Adrenal and Metabolic Interpretive Guide

Interpretive Support and Sample Protocols for the Functional Adrenal Stress Profile (BHD #201) and Metabolic Assessment Profile (BHD #101)

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Functional Medicine Overview

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The use of functional medicine is a significant breakthrough in the assessment, treatment, and prevention of numerous health disorders. With data strongly supporting this approach, many healthcare professionals are integrating functional medicine into their practices.

Functional medicine does not focus on identifying specific pathology; it searches for the underlying conditions resulting in pathophysiological processes. By using functional laboratory assessments the physiological cause of many complex health conditions can be identified. An evaluation of basic physiological processes, including digestion, cellular oxidation, liver function, and the production and regulation of steroid hormones, can measure how the body has strayed from homeostasis. Based upon laboratory test results, healthcare professionals can offer individualized therapies to improve health and restore normal function.

Conventional vs. Functional Approach

In conventional diagnostic analysis, symptoms are regarded as indicators of a specific disease state. Laboratory testing is often used to attempt to identify an underlying pathology. The working assumption is that abnormal lab values are the cause of the patient's condition. The practitioner measures deviations in the patient's laboratory values from normal values, and assigns a disease to the patient. Naming the disease confers a treatment protocol, and the patient's progress is measured in terms of the regression of the original signs, symptoms, and lab values. For a variety of reasons, conventional diagnosis often fails to identify the most basic causes of the problem, especially in cases of chronic degenerative disorders.

One problem with this approach involves the interpretation of laboratory test results as indicators of basic physiological processes. While many laboratory test data are eminently useful, their correlation to underlying physiology is usually directed at normalizing the lab values, rather than at resolving the cause of any underlying pathophysiology. The assumption is that the complex of abnormal lab values is the disease, and that normalizing the lab values will resolve the disease. Functional analysis, on the other hand, recognizes that abnormal lab values are often merely superficial markers of far deeper disorders. To achieve global, lasting remediation, the underlying disorder must be addressed.

A second problem concerns the assignment of the name of a disease to the pattern of laboratory values and presentation of symptoms. The constellation of presenting symptoms and test data often mark characteristic disease processes that may be similar among many patients. In some cases this is appropriate, as in such commonly encountered disorders as the measles. Often, however, disease processes assume highly individualized characteristics that reflect the biochemical individuality of the patient, and may not follow textbook examples as to their cause, presentation, or course. In these cases, conventional diagnosis could inappropriately categorize the patient, resulting in inappropriate treatment. In functional diagnosis a fundamental premise is that each patient is unique. The reactions of each patient both to the causative agents and to the curative procedures are evaluated on their own merits. The emphasis is not on naming and treating diseases, but on identifying functional disorder and normalizing physiological pathways.

A third problem is that conventional therapeutic protocols tend to be heavily dependent upon the administration of pharmaceutical drugs. These are chemicals so potentially powerful and dangerous as to require years of study, and a special license, to advise and prescribe their use.

It has been well documented that few drugs are completely safe and free from side effects. While some are absolutely necessary in health care, it is a sad fact that adverse reactions to prescription medicine constitute the major cause of hospital admissions in the United States. Many drugs are specifically designed to reduce or mask symptoms by altering physiological pathways. In these cases drugs fail not only to address the underlying cause of the condition, but also adversely affect other physiological pathways not part of the original disorder. In the course of drug therapy, additional disorders may replace the original, leaving the patient with a more insidious, deeply seated disorder than was present at the outset. Such an approach to health care can have tragic consequences. Functional thinking, by contrast, embraces the use of low potency, high efficacy, natural substances that strengthen physiological pathways, are compatible with natural systems, and present a minimum of adverse effects.

Until recently there have been few readily available laboratory methods with which to evaluate basic human physiology. Today, specialized laboratory procedures such as those employed by BioHealth Diagnostics can provide diagnostic assessments that functionally evaluate physiological pathways. Healthcare professionals can now pinpoint physiologic dysfunction and identify contributing factors to health problems, often exposing the root causes of existing or impending chronic illness and degenerative disease.

Prevention, Wellness, & Longevity

Many, if not most, health disorders start insidiously, and progress as subclinical entities, their presence at first unknown to their host. In this manner, serious health conditions can develop over a period of years or decades, while a patient gradually comes to suffer from undiagnosed and nonspecific symptoms. Functional medicine can be used to detect and treat health problems at their point of earliest inception, and prevent debilitating health conditions from progressing. By identifying physiological risk factors, functional medicine enables individuals to take preventive measures against a variety of disorders. Functional laboratory assessments provide data not only for general wellness, but also for the development of personalized nutritional plans, immune enhancing strategies, and life extension programs.

Control System Normalization

A Brief Overview

The ultimate purpose in functional medicine is the normalization of the patient's automatic control systems. The body's two global automatic control systems are the endocrine system and the autonomic nervous system (ANS).

Phylogenetic Developments

Thousands have been successfully treated utilizing the adrenal protocols in this guide to effectively normalize control systems, thereby resetting the Hypothalamic-Pituitary-Adrenal Axis.

Climbing the phylogenetic tree, animals are classified first as unicellular, then as multicellular. With the continuing increase in the number of cells, a large central cavity, or coelom, develops. For purposes of control and coordination, certain cells secrete chemicals into the coelom for diffusion throughout the organism. These chemicals produce a specific physiological response in cells distant from the location of their synthesis. Due to their method of production, delivery, and action, these chemicals can be classified as hormones.

As the multicellular animals become more complex, different kinds of tissues develop, and the tissues become separated, or compartmentalized, from each other and from the coelom. This makes control by diffusion difficult. Specialized elongated cells develop for the manufacture and rapid intracellular transport of small amounts of the hormones. These hormones can then be transferred to distant and compartmentalized tissues. A network of these cells, or a nerve net, is formed with autonomic characteristics. This specialized hormone delivery system is the primitive nervous system. A gut develops with its own version of a nervous system. As the increasing complexity of organisms continues, a vascular transport system, or circulatory system, is developed which more efficiently delivers large amounts of chemicals to distant parts of the body. Specific organs develop for elaborating a wide variety of hormones and secreting them directly into the circulatory system, and the endocrine system thereby appears.

With increasing body complexity, faster and more precise cell and tissue control become important. Accordingly, the specialized nerve cells, or neurons, synthesize a variety of specific hormones, package them into vesicles, transport them to distant sites within the organism, and release them. Serial and parallel connections with other neurons are formed, and a central axis of coordinating neurons, a primitive spinal cord, is established. The development of volitional control of the organism parallels the continuing development of a centralized nervous system, and with further development a sympathetic subdivision appears. Rising along the phylogenetic tree, subsequent specialization of the two major control systems, endocrine and nervous, becomes more prolific in the nervous system than in the endocrine system. Control of the body, however, is still shared by both major systems. Sometimes the responsibility of control is so diffuse among these systems that control is ascribed to an inclusive neuroendocrine system.

Autonomic Systems

The brain and spinal cord are referred to as the central nervous system. The remainder of the nervous system is the peripheral nervous system (PNS). The portion of the PNS under volitional control is the somatic division, while the rest of the PNS is referred to as the autonomic nervous system (ANS). Both the ANS and the endocrine system are essentially under automatic control. The well-known subdivisions of the ANS are the sympathetic nervous system and the parasympathetic nervous system, which, for decades, practitioners have faithfully studied to better understand and serve their patients. An underlying assumption has been that

functional nervous system normalization is achieved by affecting a balance in the interaction between these two subdivisions. Ascribing the control of specific physiological processes to one or the other of these subdivisions, in an attempt to relate them to symptomatology, to disease processes, and to specific remedies, has provided fuel for many an extended consulting session. Tailoring treatment regimens accordingly has given many of us the satisfaction that we could both explain our patients' disorders in scientific terminology, and treat them logically, consistently, and comprehensively. The corresponding neurologic pathways, internuncial connections, neurotransmitters, and control loops have all been described in detail, with a high degree of consistency, and with widespread agreement among scientists. The ANS has come to be understood in terms of the interaction between the sympathetic and parasympathetic subdivisions.

Recent advances have greatly increased our information, as some neurons have been demonstrated to produce more than one kind of neurotransmitter, and others have been shown to be receptive to more than one kind of neurotransmitter. This implies that different stimuli can produce the same effect, and that impulses carried over the same nerve can result in different effects. Anatomists have identified additional nerve fibers, and physiologists have demonstrated additional functional pathways. Following the ongoing increase in scientific knowledge, many of the neurologic pathways we once thought we understood are now demonstrating greater complexity. The interaction between sensors, local control centers, and effectors is proving to be far more complicated than previously thought. This has profound implications not only for individual pathways, but also for the entire concept of control, coordination, and normalization.

It is relatively poorly known, and perhaps of even greater interest, that many gastroenterologic physiologists now recognize the existence of yet a third subdivision of the ANS: the enteric nervous system (ENS). It can be thought of as an independent integrative system with neurophysiologic properties consistent with those of an autonomous nervous system. The ENS innervates the stomach and intestines, and includes Auerbach's (myenteric) and Meissner's (submucosal) plexuses, many enteric ganglia, and has numerous connections with both the sympathetic and parasympathetic systems. The ENS has been demonstrated to function, albeit less than optimally, without parasympathetic input. Presumably, sympathetic input is similarly unnecessary for at least partial ENS functioning.

The ENS can be considered to have three functional branches: sensory, internuncial, and motor. It is the internuncial pool that is considered to be the signature control system of the ENS, and this area may be analogous to the internuncial pool of the spinal cord. The ENS not only possesses "hardwired" programs, but is capable of modifying its output in response to sympathetic, parasympathetic, endocrine, or its own sensory input. Directly under ENS control are the gastrointestinal musculature, absorptive and secretory epithelium, enteroendocrine cells, and blood vasculature. The resulting overall picture is that it is the ENS that programs and coordinates gastrointestinal functions. With the developing scientific evidence for this third subdivision of the autonomic system, the level of complexity of nervous system control might now be increased from our former understanding by an exponential, rather than a multiplicative, factor. Realizing this increased degree of complexity and diversity, perhaps the ANS should now be referred to as the autonomic nervous systems.

Control Loops, Rhythms, & Cycles

Individual endocrine and neural control systems are regulated by control loops, also called signal loops or feed loops. All feed loops are characterized by a biologic center that produces an output; in feedback loops the level of output is fed back to the production center for

monitoring. Feedback loops provide control signals by monitoring an output source, and use the level of the output to regulate further output. Feedback loops are activated after physiological demand occurs.

Feedforward loops are characterized by input signals fed forward to a production center, which then produces an output. The output is monitored directly by the input, bypassing monitoring by the production center. Feedforward loops provide control signals activated by the input independent of the production center to regulate output. Feedforward loops are activated before physiological demand occurs. Feedback loops can be considered to be output-driven, while feedforward loops can be considered to be input-driven.

Control loops can be influenced by limbic input. Such control is considered to be volitional, and is subject to long-term change by conditioning and learning. Conditioned control loops can sometimes override natural, or unconditioned, control loops. Ending a meal when one is full is an example of natural negative feedback. Continuing to eat after one is full is an example of limbic-mediated change that overrides the natural level of the negative feedback loop. Another example concerns the doctor who continues to work when exhausted. The natural tendency to stop working is subjugated to the desire to provide service. The natural negative feedback mechanisms have been superceded by dedication to duty.

Positive feedback loops act to increase substances or signals in response to the original production of the substance or signal. Negative feedback loops act to decrease substances or signals in response to the original production of the substance or signal. An example of positive feedback is found in the generation of the nerve action potential: a slight membrane influx of sodium ions results in a massive influx of sodium ions, depolarizing the membrane. However, once the zone of depolarization has reached the distal end of the nerve, all influx stops—an example of negative feedback. These examples demonstrate how a positive feedback loop can be part of an overall negative feedback system.

Positive feedforward loops act to produce an increase in substance or signal in advance of the output. An example of this is the cardiac response of elite athletes at the starting line in a running event. In the 30 seconds preceding the sound of the starter's gun, the athletes' heart rates rise to about 80% of the maximum that will be reached during the event itself. Negative feedforward loops act to decrease or prevent output in advance of the output itself. An example of this is seen in the inhibitory presynaptic membrane potential. Release of a specific neurotransmitter decreases the excitability of the postsynaptic membrane.

Other types of feedback loops have been described which are time-dependent: the fast feedback and the delayed feedback loop. In the fast feedback loop, the control response occurs from a few seconds until about 20 minutes after the onset of the stimulus. Interestingly, the response in such a loop is dependent on the rate of change of the stimulus. In the delayed feedback loop, the control response occurs no sooner than about 40 minutes after the stimulus is presented, and is dependent on the absolute level of the stimulus. Both loops are found in pathways involving the adrenal production of corticosteroids.

Complex loops can consist of several anatomical components, including elements of both the endocrine and the nervous systems. There are several examples of control loops involving the hypothalamus, the pituitary gland, and one or more additional endocrine glands. One such loop is called the hypothalamic-pituitary-adrenal "axis." It is a major negative feedback loop modulating adrenal function. Another major negative feedback loop is the hypothalamic-pituitary-ovarian axis. Both loops involve limbic input to the hypothalamus, and can respond to

stimuli both from within as well as from outside the loop. Such stimuli can be nervous or hormonal, as well as limbic. There are countless examples of each type of control loop, probably all of which are intertwined into larger groups of control systems. Proper functioning of each type of control loop is vital.

The response of biologic feedback loops can be modulated within the loop by the gain. The gain can be viewed as the level of response elicited by a given level of stimulus. Increasing the gain increases the level of response, and decreasing the gain decreases the level of response. Adjusting the gain enables both positive and negative feedback loops a quick and easy mechanism for maintaining steady-state output within a given range. In many control loops, the gain is affected largely at the receptor level.

All positive loops signal to increase output, while all negative loops signal to decrease output. Many control systems use both types of loops. For systems in which an increase in output above the resting operating range is required, a positive feed system might be used. For systems in which a decrease in output below the resting operating range is demanded, a negative feed system might be employed. An example is seen in cardiac physiology, where both positive and negative inotropic and chronotropic feed are in constant use.

Fascinating but poorly understood, the body displays rhythms and cycles, in which there is a predictable change in physiology and/or anatomy at specific times, or over specific time intervals. The relatively simple phenomena, in which usually only one variable is described as a function of time, are referred to as rhythms. These include the variation of cortisol levels over a 24-hour period, known as cortisol's circadian rhythm. The more complex phenomena can involve several variables and several time intervals, and are called cycles. An example of this is the menstrual cycle. The fluctuating nature of these phenomena evidences the body's periodic need for certain physiologic pathways to be dominant, and for other physiologic pathways to be subjugated, during specific time intervals. This delegation of activity allows the efficient temporary production of substances and of the establishment of an effective temporary internal environment, or milieu interieur. These periodically, predictably changing phenomena are all the result of complex actions of the neuroendocrine system, and all are subject to control loops.

Adrenal Control

The pituitary has traditionally been called "the master gland," because it produces many hormones that have global effects on other glands, and because it has a close functional relationship with the hypothalamus. Another gland, the adrenal, has widespread effects on many individual physiological pathways, and on cellular energy production. Although its prominence has languished in the shadow of the pituitary, the adrenal might nonetheless be thought of as "another type of master gland." The reason for this description is that adrenal control directly affects every cell in the body.

The adrenal glands produce the complementary steroid hormones cortisol and dehydroepiandrosterone (DHEA). Cortisol and DHEA are involved directly or indirectly in virtually every aspect of cellular function. They both cross the blood-brain barrier. Cortisol is best known for stimulating gluconeogenesis, which affects every cell, tissue, and organ. A few of the other functions of cortisol are that it mobilizes protein stores in all tissues except 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 modulates gene transcription in the production of a variety of proteins, and it is therefore vital to normal physiology. It is important to realize that cortisol levels chronically outside normal physiological ranges are both an effect of dysfunction and a cause of other dysfunction. Circadian cortisol

rhythm, or the changing level of cortisol over each 24-hour period, is therefore crucially important as a determinant of health.

DHEA is the major precursor of testosterone and the estrogens. These are the "sex" hormones of clinical, as well as subclinical, importance. Their influence is widespread anatomically, physiologically, and behaviorally. The adrenals also produce the hormones epinephrine and norepinephrine, which are involved in the "fight or flight" response, and aldosterone, which regulates systemic water balance through the kidneys. Due to the global actions of its products, proper adrenal control is vital to homeostasis.

Ovarian Control

The ovaries balance the functions of four major hormones: progesterone, the estrogens, follicle-stimulating hormone (FSH), and luteinizing hormone (LH). The first two hormones have especially far reaching effects, even without pregnancy, and even after menopause. Progesterone, among other things, serves to increase bone production, reduce the risk of some cancers, and normalize blood clotting and blood sugar levels. The estrogens serve to slow the rate of bone loss, improve immunity, increase levels of high-density lipoprotein, and lower levels of low-density lipoprotein.

The ovaries cycle roughly on a lunar schedule, about every 28 days. A sharp drop in the levels of progesterone and the estrogens signal that an ovum has not been fertilized. The uterine lining is then shed with the onset of bleeding, which marks day 1 of the menstrual cycle. The drop in estrogen during the preceding few days has stimulated the anterior pituitary gland to secrete FSH. This results in one of the ovarian follicles maturing by about day 5 to 7. The follicle secretes large amounts of estrogens, which stimulates the lining of the uterus, the endometrium, to thicken and fill with nutrients. By about day 14 the continued increase in estrogens results in a surge in the release of LH. This is accompanied by a small, one-day rise in body temperature, which forecasts normal follicular rupture. The LH surge results in the follicle rupturing and expelling its ovum into one of the two fallopian tubes, a process termed ovulation, on about day 14.

The ruptured follicle involutes and is then called the corpus luteum; it secretes progesterone and still more estrogens. If fertilization does not occur, the ovum continues unchanged into the uterus. During about 14 more days, the corpus luteum degenerates, and progesterone and the estrogens greatly decrease. A new cycle begins with the shedding of the endometrium and the onset of bleeding.

Because of the profound and comprehensive effects of the female sex hormones on anatomy, physiology, and behavior, proper ovarian control is vital to the female. At this point it is important to recall two adrenal products, cortisol and DHEA. Due to the extensive, essential functions of cortisol, and because of the role of DHEA as a sex hormone precursor and modulator, proper adrenal control is a prerequisite to proper ovarian control.

Conditioning & Learning

Conditioning is the term used to signify the process of establishing the same response to repeated presentations of the same stimulus. The term learning is used to denote a response for which, usually after practice, the individual can facilitate or even create the conditions for the response to occur. Conditioning is akin to training, while learning is akin to acquisition. A continuum can exist between the two processes, but conditioning does not always result in learning, and learning can occur without prior conditioning. The conditioning of a specific

control pathway that does not result in learning can nevertheless make it easier to produce subsequent learning in that pathway and in closely related pathways.

The term *learning* is preferred when there has become some long-term consistency, or permanency, in the ease of production of the response. An example of this is riding a bicycle. In this example, a set of rather complex responses is learned, which presumably is never forgotten. Learning can take place in endocrine pathways, as well as in the somatic and autonomic nerve pathways, and in any combination of these pathways. Endocrine and autonomic learning are especially difficult to evaluate because they often occur unnoticed. Learning can occur on a societal, group, organismic, systemic, organ, tissue, cellular, or subcellular level. Learning has been demonstrated to occur on a level as basic as the calcium channels in cell membranes.

We find as evidence of learning in higher animals the situation where the individual combines a response with other stimuli to produce a more complex behavior. Playing an athletic sport presents numerous examples of somatic learning. The response of the gastrointestinal system to eating the same breakfast at the same time every morning for years presents examples of autonomic and endocrine learning. Both of the previous examples probably combine many levels and many pathways—many types of control systems—in learning.

Many factors control the process of learning. The speed of learning is directly related to, among other things, the strength of the stimulus. An example is found with a young child in a kitchen with an old-fashioned cast iron stove. The stove, when mildly warm, might not provide a sufficiently strong stimulus for the child to avoid touching it. Alternatively, the child might touch the stove repeatedly until the lesson is eventually learned that touching the stove might be harmful. But when the stove is red-hot, only one touch would be needed to instantly convince the child never to touch such a stove again.

However, *stronger* or *faster* is not necessarily *better*. Learning curves have an optimal range, above and below which the speed of learning may confer unwanted effects. A weak stimulus might not result in learning, or might result in an excessively long period for learning to occur. But an excessively strong stimulus, in addition to resulting in the desired learning, can be accompanied by additional learning of an undesirable nature. Especially in endocrine and autonomic systems, strong stimuli may concurrently result in learning not only in the pathways intended for modification, but also in other pathways not intended for modification. This can be a source of so-called side effects, or adverse effects. The child who has touched the hot stove might, in the process of learning an appropriate response, suffer adverse physical and psychological effects.

Another example of stimulus strength is prescription dose. Even in cases of correct diagnosis and the appropriate choice of pharmaceutical, an inappropriate dosage can result in an inappropriate response. With the insulin-dependent diabetic, the dosage of insulin can be critical. If the dosage is either too low or too high, serum glucose can continue to fluctuate outside its normal range. This can fail to resolve the condition originally necessitating the therapy. But complications can arise involving compensation by other systems, including those of the adrenals and the thyroid. An inappropriate dosage, while intended to provide a remedy, can actually cause additional disorder. Prudence dictates that the strength of stimuli should not exceed physiological parameters, and that the best learning curve may be one derived from stimulus strength greater than minimal, yet less than maximal.

The speed of learning is also influenced by the complexity of the task. Learning to play a simple tune on the piano might take minutes or hours; learning to play a symphonic concerto might take years or decades. Likewise, conditioning the opening of calcium channels in the membrane of a muscle fiber to a certain form of exercise might take days or weeks; conditioning the entire muscular system to respond to the exercise might take years or decades.

The number and the regularity of stimulus presentations also affect learning. Where stimuli of strength less than maximal are presented, a greater number of stimulus repetitions are required for learning to occur. A decrease in dose may require an increase in the number of repetitions. These repetitions have an optimal time interval for their administration, outside of which learning is suboptimal, or does not occur, or is accompanied by unwanted effects. Let us say that the novice baseball pitcher will learn to pitch a fast ball after 100 practice attempts. Pitching the ball once a week for 100 weeks might not produce any noticeable learning effect. Pitching the ball once a minute for 100 minutes might produce very effective results. Pitching the ball once every 10 seconds for 100 seconds might not produce a good pitch, and might result in physical, as well as psychological, injury.

Coordinating the timing of repetitions with physiological rhythms and cycles makes the learning process more efficient, and minimizes the chance of inducing adverse effects. Timing stimuli that clash with natural rhythms and cycles can exacerbate disorder; rhythms and cycles that have become unsynchronized can and must be conditioned back to their normal state. If the estrogen rhythm of a disordered menstrual cycle is being normalized, the administration of a precise dosage of progesterone might be prescribed. Progesterone and estrogen share an important control loop. Specific doses of progesterone administered at specific time intervals can simulate the natural progesterone rhythm, reorder the feedback loop affecting estrogen, and normalize the estrogen rhythm.

The sequencing of remedies is vital to produce control system normalization. Control systems are often so complex that they necessitate an ordered series of specific different treatments for their remediation. While inappropriate remedy sequencing can worsen a condition, sometimes prescribing the appropriate initial treatments in such a complex system can seem counterintuitive. An example of this is found in stage I adrenal exhaustion, where cortisol levels are elevated, sometimes markedly. The immediate reaction of the practitioner might be to lower cortisol levels using nutraceuticals or pharmaceuticals, and to diminish or eliminate exogenous sources of cortisol. To normalize the system controlling cortisol, however, it is first necessary to relieve the adrenal exhaustion. This involves providing anabolic factors needed by the adrenals to produce cortisol. Second, it requires administration of cortisol precursors to further stimulate the adrenal negative feedback loop to decrease cortisol production. In this case, the appropriate initial remedies might be opposite those that would otherwise be prescribed, as administering cortisol or cortisol precursors might seem to exacerbate rather than remediate the condition. Once the adrenal exhaustion is relieved and the control system functions closer to normal, however, the adrenals will respond more normally to the natural feedback loops, and a more intuitively consonant treatment might then be instituted.

An interesting example of some unintended results of conditioning concerns a story similar to that of Pavlov's famous dog, Ivan. In a different laboratory, some meat powder was periodically presented to another hungry dog named Rex. With the presentation of the meat powder, Rex salivated, and the experimenter, wearing a white lab jacket, rang a nearby bell. The experimenter rang the bell with each presentation of the meat powder, and then occasionally, purposefully failed to supply the powder. The bell was still rung regularly, but the powder was presented with increasingly fewer ringings. Eventually Rex salivated merely at the sound of the

bell. The story involving Ivan usually ends there, providing an example of what is known as "classical" conditioning. With Rex, however, the experiment continued, and Rex was seen to begin salivating as soon as the experimenter's hand moved toward the bell. Later, Rex would salivate as soon as any person wearing a white jacket approached the bell. Still later, Rex would salivate as the door opened to the lab. Eventually Rex would salivate at the sound of footsteps in the outer hallway leading to the door. Endocrine and autonomic conditioning had indeed occurred with Rex, to a far greater extent than might have been expected with Ivan.

There is probably an infinite number of patterns that are largely or entirely subject to conditioning and learning. But many response patterns are hardwired in our control systems, and might not be modifiable. Although many hardwired programs are modifiable, the body nevertheless "remembers" their basic normal pattern of physiological response. That pattern fits into a much greater pattern of total body physiology in which all the functions are harmonious. This is a state of homeostasis, and this is the state to which the body always tends to return.

Repair, Aging, & Degeneration

Every physiological process tends to be completed in a characteristic period. Free radicals are formed and denatured on the order of microseconds; neurotransmitters are secreted and act on receptors on the order of milliseconds; peripheral nerves regenerate on the order of millimeters daily; enteroendocrine cells are produced, mature, and degenerate on the order of days; mildly sprained ligaments heal on the order of weeks; complex bone fractures heal on the order of months; other severe injuries may heal on the order of years.

Daily damage to the body is unavoidable. It occurs in many forms, under many categories. It is always and everywhere present. It can be microscopic or macroscopic. It can arise from causes that are biochemical, electromagnetic, mechanical, pathogenic, psychological, or toxic. These causes present a constant onslaught to every body, often resulting in damage, and forcing the production of a continuing series of responses in the form of repair. Repair can be thought of as the replacement of damaged portions of tissue, while regeneration can be thought of as the production of new tissue. Repair, aging, and regeneration are said to be most active at night, during sleep. This has important implications for getting a good night's sleep.

The rate of repair is not only a function of age; it is a determinant of the nature of the anatomy and physiology resulting from the repair process. There is an optimal range for the rate of repair, outside of which the repaired tissue develops a quality less than optimal. Ligaments that are induced to heal too rapidly may develop fibrotic scarring, which can result in shortening and excessive tightness, while ligaments slow to heal may develop greater length, which results in laxity.

With aging, characteristic anatomical as well as physiological changes occur. These are not part of the process of maturation, but comprise an ongoing set of changes to a body that has already matured. These changes are also independent of those that result from injury. They follow a predictable time course and sequence somewhat common to members of the same species, and even more common to cultures within the species. An example that may transcend cultures involves the age changes to the human spinal intervertebral disc. In the third decade of life, the blood supply to the disc slows and eventually the blood vessels inside the disc disappear. By the fifth decade, it becomes evident that the morphology and chemical composition of the nucleus pulposus, which formerly had been distinct from the surrounding annulus fibrosus, is changing. By the seventh decade, the nucleus may be anatomically and histologically indistinguishable from the annulus. During this nearly lifelong transition, the anatomy and physiology of the intervertebral disc undergoes characteristic, age-dependent

changes. Other tissues throughout the body undergo their own characteristic, age-dependent changes.

There are age-dependent norms for the speed of physiological processes. With aging, all physiology of the mature body predictably slows. An accelerated decline in physiological processes, and in the consequent speed of repair, can lead to degeneration. Degeneration can be thought of as premature aging, and it arises from the periodic or chronic deviation from homeostasis.

Homeostasis & Disorder

Once homeostasis in a particular physiological pathway has been lost for some time, for whatever reason, compensations in other pathways occur. Compensation is an attempt by the body to shift metabolic processes from a weak or disordered system to a stronger or more highly ordered system, and in the process, to minimize or eliminate symptomatology. The ultimate goal is to preserve the body's overall strength; the burdens of metabolism are shifted accordingly. The continuing presence of conditioned pathways, a hallmark of compensation, testifies that homeostasis has been lost. Unfortunately, compensations, which act to minimize symptomatology, are usually insidious; many disorders are often initially subclinical. Some disorders remain subclinical throughout nearly their entire course. This makes the early detection of disorder both imperative and difficult; using symptomatology as a marker of underlying disease can be unreliable, and meaningful only in postmortem examination.

Unless disorder is remedied, a cascade effect occurs, progressing into more severe and widespread disorder. The progression of disorder can be categorized into five phases. The first phase of disorder is the deviation from homeostasis. The natural tendency of the body is to return to homeostasis, but if that is not possible, compensation progresses to the second phase of disorder: pathophysiology. Once in this phase, the body still attempts to return to the previous phase. Should the pathophysiology persist, however, ongoing compensation will eventually result in the involved tissues undergoing a morphologic change. This, the third phase of disorder, is that of pathomorphology. The body will still attempt to return to the previous phase. If it cannot, the pathomorphology will progress with continuing compensation, and eventually the patient will perceive having entered the fourth phase of disorder: symptomatology. Eventually, those sequelae that are observable might be so far down the cause-effect continuum that the original insult might be totally obscure, or even no longer present.

Still, the body will attempt to return to the previous phase. Failure to do so may result in the compensation of still more systems into dysfunction until the fifth and final phase is reached: death. As the phases proceed, they become more difficult to reverse, and the number of sequelae increases. At some point along this progression, the transition is made from acute disorder to chronic disorder. That point may occur during the transition from pathophysiology to pathomorphology, after which the disorder becomes especially difficult to arrest and reverse. The five phases of disorder can occur over a period of hours to as long as a period of decades. Moreover, as we age and degenerate, reversing any phase of every disorder becomes more difficult.

Interrupting the progression of the phases of disorder as early as possible is the most efficient and logical means for affecting a return to homeostasis. The hardwired control programs need not be relearned, but conditioning them is necessary to assist the body in overcoming the adverse effects of compensation. Judicious use of natural, or largely natural, products, in physiological rather than in pharmaceutical dosages, and coordinating their administration with

natural rhythms and cycles, can produce excellent results with a minimum of adverse effects. Gently and naturally conditioning the body's control systems, largely through supplementation directed by laboratory data and through essential lifestyle changes, is an integral part of functional medicine, and is the guiding philosophy of BioHealth Diagnostics.

Functional Adrenal Stress Profile: BHD #201

Adrenal Cortisol Rhythm and DHEA-S Average

Overview

The adrenal glands produce complementary hormones cortisol and dehydroepiandrosterone (DHEA). Cortisol and DHEA are involved in the physiology of virtually every cell. The Functional Adrenal Stress Profile, BHD #201, assesses the levels of cortisol and of the sulfate form of DHEA: DHEA-S. This profile assesses the body's ongoing level of adrenal response to both internal and external stressors. Chronic degenerative disease is an often insidious and debilitating stressor. Since adrenal exhaustion is implicated in all chronic degenerative disease, restoration of normal adrenal function is essential in the treatment and prevention of such disorder.

The Functional Adrenal Stress Profile is a salivary test easily performed at home or at work, and mailed directly to the lab. Four saliva samples are taken throughout the course of a patient's typical day, so that the cortisol circadian rhythm can be determined. Two of these samples provide an average DHEA-S value. This profile can identify stages I through III of adrenal exhaustion, which provides an accurate assessment of adrenal dysfunction.

Cortisol Rhythm (4 Timed Samples)

Cortisol is best known for stimulating gluconeogenesis, and it 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 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 either stimulate or inhibit gene transcription, it promotes apoptosis, and it affects bone 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. The general effect of excess cortisol is usually catabolic.

The salivary free fraction of the adrenal cortisol output is reported because of its high clinical correlation. Since measuring the total daily cortisol output is impractical, the sum of four individual cortisol levels is taken at specified intervals throughout the day: in the morning between 6-8 am, near noon between 12-1 pm, in the late afternoon between 4-5 pm, and at nighttime between 10 pm-12 am. The normal sum of these four readings is 23-42 nM, with the ideal being 34-36 nM.

In the presence of stressors, the body almost immediately attempts to increase cortisol levels. This increase is associated with both an endocrine and an autonomic response in preparing the body to defend itself. Elevated cortisol levels for extended periods, however, negatively affect virtually every aspect of physiology. 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 surface integrity, to maintain bone mass, to produce effective immune function, to effectively regulate inflammatory processes, or to detoxify the body. Without proper intervention, continued adrenal hyperstimulation can lead to adrenal exhaustion, and eventually adrenal failure can occur. The degree and timing of various cortisol imbalances provide the health professional with invaluable insight into the nature of the causative stressors, and allow the practitioner to formulate a remedial protocol.

DHEA-S Average (Value of 2 samples)

DHEA is the major precursor of testosterone and the estrogens. The more active, sulfate form of DHEA is DHEA-S, which provides a more reliable measure of DHEA levels. We report the average of two DHEA-S values, taken between 12-1 pm, and between 4-5 pm. The normal DHEA-S level is 2.0-10.0 ng/ml, and the ideal is 7.0-8.0 ng/ml. 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 excess cortisol. Over extended periods of an increased demand for cortisol, DHEA levels decline, and DHEA is then no longer able to counter-regulate the negative effects of excess cortisol. Depressed DHEA levels serve as an early warning of potential adrenal exhaustion.

A chronic imbalance between adrenal stimulation and cortisol and/or DHEA output is associated with a multitude of both clinical and subclinical systemic disorders, some of which are listed below. Chronically depressed DHEA results in an imbalance in sex hormones. Abnormal cortisol and/or DHEA values, either elevated or depressed, result in decreased 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 protects against inflammatory reactions to food antigens. Dysfunctional mucosal immunity is associated with an increased risk of infections and of adverse food reactions.

Ancillary Factors

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 the presence of parasites or pathogens. Additional testing may be necessary to rule out the possibility of these and other ancillary factors interfering with digestion and absorption. This type of problem could likely impede such fundamental and critical processes as the ability to absorb water, the 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, adrenal exhaustion resulting from excessive stress must not be tolerated and must be addressed.

PLEASE NOTE

- ***Test results with suggested protocols begin on page 18.***
- ***Technical resources are located after the protocols on page 41.***
- ***Dietary Supplement information is located in the appendix on page 77.***

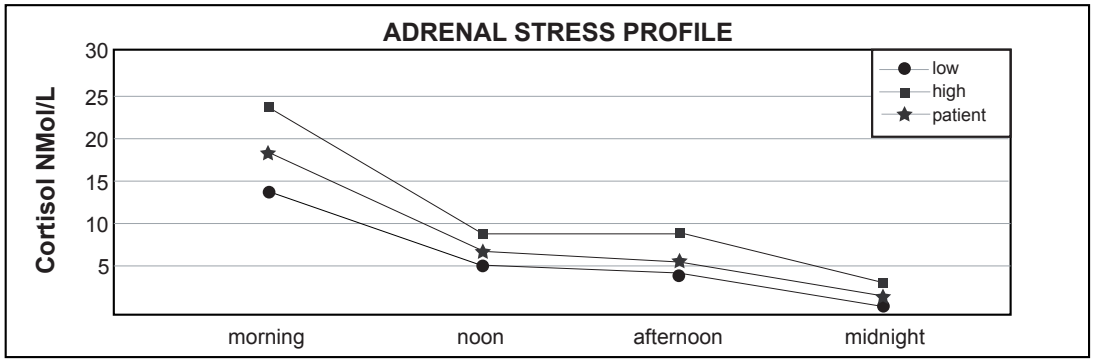
The test result on the next page illustrates an example of a NORMAL Functional Adrenal Stress Profile

Adrenal Stress Profile – Normal Sample

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)	18.2		nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)	7.0		nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)	5.1		nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)	2.0		nM	1.0 - 3.0
CORTISOL SUM		32.3		nM	23.0 - 42.0
DHEA-S AVERAGE		6.2		ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO		5.2		RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	18.2	7	5.1	2

Clinical Considerations:
Functional Adrenal Stress Profile

- The test results listed under Stages I, II, and III (stages of adrenal exhaustion) are not intended to be representative of all possible test results - however, they do provide important guidelines and effective protocols.

- Results in Stage I are rarely seen since most people in Stage I generally have adequate reserves and they often feel well. These are not typical patients that are presenting with complaints related to adrenal exhaustion. However, patients in Stage I are often heading to Stage II and eventually Stage III, short of having excellent genetics and an optimal approach to diet, stress management, sleep, and exercise.

- Stage III's with total cortisol sums below 15 may require hydrocortisone (low dose cortisol) protocols. These protocols are available upon request through BioHealth Diagnostics.

- The adrenal protocols listed in this guide do not take into consideration patients on thyroid, as improving adrenal function (augmenting DHEA and pregnenolone) can significantly improve thyroid function, thereby reducing the amount of thyroid medication necessary. Given this possibility it is suggested that any patient on thyroid should be closely monitored and lower dosages of pregnenolone and DHEA should be initially considered.

- The variation in protocols for females – Options I and II – is to draw attention to the issue that women need less DHEA than men. For example, if women are taking estrogens and/or estrogen levels are running high, they would be more of a candidate for the Option II protocol that omits sublingual DHEA.

- It is strongly recommended that practitioners consult with BioHealth Diagnostics' technical and clinical support physicians if there are any questions regarding these notes, the interpretation of tests, or the delivery of protocols. Call 800-570-2000 to set up a complimentary appointment.

Stage I Adrenal Exhaustion: Mechanism of Action

An Initial Increase in Cortisol Output

Distinguishing features:

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

Stage I
Initial

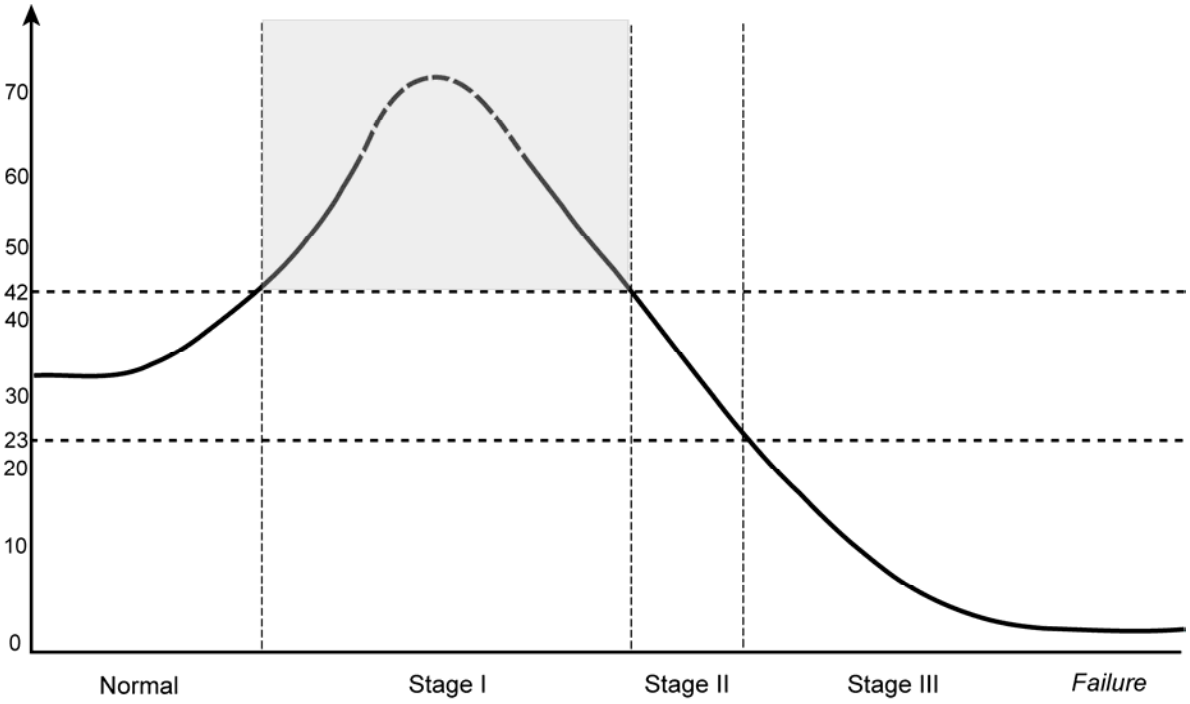
At least One Cortisol is High

Total Cortisol Sum is High

DHEA is Borderline Low, Low, or Normal

Stage I Adrenal Exhaustion is defined as a prolonged, increased excitatory stimulus to the adrenals having resulted in a prolonged, increased cortisol output, usually with a corresponding prolonged decrease in DHEA. In the hypothalamic-pituitary-adrenal control loop (HPA axis), an increase in ACTH output from the pituitary gland stimulates the adrenal glands. The level of cortisol is regulated through the HPA negative feedback. Continued demand for increased cortisol production necessitates ongoing ACTH release by the pituitary, but the adrenals can eventually experience difficulty in meeting the demand. This difficulty begins during the first stage of adrenal exhaustion.

Eventually, other pathways must compensate to facilitate the production of sufficient cortisol. One such compensation is often a shunt or "steal" of pregnenolone from the DHEA/sex hormone pathway to the progesterone/cortisol pathway. In this steal, the pathway from progesterone to cortisol becomes preferential over the pathway from DHEA to the sex hormones. There is consequently a decrease in DHEA and its metabolites, which include testosterone and the estrogens. Progesterone either remains normal or decreases, and cortisol increases. The overall cortisol increase in Stage I, therefore, is due to a combination of increased cortisol output by the adrenals, and pregnenolone steal.

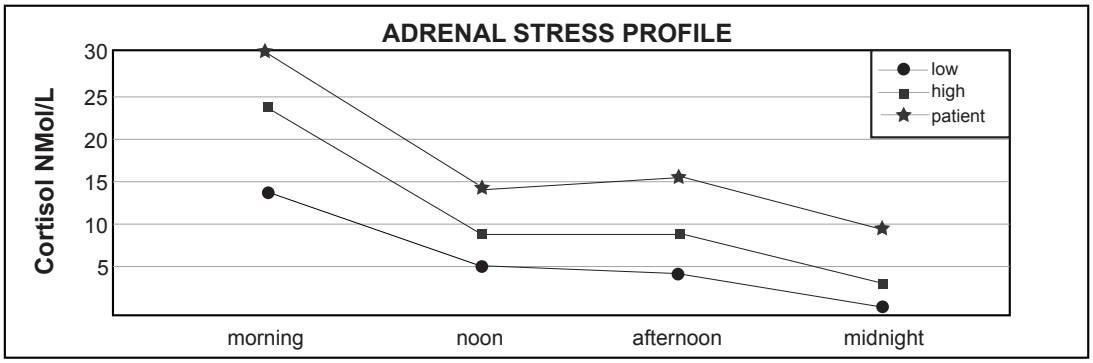


Sample Test Result 1-1/Stage 1 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)		30.0	nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)		14.6	nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)		15.4	nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)		9.2	nM	1.0 - 3.0
CORTISOL SUM			69.2	nM	23.0 - 42.0
DHEA-S AVERAGE			3.0	ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO			23.1	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	30	14.6	15.4	9.2

Therapeutic Protocol - Stage I Adrenal Exhaustion

⇦ For Test Result 1-1

Male Protocol

BioMatrix®

- Pregnenolone: 8 drops 3 times daily after meals.
- DHEA: 4 drops 3 times daily after meals.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before breakfast, lunch, and dinner.

Female Protocol Option #1

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Support Adrenals: 1 capsule with breakfast; 1 capsule with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before breakfast, lunch, and dinner.

Female Protocol Option #2

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before breakfast, lunch, and dinner.

NOTE: **Seriphos** is best taken on an empty stomach 4 to 6 hours before elevated cortisol – it helps to suppress ACTH.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicators and patient response.

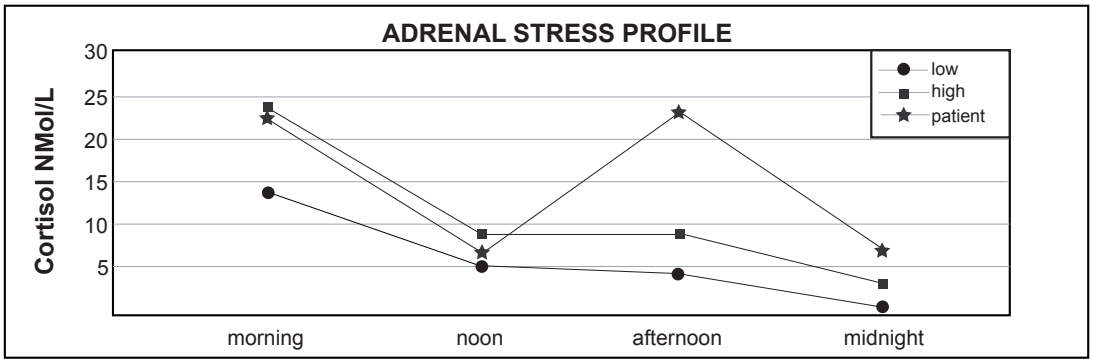
→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Test Result 1-2/Stage 1 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)	22.4		nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)	7.0		nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)		23.0	nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)		7.1	nM	1.0 - 3.0
CORTISOL SUM			59.5	nM	23.0 - 42.0
DHEA-S AVERAGE		2.0		ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO			29.75	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	22.4	7	23	7.1

Therapeutic Protocols – Stage 1 Adrenal Exhaustion

⇦ For Test Result 1-2

Male Protocol

BioMatrix®

- Pregnenolone: 8 drops 3 times daily after meals.
- DHEA: 4 drops 3 times daily after meals.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before lunch and dinner.

Female Protocol Option #1

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Support Adrenals: 1 capsule with breakfast; 1 capsule with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before lunch and dinner. Seriphos is best taken on an empty stomach 4 to 6 hours before elevated cortisol – it helps to suppress ACTH.

Female Protocol Option #2

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before lunch and dinner.

NOTE: **Seriphos** is best taken on an empty stomach 4 to 6 hours before elevated cortisol – it helps to suppress ACTH.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicators and patient response.

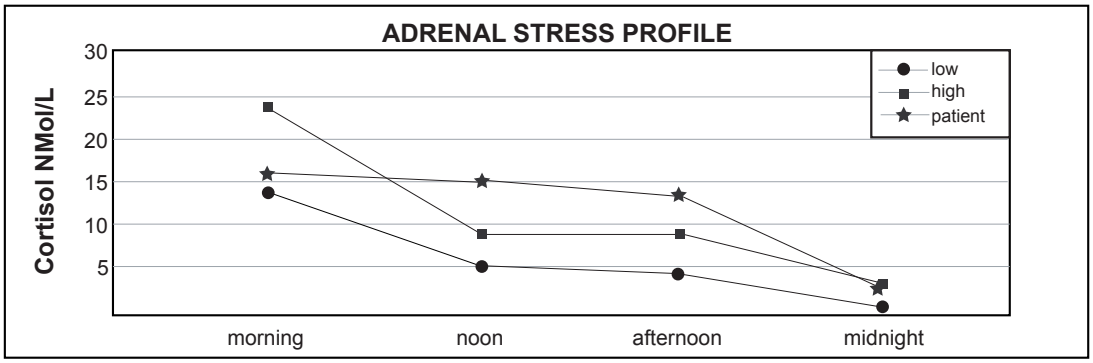
→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Test Result 1-3/Stage 1 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)	16.0		nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)		15.0	nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)		13.0	nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)	2.7		nM	1.0 - 3.0
CORTISOL SUM			46.7	nM	23.0 - 42.0
DHEA-S AVERAGE			1.3	ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO			35.9	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	16	15	13	2.7

Therapeutic Protocols – Stage 1 Adrenal Exhaustion

⇦ For Test Result 1-3

Male Protocol

BioMatrix®

- Pregnenolone: 8 drops 3 times daily after meals.
- DHEA: 4 drops 3 times daily after meals.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before lunch and dinner.

Female Protocol Option #1

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Support Adrenals: 1 capsule with breakfast; 1 capsule with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before breakfast and lunch.

Female Protocol Option #2

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Non BioMatrix

- Seriphos™: 1 capsule ½ hour before breakfast and lunch.

NOTE: **Seriphos** is best taken on an empty stomach 4 to 6 hours before elevated cortisol – it helps to suppress ACTH.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicators and patient response.

→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

NOTES

Stage II Adrenal Exhaustion: Mechanism of Action

The Transition from Increased to Decreased Cortisol Output

Stage II
Intermediate

AM, Noon or Afternoon Cortisols are Low or Borderline Low

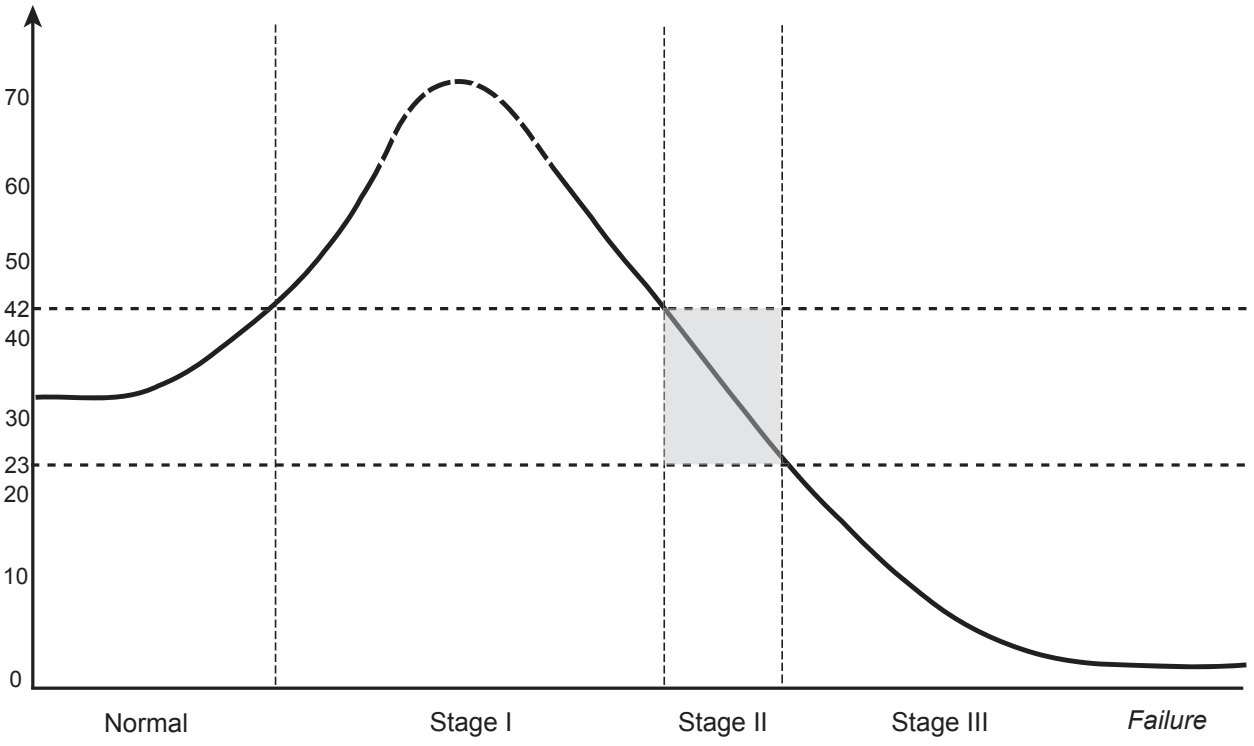
Total Cortisol Sum is Normal

DHEA Borderline Low or Low

Distinguishing features:

- (↑) anterior pituitary output of ACTH
- (↑) adrenocortical stimulation
- normal total cortisol output
- low or borderline-low morning, noon, or afternoon cortisol level
- normal nighttime cortisol level
- (↑) probability of pregnenolone steal
- (↑) probability of (↓) DHEA

Stage II Adrenal Exhaustion is a transitional phase. It signifies a continuing decline in cortisol output from levels above normal to those below normal, although ACTH stimulation remains high or even increases. There is a gradual change from increased to decreased cortisol output due to a decreasing response of the adrenal glands to protracted ACTH stimulation. Any one or more of the morning, noon, or afternoon cortisol values is low or borderline-low, but the nighttime cortisol level is usually normal. The decreasing cortisol output is a marker of mid-stage adrenal exhaustion. In this transitory stage the sum of the four cortisol levels is nevertheless normal. Pregnenolone steal from the DHEA/sex hormone pathway to the progesterone/cortisol pathway can assist in maintaining normal overall cortisol levels at the continued expense of DHEA. DHEA usually remains low or borderline-low.

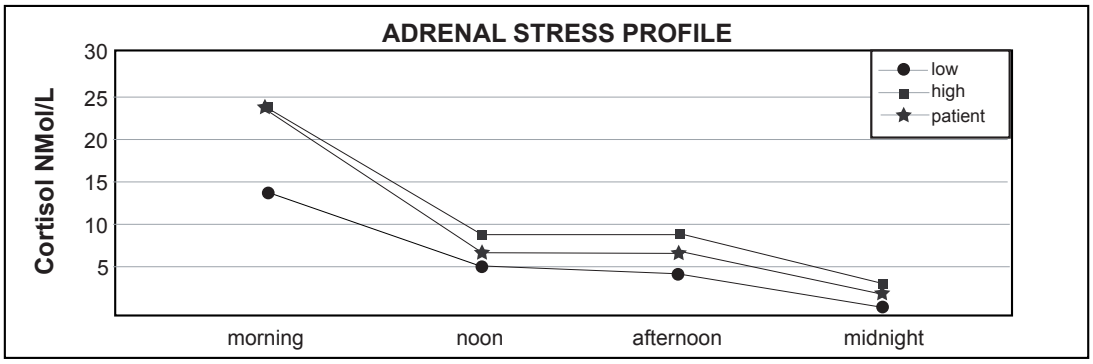


Sample Test Result 2-1/Stage 2 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)	24.0		nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)	7.0		nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)	7.0		nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)	2.5		nM	1.0 - 3.0
CORTISOL SUM		40.5		nM	23.0 - 42.0
DHEA-S AVERAGE		2.9		ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO			14.0	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	24	7	7	2.5

Therapeutic Protocols – Stage 2 Adrenal Exhaustion

⇦ For Test Result 2-1

Male Protocol

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol Option #1

BioMatrix®

- Pregnenolone: 4 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Support Adrenals: 1 capsule with breakfast; 1 capsule with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol Option #2

BioMatrix®

- Pregnenolone: 4 drops 3 times daily after meals.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicator and response.

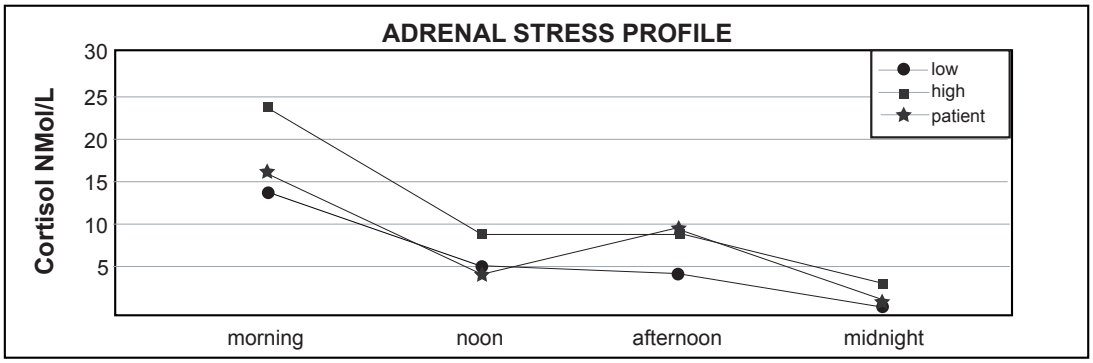
→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Test Result 2-2/Stage 2 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)	16.5		nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)		4.0	nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)		9.0	nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)	1.4		nM	1.0 - 3.0
CORTISOL SUM		30.9		nM	23.0 - 42.0
DHEA-S AVERAGE			1.7	ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO			18.2	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	16.5	4	9	1.4

Therapeutic Protocols – Stage 2 Adrenal Exhaustion

⇦ For Test Result 2-2

Male Protocol

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before lunch
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol Option #1

BioMatrix®

- Pregnenolone: 4 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before lunch
- Support Adrenals: 1 capsule with breakfast; 1 capsule with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol Option #2

BioMatrix®

- Pregnenolone: 4 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before lunch
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

NOTE: **Licorice Root Extract** helps to spare cortisol and improve blood sugar control.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicator and response.

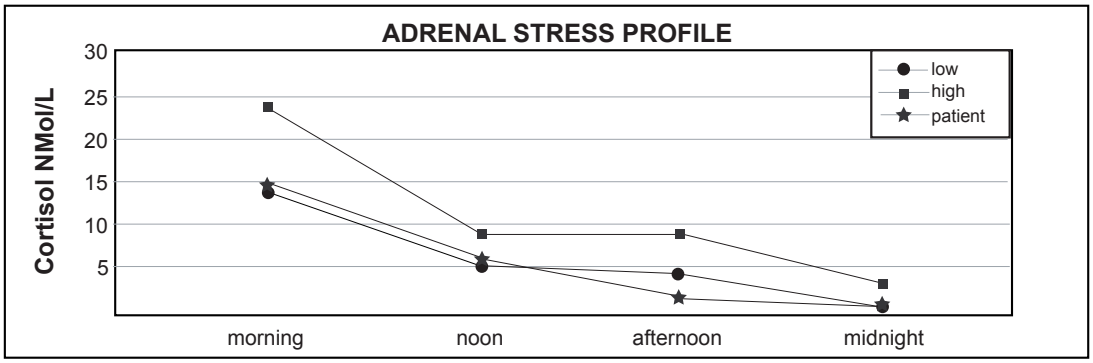
→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Test Result 2-3/Stage 2 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)	14.2		nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)	6.4		nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)		2.0	nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)	1.0		nM	1.0 - 3.0
CORTISOL SUM		23.6		nM	23.0 - 42.0
DHEA-S AVERAGE			1.0	ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO			23.6	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	14.2	6.4	2	1

Therapeutic Protocols – Stage 2 Adrenal Exhaustion

⇦ For Test Result 2-3

Male Protocol

BioMatrix®

- Pregnenolone: 8 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before breakfast and dinner
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol Option #1

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- DHEA: 2 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before breakfast and dinner
- Support Adrenals: 1 capsule with breakfast; 1 capsule with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol Option #2

BioMatrix®

- Pregnenolone: 6 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before breakfast and dinner
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

NOTE: **Licorice Root Extract** helps to spare cortisol and improve blood sugar control.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicator and response.

→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

NOTES

Stage III Adrenal Exhaustion: Mechanism of Action

The Advanced Stage with Decreased Cortisol Output

Distinguishing features:

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

Stage III
Advanced

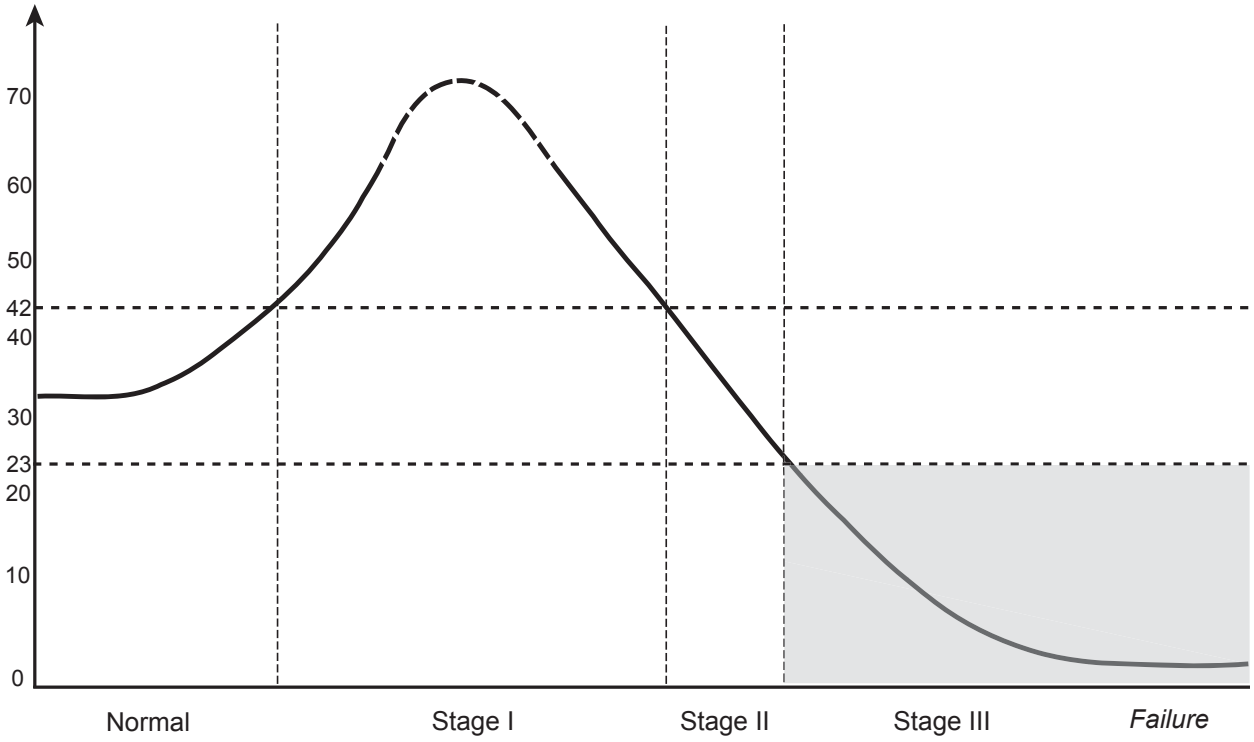
Most Cortisols are Low or Borderline Low

Total Cortisol Low

DHEA Borderline Low or Low

Stage III is the terminal stage of adrenal exhaustion. It is marked by the failure of the adrenals to produce enough cortisol to reach even normal levels in response to continued, increased ACTH stimulation. The sum of the four cortisol levels is below normal, and DHEA is usually low or borderline-low. Endocrine and autonomic pathways, through endogenous and/or exogenous stress, have been conditioned by a complex of stimuli to respond beyond normal physiological ranges. This conditioning ultimately results in adrenal gland inability to produce the amount of cortisol demanded by the degree of stimulation. The result is a hypothalamic-pituitary-adrenal axis "crash," in which essential neuroendocrine feedback loops are endogenously unable to return the system to homeostasis. In such a case there is often a decreased nighttime cortisol, which is a marker of late Stage III adrenal exhaustion.

A wide variety of seemingly unrelated symptoms usually appears; a situation which reflects the global nature of the dysfunction. Severe imbalances in other hormone systems are to be expected. Subclinical disorders are common, indicating the insidiousness of advanced adrenal exhaustion. Adrenal failure is a natural sequela, and cardiovascular failure is a high probability.

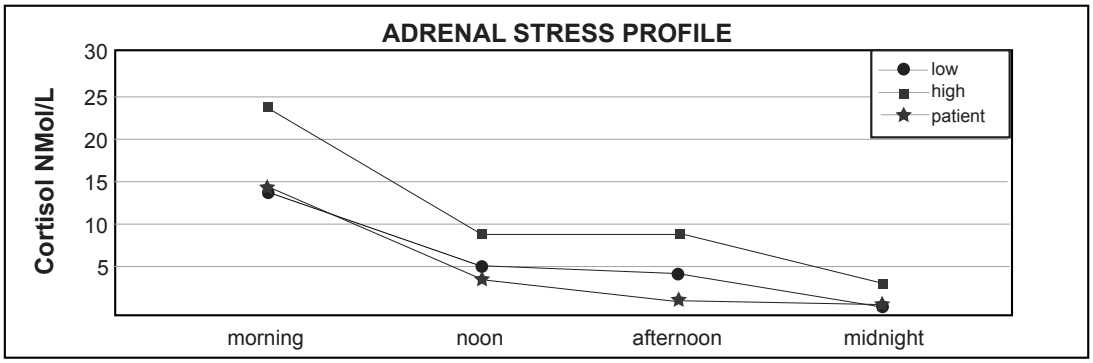


Sample Test Result 3-1/Stage 3 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)	13.2		nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)		3.3	nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)		2.3	nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)	1.0		nM	1.0 - 3.0
CORTISOL SUM			19.8	nM	23.0 - 42.0
DHEA-S AVERAGE			1.6	ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO			12.4	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	13.2	3.3	2.3	1

Therapeutic Protocols – Stage 3 Adrenal Exhaustion

⇦ For Test Result 3-1

Male Protocol

BioMatrix®

- Pregnenolone: 10 drops 3 times daily after meals.
- DHEA: 2 drops 2 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before lunch and dinner
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol Option #1

BioMatrix®

- Pregnenolone: 8 drops 3 times daily after meals.
- DHEA: 2 drops 2 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before breakfast, lunch and dinner
- Support Adrenals: 1 capsule with breakfast; 1 capsule with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol Option #2

BioMatrix®

- Pregnenolone: 8 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before lunch and dinner
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

NOTE: **Licorice Root Extract** helps to spare cortisol and improve blood sugar control.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicators and patient response.

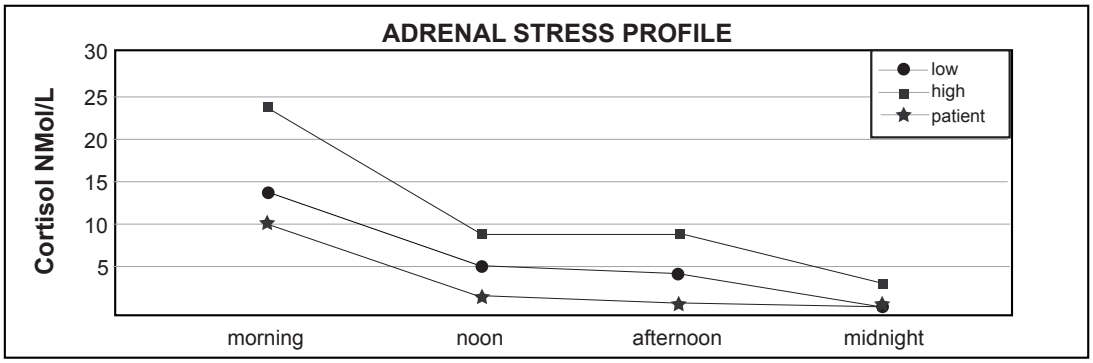
→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Test Result 3-2/Stage 3 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201					
MORNING	(6:00 - 8:00 AM)		10.0	nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)		2.0	nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)		1.2	nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)	1.0		nM	1.0 - 3.0
CORTISOL SUM			14.2	nM	23.0 - 42.0
DHEA-S AVERAGE			1.0	ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO			14.2	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	10	2	1.2	1

Therapeutic Protocols – Stage 3 Adrenal Exhaustion

⇦ For Test Result 3-2

Male Protocol

BioMatrix®

- Pregnenolone: 12 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before breakfast, lunch and dinner.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol

BioMatrix®

- Pregnenolone: 10 drops 3 times after meals daily.
- Licorice Root Extract: 10 drops 10-15 minutes breakfast, lunch and dinner.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Important Notes

- **Advanced Stage III's** (cortisol sum =<15) should be retested in 4-6 weeks. Also consider low does cortisol protocol for advanced Stage III's.
- **Licorice Root Extract** helps to spare cortisol and improve blood sugar control.
- Initially no sublingual **DHEA** is suggested. It may be added when the cortisol sum increases - subject to retesting.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicators and patient response.

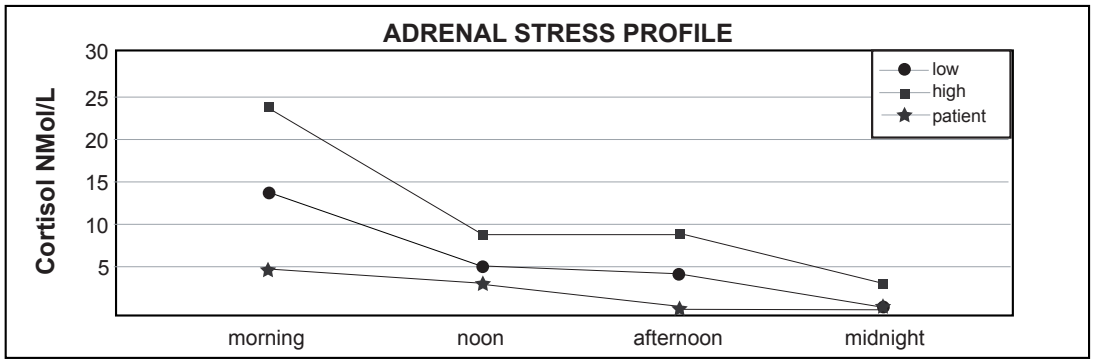
→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Test Result 3-3/Stage 3 Adrenal Exhaustion

* * * F U N C T I O N A L A D R E N A L S T R E S S P R O F I L E * * *

	NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #201				
MORNING (6:00 - 8:00 AM)		4.8	nM	13.0 - 24.0
NOON (12:00 - 1:00 PM)		3.0	nM	5.0 - 8.0
AFTERNOON (4:00 - 5:00 PM)		1.0	nM	4.0 - 7.0
NIGHTTIME (10:00 PM - 12:00 AM)		1.0	nM	1.0 - 3.0
CORTISOL SUM		9.8	nM	23.0 - 42.0
DHEA-S AVERAGE		.04	ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO		245.0	RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	4.8	3	1	1

Therapeutic Protocols – Stage 3 Adrenal Exhaustion

⇦ For Test Result 3-3

Male Protocol

BioMatrix®

- Pregnenolone: 15 drops 3 times daily after meals.
- Licorice Root Extract: 10 drops 10-15 minutes before breakfast, lunch and dinner.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Female Protocol

BioMatrix®

- Pregnenolone: 12 drops 3 times after meals daily.
- Licorice Root Extract: 10 drops 10-15 minutes breakfast, lunch and dinner.
- Support Adrenals: 2 capsules with breakfast; 2 capsules with lunch.
- Support Minerals: 3 tablets near bedtime, 15 minutes before a glycemically balanced snack.

Important Note

- **Advanced Stage III's** (cortisol sum =<15) should be retested in 4-6 weeks. Also consider low does cortisol protocol for advanced Stage III's.
- **Licorice Root Extract** helps to spare cortisol and improve blood sugar control.
- Initially no sublingual **DHEA** is suggested. It may be added when the cortisol sum increases - subject to retesting.

Additional Supplementation for All Protocols

- Vitamin C with bioflavonoids: 500 mg 4 times daily.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For suggested follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a physician consultant.
- Sublingual pregnenolone and DHEA dosages are general guidelines and may be increased or decreased subject to clinical indicators and patient response.

→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

NOTES

Hormone Markers Available from BioHealth Diagnostics

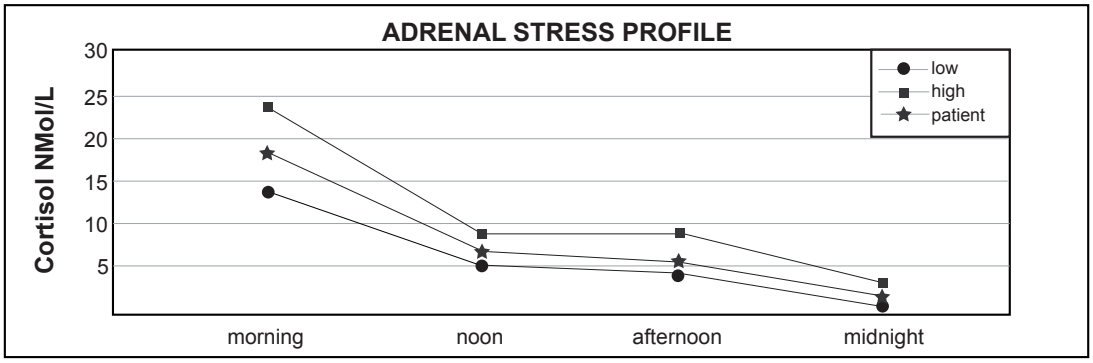
- **Androstenedione**
  A weak androgen which is a metabolite of DHEA and a direct precursor of testosterone, androstenedione can also be converted to estrone by the enzyme aromatase. In men, excessive androstenedione results in excessive estrone production.
- **Cortisol**
  Best known for stimulating gluconeogenesis it mobilizes protein stores in all tissues except the liver; it mobilizes fatty acids from adipose tissue; it is the precursor of cortisone and acts as an anti-inflammatory; and it is the primary hormone directing immune function. It is a major marker of the complex control loops regulating the sex hormones.
- **Dehydroepiandrosterone (DHEA)**
  DHEA is an important modulator of many physiological processes. It promotes the growth and repair of protein tissue 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.
- **Dihydrotestosterone (DHT)**
  DHT is made from testosterone by the enzyme 5-alpha reductase. Along with testosterone, it is responsible for the formation of primary sex characteristics of the male during embryonic life and secondary sex characteristics at puberty. Increased production of DHT in adult males is thought to cause prostate growth (hyperplasia) and male pattern baldness.
- **Estradiol**
  During the reproductive years most estradiol in women is produced by the granulosa cells of the ovaries by aromatization of testosterone from the theca cells, or conversion of estrone to estradiol. Smaller amounts of estradiol are also produced by the adrenal cortex. In men, the testes produce some estradiol. An additional source of estradiol in both sexes is peripheral aromatization of testosterone to estradiol.
- **Estriol**
  Estriol is an oxidative product of estradiol and estrone, having relatively weak estrogenic activity. Estriol is the estrogen that is made in large quantities during pregnancy and has potential protective properties against the production of cancerous cells. Estriol is the estrogen most beneficial to the vagina, cervix and vulva.
- **Estrone**
  Estrone is an estrogen produced in the fat cells, muscle cells and skin of men and women. In men, almost all estrone is converted from androstenedione, which is produced in the testes and adrenal glands. Estrone is stored in adipose tissue: the more body fat the higher the level of estrone. This becomes a vicious circle as estrone promotes the storage of fat.
- **Melatonin**
  Melatonin is secreted by the pineal gland and is important in the regulation of many hormones in the body. Among its key roles, melatonin controls the body's circadian rhythm. Production rises at night, falls by day, and affects our internal body clock and sleep cycles.
- **Progesterone**
  Progesterone is a steroid hormone synthesized from cholesterol and is important as an intermediate in the pathway to cortisol via pregnenolone. Progesterone induces the cyclic changes in the endometrium that allow implantation of the fertilized ovum. Measurement of progesterone levels is also useful to monitor women on progesterone replacement therapy.
- **Testosterone**
  While it is important for primary and secondary male sexual characteristics, libido and sexual function, muscle and bone strength and growth of normal body hair, testosterone also has favorable effects on mood, well being, energy and vitality. Most testosterone is produced in the testes with some produced in the adrenal glands. Excessive levels of testosterone have been correlated with high cholesterol, prostate problems, atherosclerosis and aggression.

Sample Functional Adrenal Stress Profile plus V w/ Estrone

* * * FUNCTIONAL ADRENAL STRESS PROFILE PLUS V w/ ESTRONE * * *

		NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #205E					
MORNING	(6:00 - 8:00 AM)	18.2		nM	13.0 - 24.0
NOON	(12:00 - 1:00 PM)	7.0		nM	5.0 - 8.0
AFTERNOON	(4:00 - 5:00 PM)	5.1		nM	4.0 - 7.0
NIGHTTIME	(10:00 PM - 12:00 AM)	2.0		nM	1.0 - 3.0
CORTISOL SUM		32.3		nM	23.0 - 42.0
DHEA-S AVERAGE		6.2		ng/ml	2.0 - 10.0
TOTAL CORTISOL/DHEA-S RATIO		5.2		RATIO	5.0 - 6.0

BioHealth Diagnostics



	morning	noon	afternoon	midnight
low	13	5	4	1
high	24	8	7	3
patient	18.2	7	5.1	2

- Page 1 -

- **For practitioners that desire to go beyond the basic Functional Adrenal Stress Profile, additional panels are available to evaluate sex hormones and melatonin. See the current Test Fee Schedule or www.biodia.com for details.**

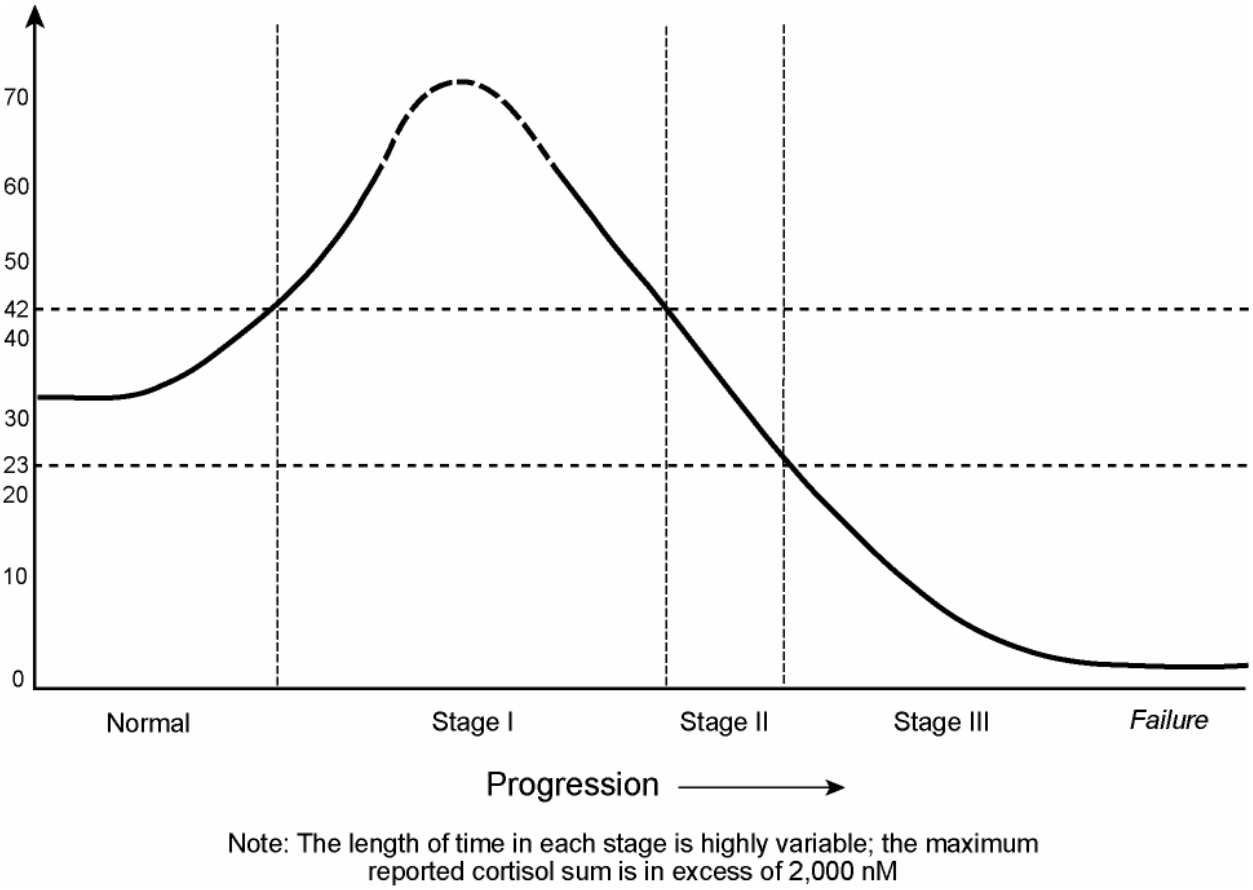
Sample Functional Adrenal Stress Profile plus V w/ Estrone

* * * FUNCTIONAL ADRENAL STRESS PROFILE PLUS V w/ ESTRONE * * *

	NORMAL	ABNORMAL	UNITS	NORMAL RANGE
BHD #205E				
SALIVARY ESTRADIOL	3.0		PG/ML	
* ESTRADIOL REFERENCE RANGE *				
FEMALES: Follicular Phase.....1.0 - 5.0 PG/ML Midcycle.....3.0 - 8.0 PG/ML Luteal Phase.....1.0 - 5.0 PG/ML Postmenopausal.....0.5 - 3.0 PG/ML Physiological Range.....1.0 - 14.0 PG/ML MALE.....1.0 - 3.0 PG/ML				
SALIVARY ESTRIOL	1.0		PG/ML	
* ESTRIOL REFERENCE RANGE *				
FEMALES: Premenopausal.....1.0 - 4.0 PG/ML Postmenopausal.....1.0 - 3.0 PG/ML Physiological Range.....1.0 - 12.0 PG/ML MALE.....0.0 - 3.0 PG/ML				
SALIVARY ESTRONE	3.0		PG/ML	2.0 - 5.0
SALIVARY PROGESTERONE	66.0		PG/ML	
* PROGESTERONE REFERENCE RANGE *				
FEMALES: Premenopausal.....50 - 400 PG/ML Postmenopausal.....5.0 - 95 PG/ML Physiological Range.....100 - 500 PG/ML MALE.....5.0 - 100 PG/ML				
TESTOSTERONE (A.M.)	55.0		PG/ML	40.0 - 130.0
* TESTOSTERONE REFERENCE RANGE *				
FEMALE MALE				
A.M. 20.0 - 60.0 40.0 - 130.0				
MELATONIN (P.M.)	12.0		PG/ML	12.0 - 23.0

- Page 2 -

Progression of Stages of Adrenal Exhaustion

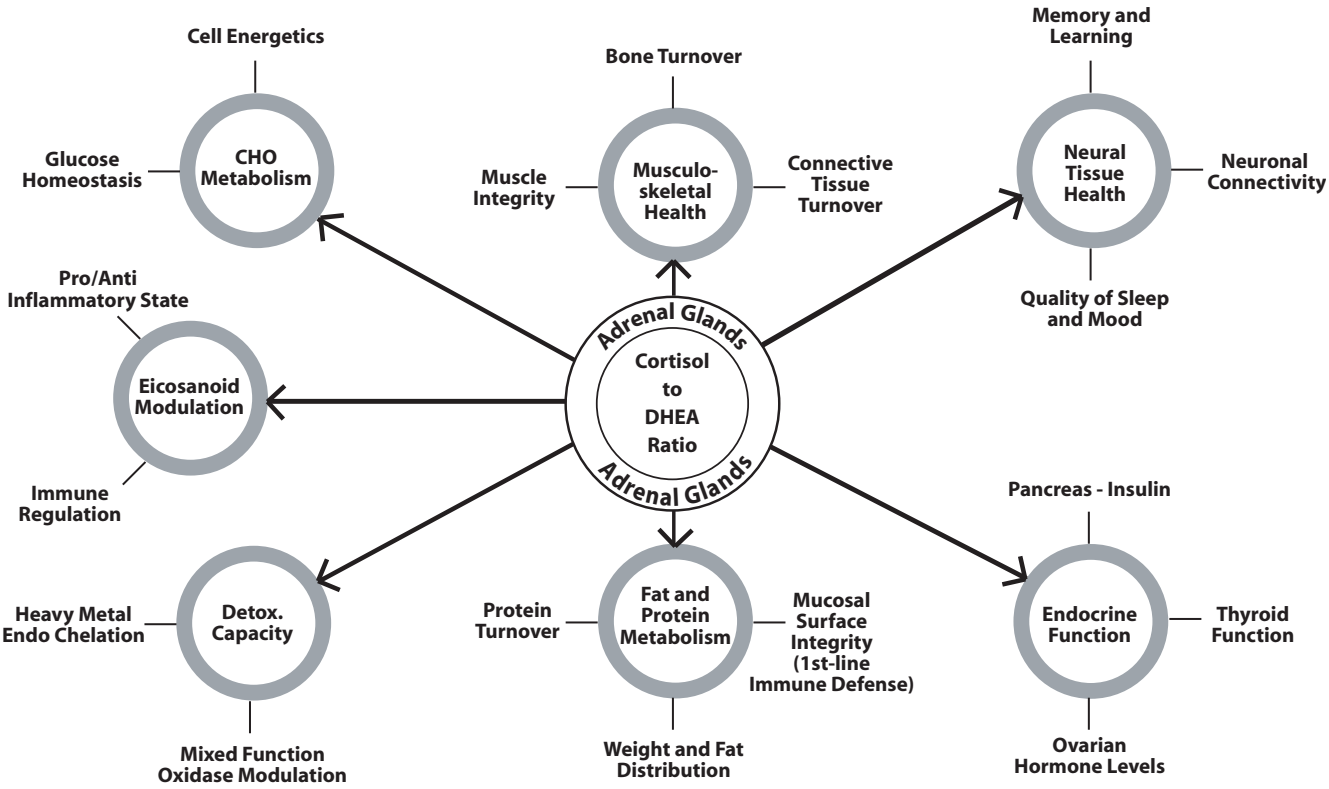


Note: The length of time in each stage is highly variable; the maximum reported cortisol sum is in excess of 2,000 nM

Note: Continued hyperstimulation of the adrenal glands is the common denominator in each stage of adrenal exhaustion (Stages I, II, and III). Ongoing hyperstimulation keeps the body in a state of chronic stress ("pregnenolone steal" or "cortisol escape" – See Page 49). This is always indicated by an elevated cortisol to DHEA ratio.

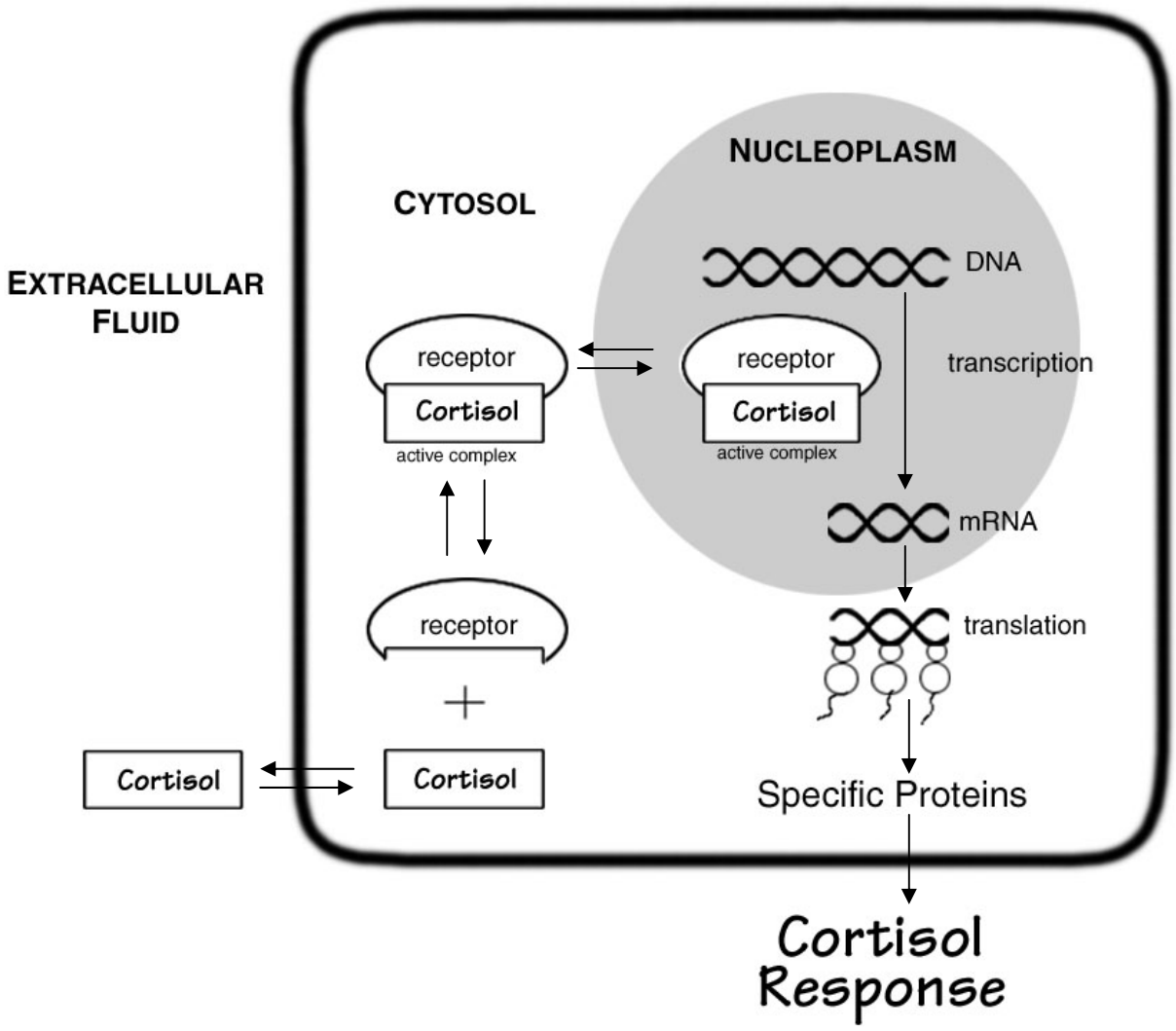
Physiological Aspects of Cortisol and DHEA

(The Adrenal Glands' Roles in Body Function Modulation)



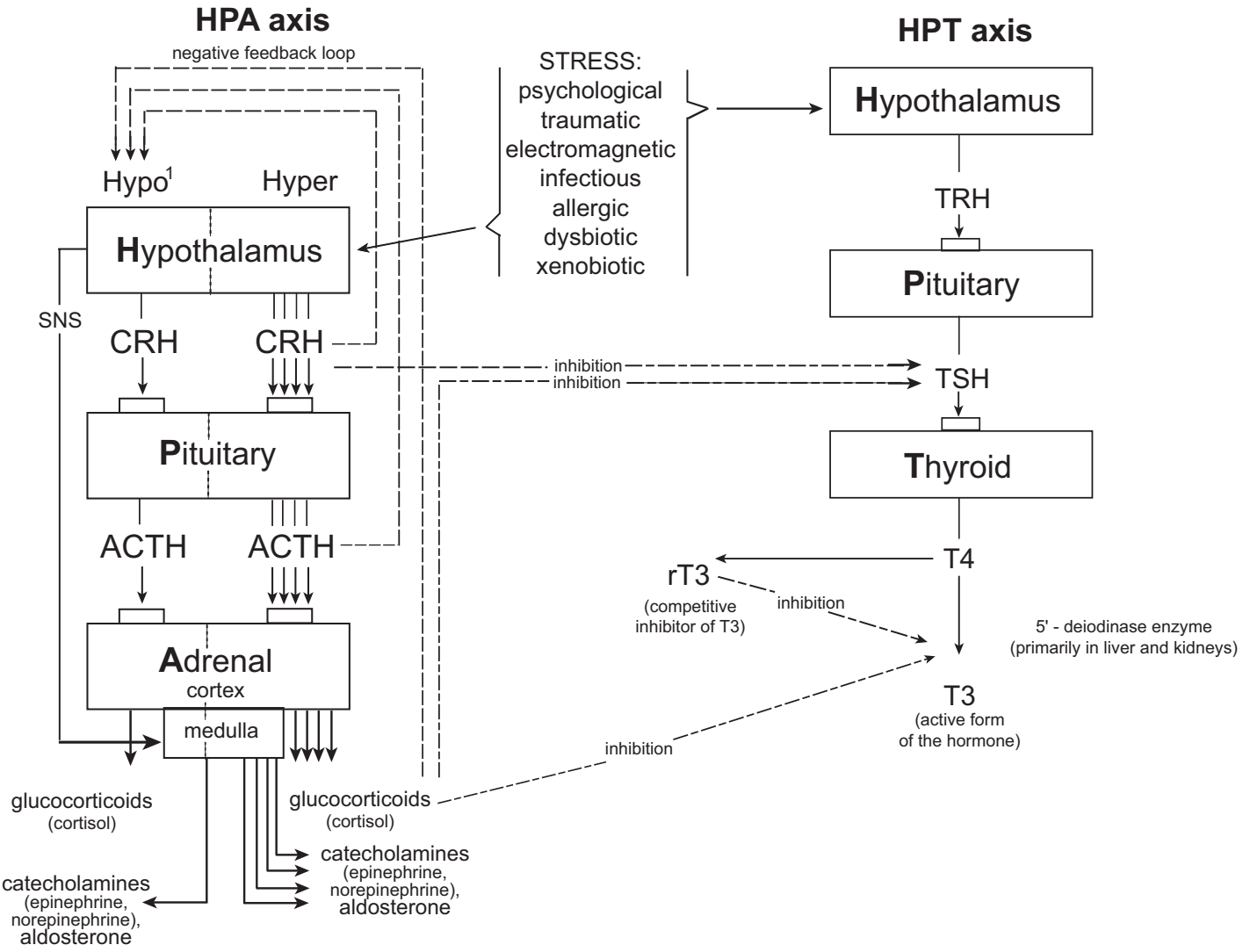
Cortisol is the primary hormone that directs immune function and is involved in virtually all aspects of body function. Both cortisol and DHEA have genetic influences. When cortisol and DHEA work together in harmony (maintaining a normal ratio between cortisol and DHEA), the body is in a normal state of adaptation to stress. When unable to maintain this normal state of adaptation, the body can now enter into a prolonged state of maladaptation to stress. This is now referred to as a chronic stress response (i.e. pregnenolone steal/cortisol escape/elevated cortisol to DHEA ratio). The longer one stays in a state of chronic stress the more compromised all aspects of body function become. This can ultimately result in hormone, immune and metabolic systems breakdown.

Cortisol Control of Gene Transcription



Modified after Goodwin, J.S., in Stites, D.P., et al., eds.; Basic & Clinical Immunology, 8th ed., Appleton & Lange, 1994.

HPA & HPT Axes

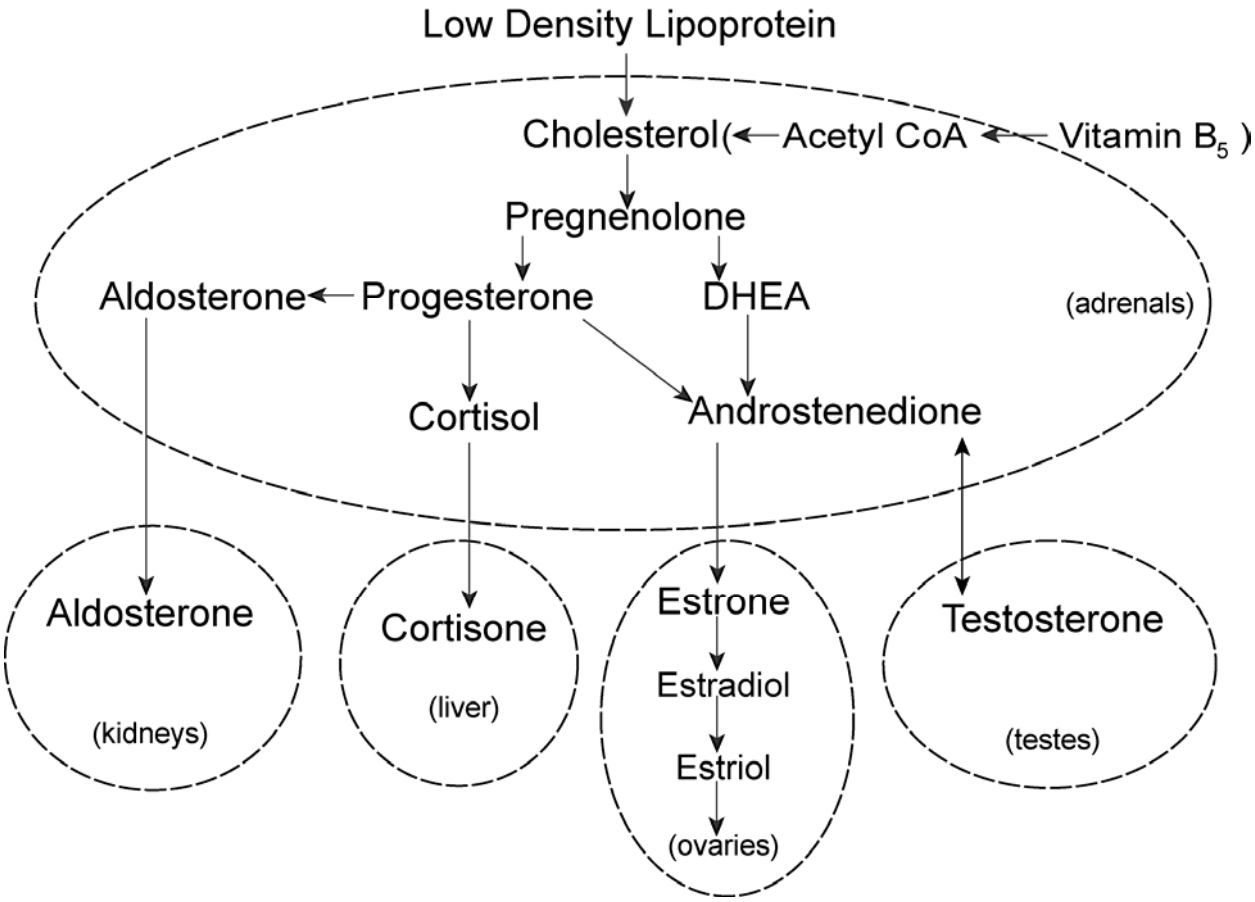


Given the direct influence of the HPA axis on the HPT axis, adrenal function should always be evaluated when assessing thyroid function.

Major points:
- Excess CRH inhibits TSH.
- Excess glucocorticoids (e.g. cortisol) inhibit conversion of the less active T4 to the more active T3.
- Excess high cortisol can result in high output of rT3 which inhibits T3.

Common Acronyms:
HPA Axis = Hypothalamic Pituitary Adrenal Axis **HPT Axis:** Hypothalamic Pituitary Thyroid Axis
CRH = Corticotrophic Releasing Hormone **ACTH** = Adrenocorticotrophic Hormone
TRH = Thyroid Releasing Hormone **TSH** = Thyroid Stimulating Hormone **rT3** = Reverse T3

Major Pathways of Steroid Hormone Synthesis



(General circulation)

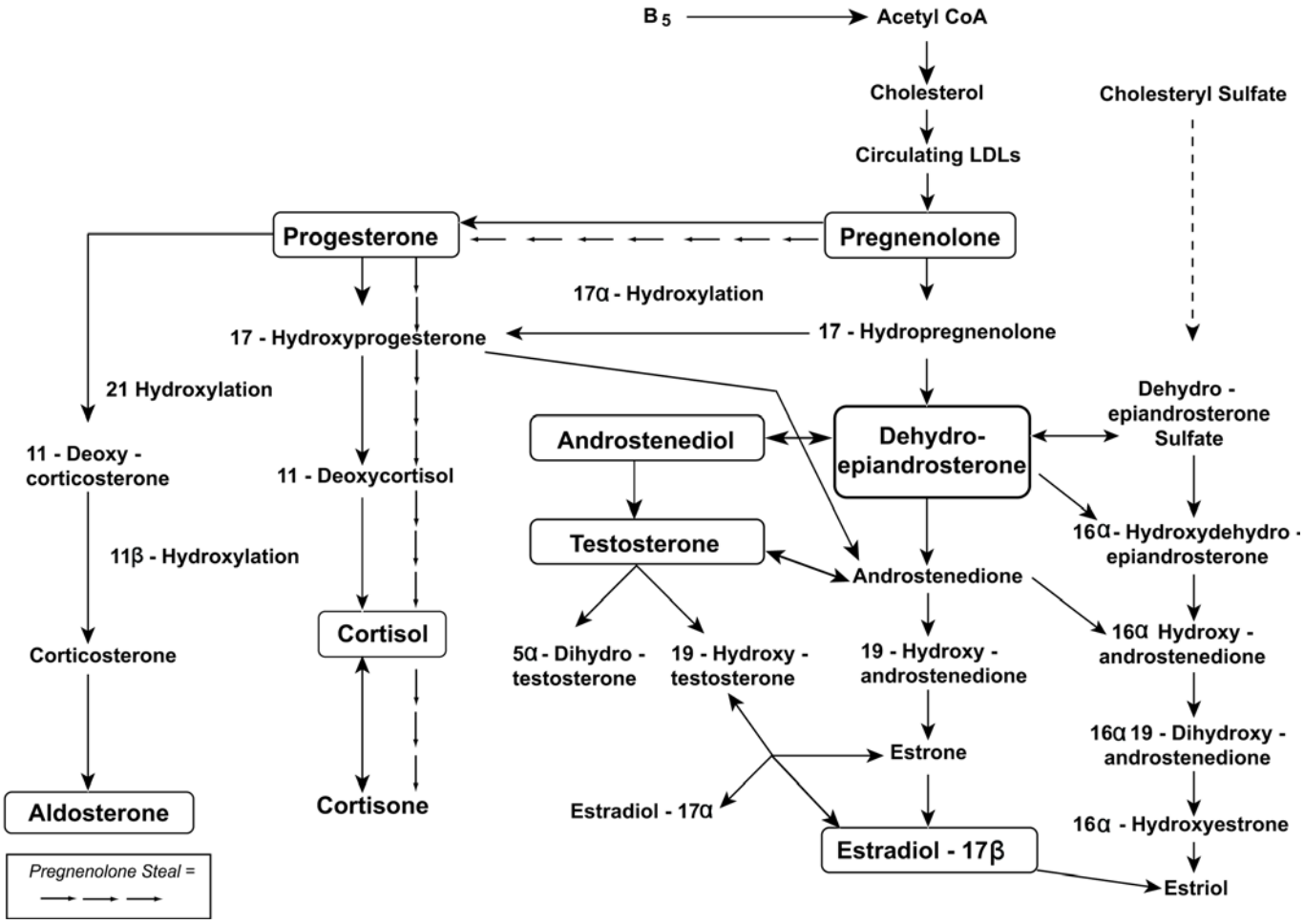
Additional production in the:

Ovaries	**Testes**
progesterone androstenedione testosterone → estradiol	DHEA androstenedione

Modified after Brook, C.G.D. & Marshall, N. J.; Essential Endocrinology, 3rd ed., Blackwell Science, 1996

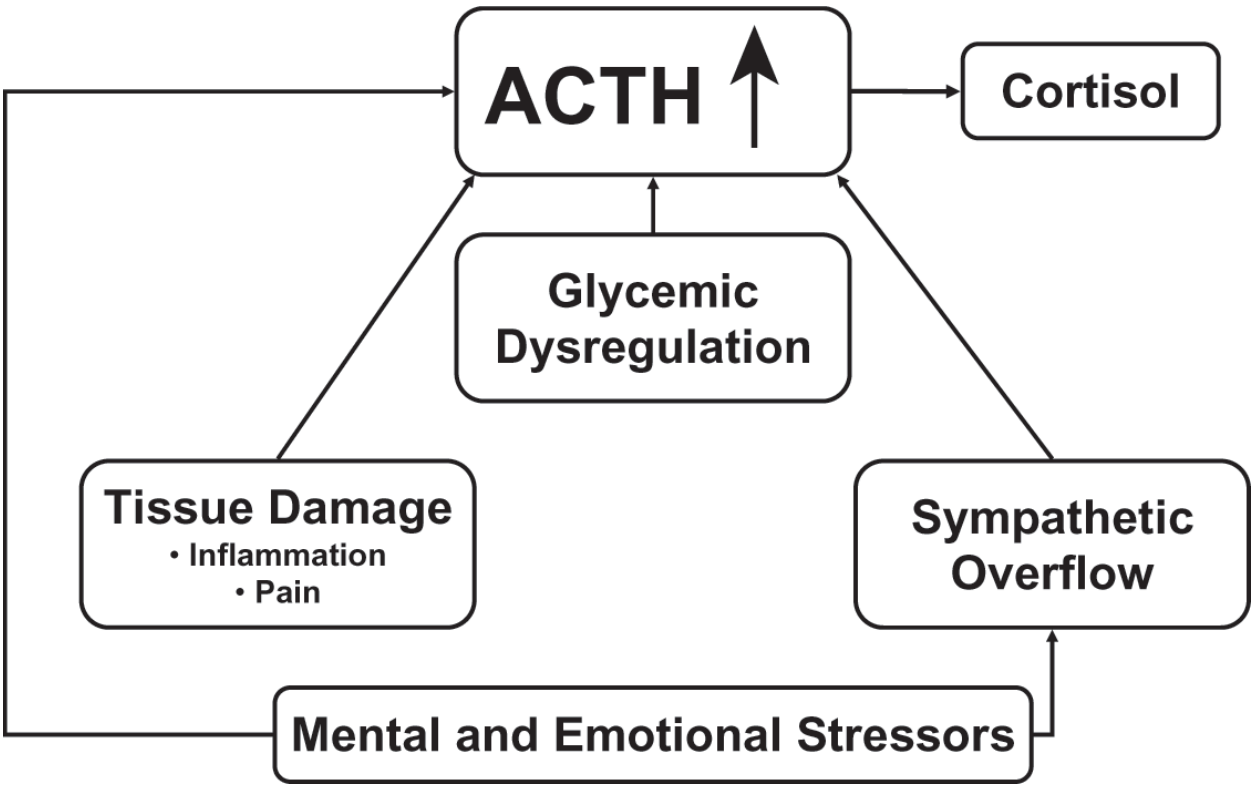
Steroidal Hormone Principle Pathways

(Understanding Pregnenolone Steal, the Preferential Pathway Under Chronic Stress)



The body's preferential pathway under chronic stress is called Pregnenolone Steal or Cortisol Escape. When the body is in a "chronic stress response", pregnenolone, the precursor to all the rest of the steroidal hormones, is diverted (see arrows) to cortisol – cortisone. This is at the detriment of all the other steroidal hormones; i.e. progesterone, aldosterone (mineral/cortical pathway/sodium-potassium pump), DHEA and its metabolites: the sex hormones, estrogens and testosterone. As pregnenolone is diverted to cortisol-cortisone, DHEA becomes depleted. The result is an elevated cortisol to DHEA ratio. This is measurable with the Functional Adrenal Stress Profile. Simply divide the cortisol sum by the DHEA(s) average to get the ratio. A normal ratio is approximately 5:1 to 6:1.

Common Inducers of ACTH Potentially Resulting in Adrenal Exhaustion

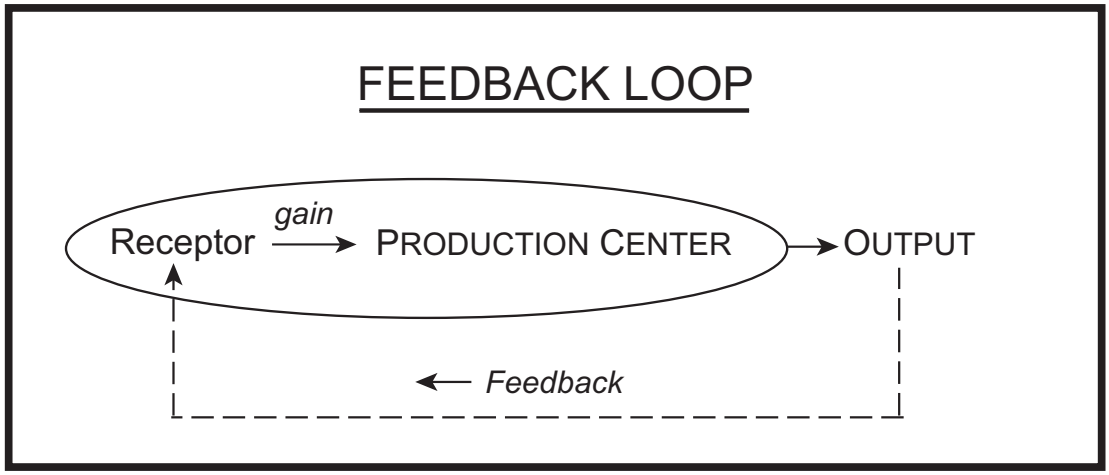


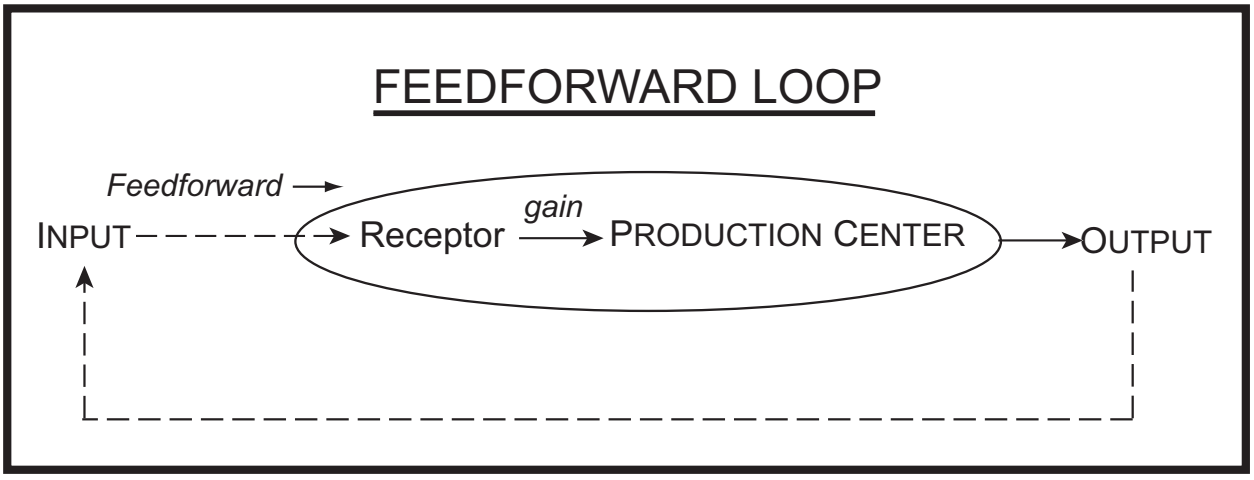
Chronic stimulation of ACTH can result in HPAA dysfunction, i.e. reduced HP sensitivity to negative feedback loop due to chronic hyperstimulation.

NOTE: Inflammation can be clinical or subclinical in nature.

Common Acronyms:
HPAA = Hypothalamic Pituitary Adrenal Axis **ACTH** = Adrenocorticotrophic Hormone

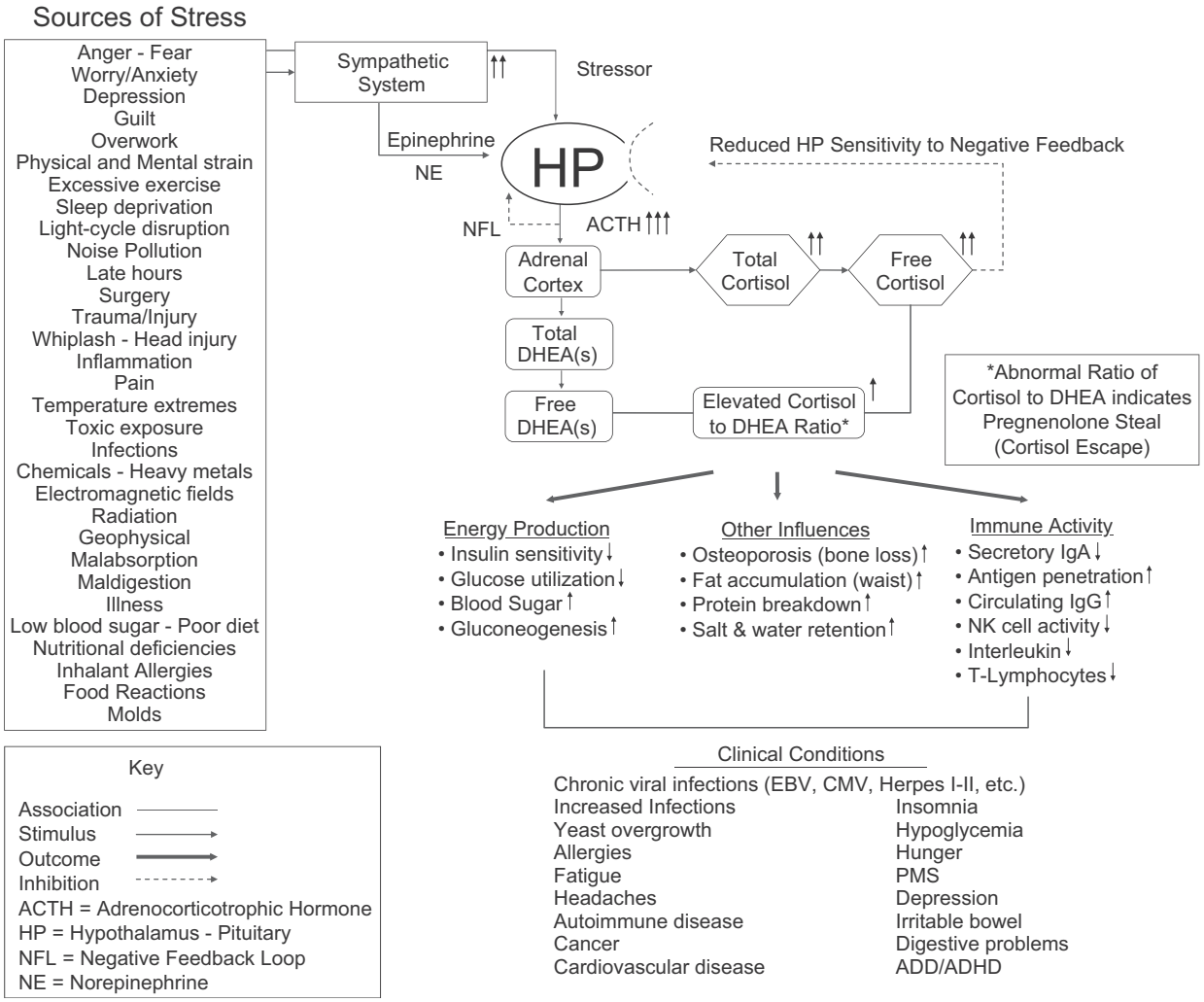
Feed Loops





Refer to *Control System Normalization* on Page 3

Chronic Stress Response



Constant hyperstimulation of the adrenal glands is a form of chronic stress that ultimately results in adrenal exhaustion.

The key to reversing adrenal exhaustion is to identify the sources of stress that have become chronic in nature. Evaluating both clinical and subclinical sources of chronic stress is paramount to clinical success. Positive lifestyle practices along with specific hormonal and nutritional support protocols will enhance recovery. However, failure to properly diagnose and treat the cause (source) of chronic stress will result in further adrenal exhaustion, and over time, hormone, immune, and metabolic systems breakdown.

Normal & Abnormal Values

BHD #201 Functional Adrenal Stress Profile

	Normal Ranges	[Ideal]	Abnormals	Units
Cortisol				
Morning	13.0 – 24.0	[18.0 – 19.0]		
Noon	5.0 – 8.0	[6]		
Afternoon	4.0 – 7.0	[5]	< or > Range	nM
Nighttime	1.0 – 3.0	[2]		
Sum	23.0 – 42.0	[36.0 – 38.0]		
DHEA-S	2.0 – 10.0	[6.0 – 8.0]	< or > Range	ng/ml

Sublingual Delivery of Hormones & Decreasing Alcohol Sensitivity

BioMatrix®* sublingual hormone products contain alcohol, making them a true sublingual. A small amount of alcohol is required to keep the ingredients in solution. Alcohol also rapidly transfers the active ingredients into the blood stream resulting in 99% absorption. This delivery method bypasses possible malabsorption in the digestive process and minimizes oxidative damage to the ingredients. The alcohol is NOT absorbed.

Advantages of Sublingual Hormone Delivery:

- Mimics body's own delivery system
- 99% absorption
- Dosage control
- Accuracy of timing of delivery
- Avoidance of malabsorption due to GI problems
- Minimizes oxidative damage to ingredients

Methods for decreasing sensitivity (burning sensation) caused by alcohol:

- Place a couple drops of vitamin A or E mycelized oil under the tongue just before taking sublingual hormones. This helps to decrease the "burning." Many individuals who are sensitive to the alcohol in sublinguals have mucosal tissue sensitivity often due to vitamin A deficiency.
- Dilute the hormone drops with a teaspoon of water and hold the solution in the mouth for two minutes or longer before swallowing.
- Place the sublinguals on the top of the tongue. This also helps to decrease the sensitivity to alcohol. Hold in mouth as long as possible before swallowing.
- Sublingual drops may be mixed with water and taken orally. Double the recommended number of drops, put them in water and drink the solution. Either with or without food is okay.
- Sublingual drops may be taken 10 to 15 minutes before or after meals (rinse away food particles in mouth first).
- Always shake bottle before use.
- Hold drops under tongue for 2 minutes before swallowing.
- Use mirror to observe accuracy of drops taken.
- For all follow-up salivary hormone testing while still on hormones: Double the number of drops and mix them in a small glass of water, starting 4-5 days before specimen collection. The other option is to stop all sublinguals 4-5 days prior to testing.

The Efficacy of Salivary Hormone Testing

The evaluation of hormone levels in the body is recognized by many physicians as an essential component of a diagnostic work-up. For decades, health professionals have relied on laboratory data to diagnose and treat conditions related to hormone levels, ratios, and patterns. With the development of the radioimmunoassay (RIA) technique in 1960 by the legendary research team of Berson and Yalow at the University of Illinois, a new world opened up for laboratory scientists to create methods for determining hormone levels in a medium scientifically more meaningful than serum.

Experts in conventional medical research believe that diagnosis and prevention of disease using salivary assays has entered a period of tremendous growth, and not just for hormones. In March 2005, the National Institutes of Health in Bethesda, MD, funded 10 groups nationwide to advance saliva testing. Major university researchers in recent years have focused on converting blood and urine assays to salivary methodologies, developing a catalog of all salivary proteins, and even working on a saliva test that can diagnose a variety of viral and bacterial diseases, such as HIV.

Unlike blood or urine hormone testing, saliva analysis assesses the biologically active compounds that are active at the cellular level. Salivary hormone analysis represents what is clinically relevant and conveys the patient's true hormonal activity, especially when multiple samples are collected over the course of a day or more. In comparison, blood analysis assesses compounds in the blood serum, most of which are protein bound. When released from their protein carriers, the compounds become free. Measuring the concentration of non-bioavailable forms in urine or serum is irrelevant since the data is insufficient as to the concentration of the more clinically significant free hormones in circulation found in saliva.

Saliva hormones more accurately reflect tissue uptake and response of hormones delivered through the skin in creams or patches. Urine and blood assays significantly underestimate hormones delivered topically, often resulting in overdosing. Health professionals that choose to use topical hormone applications can most affectively monitor these therapies with salivary assays.

As a diagnostic fluid, saliva is the most convenient, non-invasive specimen available for the patient. Invasive procedures, such as blood draws, are not just extremely impractical and costly when it comes to acquiring multiple samples; they also cause a stressful event on the body which can promote a release of cortisol, thus skewing the result for one event.

BioHealth Diagnostics Laboratory's salivary testing procedures are under greater scrutiny than the majority of other labs performing these procedures simply by virtue of its location – California, USA. California requires extensive proficiency testing and routine inspections for diagnostic laboratories to be licensed for operation. Further, only licensed lab technicians can perform this assay, while some states do not conform to strict hiring standards, permitting labs to hire unlicensed staff.

- **For a comprehensive list of technical references and a comparison of fluids used to measure hormone levels, please visit http://www.biodia.com/about_resources.html**

NOTES

Metabolic Assessment Profile: BHD #101

Indican, Lipid Peroxides, and Urinary Bile Acid Sulfates (UBAS)

Overview

The Metabolic Assessment Profile, BHD #101, measures the levels of indican, lipid peroxides, and urinary bile acid sulfates (UBAS). It consists of three analyses of urine easily collected at home, and mailed directly to the lab. This profile provides the practitioner with clinical data relevant to a multitude of health disorders. Its findings are applicable in treating existing health concerns and in counseling for nutritionally-based wellness and anti-aging programs.

These three lab tests measure the level of dysfunctional protein digestion, oxidative cellular damage, liver function, and detoxification capacity. Poor protein digestion signals the failure to provide chemicals to produce structures, substrates, and enzymes. Oxidative cellular damage can undermine even the strongest physiological pathway. Impairment of liver function – namely compromised detoxification – is a common factor that leads to degenerative disorders.

Indican

The level of indican is an index of the efficiency of protein digestion. The indican scale measures the presence of indol, a metabolic byproduct of the action of intestinal bacteria on the amino acid tryptophan. Compromised amino acid or protein digestion can be caused by insufficient gastric hydrochloric acid, insufficient digestive enzymes, adverse food reactions, parasitic infection, fungal infection, an overgrowth of bacteria that metabolize specific proteins, hypermotility of the small intestine, or other gastrointestinal dysfunction.

Poor protein digestion can also result from the dietary intake of certain kinds of protein. One such category of food proteins is a group called lectins. A property common to lectins is that they agglutinate specific cell surface antigens. Lectins have many beneficial effects, and some harmful ones. A beneficial example is the agglutination of cancer cells, which makes them easier for macrophages to phagocytize. Determining which lectins will cause agglutination, however, differs among individuals, possibly based on blood type. A commonly found lectin is gluten, which is present in various forms in several cereal grains. In the intestines of some individuals, this lectin can agglutinate with other food proteins, which makes all concurrent digestion difficult or impossible. Ingestion of incompatible lectin-containing foodstuffs can lead to chronic, subclinical agglutination, indigestion, and eventually, putrefaction.

Putrefaction is especially important because it can produce dozens of types of carcinogens. These substances can then enter the liver through the general circulation. Undigested protein also increases systemic toxicity, burdening the detoxification capacity of the liver. Poor protein digestion can lead to other problems, such as intestinal microbial overgrowth, which in turn can lead to unfavorable pH changes and impaired absorption. These factors can prevent the synthesis of essential proteins and the compounds they comprise. Eventually, the inability to digest protein can prevent proper glycemic control, and can lead to global hormone imbalance. With poor protein digestion, eventually all absorption is adversely affected, and proper water balance becomes difficult to maintain. This can be a prelude to chronic degenerative disorder including gastrointestinal disease and cancer. Without proper digestion, it is impossible to have optimal health.

Lipid Peroxides

The level of lipid peroxides is an index of cellular membrane damage due to the action of free radicals. The organelle membranes, such as those of the mitochondria, lysosomes, and

peroxisomes, can be damaged as well. This damage is lipid peroxidation, and it is the result of an excess of prooxidants over antioxidants. Such an excess, categorized as oxidative stress, can damage membrane proteins and cholesterol, as well as membrane lipids. The elevation of lipid peroxides can serve as an early warning of the long-term effects of oxidative stress. The natural sequel of oxidative stress is chronic degenerative disease. One example is that peroxidation of low density lipoproteins contributes to atherosclerosis. Other associated diseases include coronary artery disease and cancer, the leading causes of death in the United States.

Oxidative stress can result from exposure to toxins or pathogens, from inappropriate lifestyle factors, excessive exercise, or byproducts of normal metabolism. Monitoring the level of antioxidants is important because while low levels can result in an excess of free radicals, high levels can cause fatigue and weakness. The key to free radical control is to maintain a balance between prooxidants and antioxidants. Proper free radical control is essential to good health.

Urinary Bile Acid Sulfate (UBAS)

UBAS is a direct measurement of liver function. Bile acid levels are regulated by the enterohepatic circulation; when small amounts leak into the bloodstream, little is converted to sulfate and excreted in the urine. Elevated bile acid levels are associated with impaired liver function, hepatocellular damage, and a high specificity toward hepatobiliary diseases. The UBAS can be used to monitor drug therapies and identify those at risk taking prescription drugs.

If liver function is compromised, oxidative byproducts, partially metabolized hormones, drugs, or other metabolically undesirable compounds continue to circulate, causing cellular damage and ultimately, cellular death.

PLEASE NOTE

- ***Test results with suggested protocols begin on page 62.***
- ***Technical resources are located after the protocols on page 71.***
- ***Dietary Supplement information is located in the appendix on page 77.***

The test result on the next page illustrates an example of a NORMAL Metabolic Assessment Profile

BHD #101 – Normal Sample

* * * * * B H D # 1 0 1 / M E T A B O L I C P R O F I L E * * * * *

URINARY INDICAN	NEGATIVE	

A POSITIVE INDICAN INDICATES INADEQUATE DIGESTION OF DIETARY PROTEIN AND/OR AN OVERGROWTH OF BACTERIA IN THE SMALL AND/OR LARGE INTESTINE. THIS TEST IS MEASURING INDICAN THAT IS PRODUCED VIA THE ACTION OF INTESTINAL BACTERIA ON THE AMINO ACID TRYPTOPHAN, WHICH IS INGESTED AS A PART OF FOOD PROTEIN.

POS (1+) = LOW, POS (2+) = MEDIUM, POS (3+) = HIGH, POS (4+) = VERY HIGH

URINARY LIPID PEROXIDES	6.2	nM/mg cre 1.0 - 7.5

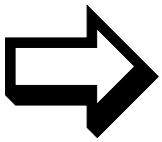
ELEVATED LEVELS OF LIPID PEROXIDES IS AN INDEX OF CELLULAR MEMBRANE DAMAGE DUE TO THE ACTION OF FREE RADICALS. THE ELEVATION OF LIPID PEROXIDES CAN SERVE AS AN EARLY WARNING OF THE LONG TERM EFFECTS OF OXIDATIVE STRESS. OXIDATIVE STRESS CAN RESULT FROM EXPOSURE TO TOXINS OR PATHOGENS, FROM INAPPROPRIATE LIFESTYLE FACTORS, EXCESSIVE EXERCISE, OR BYPRODUCTS OF NORMAL METABOLISM.

URINARY BILE ACID SULFATES	7.9	umol/g cre 1.0 - 8.0 Males: 1.0 - 8.0 umol/g Females: 1.0 - 12.0 umol/g

URINARY BILE ACID SULFATES IS A DIRECT MEASUREMENT OF LIVER FUNCTION. BILE ACID LEVELS ARE REGULATED BY THE ENTEROHEPATIC CIRCULATION AND LITTLE LEAKS INTO THE BLOODSTREAM AND IN CONSEQUENCE LITTLE IS CONVERTED TO SULFATE AND EXCRETED IN THE URINE. ELEVATED BILE ACID LEVELS ARE ASSOCIATED WITH IMPAIRED LIVER FUNCTION, HEPATOCELLULAR DAMAGE, AND A HIGH SPECIFICITY TOWARD HEPATOBILIARY DISEASES.

NOTES

Metabolic Assessment Profile (BHD #101)
Sample Tests with Protocols



Clinical Considerations: Metabolic Assessment Profile

BioHealth's Physician Consultants are available to assist with technical support, clinical applications, and therapeutic protocols. As you review this guide, be aware that there are multiple clinical considerations and underlying causative factors to consider (more than we could possibly list and/or do justice to in this format).

For example, there are numerous possibilities for a finding of a positive indican. To name just a few: Infections, gluten and lactose intolerance, food allergies, lectin incompatibility, hypermotility of the small intestine, and dysautonomia (dysfunction of the autonomic nervous system).

BioHealth's Physician Consultants can suggest the most time and cost effective methods of uncovering the underlying causes of health problems.

Call 800-570-2000 for Physician Consultant appointments.

Sample Result – Positive Indican

* * * * * B H D # 1 0 1 / M E T A B O L I C P R O F I L E * * * * * *

URINARY INDICAN		**POSITIVE (2+)**

A POSITIVE INDICAN INDICATES INADEQUATE DIGESTION OF DIETARY PROTEIN AND/OR AN OVERGROWTH OF BACTERIA IN THE SMALL AND/OR LARGE INTESTINE. THIS TEST IS MEASURING INDICAN THAT IS PRODUCED VIA THE ACTION OF INTESTINAL BACTERIA ON THE AMINO ACID TRYPTOPHAN, WHICH IS INGESTED AS A PART OF FOOD PROTEIN.

POS (1+) = LOW, POS (2+) = MEDIUM, POS (3+) = HIGH, POS (4+) = VERY HIGH

URINARY LIPID PEROXIDES	6.1	nM/mg cre 1.0 - 7.5

ELEVATED LEVELS OF LIPID PEROXIDES IS AN INDEX OF CELLULAR MEMBRANE DAMAGE DUE TO THE ACTION OF FREE RADICALS. THE ELEVATION OF LIPID PEROXIDES CAN SERVE AS AN EARLY WARNING OF THE LONG TERM EFFECTS OF OXIDATIVE STRESS. OXIDATIVE STRESS CAN RESULT FROM EXPOSURE TO TOXINS OR PATHOGENS, FROM INAPPROPRIATE LIFESTYLE FACTORS, EXCESSIVE EXERCISE, OR BYPRODUCTS OF NORMAL METABOLISM.

URINARY BILE ACID SULFATES	5.7	umol/g cre 1.0 - 12.0 Males: 1.0 - 8.0 umol/g Females: 1.0 - 12.0 umol/g

URINARY BILE ACID SULFATES IS A DIRECT MEASUREMENT OF LIVER FUNCTION. BILE ACID LEVELS ARE REGULATED BY THE ENTEROHEPATIC CIRCULATION AND LITTLE LEAKS INTO THE BLOODSTREAM AND IN CONSEQUENCE LITTLE IS CONVERTED TO SULFATE AND EXCRETED IN THE URINE. ELEVATED BILE ACID LEVELS ARE ASSOCIATED WITH IMPAIRED LIVER FUNCTION, HEPATOCELLULAR DAMAGE, AND A HIGH SPECIFICITY TOWARD HEPATOBILIARY DISEASES.

Therapeutic Protocol - Positive Indican

BioMatrix®
Support Digestion: 2 tablets 10-15 minutes before breakfast-lunch-dinner

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a BioHealth physician consultant.

→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Result – Elevated Lipid Peroxides

* * * * * B H D # 1 0 1 / M E T A B O L I C P R O F I L E * * * * * *

URINARY INDICAN	NEGATIVE		

A POSITIVE INDICAN INDICATES INADEQUATE DIGESTION OF DIETARY PROTEIN AND/OR AN OVERGROWTH OF BACTERIA IN THE SMALL AND/OR LARGE INTESTINE. THIS TEST IS MEASURING INDICAN THAT IS PRODUCED VIA THE ACTION OF INTESTINAL BACTERIA ON THE AMINO ACID TRYPTOPHAN, WHICH IS INGESTED AS A PART OF FOOD PROTEIN.

POS (1+) = LOW, POS (2+) = MEDIUM, POS (3+) = HIGH, POS (4+) = VERY HIGH

URINARY LIPID PEROXIDES	**8.7**	nM/mg cre	1.0 - 7.5

ELEVATED LEVELS OF LIPID PEROXIDES IS AN INDEX OF CELLULAR MEMBRANE DAMAGE DUE TO THE ACTION OF FREE RADICALS. THE ELEVATION OF LIPID PEROXIDES CAN SERVE AS AN EARLY WARNING OF THE LONG TERM EFFECTS OF OXIDATIVE STRESS. OXIDATIVE STRESS CAN RESULT FROM EXPOSURE TO TOXINS OR PATHOGENS, FROM INAPPROPRIATE LIFESTYLE FACTORS, EXCESSIVE EXERCISE, OR BYPRODUCTS OF NORMAL METABOLISM.

URINARY BILE ACID SULFATES	5.2	umol/g cre	1.0 - 8.0 Males: 1.0 - 8.0 umol/g Females: 1.0 - 12.0 umol/g

URINARY BILE ACID SULFATES IS A DIRECT MEASUREMENT OF LIVER FUNCTION. BILE ACID LEVELS ARE REGULATED BY THE ENTEROHEPATIC CIRCULATION AND LITTLE LEAKS INTO THE BLOODSTREAM AND IN CONSEQUENCE LITTLE IS CONVERTED TO SULFATE AND EXCRETED IN THE URINE. ELEVATED BILE ACID LEVELS ARE ASSOCIATED WITH IMPAIRED LIVER FUNCTION, HEPATOCELLULAR DAMAGE, AND A HIGH SPECIFICITY TOWARD HEPATOBILIARY DISEASES.

Therapeutic Protocol – Elevated Lipid Peroxides

BioMatrix®
Support Anti-Ox: 1 capsule 3 times a day with breakfast-lunch-dinner

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a BioHealth physician consultant.

→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Result – Elevated Urinary Bile Acid Sulfates (UBAS)

* * * * * B H D # 1 0 1 / M E T A B O L I C P R O F I L E * * * * *

URINARY INDICAN	NEGATIVE		

A POSITIVE INDICAN INDICATES INADEQUATE DIGESTION OF DIETARY PROTEIN AND/OR AN OVERGROWTH OF BACTERIA IN THE SMALL AND/OR LARGE INTESTINE. THIS TEST IS MEASURING INDICAN THAT IS PRODUCED VIA THE ACTION OF INTESTINAL BACTERIA ON THE AMINO ACID TRYPTOPHAN, WHICH IS INGESTED AS A PART OF FOOD PROTEIN.

POS (1+) = LOW, POS (2+) = MEDIUM, POS (3+) = HIGH, POS (4+) = VERY HIGH

URINARY LIPID PEROXIDES	2.0		nM/mg cre 1.0 - 7.5

ELEVATED LEVELS OF LIPID PEROXIDES IS AN INDEX OF CELLULAR MEMBRANE DAMAGE DUE TO THE ACTION OF FREE RADICALS. THE ELEVATION OF LIPID PEROXIDES CAN SERVE AS AN EARLY WARNING OF THE LONG TERM EFFECTS OF OXIDATIVE STRESS. OXIDATIVE STRESS CAN RESULT FROM EXPOSURE TO TOXINS OR PATHOGENS, FROM INAPPROPRIATE LIFESTYLE FACTORS, EXCESSIVE EXERCISE, OR BYPRODUCTS OF NORMAL METABOLISM.

URINARY BILE ACID SULFATES		**8.9**	umol/g cre 1.0 - 8.0 Males: 1.0 - 8.0 umol/g Females: 1.0 - 12.0 umol/g

URINARY BILE ACID SULFATES IS A DIRECT MEASUREMENT OF LIVER FUNCTION. BILE ACID LEVELS ARE REGULATED BY THE ENTEROHEPATIC CIRCULATION AND LITTLE LEAKS INTO THE BLOODSTREAM AND IN CONSEQUENCE LITTLE IS CONVERTED TO SULFATE AND EXCRETED IN THE URINE. ELEVATED BILE ACID LEVELS ARE ASSOCIATED WITH IMPAIRED LIVER FUNCTION, HEPATOCELLULAR DAMAGE, AND A HIGH SPECIFICITY TOWARD HEPATOBILIARY DISEASES.

Therapeutic Protocol – Elevated UBAS

BioMatrix®

Support Liver: 3 capsules ½ hour before breakfast
OR
1 capsule 3 times a day ½ hour before breakfast-lunch-dinner

Support Anti-Ox: 2 capsules with breakfast
OR
1 capsule with breakfast and 1 capsule with dinner

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a BioHealth physician consultant.

→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

Sample Result – Positive Indican, Elevated Lipid Peroxides, and Elevated Urinary Bile Acid Sulfates (UBAS)

* * * * * B H D # 1 0 1 / M E T A B O L I C P R O F I L E * * * * *

URINARY INDICAN	**POSITIVE (3+)**	

A POSITIVE INDICAN INDICATES INADEQUATE DIGESTION OF DIETARY PROTEIN AND/OR AN OVERGROWTH OF BACTERIA IN THE SMALL AND/OR LARGE INTESTINE. THIS TEST IS MEASURING INDICAN THAT IS PRODUCED VIA THE ACTION OF INTESTINAL BACTERIA ON THE AMINO ACID TRYPTOPHAN, WHICH IS INGESTED AS A PART OF FOOD PROTEIN.

POS (1+) = LOW, POS (2+) = MEDIUM, POS (3+) = HIGH, POS (4+) = VERY HIGH

URINARY LIPID PEROXIDES	**16.6**	nM/mg cre 1.0 - 7.5

ELEVATED LEVELS OF LIPID PEROXIDES IS AN INDEX OF CELLULAR MEMBRANE DAMAGE DUE TO THE ACTION OF FREE RADICALS. THE ELEVATION OF LIPID PEROXIDES CAN SERVE AS AN EARLY WARNING OF THE LONG TERM EFFECTS OF OXIDATIVE STRESS. OXIDATIVE STRESS CAN RESULT FROM EXPOSURE TO TOXINS OR PATHOGENS, FROM INAPPROPRIATE LIFESTYLE FACTORS, EXCESSIVE EXERCISE, OR BYPRODUCTS OF NORMAL METABOLISM.

URINARY BILE ACID SULFATES	**23.2**	umol/g cre 1.0 - 8.0 Males: 1.0 - 8.0 umol/g Females: 1.0 - 12.0 umol/g

URINARY BILE ACID SULFATES IS A DIRECT MEASUREMENT OF LIVER FUNCTION. BILE ACID LEVELS ARE REGULATED BY THE ENTEROHEPATIC CIRCULATION AND LITTLE LEAKS INTO THE BLOODSTREAM AND IN CONSEQUENCE LITTLE IS CONVERTED TO SULFATE AND EXCRETED IN THE URINE. ELEVATED BILE ACID LEVELS ARE ASSOCIATED WITH IMPAIRED LIVER FUNCTION, HEPATOCELLULAR DAMAGE, AND A HIGH SPECIFICITY TOWARD HEPATOBILIARY DISEASES.

Therapeutic Protocol - Positive Indican, Elevated Lipid Peroxides, and Elevated Urinary Bile Acid Sulfates (UBAS)

BioMatrix®

Support Liver: 3 capsules 3 times daily ½ hour before breakfast-lunch-dinner.
Support Anti-Ox: 2 capsules 3 times daily with breakfast-lunch-dinner.
Support Digestion: 2 tablets 10-15 minutes before breakfast-lunch-dinner.

Additional Considerations

- *Lifestyle Guide to Optimal Health* from BioHealth Diagnostics to educate patient on important lifestyle factors.
- For follow-up testing guidelines and clinical considerations contact BHD to schedule a complimentary consultation with a BioHealth physician consultant.

→ Unless otherwise stated, all protocols should be followed for a minimum of 12 weeks.

NOTES

Interrelationships of Indican, Lipid Peroxides & Urinary Bile Acid Sulfates (UBAS) – BHD #101

Indican

Tryptophan → Proper intestinal bacterial digestion → NH_4^+ + $COOH^-$

Tryptophan → Poor intestinal bacterial digestion → **MUC** (indol)

Lipid Peroxides

Free Radicals → (↑) [Antioxidants: Prooxidants] → Homeostasis

Free Radicals → (↓) [Antioxidants: Prooxidants] → **MUC** (cell membrane debris)

UBAS

MUC → Liver → [Enterohepatic circulation] → Low levels of UBAS → Normal liver function

MUC → Liver → [Enterohepatic circulation] → High levels of UBAS → Impaired liver function

MUC Control

MUC Genesis
Poor Intestinal Bacterial Digestion (**Indican**↑)
(↓) [Antioxidants: Prooxidants] (**Lipid Peroxides**↑)

MUC Denaturation
Liver Function / Detoxification Capacity (**UBAS**)

MUC – metabolically undesirable compound

Each of the above metabolic markers can be directly related to sources of stress that have become chronic in nature, keeping the body in a state of chronic stress ("Chronic Stress Response"), ultimately resulting in adrenal exhaustion as well as eventual overall hormone, immune and metabolic breakdown.

Urine Indican Test (Obermeyer Test) Overview

Introduction

The essential amino acid tryptophan is converted to indole by intestinal bacterial cleavage of the tryptophan side chain. Following absorption, indole is converted to 3-hydroxy indole (indoxyl or indican) in the liver, where it is then conjugated with potassium sulfate or glucoronic acid. It is then transported through the blood to the kidneys for excretion.

Clinical Application

As most of the endogenous indoles have a side chain which prevents cleavage and are instead metabolized to skatole, the production of indicans (indoxyl potassium sulfate and indoxyl glucoronate) indicates bacterial activity in the small and large intestines. The table below lists conditions in which increased levels are found. Elevated levels are considered as an indicator of intestinal toxemia and overgrowth of anaerobic bacteria.

Conditions with Elevated Levels of Urinary Indican[1-4]
- Inflammatory bowel disease
- Celiac disease
- Hypochlorhydria
- Achlorhydria
- Gastric ulcer
- Biliary and intestinal obstruction
- Jejunal diverticulosis
- Scleroderma
- Postgastrectomy
- Hartnup's disease
- Pancreatic insufficiency
- Diminished peristalsis
- Blue diaper syndrome
- Hypermotility of the small intestine

Procedure

Detection of indicans depends upon its decomposition to indoxyl and subsequent oxidation to indigo blue. It is then concentrated into a layer of chloroform for easier measurement.

Results

Urine color	0 (normal)
Light blue	1+ (low positive)
Blue	2+ (medium positive)
Violet	3+ (high positive)
Jet black	4+ (very high positive)

Interpretation

A positive test may indicate one of the diseases listed in table 1, hypochlorhydria, bacterial overgrowth in the small and/or large intestine, maldigestion and/or malabsorption of protein.

Lipid Peroxides (LPO-CC Assay)

The LPO-CC assay is a direct measurement of lipid peroxides correlating with serum lipid peroxides at 98 to 99%. Urine samples are stable for weeks and do not require refrigeration or freezing.

The LPO-CC assay specifically and directly measures LPO. In the presence of hemoglobin, lipid peroxides are reduced to hydroxyl derivatives (lipid alcohols) which oxidatively cleave colorless MCDP into methylene blue.

Urinary Lipid Peroxides reference range: 1.0 – 7.5nM/mg creatinine.
Ideal range: < 6.0 nM/mg creatinine.

Urinary Lipid Peroxides in the upper end of the reference range (i.e. levels > 6.5 nM/mg creatinine and < 7.5 nM/mg creatinine) may be clinically relevant. Antioxidant levels should be considered and retested after 4 weeks. Levels > 7.5 creatinine should be monitored closely. Aggressive anti-oxidative therapy should be considered as well as thorough investigation of cause(s) of increases in free radical activity.

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Urinary Bile Acid Sulfates (UBAS)

In healthy subjects, only small amounts of bile acids are eliminated in urine. However, high Sulfated Bile Acids (SBA) concentrations can lead to the formation of water-soluble conjugate forms that can be rapidly eliminated in urine. These are primarily sulfated moieties that have a 10-fold renal clearance compared with non-sulfated forms. Sulfation of bile acids is not unique as sulfation of hydroxylated compounds by the liver is a well-established method of detoxification of a wide range of endogenous metabolites and xenobiotics. Renal excretion of sulfated bile acids is thought to represent an important excretory mechanism when high SBA accumulates. These urinary bile acid sulfates (UBAS) reflect an average of the SBA concentrations during the interval of urine formation. Normalization of the UBAS concentration using the urine creatinine concentration eliminates the influence derived from urine concentration.

UBAS has been approved by the FDA. Extensive clinical trials have demonstrated the efficacy of the method:

- A study conducted by the Kobe University Medical Center on 383 subjects showed that 60 normal controls all had low UBAS while of the 323 patients with impaired hepatic function (cirrhosis, hepatitis, carcinoma) as proven by biopsy, 81% had elevated UBAS levels.
- A study of 200 randomly selected patients at the VA Medical Center, Brooklyn N.Y., showed that the sensitivity of UBAS equaled the conventional serum enzyme tests (ALT, AST, GGT) as a marker for liver disease. In a separate study of 30 patients confirmed for HCV by PCR-RNA, the sensitivity of UBAS was equivalent to ALT and AST.
- A study of 100 patients with confirmed HCV by PCR-RNA at the St. Louis University Medical Center Department of Gastroenterology (Dr. Bruce Bacon, Principal Investigator), showed identical percentages of patients with elevated UBAS and elevated ALT.
- A study of over 3000 applicants for life insurance showed that for those persons with all serum liver enzymes within normal range, 98% had UBAS below the normal cutoff point.

UBAS Reference Ranges

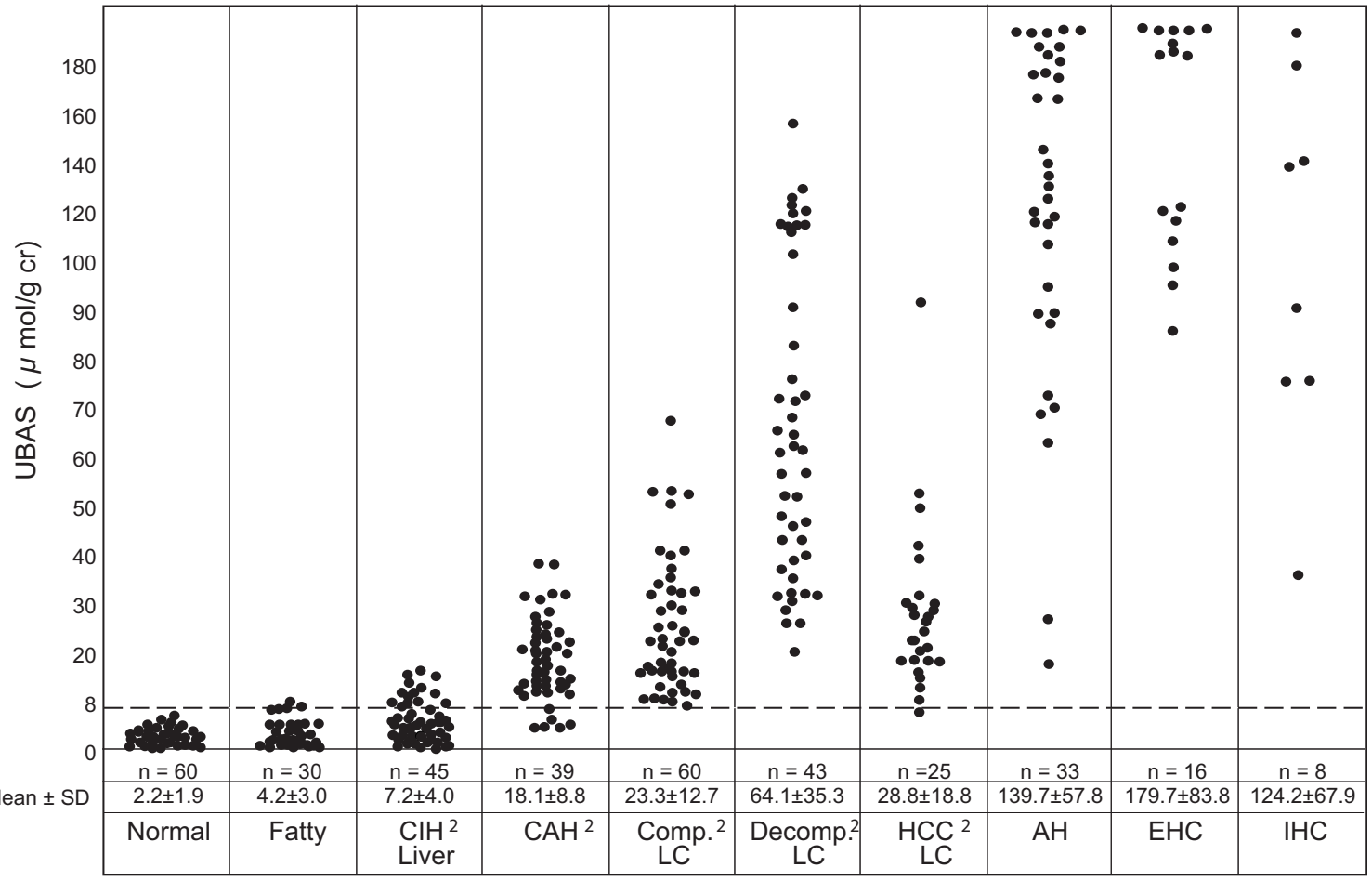
Males: 1.0 – 8.0 umol/g cre
Females: 1.0 – 12.0 umol/g cre
Reference ranges not established for children < 10 yrs. old

Males: Ideal range < 6
8 – 12 range = mildly impaired liver function

Females: Ideal range < 9
12 – 15 range = mildly impaired liver function

Males > 12 and females > 15 indicate Hepatocellular damage. Assessment of Hepatobiliary diseases and prescription drug intake is indicated.

The following hepatobiliary diseases have been identified and corrected with the UBAS:



CIH: Chronic inactive hepatitis, CAH: Chronic active hepatitis, Comp. LC: Compensated liver cirrhosis, HCC: Hepatocellular Carcinoma, Decomp. LC: Decompensated liver cirrhosis, AH: Acute hepatitis, EHC: Extrahepatic cholestasis, IHC: Intrahepatic cholestasis

[1]Kobe University School of Medicine. [2]Confirmed by Biopsy

References

1. G.P. van Berge Henegoiwen, et.al. Gut, 17, 861 (1976).
2. P. Czgan, et.al., Frontiers of Liver Disease, Thime-Stratton, New York, 19-36, (1981)
3. V. Simko, et.al., Hepatology, 7, 115 (1987).
4. Y. Tazuke, et.al., Japan Journal of Clinical Chemistry, 21, 249 (1992)
5. FDA 510(k) #K9805525/993941
6. V.Simko, Proceedings of the 6th International Symposium on Hepatitis-C and related viruses, National Institutes of Health, Bethesda, Maryland, June 6-9, 1999.

Normal & Abnormal Values

BHD #101 Metabolic Assessment Profile

Indican		[Negative]	Positive*	
Lipid Peroxides	≤ 7.5 (≥ 6.5 ≤ 7.5) Borderline	[≤ 6.0]	> Range	nM/mg cre
UBAS	Males: 1.0 – 8.0 Females: 1.0 – 12.0 Children: ≤ 10 yrs of age, reference ranges not established	[≤ 6.0] [≤ 9.0]	> Range	umol/g cre

* Low positive (1+)
Medium positive (2+)
High positive (3+)
Very high positive (4+)

BioMatrix® Dietary Supplements

> Visit **biomatrixone.com** for more information

When Dr. William G. Timmins set out to formulate nutraceuticals that would surpass the efficacy of the products then used in his practice, his passion for helping the end user was high.

For over two decades Dr. Timmins has worked with chronically ill patients and serious health enthusiasts determined to feel their best. He also has advised hundreds of health professionals on how to diagnose and treat the cause of illness and disease. Realizing the powerful potential of nutritional supplementation, he exhaustively researched available formulations and developed a dispensary for his patients' needs. But two issues remained:

- Products regarded for their specific therapeutic applications did not make a consistently positive difference – while generally "helpful" they did not live up to their marketing claims or the purported purpose of the formulation. The ingredients did not appear to be high grade despite manufacturer statements, and many products did not contain the co-factors, carriers, and substrates vital for optimal effectiveness.
- Some protocols required patients to purchase multiple products to serve a single functional goal – compliance was hard to maintain as patients found it difficult to follow the dosing schedule and afford the protocol.

To address these clinical needs Dr. Timmins' consulted with leading scientists, clinicians, and supplement manufacturers to develop his own formulations; formulations that would solve the problems encountered by clinicians everywhere: Unstable and sub-optimal ingredients, as well as costly and complex protocols.

BioMatrix formulas are loaded with science and purpose. The clinical application of each product is diverse and substantial. Leaving no stone unturned, Dr. Timmins designed these products with you and your patients in mind – cutting no corners in the quality of raw materials and manufacturing. BioMatrix dietary supplements can achieve predictable and positive health outcomes because they are scientifically selected, formulated, and prescribed to meet the unique nutritional needs of the patient. Extensive clinical studies, involving thousands of patients and their laboratory assessments, indicate that specific, identifiable nutritional deficiencies are linked to specific, identifiable physiological dysfunctions. BioMatrix supplements are manufactured according to BioHealth Diagnostics' specifications, which demand the highest possible quality, and are in accordance with the highest manufacturing standards in the industry. ***The nutrient levels on the BioMatrix label are guaranteed through the expiration date as required by the FDA.***

Patient Referral Program – Selective Supplements

Healthcare practitioners may order supplements and have them sent directly to the patient or the patient may purchase products directly from BioHealth. When a patient orders BioMatrix dietary supplements, the referring practitioner receives a 30% commission on the retail purchase price of each order. All bookkeeping, tracking, storage, and other expenses related to product sales are incurred by BioHealth. This program frees practitioners from researching, purchasing, stocking, and shipping inventory, so that they can focus energy on what they do best: patient care. Physician information is collected from the patient in order to assure accurate recordkeeping. **To get started, call Client Services at 800-570-2000.**

Support Adrenals

The Adrenal Glands and Stress

Supporting the adrenal glands is not an option, but a necessity. Everyone experiences stress, so each of us needs some level of nourishment and support for the organs directly responsible for resisting the damage of stress – the adrenal glands. Given unhealthy diets and lifestyles, plus exposure to infectious organisms, toxins and pollutants, our nutrients must be exceptional to absorbable and provide adequate protection. Your patients need a daily supplement to help the adrenals work against the odds.

Stress causes the adrenal glands to become over-stimulated, often resulting in exhaustion and compromised function. During periods of demand, essential nutrients are quickly depleted. You need a formula that addresses the replenishment of nutrients while also providing the cells with carefully balanced co-factors that help reduce the load of physical stressors.

Flagship of the BioMatrix Line

Since its development in 1998, Support Adrenals has earned its place as the flagship of the BioMatrix line. It is the result of Dr. William Timmins quest to design an affordable, yet highly impactful, daily supplement to support the adrenal glands. For some patients it has helped reduce cravings for coffee or sodas. For others it has been a critical component of therapies that reverse severe adrenal exhaustion. Thousands of patients and doctors have come to know the potent efficacy of this formulation through the resolution of chronic symptoms, such as fatigue, brain fog, allergic sensitivity, and others.

Experienced clinicians recommend their patients take Support Adrenals every day for the obvious benefits - the mechanisms of action in Support Adrenals are subtle and powerful. Unlike many adrenal formulas that hyperstimulate the glands and further promote adrenal exhaustion, Support Adrenals simply improves the patient's resistance against chronic stress. One would be hard pressed to find any adrenal product with the quality of raw materials and therapeutic levels of bioavailable nutrients that is evident in Support Adrenals.

Recommended Dosage

The general recommended dosage is 2 capsules with breakfast and lunch. Consult this interpretive guide for further considerations.

Special Considerations

- It is unnecessary to take other B Vitamins while on Support Adrenals.
- Contraindicated for usage during pregnancy.

Support Adrenals

Ingredients

Two Capsules Contain:

Vitamin C (88% as Ascorbic Acid, 12% as Ascorbyl Palmitate)	100 mg
Thiamin (as Thiamin Mononitrate)	50 mg
Riboflavin	50 mg
Niacin (40 mg as Niacinamide, 10 mg as Niacin)	50 mg
Vitamin B-6 (30 mg as Pyridoxine HCl, 20 mg as Pyridoxine 5 Phosphate)	50 mg
Folate (as Folic Acid)	400 mcg
Vitamin B-12 (as Cyanocobalamin)	100 mcg
Biotin	2000 mcg
Pantothenic Acid (as Calcium Pantothenate)	200 mg
Zinc (as Zinc Malate)	1.5 mg
Copper (as Copper Citrate)	0.55 mg
PABA (Para-Aminobenzoic Acid)	75 mg
Lemon Pure Form Bioflavonoid Complex	50 mg
Choline Bitartrate	50 mg
Inositol	50 mg
Dried ethanol/water extract of Rosemary leaf (4:1)	36 mg
Dried ethanol/water extract of Siberian Ginseng root	50 mg
Naringin (extracted from grapefruit)	36 mg
Hesperidin Methylchalcone	36 mg
Rutin	10 mg
DHEA (Dehydroepiandrosterone, micronized)	8 mg
Pregnenolone (micronized)	8 mg

Other Ingredients:
Gelatin Capsule

⇒ These nutrient levels are guaranteed through the expiration date as required by the FDA.

Support Anti-Ox

Oxidative Stress and Free Radical Damage

Oxidative stress occurs when the production of free radicals and other oxidative molecules exceeds the capacity of the body's antioxidant defenses. Cells react with oxygen as part of energy metabolism. As a consequence of these normal processes, free radicals - atoms or molecules which have unpaired electrons - are produced. Free radicals are very unstable and react with other compounds, trying to capture the needed electron to gain stability. Generally, free radicals attack the nearest stable molecule, stealing its electron. When that molecule loses its electron, it becomes a free radical itself, beginning a chain reaction. Once the process is started, it can cascade, resulting in the disruption of healthy cells.

Free radicals are produced normally in the body during metabolism and also as a result of chronic stress. Also, living in a world that is far from clean and pure, the body must cope with the daily challenges of a toxic world. A strong and effective dietary supplement can help overcome the unavoidable, harmful effects of our environment. For patients with pronounced oxidative stress (revealed through laboratory markers such as lipid peroxides) higher dosages can be used to reverse damage and resist future problems.

Therapeutic Levels of Antioxidants

Support Anti-Ox is a potent antioxidant formula with a synergistic blend of nutrients formulated to protect every cell in the body from free radical damage. When Dr. Timmins set out to create an antioxidant formula for his patients, he had questions for prominent manufacturers about their formulas: “Why are the levels of CoQ10 so low? Why is there such a small amount of Alpha Lipoic acid and grape seed extract? Why don’t you use natural carotenoids?” To these questions and others he received a consistent response: “It would be too expensive. We compete with health food stores.” Knowing that patients with pronounced oxidative stress damage require high levels of certain nutrients, Dr. Timmins took the position that it is costly to use inexpensive antioxidants – he formulated Support Anti-Ox to provide robust antioxidant support.

A Single Antioxidant Product - Better Absorption, Improved Compliance

It would take multiple multi-nutrient antioxidant products to achieve the combined therapeutic levels available in Support Anti-Ox. This popular product is the result of Dr. Timmins' study of hundreds of patients and their oxidative stress laboratory results. Using the data yielded by his clinical study, Dr. Timmins synthesized a single product that incorporates antioxidants proven successful in fighting oxidative stress. In addition to classic free radical scavengers and the finest antioxidant substances, Support Anti-Ox also includes pure-form bioflavonoids, which are necessary for tissue healing and reducing the inflammation that is associated with excessive oxidative stress. Support Anti-Ox is an ideal daily supplement and is used by doctors in therapeutic protocols that address advanced oxidative stress.

Recommended Dosage

The recommended dosage is based on three escalating levels of lipid peroxides as assessed by BioHealth Diagnostics’ tests. Stage I dosage is 2 capsules with breakfast. Stage II is 2 capsules with breakfast and 2 with either lunch or dinner. Stage III is 2 capsules 3 times a day or 3 capsules 2 times a day with meals.

Special Considerations

Support Anti-Ox should be taken with food for optimal absorption. If the capsules are taken only once a day, it is best to take them with breakfast so the body is oxidatively protected throughout the course of the day.

Support Anti-Ox

Ingredients

Two Capsules Contain:

Vitamin A (as 10000 IU Betatene natural mixed carotenoids and 2000 IU Vitamin A Palminate)	12000 IU
Vitamin C (342 mg as Calcium Ascorbate, 342 mg as Magnesium Ascorbate, 16 mg as Ascorbyl Palminate)	700 mg
Calcium (as Calcium Ascorbate)	48 mg
Vitamin E (as d-alpha tocopherol acid succinate)	400 IU
Magnesium (as Magnesium Ascorbate)	26 mg
Selenium (as Selenium Chelate)	75 mcg
Lemon Pure Form Bioflavonoid Complex	100 mg
Alpha Lipoic Acid	100 mg
Activin - Dried ethanol extract of grape seed (Vitis vinifera)	75 mg
Coenzyme Q10	50 mg
Rutin	5 mg

Other Ingredients:
Gelatin Capsule

Bottle size: 60 Capsules

⇒ These nutrient levels are guaranteed through the expiration date as required by the FDA.

Support Digestion

Enzymes – Catalysts of Wellness

Enzymes are involved in every life process in the body. Support Digestion is replete with enzymes responsible for healthy breakdown of dietary nutrients. Digestive enzymes are secreted into the digestive tract to break down macronutrients so they can be absorbed across the gut wall. If this enzyme system does not work effectively, optimal health cannot be maintained because of the failure to absorb needed nutrients. Due to poor dietary choices, chronic stress, and infections, it's no wonder that so many patients complain of digestive distress and the resultant fatigue.

While digestive enzymes should not be used to cover up an underlying dysfunction, their applications are broad and serve to relieve GI distress while the clinician determines the causes of GI symptoms. Also, many people develop hydrochloric insufficiency at one time or another and supplementing HCl can help to optimize pH and optimize enzymatic activity. In some cases patients with advanced states of GI dysfunction will need a digestive enzyme formula every day for the rest of their lives – for others, it provides relief while the cause of the problem is diagnosed and resolved. BioMatrix Support Digestion's formula is preferred by hundreds of health professionals over competing products due to its clinical efficacy.

Bi-phasic Formula...Better Results

Support Digestion is formulated to help improve digestive function. The product is bi-phasic, meaning it addresses digestive issues both in the stomach (phase I) and in the small intestine (phase II). An ingredient that makes Support Digestion unique is Ox bile, a critical component which aids in the emulsification of fats. Support Digestion also contains Pancreatin 6x. This substance contains pancreatic enzymes, chiefly amylase, protease, and lipase, which are necessary for the breakdown of carbohydrates, proteins, and fats.

Recommended Dosage

The general recommended dosage is 2-3 tablets approximately 10-15 minutes before a meal.

Special Considerations

Support Digestion may be taken at the beginning of a meal if stomach sensitivities exist.

Support Digestion

Ingredients

One Tablet Contains:

First Phase (In Stomach)
Betaine HCl.....100 mg
Glutamic Acid.....110 mg
Pepsin.....100 mg
Papain.....50 mg

Second Phase (In Duodenum)
Pancreatin 6x.....100 mg
Pancrelipase.....50 mg
Amylase.....30 mg
Bromelain.....40 mg
Ox Bile Extract.....60 mg

Other Ingredients;
Dicalcium Phosphate, Magnesium Stearate, Sorbitol, Pharmaceutical Lac Glaze

Bottle size: 180 capsules

⇒ These nutrient levels are guaranteed through the expiration date as required by the FDA.

Support Liver

The Body's Filter and Protector

The liver may be the single most important organ in the body for supporting overall physical health. It is the largest organ in the body (besides the skin) and has an enormous amount of blood flowing through it every minute of our lives. It cleanses of the bloodstream, with its Kuppfer cells acting as the filter, and is of vital importance to immunity and energy production. The liver is best known for its role in detoxification, transforming substances like ammonia, metabolic waste, drugs and chemicals, so that they can be excreted. The liver is also the source of bile, which functions to break down fats. It is a source of energy, storing glucose in the form of glycogen which is converted back to glucose. Metabolizing carbohydrates, proteins and fats, making food available to the body for energy, tissue building, activating enzymes...the list of the liver's functions is long and reinforces the point that we need to protect it!

Today's world is toxic. The liver is under unprecedented chronic stress. Environmental chemicals, prescription and illicit drugs, excessive use of alcohol and caffeine, poor diet, pollution, metabolic disorders, parasites, etc - it's amazing that we live with our livers as well as we do! Defending the filter of the body from damage is essential to maintaining health and avoiding disease – a sluggish liver equals sluggish mind and body.

A Critical Organ Demands an Advanced Formula

Support Liver was designed by Dr. Timmins to support the two phases of liver detoxification.

The Two Phases of Detoxification

The liver transforms fat-soluble toxins into a water-soluble form so they can be released through the kidneys for elimination through urine and into bile for elimination through the colon. This transformation occurs during a two-phase process:

Phase I involves a group of 50 to 100 enzymes called the cytochrome P448 and P450 systems. These enzymes play a central role in the detoxification of both exogenous compounds (such as drugs and pesticides) and endogenous (such as hormones), as well as the synthesis of steroid hormones and bile acids.

A side effect of this metabolic activity is the production of free radicals, which bind to cellular components and cause cellular damage. The most important antioxidant for neutralizing these free radicals is glutathione, which is needed both for Phase I and Phase II. When exposure to high levels of toxins produces so many free radicals from Phase I detoxification that all the glutathione is exhausted, Phase II processes dependent on glutathione cease. This causes an imbalance between Phase I and Phase II activity, which results in severe toxic reactions, due to buildup of toxic intermediate forms.

Phase II detoxification involves conjugation, which means that a protective compound becomes bound to the toxin. Besides glutathione conjugation there are essentially five other processes: amino acid conjugation, methylation, sulfation, sulfoxidation, acetylation and glucuronidation. These enzyme systems need specific nutrients in order to function. If the liver cells are not functioning properly, phase II detoxification slows down and increases the toxic load by allowing the buildup of toxic intermediates. Support Liver contains the ideal amounts of specific nutrients to support this phase, as well as phase I.

Recommended Dosage

The general recommended dosage is 3 capsules ½ hour before breakfast. Subject to laboratory test results, some patients may need up to 9 capsules per day (may be taken in divided dosages on an empty stomach).

Special Considerations

Taking amino acids on an empty stomach will dramatically increase their uptake. Consider BioMatrix Support Adrenals to assure adequate levels of B-6, B-12, and folate required for methylation.

Support Liver

Ingredients

Three Capsules Contain:

Vitamin C (as Ascorbyl Palmitate)	9 mg
L-Methionine	300 mg
Lemon Pure Form Bioflavonoid Complex	450 mg
N-Acetyl-Cysteine	150 mg
Taurine	75 mg
L-Glutathione (reduced)	75 mg

Other Ingredients:
Gelatin Capsule

Bottle size: 90 Capsules

⇒ These nutrient levels are guaranteed through the expiration date as required by the FDA.

Support Minerals

Mineral Supplementation is Essential

If your patients live in a pristine environment with clean air, rich organic soil, pure spring water, and have a healthy lifestyle - as well as no problems with digestion and absorption - you probably won't suggest they take a mineral supplement. But most of us live in a world where the air is polluted, the soil has been diluted of nutrients due to over-farming, pristine drinking water is not commonplace, and compromised digestion is the norm - add to this overcooked foods, poor dietary choices, chronic stress, and the habitual use of substances that destroy minerals, such as cigarettes, sodas, and alcohol - it is no wonder that we need support in the form of an intelligently designed mineral supplement.

Highly Absorbable Mineral Formula

Support Minerals was formulated by Dr. Timmins to deliver minerals to their target cells by making use of co-factors required in the absorption and assimilation process. The betaine hydrochloric acid and glutamic acid in the formula help with acidification and promote absorption by assisting in the transfer across the cell membrane. The co-factors folic acid, biotin, and vitamins A and D3 support the uptake of the essential minerals. Folic acid and biotin maintain healthy cell function and assist in the production of enzymes, while contributing to stable nighttime blood sugar. When blood sugar is stable during sleep the body's ability to repair is enhanced and minerals can more readily fulfill their purposes. Vitamins A and D3 are included in Support Minerals for their respective roles in bone growth and calcium absorption.

Krebs Cycle Chelates for Bioavailability

The macro and trace minerals in the formula are carefully balanced to prevent conflicts in assimilation. Towards this goal the product also uses Krebs cycle intermediates. The Krebs cycle intermediates in Support Minerals are a unique chain of five organic acids: citrate, fumarate, malate, succinate, and glutarate. Minerals chelated to these intermediates are readily absorbed and utilized by the body. Krebs cycle intermediates can bind two or three mineral molecules for every one of their own molecules and are easily ionized. This enhances the bioavailability of the minerals to which they are chelated by increasing the amount of ionized minerals in the intestinal tract.

Recommended Dosage

The general recommended dosage is 3 tablets a day on an empty stomach. It is best to take Support Minerals at or near bedtime. By taking calcium when cortisol is low, absorption is improved and the ability to support bone density is optimized.

Support Minerals

Ingredients

Three Tablets Contain:

Vitamin A	100 IU
Vitamin D3	50 IU
Folic Acid	200 mcg
Biotin	300 mcg
Calcium (from Calcium Krebs*)	400 mg
Iodine (from Potassium Iodine)	100 mcg
Magnesium (from Magnesium Krebs*)	200 mg
Zinc (from Zinc Krebs*)	10 mg
Selenium (from Selenium Krebs*)	20 mcg
Copper (from Copper Krebs*)	1 mg
Manganese (from Manganese Krebs*)	20 mg
Chromium GTF (from Chromium Polynicotinate)	100 mcg
Molybdenum (from Molybdenum Krebs*)	50 mcg
Potassium (from Potassium Krebs*)	99 mcg
Silicon	2 mg
Vanadium (from Vanadium Krebs*)	50 mcg
Betaine Hydrochloride (from 50 mg of Betaine HCl)	38 mg
Boron (from boron citrate)	50 mcg
Glutamic Acid (from 50 mg of Glutamic Acid HCl)	40 mg

Also contains:
Cellulose, Vegetable Sterate

*Krebs = Citrate, Fumarate, Malate, Glutarate, and Succinate Complex

⇒ These nutrient levels are guaranteed through the expiration date as required by the FDA.

DHEA

BioMatrix DHEA is of the highest pharmaceutical grade. Our DHEA is formulated from wild yam. Its molecular structure is identical to that which the body naturally produces. It contains just enough alcohol to be absorbed sublingually. Because BioMatrix DHEA is delivered sublingually, it bypasses gastrointestinal problems (malabsorption), while replicating the body's natural delivery method of the hormone. 1.2 mg (1 drop) of BioMatrix DHEA is equivalent to 3 mg of micronized oral DHEA. BioMatrix DHEA has a 99% absorption rate.

Clinical Applications

DHEA is critical in addressing hormonal imbalance and in supporting proper adrenal and thyroid function. It has been shown to promote healthy cardiovascular function, boost energy, stimulate mental health, reduce stress, improve libido, decrease body fat, and promote an overall sense of well-being.

Recommended Dosage

The general recommended dosage is 2 drops 3 times a day.

Special Considerations

Consult your physician if you are pregnant or nursing. You should not use this product if you have high DHEA levels or a hyperthyroid condition.

Ingredients

One Drop (.03 ml) Contains:

Dehydroepiandrosterone .....Approx. 1.2 mg

Other Ingredients:
Glycerin, Alcohol, Vanilla Flavor

Bottle size: 30ml, approximately 1,000 drops
Shake bottle before every use.

Licorice Root Extract

BioMatrix Licorice Root Extract is designed for use in supporting the adrenals. One of the primary compounds in licorice root is glycyrrhizin (a substance that has a molecular structure similar to corticosteroids). As such, licorice root aids in hypoadrenalism by partially blocking the enzyme that converts cortisol to cortisone, thus sparing cortisol. BioMatrix licorice root is 100% organically grown and harvested. A high-pressure liquid chromatography test of the plant is performed to determine the peak of botanical harvest. The compound is water-extracted within days of the harvest.

Clinical Applications

Licorice root is primarily used in treating adrenal exhaustion. This product can help to improve headaches, low sex drive, anxiety, moodiness, swollen breasts, water retention, PMS symptoms, blood sugar control, and the ability to balance hormones.

Recommended Dosage

The general recommended dosage is 5-10 drops sublingually 3 times a day, 10-15 minutes before meals or right after meals.

Special Considerations

Licorice root is contraindicated with high blood pressure and hypertension.

Ingredients

One Drop (.05 ml) Contains:

Whole Licorice Root Extract (Glycyrrhiza) ..... Approx. 10 mg

Bottle size: 2 oz, approximately 1,200 drops

Pregnenolone

BioMatrix Pregnenolone is of the highest pharmaceutical grade. Our pregnenolone is formulated from wild yam. Its molecular structure is identical to that which the body naturally produces. It contains just enough alcohol to be absorbed sublingually. Because BioMatrix Pregnenolone is delivered sublingually, it bypasses gastro-intestinal problems (absorption), while replicating the body's natural delivery method of the hormone. 1.2 mg (1 drop) of BioMatrix Pregnenolone is equivalent to 3 mg of micronized oral pregnenolone. BioMatrix Pregnenolone has a 99% absorption rate.

Clinical Applications

As a precursor to corticosteroids, pregnenolone is vital in treating those with hyper and hypoadrenalism. It has been shown to decrease the symptoms of PMS, aid in immune activity, improve mood, memory and thinking, as well as aid significantly in combating rheumatoid arthritis.

Recommended Dosage

The general recommended dosage is 2 drops 3 times a day.

Special Considerations

Consult your physician if you are pregnant or nursing. You should not use this product if you have high DHEA levels or a hyperthyroid condition.

Ingredients

One Drop (.03 ml) Contains:

Pregnenolone.....Approx. 1.2 mg

Other Ingredients:
Glycerin, Alcohol, Vanilla Flavor

Bottle size: 30 ml, approximately 1,000 drops
Shake bottle before every use.

ProGest

BioMatrix ProGest is of the highest pharmaceutical grade and is formulated from wild yam. Its molecular structure is identical to that which the body naturally produces. It contains just enough alcohol to be absorbed sublingually. Because BioMatrix ProGest is delivered sublingually, it bypasses gastro-intestinal problems (malabsorption), while replicating the body's natural delivery method of the hormone. 1.2 mg (1 drop) of BioMatrix ProGest is equivalent to 3 mg of micronized oral progesterone. BioMatrix ProGest has a 99% absorption rate.

Clinical Applications

In clinical studies, progesterone has been shown to alleviate headaches, low sex drive, anxiety, moodiness, swollen breasts, water retention, PMS symptoms, food cravings, depression, fuzzy thinking, and irritability. It has also been used to protect against fibrocystic breasts and endometrial cancer.

Recommended Dosage

The general recommended dosage is 2 drops sublingually 3 times a day.

Special Considerations

Consult your physician if you are pregnant or nursing.

Ingredients

One Drop (.03 ml) Contains:

Wild Yam Extract ..... Approx. 1.2 mg

Other Ingredients:
Glycerin, Alcohol, Vanilla Flavor

Bottle size: 30 ml, approximately 1,000 drops
Shake bottle before every use.

Seriphos

Also known as phosphorylated serine, Seriphos increases the sensitivity of the cortisol receptors in the anterior pituitary. This stimulates the negative feedback loop controlling the release of adrenocorticotropic hormone (ACTH). The anterior pituitary then reduces ACTH output, resulting in lower cortisol production. Seriphos crosses the blood-brain barrier; it may help to optimize brain neurotransmissions, specifically in the hypothalamic-pituitary area. In clinical trials, Seriphos was shown to promote memory retention and recall by stimulating neuronal plasticity, which can slow age-dependent neurotransmitter deterioration.

Clinical Applications

Seriphos is primarily used to reduce pituitary resistance to cortisol feedback in cases of cortisol hypersecretion. It has been clinically proven to aid in memory deficit, cognitive decline, senile dementia, and early cases of Alzheimer's disease.

Recommended Dosage

The general recommended dosage is 1-3 capsules a day between meals.

Special Considerations

Seriphos should not be given simultaneously with adrenergic agonists or alkaloid stimulants (e.g., caffeine). Seriphos is not recommend for those with reduced kidney function or who are pregnant. For those with gastric sensitivity, Seriphos should be taken with meals.

Ingredients

Four Capsules Contain:

Calcium	180 mg
Magnesium	180 mg
Phosphorous	760 mg
L-Serine	180 mg

Special Dietary Ingredients:
Derived from a phosphorylated mixture of L-Serine and ethanolamine as salts of calcium and magnesium.

Special Considerations and Contraindications

The following are some known special considerations and contraindications pertinent to the protocols set forth in this guide. It is not an exclusive list, nor is it a substitute for the practitioner's independent, professional judgment.

- All BioMatrix™ sublingual [S.L.] hormones deliver 1.2 mg. per drop S.L. [99% absorption]. 1.2 mg. of S.L. is the equivalent to approximately 3 mg. of micronized oral hormones. The absorption of micronized oral hormones is approximately 40 to 50%. Therefore, for example, 8 mg. of DHEA micronized oral would equal approximately 3.5 to 4 mg. absorbed, the equivalent to approximately ¾ drop of DHEA [S.L.].

- Pregnenolone and DHEA are contraindicated for patients with a hyperthyroid condition.

- The adrenal protocols listed in this interpretive guide do not take into consideration patients on thyroid. Since improving adrenal function (augmenting DHEA and pregnenolone) can significantly improve thyroid function, thereby reducing the amount of thyroid medication prescribed. Given this possibility it is suggested that any patient on thyroid should be closely monitored and lower dosages of pregnenolone and DHEA should be considered initially.

- Sublingual hormones are best taken 10–15 minutes before meals or right after meals.

- Generally, pregnenolone should not be taken after 5–6 PM as it is an antagonist to the GABA chloride channel.

- Whole Licorice Root Extract is contraindicated for patients with high blood pressure/hypertension

- Seriphos contains a high phosphorous-to-calcium ratio and therefore additional calcium should be taken. Consider taking 3 BioMatrix Support Mineral tablets at bedtime. Seriphos should not be given simultaneously with adrenergic agonists or alkaloid stimulants (e.g., caffeine). Seriphos is not recommend for those with reduced kidney function or who are pregnant. For those with gastric sensitivity, Seriphos may also be taken with meals. However, it is most effective taken ½ hr or more before food or a minimum of 2 hours after food on an empty stomach.

- Consider supplementing BioMatrix Support Liver by taking B12, B6, and folate with meals to help ensure methylation. These nutrients are supplied by BioMatrix Support Adrenals.

NOTES

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