

## Lab Test Descriptions

### Functional Adrenal Stress Profile: BHD #201

- Sample required: 4 vials with 3 mL each of saliva
- Lab reporting time: 3 - 4 business days

**Overview** The Functional Adrenal Stress Profile requires a series of four time specific saliva collections (morning, noon, afternoon and nighttime) during a typical day on which cortisol is measured to establish its circadian rhythm. Additionally, the sulfated form of DHEA (DHEA-S) is measured on the noon and afternoon samples and the average of those results is reported. Assessing the cortisol rhythm and DHEA-S average is a critical first step in new patient evaluation as well as a fundamental component in follow up studies.

**Physiology** Cortisol, which is best known for stimulating gluconeogenesis, is essential for normal glycogenolysis. Cortisol affects the heart, vasculature, blood pressure, water excretion, and electrolyte balance. It mobilizes protein stores in all tissues except the liver; it mobilizes fatty acids from adipose; it is the precursor of cortisone and acts as an anti-inflammatory; and it is the primary hormone directing immune function. Cortisol can stimulate or inhibit gene transcription, promote apoptosis, and affect bone metabolism and calcium dynamics. It affects behavior, mood, neural activity, and a variety of central nervous system biochemical processes. Cortisol affects the eyes, gastrointestinal tract, reproductive function, and the production and clearance of other classes of hormones. It is a major marker of the complex control loops regulating the sex hormones. The general effect of excess cortisol is usually stimulatory and catabolic; a deficiency of cortisol usually results in a slowing of physiology.

The salivary free fraction of the adrenal cortisol output is reported because of its high clinical correlation to accurately assess adrenal function. To determine the cortisol circadian rhythm, four individual cortisol levels is taken at specified intervals throughout the day: in the morning between 6 and 8 a.m., between 12 and 1 p.m., in the late afternoon around 4 or 5 p.m., and at nighttime between 10 p.m. and 12 a.m.

In the presence of stressors, the body almost immediately attempts to increase cortisol levels. This increase is associated with both endocrine and autonomic responses in preparing the body to defend itself normally. However, elevated cortisol levels for extended periods negatively affect virtually every aspect of physiology. For

example, it becomes more difficult to maintain proper blood sugar levels; to slow down for rest, recovery, and repair; to get good quality sleep; to balance other hormones; to maintain mucosal immune integrity; to maintain bone mass, to produce effective general immune function; to effectively regulate inflammatory processes; or to detoxify the body. Without proper intervention, continued high adrenal stimulation can lead to adrenal exhaustion and lowered cortisol levels. Eventually adrenal or cardiac failure can occur.

DHEA is the major precursor of testosterone and the estrogens. It becomes active at puberty. In this profile, the more stable, sulfated form of DHEA, DHEA-S is measured, providing a more reliable measure of DHEA levels than measuring DHEA directly. DHEA is an important modulator of many physiological processes. It promotes the growth and repair of protein tissue (especially muscle), and acts as a counter-regulatory agent to cortisol, negating many of the harmful effects of continued excess cortisol. When increased demand for cortisol is prolonged, DHEA levels decline. DHEA then is no longer able to balance the negative effects of excess cortisol. Depressed DHEA levels serve as an early warning of potential adrenal exhaustion. In fact, adrenal exhaustion is evidenced by an elevated ratio of the sum of the four cortisol measurements to the DHEA-S average. (The ideal level of the aforementioned ratio is 5 or 6:1)

A chronic imbalance between adrenal stimulation and cortisol and/or DHEA output is associated with a multitude of both clinical and subclinical systemic disorders. Chronically depressed DHEA output results in an imbalance in sex hormones. Abnormal cortisol and/or DHEA values (either elevated or depressed) result in a decrease in the activity of the immunocytes that produce secretory IgA (sIgA). sIgA provides a mucosal first-line immune defense against virtually every pathogen, including parasites, protozoa, yeasts, fungi, bacteria, and viruses. sIgA also provides a normal immune response to regularly encountered food proteins. Dysfunctional mucosal immunity is associated with an increased risk of infections and of adverse food reactions.

**Clinical Use** The degree and timing of cortisol imbalances provide the healthcare professional with valuable insights into the nature of causative stressors, and allow the practitioner to formulate remedial protocols. Readily identifiable inducers of increased adrenal stimulation include stressors such as tissue damage, inflammation, pain, and mental or emotional stress. Other significant physiological stressors can be subclinical, and include intolerance to the gliadin fraction of gluten protein, lactose or sucrose intolerance, glycemic dysregulation, delayed food sensitivity, and infection with viruses, bacteria parasites and/or other pathogens. **Additional testing**

**may be necessary to rule out the possibility of these and other factors interfering with digestion and absorption and creating inflammation and stress on adrenal glands.** These types of problems could impede absorption and assimilation of essential nutrients, and the maintenance of normal blood sugar. Chronic dysfunction of any of these processes is a sufficient cause of adrenal exhaustion. Physiological pathways, organs, or systems identified as being the major cause of some other disorder may concurrently serve as causative agents in adrenal exhaustion. In most cases, regardless of the priority given to another pathway, organ, or system as being dysfunctional and virtually regardless of the condition identified as adrenal exhaustion resulting from excessive stress must be addressed and rectified in order to restore normal physiology or function.

**Conditions Assessed** Conditions that may be assessed include adrenal exhaustion, often misdiagnosed as hypothyroid, but may include a hypothyroid condition as well; systemic hyper or hypo-excitability, whether of suspected neural or hormonal origin, including suspected thyroid, pancreatic, and sex hormone disorders; states of immunodeficiency; and states of abnormal physiological response to any of a variety of stimuli including foods in the normal diet.

**Logical Sequence of Testing** The logical sequence of using this test as an initial or as a follow-up test is determined by a variety of individual considerations, including the patient's chief complaint, the array of signs and symptoms, the chronicity of the condition, the tests previously taken, and the judgment of the practitioner.

**COST : \$160**

### **Functional Adrenal Stress Profile plus V, #205**

- Turnaround: 3 -4 days
- 4 Cortisol, 2 averaged DHEAS, 1 Estradiol, 1 Estriol, 1 Testosterone (AM), 1 Melatonin (bedtime), 1 Progesterone (bedtime)

This profile is clinically indicated to evaluate an individual's ability to adapt to

environmental, mental, emotional, and physiological stressors; to determine the efficacy of DHEA therapy; to assess rest and recovery relative to morning and bedtime cortisol; and bedtime levels of melatonin and progesterone.

The Functional Adrenal Stress Profile plus V provides an adrenal rhythm and a DHEA to Cortisol ratio. Abnormal adrenal rhythm can negatively influence energy

production; immune system health; skin regeneration; muscle and joint function; bone health; sleep quality; and liver, pancreas and thyroid function.

Adrenal dysfunction may be associated with the following symptoms: excessive fatigue; chronic stress and related health problems; dizziness upon standing; weakness; hypoglycemia; nervousness; irritability; depression; inability to concentrate; confusion; poor memory; low blood pressure; insomnia; premenstrual tension; sweet cravings; headaches; alcohol intolerance; excessive hunger; alternating diarrhea and constipation; sternocleidomastoid/trapezius pain and spasms; epigastric discomfort; poor resistance to infection; food and/or inhalant allergies; dyspepsia; tenderness in adrenal area; migraine headaches; low body temperature; and diminished sex drive.

Estrogens and Testosterone are included in this profile to further evaluate the efficacy of DHEA therapy. Since DHEA can convert to Estrogens and/or Testosterone, the use of DHEA may be contraindicated if Estrogens and/or Testosterone levels are elevated.

Conversely, if Estrogens and/or Testosterone levels are depressed, DHEA and/or other therapeutic measures may be indicated. Bedtime Cortisol, Melatonin, and Progesterone levels are indicators for rest and recovery and are indicated for anyone with sleep disorders.

**SUMMARY:** Evaluating the Cortisol circadian (24hour) rhythm along with DHEA provides an accurate assessment of adrenal function and can reveal maladaptation to stressors. Salivary (free fraction) hormone testing determines the bioactive values at the cellular level, thereby providing a functional assessment of the effects of environmental and physiological stressors.

**COST: \$277**

## Expanded Premenopause Hormone Profile: BHD #208

- Sample required: 17 test tubes with 3 mL each of saliva
- Lab reporting time: 3 - 4 days

**Overview** This test is ideal for mapping female cycles longer than 24 days or for data collection. This test uses 17 saliva samples to measure the rhythm of progesterone and one of the estrogens [namely, estradiol (E2)] over a complete menstrual cycle. The results provide a mapping of the menstrual cycle to aid in the evaluation of metabolic imbalances associated with sex hormones.

**Physiology** The menstrual cycle involves the functional and structural uterine changes necessary for the development and fertilization of an ovum. The cycle is lunar in length, with 28 days usually listed as normal. Progesterone and estrogen act as leaders in the cycle, and the levels of other hormones notably, the luteinizing and follicle stimulating hormones fluctuate in response to the changing levels of the first two.

Both the physiology and morphology of the associated tissues normally fluctuate in a correspondingly predictable pattern within the cycle. The rhythm of each hormone has established norms, and the divergence of any hormone from these values can result in a cascade of compensations involving several other hormones. The effects of such a divergence from normal values can result in adverse changes in the physiology and morphology of target tissues, in other hormone systems not considered part of the menstrual cycle, and in behavior.

Cholesterol forms pregnenolone in the adrenal glands. Pregnenolone then metabolizes into progesterone and DHEA. DHEA readily forms a sulfated metabolite, DHEA-S, which is the species usually measured because of its increased stability. Progesterone also forms cortisol, while DHEA forms testosterone and the three estrogens - estrone (E1), estradiol (E2), and estriol (E3). The progesterone cortisol pathway acts as a metabolic balance for the DHEA estrogen/testosterone pathway.

All these hormones are either adrenal products or metabolites of adrenal products, giving them a close functional relationship to one another. If the metabolic supply of pregnenolone is adequate, the cycle can nevertheless become disordered when just a single pregnenolone metabolite remains outside its normal range. Because of its prominent and ubiquitous use in tissue cells, cortisol (a direct progesterone metabolite) is often at the heart of

menstrual hormone metabolism.

Balancing the menstrual hormones is important not only to normalize menstruation, but also to control many other physiological systems with anatomic and behavioral sequelae. Sites and processes seemingly distant and unrelated to menstrual function are involved. A very short list of factors strongly influenced by menstrual hormones includes maintaining the endometrium; promoting embryo and fetus survival; influencing the onset of breast, endometrial, and ovarian cancer; bone production; glycemia; cellular oxidation; blood clotting; psychological depression; phagocyte activity; serum cholesterol; and muscle mass.

**Clinical Use** The task in reordering a disordered menstrual cycle lies not simply in restoring the levels of hormone output but in normalizing the timing and distribution of those levels as well. Notably, adrenal function helps to rebalance progesterone with the DHEA/estrogen/testosterone pathway, which promotes menstrual cycle normalization.

Another intervention that is relatively mild yet highly effective is the measured administration of low doses of the immediate cortisol precursor, progesterone. Altering the daily dose of readily absorbable progesterone over the course of a cycle can result in the normalizing of estrogen levels, with subsequent normalization of the other menstrual hormones as well. Appropriate hormone levels generally lead to the normalization of menstrual physiology, anatomy, and behavior. This test maps the menstrual cycle to provide a basis for and to monitor hormone therapy.

**Conditions Assessed** Conditions that may be assessed include suspected hormone imbalance, menstrual dysfunction, and possible causes of associated physiological, morphological, and psychological upset. Sequelae include emotional fragility, mood swings, anxiety, panic attacks, premenstrual syndrome (PMS), hot flashes, night sweats, bloating, excessive weight gain or loss, excessively high or low energy, chronic digestive upset, migraine headaches, repeated miscarriage, and infertility.

**Logical Sequence of Testing** The logical sequence of using this test as an initial or as a follow-up test is determined by a variety of individual considerations, including the patient's chief complaint, the array of signs and symptoms, the chronicity of the condition, the tests previously taken, and the judgment of the

practitioner.

**COST: \$305**

### **Single Testosterone: BHD #256**

Tests Testosterone levels (One day).

**COST: \$60**

### **BioHealth GI Panels:**

#### **GI Pathogen Screen w/H. pylori Antigen: Combination BHD #401 and #418**

#### **GI Pathogen Screen: BHD #401**

- Sample required: 5 vials and 1 slide with stool samples
- Lab reporting time: 3 - 6 business days

**Overview** This stool analysis determines the presence of ova and parasites such as protozoa, flatworms, or roundworms; immunoglobulin G (IgG) to *Cryptosporidium parvum*, *Entamoeba histolytica*, and *Giardia lamblia* antigens in stool; bacteria, fungi (including yeasts), and occult blood; and *Clostridium difficile* colitis toxins A and B.

Five stool samples and one smear are taken over a four day period, providing a highly reliable comprehensive analysis of intestinal microflora.

**Physiology** Causes for concern are both an overgrowth of microorganisms that are normally present in the intestines and the presence of microorganisms that are *not* normally present in the intestines. Either condition signals that major physiological pathways in the intestinal environment are outside homeostatic

limits. Some of the immediate consequences can include adverse alterations in pH, digestion, and absorption. These factors set the stage for further deviations from health, including the retention and proliferation of microorganisms that would be maintained ordinarily at a lower concentration, or would be rapidly expelled. Such conditions can produce anatomic disruption of the intestinal mucosa resulting from the physical infestation of the microorganism, and chemical insult and physiological upset of the mucosa caused by adverse reactions to the metabolic products of the invader.

Malabsorption and malabsorption of nutrients can produce longer term dysfunction of the host. This condition can persist subclinically for years, even decades. By the time signs and symptoms become evident, the patient might be suffering severe and extensive underlying pathophysiology.

Even more ominous than a primary infestation is the tendency of invading microorganisms to metamorphose into various stages, and to migrate to tissues and organs sometimes distant from the gastrointestinal tract. Such stages, including cysts, can remain dormant within tissues, and can be extremely difficult to detect.

Discouragingly, the level of difficulty of detection is often directly proportional to the level of difficulty of treatment. These factors underscore the importance of maintaining constant vigilance in controlling the intestinal environment.

Secondary infections, often involving so called "opportunistic" organisms, can provide evidence of a more deeply rooted, insidious process. One such organism is the yeast *Candida albicans*, which is implicated in a variety of disorders and has a predilection for virtually any mucous membrane. Often innocuously present in small amounts, it is important not only to control its concentration, but also to correct the causes and the effects of its proliferation.

Several methods can be used to detect intestinal microflora. Direct microscopic examination can reveal the ova and mature forms of parasites; immunological analysis can detect active immunoglobulins to pathogens; chemical analysis can reveal the presence of toxins and occult blood. All three methods are used in the GI Pathogen Screen (BHD #401). Varying fecal transit times and the natural cycling of

parasites through their successive stages mandate a sufficiently large group of samples to provide a representative profile; samples are generally taken over



four days. However, if a patient has slow transit/retention times, sampling every other or every third day may increase recovery rate.

**Clinical Aspects** Optimal intestinal health is a prerequisite for most body physiology. The functions of digestion and absorption are so fundamental to the maintenance of homeostasis in metabolism that every physiological process is ultimately dependent upon digestive function and process. Suboptimal digestive function can be either a basic cause of or a substantial contributor to a variety of disorders, some of which may have seemingly little or no obvious clinical correlation to intestinal physiology.

This reliable intestinal microflora screen documents parasitic and pathogenic involvement that can interfere with normal gastrointestinal function and develop into a pathological condition.

**Conditions Assessed** Conditions that may be assessed include suspected parasitic or pathogen infection, maldigestion, malabsorption and pathologies caused by infectious agents.

**Logical Sequence of Testing** The logical sequence of using this test as an initial or a follow-up test is determined by a variety of individual considerations, including the patient's chief complaint, the array of signs and symptoms, the chronicity of the condition, the tests previously taken, and the judgment of the practitioner.

### **Helicobacter pylori Antigen, #418**

- **Turnaround: 3 - 4 days**
- **Requires stool sample**

It is now well documented that *Helicobacter pylori* is responsible for up to 90% of duodenal ulcers, 70% of gastric ulcers and the majority of MALT lymphomas. As well, a recent epidemiological study confirmed the link between the infection and an increased risk of developing gastric cancer (NEJM, Vol 345:784J789, 2001, No. 11).

The eradication of the infection significantly decreases the development of gastric cancer in patients with precancerous lesions (JAMA, 2004; 291: 187J194).

## **Helicobacter pylori Stool Antigen Test (HpSA)**

The HpSA non-invasive test for accurately diagnosing *Helicobacter pylori* infections. The Premier Platinum HpSA Plus, an enzyme immunoassay for the detection of *Helicobacter pylori* antigens in human stool, cleared by the FDA, is now widely used in many countries, as a valuable tool for the *H.pylori* patients' management.

### **Validation studies**

The HpSA test was validated in studies including more than 10,000 patients, in many different countries world-wide. More than 40 studies, published in peer-reviewed journals, report an average accuracy exceeding 90%, in both adult and pediatric populations, for diagnosing the infection and for confirming the eradication after the therapy. The test seems to be equivalent to the Urea Breath Test, with the exception of being less influenced by the medications (PPI's, H2 blockers and antibiotics) which strongly reduce the sensitivity of the urease-based techniques.

### **The role of the Stool Antigen test in the Primary Care**

The HpSA, being more accurate than the serology and more readily available than the Urea Breath Test, is an important option whenever the use of a non-invasive technique is recommended. Cost/benefit analyses support the use of the HpSA in different situations and prevalence of infection. The use of non-invasive tests has been advocated in different strategies for the management of dyspeptic patients in the primary care. The Maastricht Guideline considers as acceptable a "test and treat" approach for patients below 45 years, with no alarm symptoms. "Diagnosis of the infection should be by UBT or Stool Antigen test." While the serology has a low positive predictive value, because of the high rate of false positive results, the UBT and the HpSA are accurate enough for justifying an eradication therapy. An alternative approach, "test and scope", suggests the use of non-invasive tests for screening the patients with higher risks to be further investigated with an endoscopy.

**COST: \$338 (401 HB) GI pathogen screen with H. Pylori Antigen**

**Helpful links:**

BioHealth: <http://biohealthlab.com/>

A complete list of tests, including descriptions, that BioHealth offers may be found here: <http://biohealthlab.com/test-menu/>

Metamatrix / GenovaLabs: <http://www.metamatrix.com>

A complete list of tests, including descriptions, that Metamatrix offers may be found here: <http://www.metamatrix.com/testJmenu/profiles/categorized>

Emerson Ecologics: <http://www.emersonecologics.com>

Advanced Chiropractic & Wellness : <http://www.StillwaterChiropractor.com>