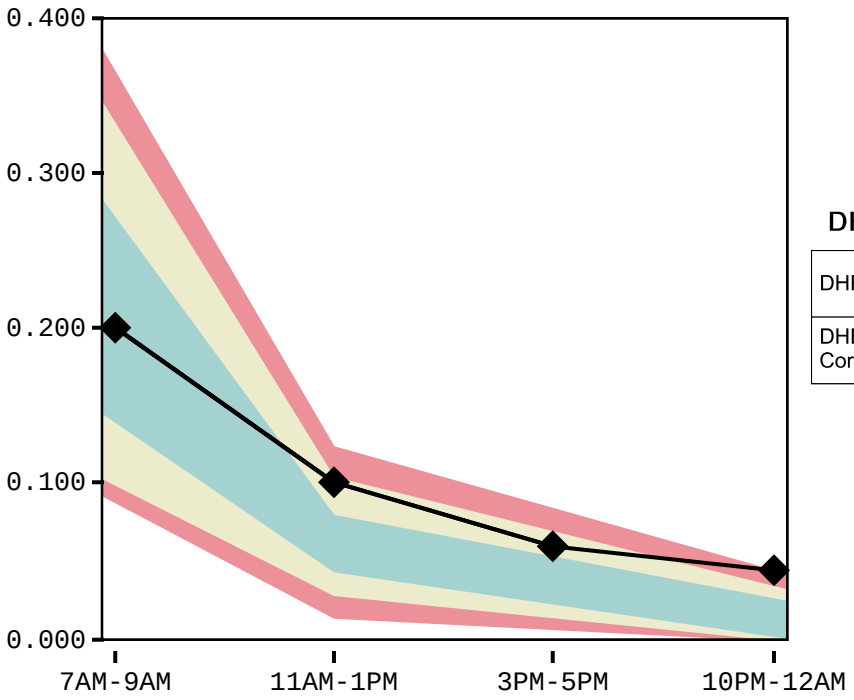
Melatonin activity is normal throughout the sample period revealing a normal melatonin circadian rhythm.

As well as playing a crucial role in sleep-wake cycles, melatonin influences other vital functions, including cardiovascular and antioxidant protection, endocrine function, immune regulation and body temperature.

Methodology: EIA

Salivary Cortisol and DHEA

Cortisol, Free (Salivary)



DHEA

		Reference Range
DHEA 7AM - 9AM♦	150	71-640 pg/mL
DHEA: Cortisol Ratio/10,000♦	750	358-2,538

Results

Cortisol, Free (Salivary)	7AM-9AM*	11AM-1PM*	3PM-5PM*	10PM-12AM*
Patient Result (mcg/dL) >>	**0.200**	**0.100**	**0.060**	**0.043**
Reference Range (mcg/dL) *Based on Collection Times	0.097-0.337	0.027-0.106	0.013-0.068	<=0.034
Actual Collection Time	7:00AM	11:00AM	4:00PM	11:00PM

Commentary

Cortisol reference ranges are for patients 18-65 years old.

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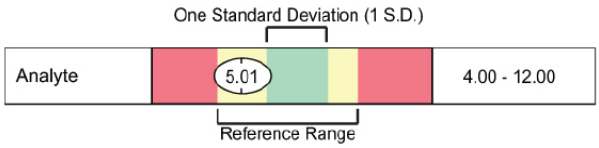
The **Reference Range** is a statistical interval representing 95% or 2 Standard Deviations (2 S.D.) of the reference population.

Commentary

One Standard Deviation (1 S.D.) is a statistical interval representing 68% of the reference population. Values between 1 and 2 S.D. are not necessarily abnormal. Clinical correlation is suggested. (See example below)



Diurnal Cortisol Rhythm/Slope

The natural cortisol diurnal rhythm shows a peak within the first hour after awakening, a rapid decline over the morning hours, and then a tapering through the rest of the day before reaching a nighttime nadir.

A flat slope is characterized by low morning levels, blunted afternoon response and/or evening drop in cortisol levels. Flattened slopes are:

- Associated with a chronic stress burden, poor psychosocial functions, lack of HPA axis resiliency and lower perceived control over stress.
- Predictive of health outcomes, such as increased breast cancer mortality, increased coronary calcifications, and increased body mass index.
- Seen in Post-Traumatic Stress Disorder (PTSD), persistent fatigue, anxiety, depression, and Addison's Disease.

A "high flat" slope is characterized by high morning levels that fail to show a diurnal decrease.

- They can be a normal/appropriate response to a major stressor.
- High flat slopes might also suggest a challenge that seems insurmountable.

Timed Cortisol Measurements

Specific cortisol elevations throughout a diurnal rhythm may be caused by any number of acute mental, emotional and physical daily stressors, blood sugar dysregulation, exercise or pain. Abnormal results should be correlated with each patient's clinical presentation and specific daily routine.

Morning (7:00 AM – 9:00 AM) cortisol measurement reflects peak ACTH-mediated adrenal gland response.

- Exaggerated levels can be seen with exercise, blood sugar dysregulation, daily stressors, pain, and underlying adrenal hyperplasia or Cushing's syndrome.
- Low levels may reflect an inability to mount a peak response as is seen in adrenal dysfunction and/or down regulation from chronic stressors.

Mid-morning (11:00 AM – 1:00 PM) cortisol levels reflect an adaptive function of the HPA axis to daily routine.

- Elevated levels should be correlated with daily stressors, such as exercise, blood sugar dysregulation, perceived and actual lifestyle stressors and pain.
- Lower levels can reflect HPA axis dysfunction.

Afternoon (3:00 PM – 5:00 PM) cortisol is often reflective of glycemic control due to the post-prandial timing of collection.

Commentary

- Elevated levels can reflect any number of daily stressors as previously outlined.
- Low levels can reflect underlying HPA axis dysfunction.

Evening (10:00 PM – 12:00 AM) cortisol levels are a good indication of baseline HPA axis function since they represent the lowest level during the circadian rhythm.

- Elevated levels may be due to stress, exercise, alcohol, and specific lifestyle stressors.
- Elevated evening salivary cortisol is linked to insomnia
- High evening cortisol levels are also associated with various diseases such as diabetes, cardiovascular disease, hormonally driven cancers, and osteoporosis.

Treatment of elevated cortisol should be directed at the root cause of the stressor. Lifestyle modification with relaxation methods, dietary changes, pain management, and overall HPA axis support with nutrition and/or adaptogens can be helpful. Glandulars may be added if additional support is necessary.

References:

1. Clow A, Thorn L, Evans P. Hucklebridge F. The awakening cortisol response: methodological issues and significance. *Stress.* 2004;7(1):29-37.
2. Stalder T, Kirschbaum C, Kudielka BM, et al. Assessment of the cortisol awakening response: Expert consensus guidelines. *Psychoneuroendocrino.* 2016;63:414-432.
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5. Saxbe DE. A field (researcher's) guide to cortisol: tracking HPA axis functioning in everyday life. *Health Psychol Rev.* 2008;2(2):163-190.