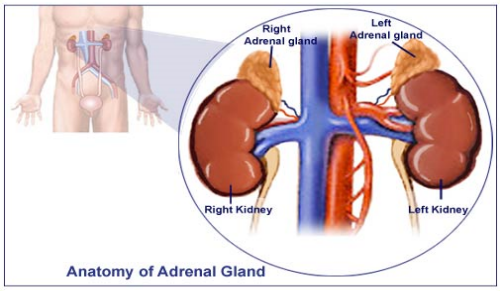
Adrenal Fatigue

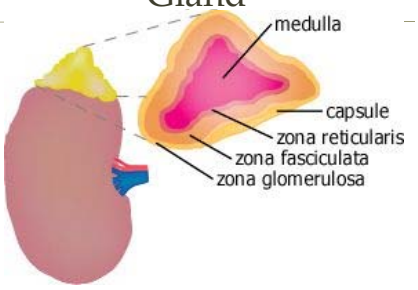
Causes, Testing and Treatment

What Are The Adrenal Glands



Anatomy of Adrenal Gland

Structure of the Adrenal Gland



Adrenal Gland Function

- The adrenal glands – composed of an interior ***medulla*** and an outer ***cortex.***
- **Medulla** (inner part) - produces adrenaline-like hormones (epinephrine, norepinephrine)
- **Cortex** (3 layers):
  - ***Outer (Zona Glomerulosa) – Aldosterone***
  - ***Middle (Zona Fasciculata) – Cortisol***
  - ***Inner (Zona Reticularis) - DHEA, androgens***
  - When the adrenal gland falters and weakens = ***Adrenal Insufficiency.***
  - Complete failure of adrenal glands = ***Addison's Disease***
  - Overproduction of adrenal hormones = ***Cushing Syndrome***

Adrenal Hormones

Cortisol, DHEA, Aldosterone

Cortisol

- Mobilizes and increases amino acids and fatty acids to be used as fuel for energy production.
- Stimulates the liver to convert amino acids to glucose.
- Stimulates increased glycogen in the liver. Glycogen is the stored form of glucose.
- Opposes the action of insulin.
- Increases blood pressure.
- Counteracts inflammation and allergies.
- Maintains resistance to stress (e.g. infections, physical trauma, temperature extremes, emotional trauma, etc.)
- Maintains mood and emotional stability.
- Highest in the morning then decreases throughout the day.

Too Much Cortisol

- Diminishes cellular utilization of glucose
- Increases blood sugar levels
- Decreases protein synthesis
- Increases protein breakdown that can lead to muscle wasting
- Causes demineralization of bone that can lead to osteoporosis
- Interferes with skin regeneration and healing
- Causes shrinking of lymphatic tissue
- Diminishes lymphocyte numbers and functions

DHEA

- Major precursor of testosterone and the estrogens
- Reverses immune suppression and other unfavorable effects caused by excess cortisol
- Stimulates bone deposition and remodeling
- Increases muscle mass, decreases body fat
- Supports thyroid conversion of T4 to more active T3
- Accelerates recovery from acute stress (lack of sleep, excessive exercise, mental strain)
- Decreases total cholesterol and LDL
- DHEA-S: Sulfated form is more stable and provides a more reliable measurement of DHEA

Aldosterone

- Regulates sodium/potassium balance in the body.
- Promotes reabsorption of water and sodium in the kidneys.
- Promotes the excretion of potassium.
- Increases blood pressure.
- Produced in a diurnal rhythm like cortisol.

Extreme Adrenal Pathology

Cushing's Syndrome and Addison's Disease

Cushing's Syndrome

- Overproduction of adrenal hormones
- Signs and symptoms include: rounded face, truncal obesity, thin arms and legs, buffalo hump, acne, fatigue, high blood pressure, elevated blood glucose, bone loss.
- Psychiatric Symptoms
  - Depression
  - Anxiety
  - Loss of emotional control
  - Cognitive Difficulties

Addison's Disease

- Adrenal glands fail to produce hormones.
- People manifest with weakness, fatigue, low blood pressure, salt cravings, low blood sugar, abdominal and joint pain
- Psychiatric symptoms
  - Anxiety
  - Mood and personality changes
  - Depression
  - Psychosis and delirium – rare, but seen in severe cases.

Adrenal Fatigue

Causes, Signs & Symptoms

Forms of Stress

STRESSORS:

- Physical – fractures, muscle injuries, nerve compression.
- Emotional/Mental – fear, excitement, worry, anxiety, etc.
- Poor glucose management; poor quality diet
- Nutrient deficiencies
- Chemical – environmental pollutants, smoke, heavy metals, drugs, toxic food, vaccines, infections, etc.
- Predestined – job, family, location, etc. which cannot be changed or avoided.

Causes of Adrenal Fatigue

- Anger
- Fear
- Worry/Anxiety
- Depression
- Guilt
- Overwork/Physical or Mental Strain
- Excessive Exercise
- Sleep Deprivation
- Light Cycle Disruption
- Late Hours
- Surgery
- Trauma/Injury
- Chronic Inflammation
- Chronic Infections
- Chronic Pain
- Temperature Extremes
- Toxic Exposure
- Malabsorption
- Maldigestion
- Chronic Illness
- Chronic Allergies
- Low Blood Sugar
- Poor Nutrition

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Common Signs & Symptoms of Adrenal Fatigue

- Excessive Fatigue
- Weakness
- Low Body Temp
- Poor Concentration/Brain Fog
- Nervousness/Irritability
- Depression/Anxiety
- Increased Allergies
- Hair Loss
- Headaches
- Dizziness Upon Standing
- Low Blood Pressure
- Heart Palpitations
- Immune Deficiency
- PMS/Menstrual Changes
- Inflammation
- Insomnia
- Difficulty gaining/losing weight
- Hypoglycemia
- Cravings for caffeine
- Cravings for sweets
- Cravings for salt
- Muscle and joint pain
- Digestive Disorders
- Diminished Sex Drive
- Reduced perspiration
- Muscle Spasms

Perceptions of Stress

#1 Cause of Dysfunctional Cortisol/Stress Response:

MENTAL/EMOTIONAL

"How we perceive an event, rather than the event itself, is most important in generating a stress response"

#2 Cause of Dysfunctional Cortisol/Stress Response:

IMBALANCED BLOOD SUGAR CONTROL

"Simple carbohydrate ingestion leads to rapid elevations in blood sugar which ultimately leads to 'up & down' dysregulation via insulin and cortisol responses."

#3 Cause of Dysfunctional Cortisol/Stress Response:

EVERYTHING ELSE!

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Mental & Emotional Stressors

- Perception of an event leads to a mental/emotional response.
- A positive or negative response results in electrical changes in the heart and nervous system.
- This will ultimately affect immune and hormonal responses resulting in a normal or abnormal physiological effect.
- Overstimulation of the sympathetic nervous system results in a reduction of SIgA output which further results in a lowered first line immune defense.

Secretory IgA

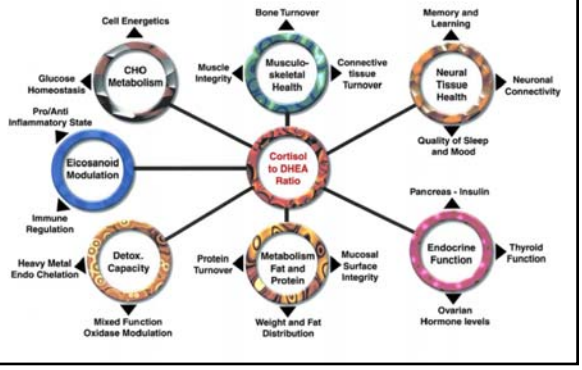
- Primary immunoglobulin produced on the mucosal surfaces of the GI tract, sinuses and nasal passages, upper respiratory system, bladder, vagina and urethra in men and women.
- Neutralizes viruses and bacteria at the site of initial infection preventing them from penetrating mucosal surfaces.
- Does not initiate an inflammatory response.
- Reduced production during stress.
- Elevated cortisol to DHEA ratio due to chronic stress reduces SIgA.
- Low SIgA contributes to the progression of adrenal fatigue by suppressing a healthy response to pathogens.

Cortisol to DHEA Ratio

- Cortisol is a catabolic hormone; breaking down tissues to be used for energy. Cortisol also suppresses the immune response.
- DHEA is an anabolic hormone; it builds up bone and muscle tissue, opposing the effects of cortisol. DHEA supports the immune response.
- Cortisol and DHEA must exist in a proper ratio to keep the catabolic and anabolic effect in balance.
- If cortisol dominates, we maintain a catabolic state in which the immune system is suppressed.

Physiological Aspects of Cortisol & DHEA

Importance of Assessing Adrenal Function



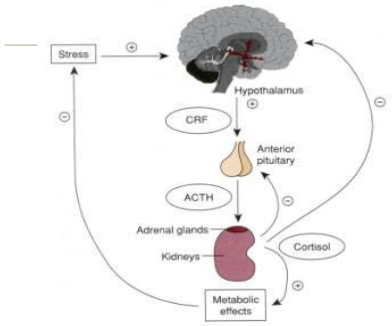
Chronic Stress Response

Stress Induced Hormonal Imbalance

What is the HPA Axis

- The hypothalamus is the control center for most of body's hormonal systems.
- Cells in hypothalamus produce the hormone corticotrophin-releasing factor (CRF) in response to **physical or psychological stress .**
- The hypothalamus secretes CRF, which in turn binds to specific receptors on pituitary cells, which produce **adrenocorticotropic hormone (ACTH).**
- ACTH is then transported to the adrenal gland to stimulate the production of adrenal hormones.

Hypothalamic-Pituitary-Adrenal Axis



The Stress Response

2 Major Systems:

- *Catecholamines* – Prepare the body to act; Epi/Norepi
- *Cortisol* – Mobilizes energy (glucose) and other substances to fuel the action

Catecholamines:

- Increases HR, return of blood to heart, cardiac output, and blood pressure
- Dilates blood vessels of skeletal muscle
- Increases blood sugar – promotes glucose formation
- Decreases Insulin release from the pancreas
- Prevents glucose uptake from peripheral tissues
- Increases FFA's and cholesterol in bloodstream
- Overall effect is to mobilize energy for the central nervous and skeletal systems to respond to a stressful situation.

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The Stress Response

Cortisol

- Increases glucose formation, and protein breakdown
- Increases glucose utilization by the CNS
- Increases "Insulin Resistance" in peripheral system
- Suppresses gastric emptying, slows digestion
- Inhibits sex hormone effects and production, alters reproduction
- Increases Blood Pressure
- Suppresses immune function
- Alters thyroid function, production, and effectiveness
- Depletes the body of Magnesium, Zinc, Glutamine, Carnitine

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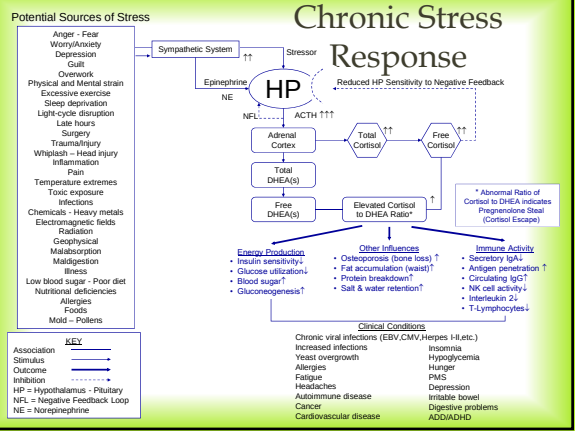
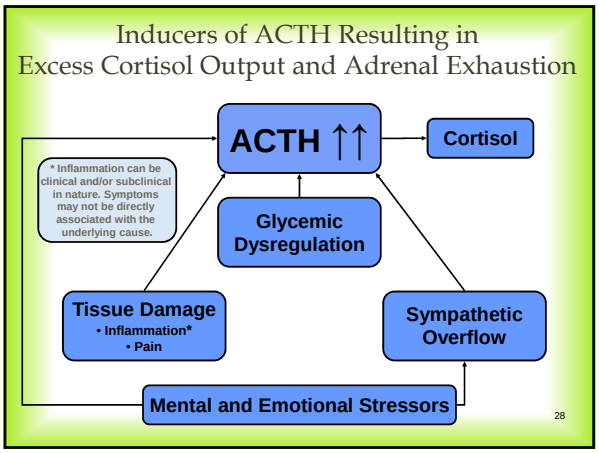
Chronic Stress Response




Inducers of ACTH Resulting in
Excess Cortisol Output and Adrenal Exhaustion
ACTH ↑↑
Cortisol
* Inflammation can be clinical and/or subclinical in nature. Symptoms may not be directly associated with the underlying cause.
Glycemic Dysregulation
Tissue Damage
• Inflammation*
• Pain
Sympathetic Overflow
Mental and Emotional Stressors
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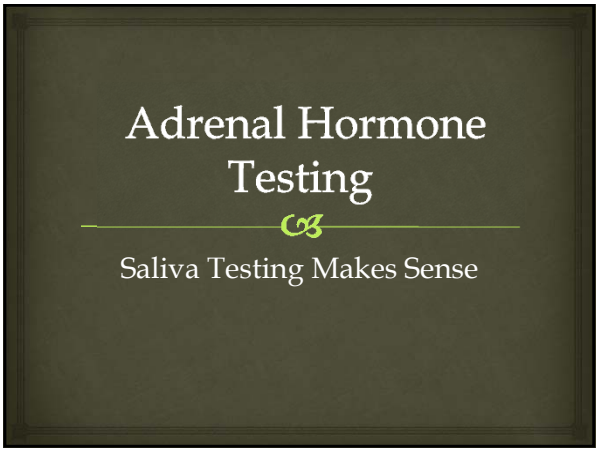
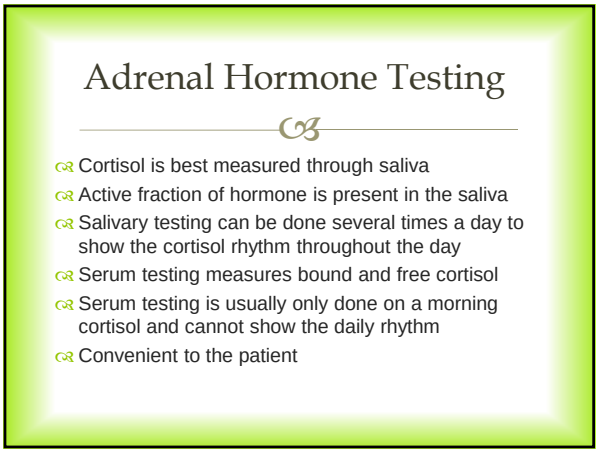
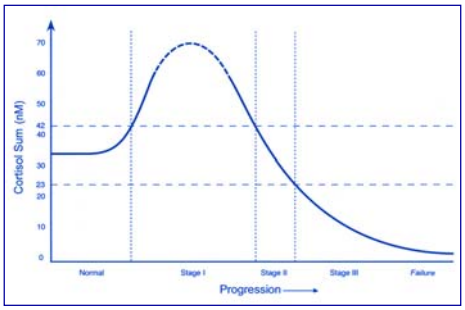

Adrenal Hormone Testing
Saliva Testing Makes Sense


Adrenal Hormone Testing
Cortisol is best measured through saliva
Active fraction of hormone is present in the saliva
Salivary testing can be done several times a day to show the cortisol rhythm throughout the day
Serum testing measures bound and free cortisol
Serum testing is usually only done on a morning cortisol and cannot show the daily rhythm
Convenient to the patient

Progression of Stages in Adrenal Exhaustion



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Normal Adrenal Function

Adaptation to Stress

Functional Adrenal Stress Profile indicates:

- Cortisol sum is within normal reference range (ideally mid-range)
- Individual cortisols are within normal reference range (ideally mid-range)
- DHEA(S) average is within normal reference range (ideally 6 to 8)
- Total cortisol sum divided by DHEA(S) average is approximately 5:1 to 6:1 ratio
- Normal 24-hour circadian rhythm (cortisol rhythm)

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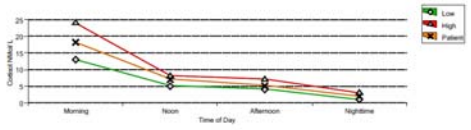
Functional Adrenal Stress Profile – Normal

Functional Adrenal Stress Profile - 201

Parameter	Result	Reference Range	Units
Cortisol - Morning (6 - 8 AM)	18.2	13.0 - 24.0	nM/L
Cortisol - Noon (12 - 1 PM)	7.0	5.0 - 8.0	nM/L
Cortisol - Afternoon (4 - 5 PM)	5.1	4.0 - 7.0	nM/L
Cortisol - Nighttime (10 PM - 12 AM)	2.0	1.0 - 3.0	nM/L
Cortisol Sum	32.3	23.0 - 42.0	nM/L
DHEA-S Average	6.20	2.0 - 10.0	ng/mL
Cortisol/DHEA-S Ratio	5.21	5.0 - 6.0	Ratio



This profile is used to evaluate the adrenal glands and hormone balance. In the event of adrenal exhaustion, underlying causes must be determined through additional lab testing and investigation into environmental and lifestyle factors, while also supporting the adrenals with nutritional protocols and lifestyle modifications.

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Stage I Adrenal Fatigue

Functional Adrenal Stress Profile indicates:

- (↑) anterior pituitary output of ACTH
- (↑) adrenocortical stimulation
- (↑) cortisol output
- pregnenolone steal
- (↓) DHEA
- (↑) probability of elevated nighttime cortisol

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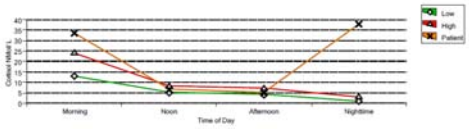
Functional Adrenal Stress Profile – Stage I

Functional Adrenal Stress Profile - 201

Parameter	Result	Reference Range	Units
Cortisol - Morning (6 - 8 AM)	**33.6***	13.0 - 24.0	nM/L
Cortisol - Noon (12 - 1 PM)	6.5	5.0 - 8.0	nM/L
Cortisol - Afternoon (4 - 5 PM)	4.9	4.0 - 7.0	nM/L
Cortisol - Nighttime (10 PM - 12 AM)	**37.9***	1.0 - 3.0	nM/L
Cortisol Sum	**82.9***	23.0 - 42.0	nM/L
DHEA-S Average	3.60	2.0 - 10.0	ng/mL
Cortisol/DHEA-S Ratio	**23.0***	5.0 - 6.0	Ratio



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Stage II Adrenal Fatigue

Intermediate Stage of Adrenal Exhaustion

Functional Adrenal Stress Profile indicates:

- (↑) anterior pituitary output of ACTH
- (↑) adrenocortical stimulation
- cortisol sum is within normal reference range
- low or borderline-low morning, noon, or afternoon cortisol levels
- usually normal nighttime cortisol level
- pregnenolone steal
- (↓) DHEA

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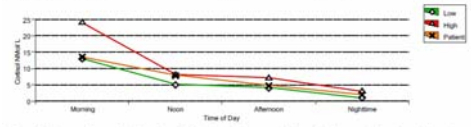
Functional Adrenal Stress Profile – Stage II

Functional Adrenal Stress Profile - 201

Parameter	Result	Reference Range	Units
Cortisol - Morning (6 - 8 AM)	13.5	13.0 - 24.0	nM/L
Cortisol - Noon (12 - 1 PM)	7.8	5.0 - 8.0	nM/L
Cortisol - Afternoon (4 - 5 PM)	4.7	4.0 - 7.0	nM/L
Cortisol - Nighttime (10 PM - 12 AM)	2.0	1.0 - 3.0	nM/L
Cortisol Sum	28.0	23.0 - 42.0	nM/L
DHEA-S Average	**0.20***	2.0 - 10.0	ng/mL
Cortisol/DHEA-S Ratio	**140***	5.0 - 6.0	Ratio



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Stage III Adrenal Fatigue

Advanced Stage of Adrenal Exhaustion

Functional Adrenal Stress Profile indicates:

- (↑) anterior pituitary output of ACTH
- (↑) adrenocortical stimulation
- (↓) total cortisol output
- usually low nighttime cortisol level
- pregnenolone steal
- (↓) DHEA

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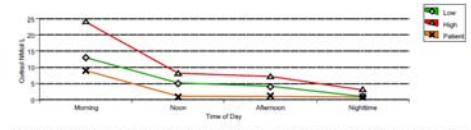
Functional Adrenal Stress Profile – Stage III

Functional Adrenal Stress Profile - 201

Parameter	Result	Reference Range	Units
Cortisol - Morning (6 - 8 AM)	**9.0***	13.0 - 24.0	nM/L
Cortisol - Noon (12 - 1 PM)	**0.9***	5.0 - 8.0	nM/L
Cortisol - Afternoon (4 - 5 PM)	**1.2***	4.0 - 7.0	nM/L
Cortisol - Nighttime (10 PM - 12 AM)	**0.8***	1.0 - 3.0	nM/L
Cortisol Sum	**11.9***	23.0 - 42.0	nM/L
DHEA-S Average	**0.90***	2.0 - 10.0	ng/mL
Cortisol/DHEA-S Ratio	**13.2***	5.0 - 6.0	Ratio



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Adrenal Therapy

Lifestyle Recommendations & Supplement Options

General Recommendations for Adrenal Exhaustion

Lifestyle Management

1. Strict dietary glycemic control
2. Mental/emotional stress reduction
3. Bedtime by 10:00 pm – address sleep issues/hygiene
4. Exercise only upon further evaluation

Retest Protocol

1. After 12 weeks: Adrenal Stress Profile (general recommendation)
2. Assess by clinical presentation – has your patient improved? If not, rule out subclinical factors (infections, GI issues, thyroid, cellular energy)

Clinical Considerations

1. Evaluate clinical "seen" stressors (lifestyle factors)
2. Rule out subclinical "unseen" stressors

Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks. Supplements suggested are based upon clinical experience and anecdotal evidence. You may request ingredient facts by calling 800-570-2000.

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Basic Adrenal Protocol

- Support Adrenals – 1-2 capsules with breakfast and lunch.
- Pregnenolone – 10-12 drops SL TID after meals but no later than 5 pm. Hold under tongue for 2 minutes then swallow.
- DHEA – 2-4 drops SL TID after meals but no later than 5 pm. Hold under tongue for two minutes then swallow.
- Licorice Root Extract – 8-10 drops. Timing of dosage varies according to drops in cortisol.
- Support Minerals – 3 tablets at bedtime.

Support Adrenals

- B-Complex
- Vitamin C
- Botanicals
- Phytonutrients
- DHEA
- Pregnenolone
- Supports without overstimulating
- Dosage: 1-2 caps with breakfast and lunch

Licorice Root Extract

- Glycyrrhizin can help with headaches, low sex drive, anxiety, moodiness, blood sugar control, low blood pressure and hormone balance.
- Acts like aldosterone in that it increases sodium reabsorption and potassium excretion.
- Increases ½ life of cortisol.
- Contraindications: high blood pressure.
- Dosage varies: One drop contains 35 mg LRE with 0.72 mg glycyrrhizin

Support Glucose

- Glucose stabilizing herbs and nutrients
- Supports glucose utilization for energy
- Reduces free radical damage associated with high blood glucose
- Supports healthy insulin response when used with a glycemically balanced diet
- Dosage: 1 capsule with each main meal

Pregnenolone

- Precursor to all steroid hormones
- Supports cortisol, DHEA and sex hormones
- Increases resistance to stress
- Improves mood, energy, immunity, memory, PMS and menopausal symptoms
- Dosage varies: 1.2 mg/drop SL

DHEA

- Precursor to testosterone and the estrogens
- Reverses immune suppression and other unfavorable effects of excess cortisol
- Balances effects of cortisol
- Improves bone density and muscle mass
- Dosage varies: 1.2 mg/drop SL

Support Minerals

- Highly bioavailable blend of macro and trace minerals
- Promotes healthy bones, hair, skin and nails
- Krebs Cycle intermediates
- 2:1 ratio of calcium to magnesium
- Additional blood glucose support
- Dosage: 3 tablets at bedtime

BioMatrix Protocols

- BioMatrix Protocols for Stage I, Stage II and Stage III Adrenal Fatigue are available to health professionals with professional log in at:

www.biomatrixone.com

BioHealth Laboratory

- Specializing since 1999 in these areas of testing:
  - Salivary Adrenal & Hormone Profiles
  - Urinary Metabolic Profiles
  - GI Pathogen Screening
  - Secretory IgA coming soon
- Superior Thermal Packaging to Preserve Samples
- Free Access to Clinical Training
- Industry Leading Commitment to Quality Assurance

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