GENOVA DIAGNOSTICS EUROPE

46-50 Coombe Road
New Malden
Surrey KT3 4QF

63 Zillicoa Street
Asheville, NC 28801

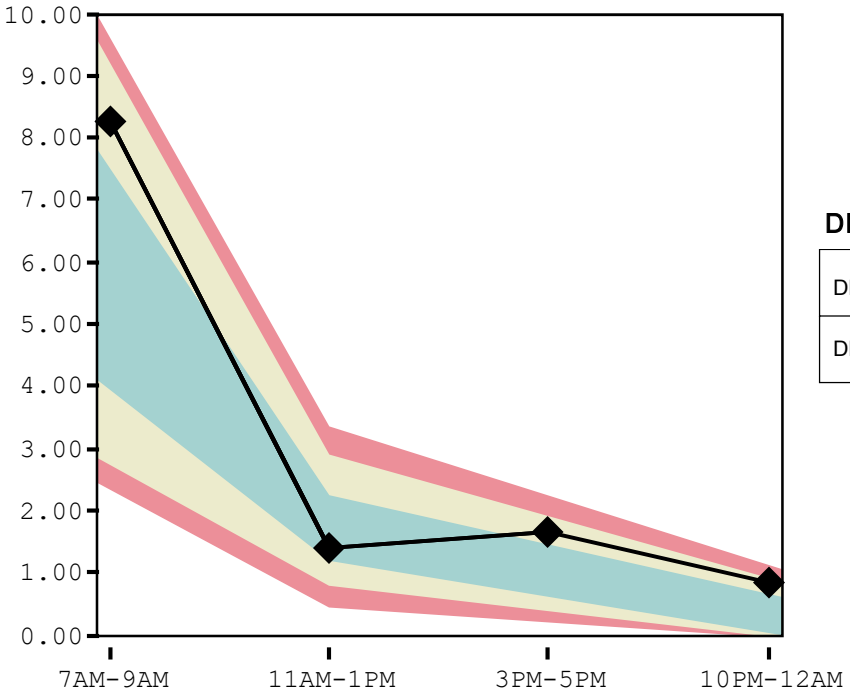
Adrenal Stress Profile

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

4302 Adrenal Stress Profile
Methodology: EIA

Salivary Cortisol and DHEA

Salivary Cortisol



DHEA

		Reference Range
DHEA ♦	1.91	0.25-2.22 nmol/L
DHEA: Cortisol Ratio♦	0.23	0.05-0.32

Results

	7AM-9AM*	11AM-1PM*	3PM-5PM*	10 PM-12AM*
Patient Result (nmol/L) >>	**8.28**	**1.38**	**1.66**	**0.83**
Reference Range (nmol/L) *Based on Collection Times	2.68-9.30	0.75-2.93	0.36-1.88	<=0.94
Actual Collection Time	7:01AM	9:01AM	3:01PM	10:01PM

Commentary

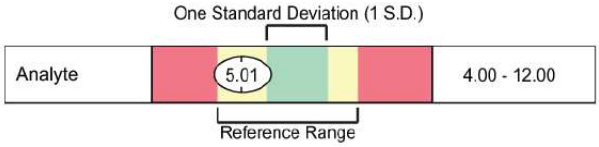
Cortisol reference ranges are for patients 18-65 years old.

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.

The performance characteristics of all assays have been verified by Genova Diagnostics, Inc. All assay have been cleared by the U.S. Food and Drug Administration, unless otherwise noted with ♦.

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

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)



Cortisol reference ranges are based on samples collected over one day during the following time periods (+/- 2hrs):
#1: 7AM - 9AM
#2: 11AM - 1PM
#3: 3PM - 5PM
#4: 10PM - 12AM

Results for samples collected outside the recommended time period should be interpreted with caution as the stated reference range may not apply.

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.

Commentary

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.

Sample 1 (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.

Sample 2 (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.

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

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

Sample 4 (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.

DHEA

DHEA levels peak at around age 25, then decline steadily through the following decades. DHEA can be converted downstream in the steroidogenic pathway to create androgens and estrogens. It has antioxidant and anti-inflammatory properties and can be protective against corticosterone's neurotoxic effects.

- Lower levels of DHEA are seen with advancing age and have been associated with immune dysregulation, cardiovascular disease, arthritis, osteoporosis, insomnia, declining cognition, depression, fatigue, and decreased libido.
- Elevated levels of DHEA may reflect endogenous exposure and supplementation. Other considerations include Polycystic Ovarian Syndrome (PCOS,) adrenal hyperplasia and adrenal tumors.

Commentary

General recommendations include overall control of the cortisol response, HPA axis support using nutrition, adaptogens, and behavioral modification.

DHEA:Cortisol Ratio

This calculation represents anabolic and catabolic balance. Since DHEA acts not only as an anabolic hormone, but appears to down-regulate the cellular effects of cortisol, this measurement can theoretically enhance the predictive value of HPA axis dysfunction.

- An elevated ratio reflects elevated DHEA levels as compared to cortisol, which favors anabolic activity. Specific cortisol and DHEA abnormalities should be evaluated as outlined previously.
- A decreased ratio generally reflects a more catabolic state. It is associated with cortisol elevations and HPA-axis imbalances. Specific cortisol and DHEA abnormalities should be addressed.
- An optimal ratio indicates proper HPA axis homeostasis.

References:

1. Saxbe DE. A field (researcher's) guide to cortisol: tracking HPA axis functioning in everyday life. *Health Psychol Rev.* 2008;2(2):163-190.
2. Maninger N, Wolkowitz OM, Reus VI, Epel ES, Mellon SH. Neurobiological and neuropsychiatriceffects of dehydroepiandrosterone (DHEA) and DHEA sulfate (DHEAS). *Front Neuroendocrinol.* 2009;30(1):65-91.
3. Pluchino N, Drakopoulos P, Bianchi-Demicheli F, Wenger J, Petignat P, Genazzani A. Neurobiology of DHEA and effects on sexuality, mood and cognition. *J Steroid Biochem Mol Biol.* 2015;145:273-280.
4. Clow A, Hucklebridge F, Thorn L. The cortisol awakening response in context. *Int Rev Neurobiol.* 2010;93:153-175.
5. Stalder T, Kirschbaum C, Kudielka BM, et al. Assessment of the cortisol awakening response: Expert consensus guidelines. *Psychoneuroendocrinology.* 2016;63:414-432.
6. Wust S, Wolf J, Hellhammer DH, Federenko I, Schommer N, Kirschbaum C. The cortisol awakening response-normal values and confounds. *Noise health.* 2000;2(7):79.
7. Fries E, Dettenborn L, Kirschbaum C. The cortisol awakening response (CAR): facts and future directions. *Int J Psychophysiol.* 2009;72(1):67-73.