

Adaptogenic and Anabolic Botanicals to Promote Allostasis

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Part I: Context and Systems

Restorative Herbal Medicine: Historical Context

Humans have used plants for thousands of years as food, spice, and medicine to sustain life, restore health, and optimize longevity. Ancient medical traditions such as Chinese medicine and Ayurveda classify botanicals according to specific parameters. Their ancient practitioners studied, classified, and described in detail the specific properties of plants and their influence on human health. These herbs are still revered and utilized by today's herbalists in an unbroken chain of medical tradition. Modern scientists, exploring the realm of botanicals, are discovering the validity of their benefits.

Ayurvedic and Chinese Restorative Medicine

Chinese medicine and Ayurvedic herbalists identify a group of botanical medicines that possess unique and special attributes. These herbs are found to be restorative and even rejuvenative to the tissues, organs, and systems of the body. They are appropriate for long-term use with no toxicity. These elite herbs have been used for thousands of years to restore vitality and physiological function after illness. They are powerful herbs that are also valued to prevent illness, foster well-being, and promote longevity.

Ayurvedic medicine classifies these unique herbs as *Rasayana* – literally Path (*ayana*) of essence (*rasa*). These botanicals are known to enhance life and lengthen the lifespan. Modern research on Rasayana herbs finds they possess antioxidant, anti-inflammatory, and adaptogenic qualities.¹

Specific herbs from several botanical classifications in Chinese medicine are noted for these attributes. Traditionally, Taoist monks utilized them to support their meditative practices, maintain optimal health, and promote longevity. Chinese practitioners esteemed them as potent restoratives.

These botanical medicines are ideally utilized in the context of a healthy lifestyle, cultivation of mental/emotional equanimity, and other health-promoting practices focused on harmony of body, mind, and spirit. These special herbs are revered today for their ability to strengthen immunity and resistance to disease, and to support physical strength, endurance, and resilience. They enhance mental clarity, promote equanimity, and facilitate a calm spirit.

Adaptogenic Botanicals and Allostasis

In the 1950s, Russian scientists studied some of these elite herbs and termed them *adaptogenic* because of their ability to enhance adaptive capacity. All living organisms constantly respond and adapt to ongoing stimuli from our ever-changing environment. Botanical adaptogens support the human organism's ability to respond appropriately in order to maintain *allostasis* – the ability of the system to constantly change, adapt, and support homeostasis.

Modern-day Russian and Western research regarding the ongoing relationship between health and our ability to adapt to change has developed over the last century-and-a-half. It has grown from conceptualization of basic principles such as homeostasis and adaptation to a more advanced understanding of the complexity of the vast interrelationships and dynamic processes that maintain our health and well-being. Within this context, botanical adaptogens are known to primarily modulate the neuroendocrine system, which orchestrates the adaptive response.



This paper explores the development of some of the primary theories that contribute to our understanding of processes of health and disease. Key concepts are presented in relation to the therapeutic use of adaptogenic botanicals. These unique herbs offer a powerful means to restore health, maintain health, and enhance well-being. Well-being refers to the quality of our life and to our ability to engage fully with all facets of our being so that we can enjoy harmonious relationships with our family, our work, and within our community.

Homeostatis, Allostasis, and Adaptation

In the development of Western medicine, Claude Bernard was perhaps the first to introduce the concept that our internal balance is the main factor determining our health and resistance to disease. This was considered quite heretical during his time when germs were considered the primary causative factor of disease. Bernard, a French physiologist (1813 – 1878) introduced the concept of the *milieu interieur*, the body's internal environment. He described the body's ongoing process of self-regulation to preserve health and referred to this process as *dynamic equilibrium*.

In the 1920s, Harvard physiologist Walter B. Cannon (1871 – 1945) called this bodily process of dynamic equilibrium *homeostasis*. Homeostasis refers to the ongoing bodily processes that constantly adjust to internal and external factors (temperature, food, and so forth), allowing us to function consistently. Canon also studied emotional disturbances and their influence on physiological and adrenal function.

While traditional healing systems such as Chinese medicine have recognized the impact of stress and negative emotions on physiology for thousands of years, this was the start of such research in the West. Canon was the first to use the word stress in relationship to the human experience. Prior to that it was used in the context of engineering forces. Canon described stress as a force that disturbs homeostasis.^{2,3}

Selye's Biological Stress Response

Hans Selye (1907 – 1982) developed a more advanced model of stress and its influence on health and the development of disease. Selye, an endocrinologist, was known as the “Einstein of medical research”. His research describes a progression of physiological responses to stress. He recognized that a stressor triggering the stress response could be physical, chemical, emotional, or psychological. He found that stress can weaken the interior environment and that the response to stress is unique to each person. An individual's inherent strengths and weaknesses determines their ability to adapt and how stress will influence their health. Selye developed the general adaptation syndrome model, which he later renamed the biologic stress response. It outlines the general response of the organism to stress. His 1936 article *Stress-Induced Illness* defined stress as “the nonspecific response of the body to any demand”.^{4,5}

Selye's Biological Stress Response Stages^{5,6}

Stage 1: Alarm Reaction

The neuroendocrine response to stress is protective and designed to be short-lived. The release of hormones, especially adrenaline and cortisol, promote a cascade of metabolic responses. The sympathetic nervous system is activated and tissue catabolism increases as the system prepares for action.

Stage 2: Resistance

The HPA (hypothalamic-pituitary-adrenal) axis is activated in this phase. The system adapts, stress is



resolved, and homeostasis is regained. This adaptation may be beneficial or detrimental to the organism. Ideally, adaptation is beneficial, as the body develops resistance to the stressor and improves its adaptive capacity and health.

Stage 3: Exhaustion

With continuing stress and/or poor adaptation, the organism experiences disruption in normal function and homeostasis. Prolonged circulation of stress hormones such as cortisol and adrenaline causes tissue damage. A combination of factors contributes to eventual exhaustion, hormonal depletion, dysregulation of systems, and the development of illness.

In the initial phases, Selye notes three major tissue changes: thymus atrophy, lymph atrophy, and erosion of the stomach lining. During the normalizing resistance phase, these changes usually resolve. If stress is unresolved, these tissue changes reoccur and worsen during the exhaustion phase. This suggested to Selye that the adaptability of living organisms is finite. He attributes the limits of adaptability – what he called *adaptation energy* – primarily to genetics.

Allostasis

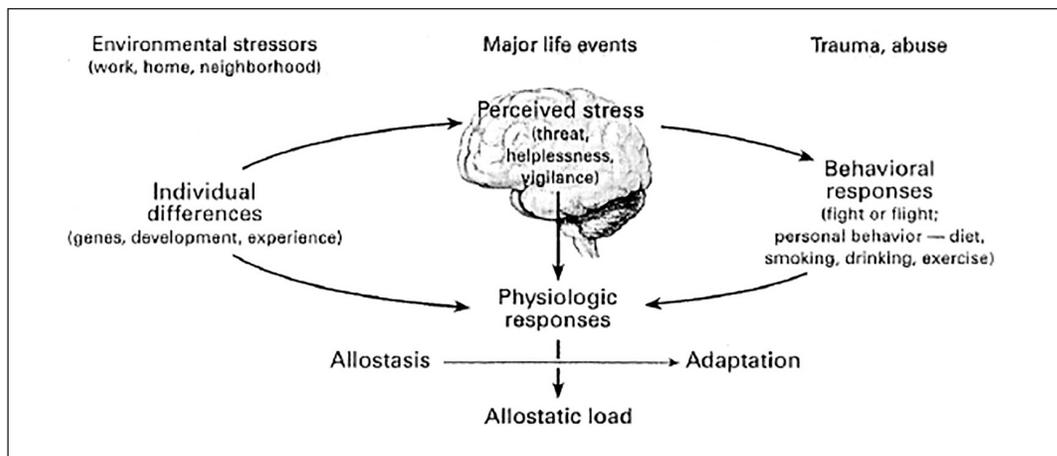
The most basic assessment of good health includes well-being and vitality. These qualities influence our resilience – the ability to adapt to the constant changes and challenges of life. Stress is a natural part of life as we constantly interact with our environment, with others, and within ourselves. Our individual response to stress either helps us adapt or becomes a contributing factor to maladaptation.

Cannon described homeostasis as a coordinated ongoing process that maintains a steady state in the body. This includes processes such as pH regulation, oxygen levels, and body temperature.⁷ The concepts of *allostasis* and *allostatic load* offer a fuller perspective. Bruce S. McEwen, an endocrinologist, describes allostasis as the mechanism through which the body maintains homeostasis. The concept of allostasis, first introduced by Peter Sterling and Joseph Eyer, refers to ongoing processes that maintain stability

Measures of Allostatic Load

- Systolic and diastolic blood pressure
- Indices of cardiovascular activity
- Waist-hip ratio
- An index of more chronic levels of metabolism and adipose tissue deposition, thought to be influenced by increased glucocorticoid activity
- Serum HDL and total cholesterol
- Related to the development of atherosclerosis – increased risks being seen with higher levels in the case of total cholesterol and lower levels in the case of HDL
- Blood plasma levels of glycosylated hemoglobin
- An integrated measure of glucose metabolism over several days time.
- Serum dihydroepiandrosterone sulfate (DHEA-S)
- A functional HPA axis and antagonist
- Over-night urinary cortisol excretion
- An integrated measure of 12-hr HPA axis activity
- Overnight urinary noradrenalin and adrenalin excretion
- Integrated indices of 12-hr sympathetic nervous systems activity

See reference #21.



See reference #21.

(homeostasis) through change. This includes normal life changes (seasons, pregnancy, etc.) and unexpected events that disrupt normal functions.⁷⁻⁹

The nervous, endocrine, and immune systems mediate allostatic processes in a complex, integrated manner. While stress contributes to allostatic load, chronic stress leads to the more severe stage of *allostatic overload* with multiple disruptions throughout all systems of the body.

Chronic stress contributes to structural and functional changes in the brain, particularly in the prefrontal cortex, the amygdala, and the hippocampus.⁸ These changes include loss of dendrite growth, shortening of dendrites, remodeling of the hippocampus, and reduced hippocampal volume. Behavioral changes include heightened fear response, increased anxiety, memory loss, and cognitive decline. Disruption of normal cortisol fluctuations influence Circadian rhythms of sleep and waking.⁸⁻¹¹

Prolonged stress has multiple effects on the brain due to its inherent plasticity. In particular, trauma and prolonged stress during preconception through the developmental stages of early childhood is found to adversely affect the brain. This creates a predisposition to the stress response throughout life and to pathologies later in life. These changes can be ameliorated and to some extent reversed.^{7,8:11-13}

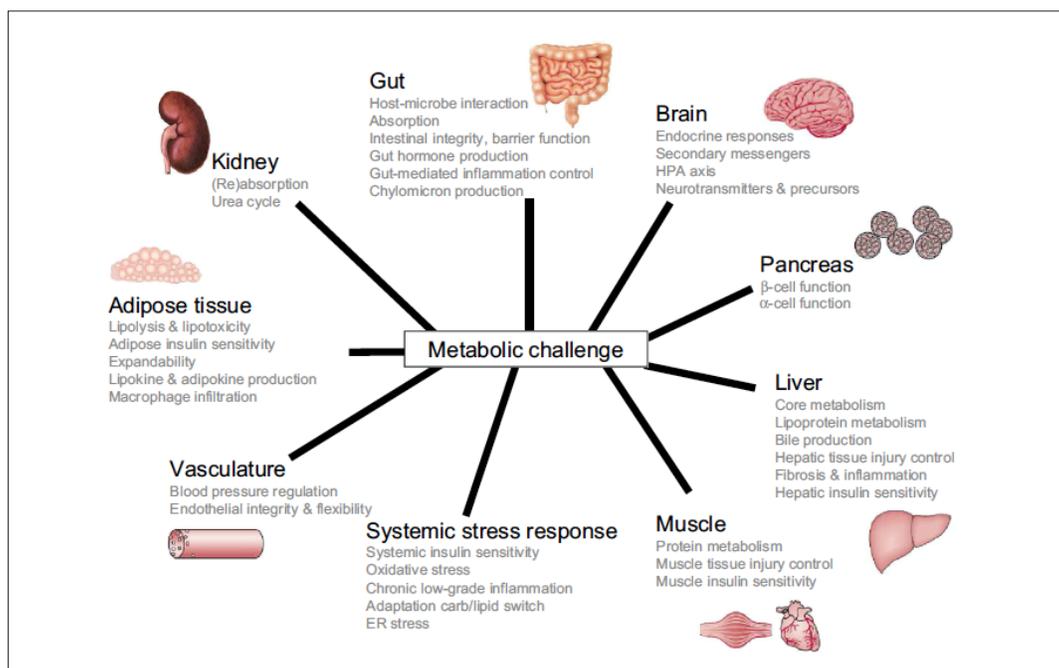
Inflammatory and oxidative processes increase with long-term stress. This adversely effects cellular systems and accelerates cellular aging. Cellular systems affected include cell signaling, mitochondrial function, biological oscillations, and many others. These factors along with metabolic imbalance can contribute to the erosion of telomeres, which are associated with longevity.⁸

At its foundation, the allostatic model represents the balance between metabolic energy and the constant, ever-changing demands of life. In conditions of prolonged stress, whether real or perceived, the physiology remains on constant alert due to overactivity of its arousal systems. This leads to depletion of vital energy reserves, fatigue, and a host of other issues. Since the physiology is not able to maintain stability, systems become increasingly dysfunctional, and the person becomes prone to serious pathophysiology.

Metabolic Model of Homeostasis

One definition of health is as an ongoing process of adaptability, flexibility, and robustness.¹⁴ In the context of nutrition and metabolism, *Phenotypic flexibility* is an allostatic process that describes the organisms metabolic capacity to respond to the continually changing environment.^{15,16}

Phenotypic flexibility, unique in each individual, is an indicator of health status. Flexibility progresses to inflexibility with the onset and progression of disease.¹⁶ The degree or amplitude of the stress response, the adaptive capacity of the person, and the effectiveness and the duration of the response are determining factors that define the phenotypic flexibility of the individual.¹⁶ This involves cellular processes of energy production (ATP production and synthesis), DNA repair, cellular response to oxidative stress, inflammatory processes, and other factors.¹⁶ Researchers are currently exploring which markers might be helpful to determine health status, rather than disease status, in individuals.^{14,17}



Physiological processes involved in phenotypic flexibility. Thirty-five different physiological processes that may be influenced by food and nutrition have been defined. The optimal nutritional stress challenge should trigger all these physiological processes, so that it allows the broad quantification of nutritional health effects.

See reference #14.

Nutrition influences phenotypic flexibility and scientists are particularly fascinated with the role of micronutrients as cofactors in metabolic homeostasis. Micronutrients such as flavonoids act as enzymes, enhance hormonal function, and exert antioxidant and anti-inflammatory influence.¹⁵ The field of nutrigenomics studies how food and plant constituents affect gene expression and how gene expression influences the absorption, metabolism, elimination, and other processing of a nutrient.¹⁸ These studies enhance our understanding of how botanicals interact with and modulate multiple functions, processes, and systems in the human body.

Stress Response Systems

Our body is a system of well-orchestrated networks that continuously interact, communicate, and respond simultaneously. Three key systems that engage in the stress response are the metabolic system, neuroendocrine system, and immune system. This response is a complex process of primary and secondary reactions and feedback mechanisms that work to maintain allostasis. These systems are engaged therapeutically to facilitate healing from illness, support health, and enhance longevity.^{15,16,19} Here, our primary concern is the neuroendocrine and metabolic systems.

Neuroendocrine Stress Response

The brain is the central modulator and primary controller of allostasis.^{8,9,13} Core brain centers mediate physiological and behavioral responses to real or perceived stress. These include the hippocampus, amygdala, prefrontal cortex, hypothalamus, and anterior lobe of the pituitary gland.^{8-10,13,20-23}

The amygdala, hippocampus, and prefrontal cortex work together as a stress response network. The amygdala activates the locus coeruleus, which processes anxiety and increases alert attention. It also activates the SNS (sympathetic nervous system) fight-or-flight response. The amygdala triggers nerve responses in the hypothalamic paraventricular nucleus (HPVN) which, in turn, activates the pituitary gland and HPA axis.^{9,22,24-26}

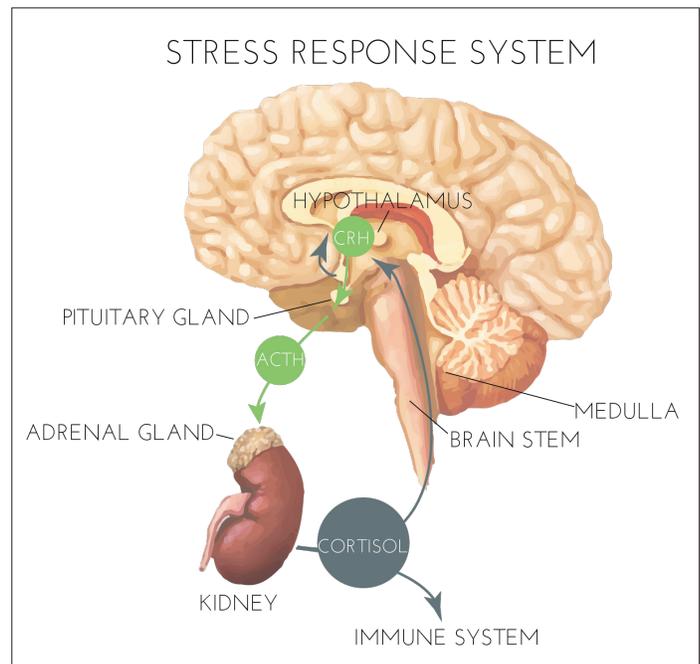
Stressor-specific response systems of the brain determine which circuits are activated, level of response, and duration of response.²⁴ Stimulation of the stress response can be anticipatory or reactive. The elicited response occurs at multiple levels in a complex, non-linear, integrated manner to maintain on ongoing mediation and modulation of homeostasis and allostasis.²⁷

The production and relay of neurotransmitters and hormones are in a continual state of flux, working together to support allostasis.¹⁹ Their integrated function, referred to as the neuroendocrine system, impacts health, aging, and disease. At the core of the neuroendocrine system is the HPA (hypothalamic-pituitary-adrenal) axis, which modulates multiple processes.⁸

Primary mediators of the HPA axis stress response are the glucocorticoids (GCs) and the catecholamines. Both the hippocampus and prefrontal cortex are rich in glucocorticoid receptors. GCs promote release of fuel for energy needed during fight-or-flight and help restore homeostasis during recovery. Their release is mediated by the HPA axis via the HPVN.^{20,28} Prolonged glucocorticoid secretion exerts a long-term catabolic influence and contributes to metabolic, affective, and psychological disease.^{8,13,22,27,29,30}

Metabolic Stress Response

Metabolic homeostasis is another parameter of allostasis. Metabolism is an ongoing, dynamic, biochemical



process at the cellular level that sustains life through continual transformation of nutrients and molecular compounds. Metabolic balance influences endocrine function, immunity, cell proliferation, cellular communication, bioenergetics, mood, and behavior.³¹⁻³³

This refers to the balance of catabolic (breaking down) and anabolic (building up) activity. The balance between energy input and energy expenditure is the basis for the concepts of allostasis and allostatic overload. While both processes occur continuously, anabolic processes are favored during times of rest, healing, pregnancy, lactation, and growth. Anabolic metabolism influences immune response, protein synthesis, cellular repair, cell function, and bioenergetics.

The natural aging process is associated with reduced anabolic activity and increased catabolic activity. Recovery and healing takes longer and metabolism often slows. This is exacerbated by multiple factors that can contribute to chronic illness, degenerative disease, and metabolic disease.

Allostatic overload causes accelerated catabolism and depletion of internal energy. Decreased muscle mass, lowered immune response, compromised resistance to disease, and hormonal imbalance are indicators of increased catabolic activity. Muscle wasting can become problematic in the elderly or in those with degenerative disease when it progresses to sarcopenia or cachexia.

Considering four stages of metabolic stress in disease, as described below, offers a complementary model to that of Selye's or McEwen's with emphasis on the interaction between metabolic and neuroendocrine systems.³¹

Metabolic Stages of Illness and Recovery³¹

Metabolic Stage 1

During the adaptive response, catabolic processes increase as glucose, fatty acids, and amino acids are broken down from liver and muscle stores to provide fuel for action. Insulin resistance develops to support the increased need for glucose and fatty acids. Increased oxidation of carbohydrates and increased energy output contributes to mitochondrial dysfunction. Over time, this leads to inefficient substrate cycling and loss of lean body mass. This is partially attributed to a decrease in the anabolic hormones IGF-1 (insulin-like growth factor) and testosterone.

Metabolic Stage 2

Without resolution, the allostatic load and inflammatory processes increase. Neuroendocrine changes contribute to organ dysfunction, increased catabolic process, insulin resistance, and hormonal changes. This stage represents a progression from an adaptive to a maladaptive response.

Glucocorticoids:

- induce glycogenolysis in the liver
- suppress innate immunity in immune organs
- inhibits bone & muscle growth
- potentiate SNS-mediated vasoconstriction
- invoke proteolysis and lipolysis
- suppress reproductive function via the HP-gonadal axis
- induce behavioral depression

See reference #27.

Metabolic Stage 3

The third stage reflects progression to an illness that is critical, degenerative, prolonged, and likely has a poor prognosis.

Metabolic Stage 4

This model features a recovery stage. Here, the body returns to anabolic balance and inflammatory pathways are downregulated. Appropriate therapy focuses on building lean muscle mass utilizing dietary nutrition and anabolic agents. The selection of botanicals that promote dynamic, anabolic processes during this stage is essential.

Complex Adaptive Systems Theories

The concept of health also includes resiliency, adaptability, and dynamism.^{14,34} Our ability to adapt and evolve with our constantly changing environment is a dynamic process.³⁷ *Complex adaptive systems theory* describes living organisms, including plants and humans, as complex systems that are self-organizing and dynamic.³⁴ This perspective further recognizes humans and all life forms as dynamic, living systems that constantly adapt in relationship and co-evolve with all other living systems on and including the planet itself. Modern scientists refer to this as an ongoing, interactive *Complex Adaptive System*.^{15,16,34,35}

The recognition of this process inherent in living systems is currently evolving in the worldwide scientific community. The interdisciplinary approach is known by many names including *Complex Systems Theory* or *Complex Adaptive Systems Theory*. Complex adaptive systems theory recognizes that there is an ongoing dynamic interplay between physiology, environment, cognition, emotion, cultural, and other factors that influence our health. This understanding represents an interdisciplinary, multiple systems approach to understanding the complex, interactive dynamics of allostasis.^{15,16,34-37}

Synergistic Adaptogenic Formulations

Chinese and Ayurvedic traditional medical systems are fundamentally based on the concepts being explored today in complex adaptive systems theories. Therefore, they most commonly utilize complex formulas with many herbs combined together for optimal results. These formulas are carefully designed to facilitate and engage a multi-systems response to promote healing. This concept of using multiple herbs and natural compounds to form a synergistic formula underpins the philosophy of herbal medicine, which seeks to address the root cause of conditions and offer restorative modalities.

The *terroir* of the herb, its energetic influence, and biochemical actions interact in a beneficial manner with the dynamic, complex, human system to evoke a healing response. Epigenetic assays show that the gene expression profile of a whole traditional formula is unique and different than the effects from the individual herbs.^{38,39} In original Russian studies, a balanced adaptogenic formula given to Olympic athletes and cosmonauts was found to have an enhanced effect when compared to any adaptogenic herb administered singly.^{38,39}

PART II: Adaptogenic Botanicals

Russian Research of Adaptogenic Botanicals

Humans and plants have coevolved over millennia and modern researchers are rediscovering how plants powerfully interact in a multi-faceted manner with human physiology to restore and enhance healthy function from the cellular level to more complex systems and tissues.

In the 1950s, Russians began studying the elite herbs used as restorative and rejuvenative tonics in Asian and Russian traditional medicine systems. They were interested in enhancing the performance of Russian Olympic athletes, cosmonauts, and military without the adverse side-effects of steroids.

Eleuthero (*Eleutherococcus senticosus*) is perhaps the most widely-researched adaptogen. The unique qualities of this herb led Russian scientist Dr. Nikolai Lazarev (1870 – 1942) to coin the term *adaptogen* in the late 1940s. Later, Israel I. Brekhman, MD (1921 – 1994) intensively studied Eleuthero and used its remarkable properties to define the characteristics of adaptogenic herbs. The simplest definition of an adaptogen is *any agent that increases nonspecific resistance of an organism to stress and other environmental influences*. The traditional definition of an adaptogenic herb, as set by Dr. Brekhman includes four parameters:^{40,41}

1. It elicits a nonspecific (general) response in the host.
2. It increases resistance to multiple stressors, including physical, chemical, or biological.
3. It normalizes and stabilizes function.
4. It causes no harm or adverse effects.

The primary herbs identified as being adaptogenic in these original Russian studies included Eleuthero, Shisandra, Panax Ginseng, Rhodiola, and Ashwaganda.

Therapeutic Use of Adaptogenic Botanicals

Restore Allostasis; Modulate Neuroendocrine Response

Adaptogenic botanicals are nonspecific in action without being stimulating. By definition, adaptogens exert a modulatory influence. Because they normalize hypo- or hyper- conditions, they are of primary importance in calming the stress response and restoring function. Adaptogenic botanicals are known to modulate cellular function, cell-signaling, neuroendocrine function, metabolic homeostasis, and immune response. These powerful herbs are foundational in any health program to help restore allostatic processes including the normal biological complexity found in healthy systems.

They are restorative in nature, with nourishing properties. These botanicals support an efficient adaptive response and optimize the body's natural resilience. Adaptogens help normalize the entire system and enhance recovery time from stress. They help revitalize exhausted organ and energy systems.

Adaptogenic Botanicals:

- nonspecific action
- normalize hypo- and hyper-conditions
- support physiological adaptation
- facilitate allostasis
- Enhance the body's normal processes
- nourish vital life force
- no side-effects or toxicity
- modulate neuroendocrine function



Eleuthero Root (*Eleutherococcus senticosus*)

Eleuthero is considered the premier adaptogenic herb. Dr. Brekman used the notable properties of Eleuthero to create the defining characteristics of adaptogenic botanicals. It demonstrates a consistent ability to normalize function, increase biological resistance, and enhance natural energy systems.^{42,43} Eleuthero benefits the body's adaptive capacity, increases biological resistance, and normalizes physiological responses. Eleuthero supports and optimizes endocrine and adrenal gland function during times of stress. It helps normalize blood glucose levels.^{44,45}



Eleuthero (*Eleutherococcus senticosus*)

Because of these actions, Eleuthero enhances athletic performance, improves recovery time from physical exertion, and supports healing from stress and illness.^{43,46-48} People in the Siberian Taiga region traditionally used Eleuthero to increase performance, support resistance to infections, and improve quality of life.

Due to Brekman's research, Eleuthero became popular in Russia in the late 1950s. For several decades it was included in herbal regimens to enhance performance and recovery time in Russian athletes. It is found highly effective to enhance physical energy, endurance, and mental acuity. Oxygen intake during exercise is improved, which allows for increased stamina and longer workouts with quicker recovery time, especially in performance athletes.^{43,49}

Because of its tonic actions, Eleuthero was first marketed as "Siberian Ginseng". While Eleuthero is a member of the *Araliaceae* family along with Panax Ginseng, the two are distant relatives. Eleuthero does not contain the ginsenosides for which true Ginseng is famous. Its primary active compounds are steroidal glycosides called *eleutherosides*. Other active constituents include triterpene saponins, phenolic compounds, and lignans. Eleuthero contains vitamin E, carotenoids, and a wide array of minerals.^{40,50}

Eleuthero demonstrates anabolic activity.^{42,49} It enhances protein synthesis in the pancreas, liver, and adrenal cortex.^{42,45} One of Eleuthero's bioactive compounds, Eleutheroside B, is the key compound that plays a significant role in its anti-stress and anabolic actions.^{42,50-52}

Eleuthero is noted for its ability to decrease adrenal hypertrophy, which often occurs in the context of a prolonged stress response.⁴⁰ Eleuthero helps prevent or alleviate the stress response by normalizing function. It helps delay the onset of adrenal exhaustion (the third phase of Hans Selye's General Adaptation Syndrome).⁵³

Eleuthero also helps combat the adverse effects of sleep-deprivation.^{54,55} It has profound anti-fatigue influence and a small study showed it to benefit those diagnosed with idiopathic chronic fatigue.⁴⁰

Panax Ginseng Root (*Panax ginseng*)

Panax Ginseng is a highly-revered herb used as food and medicine in Asia for over 4,000 years. The name *Panax* is derived from the Greek word *pan* (meaning all) and *-axos* (medicine or remedy) – reflecting Ginseng's use as a panacea. The Chinese name for Ginseng is *Ren Shen* or "human root", as the root sometimes grows in the shape of a person with a head and two legs. It is believed to embody a human's three essences (body, mind, and spirit) and to contain the essence of the earth. It

is revered for its ability to promote longevity through its nourishing qualities. Known to strengthen the body and restore vitality, Ginseng is used by Chinese practitioners to treat many types of illness to promote health.⁵⁶

Ginseng has been used for thousands of years to help resolve serious illness, combat fatigue, and promote longevity. It is a powerful botanical that enhances vital energy, benefits physical performance, and promotes stamina. Ginseng enhances recovery from exertion and muscle fatigue.⁵⁷⁻⁶⁰

Ginseng exerts a modulatory influence on the central nervous system. It facilitates the stress response, acts on the hypothalamus, and modulates the activity of the adrenal cortex. It helps normalize glucocorticoid levels and enhances recovery. Ginseng modulates healthy blood glucose levels.⁶¹⁻⁶⁴ It is found beneficial for neurasthenia and mild depression. Ginseng is reported to be neuroprotective, to benefit concentration, and to enhance cognitive ability.^{57-60;65}

Panax Ginseng is known for its high content of ginsenosides, which are triterpenoid saponins. It is also high in polysaccharides, peptide glycans, and flavones.⁶⁶ Ginsenosides in Ginseng exert antioxidant activity and enhance the antioxidative defense system, including glutathione. Ginseng promotes the activity of the antioxidant enzymes GSH-Px (glutathione peroxidase) and SOD (superoxide dismutase).⁶⁷ It is found to decrease levels of proinflammatory cytokines. It modulates and enhances immune system response, NK (natural killer) cell activity, and interferon production.^{65,68,69}

Processed (Red) Ginseng has properties uniquely different than unprocessed (White) Ginseng although both are noted for their tonic, nourishing qualities. White Ginseng (Fresh, unprocessed) is more neutral in quality with a calming and quiescent influence.

Red Ginseng is prepared in a specific manner and steamed with herbs that cause it to become more heating in nature. This processing imparts Red Ginseng with the ability to restore dynamic vigor and vitality to the body. It can be too heating and stimulating for those with specific conditions, including high blood pressure. Red Ginseng is found to contain a higher ginsenoside content due to the conversion of naturally-occurring compounds to ginsenosides during the steaming process.⁶⁶

American Ginseng Root (*Panax quinquefolius*)

American Ginseng is a Panax species native to eastern North America where it grows as an understory plant in forests. It has been collected from the wild for hundreds of years and widely used as a tonic by those living in areas where it grows. Currently, the wild population is in decline and close to extinction due to over-harvesting.^{70,71}



American Ginseng Root (*Panax quinquefolius*)

The Eclectic physicians practiced in America in the latter half of the 19th and first half of the 20th centuries. They used botanical remedies extensively and valued American Ginseng as a tonic to support energy, stamina, and endurance.^{72,73}

American Ginseng is highly esteemed for its ability to restore energy reserves and impart energy without being excitatory or heating, as with Red Ginseng. Because of this, American Ginseng is

more highly prized in Asia than is Red Ginseng. It contains ginsenosides in different ratios than those found in Asian Ginsengs. American Ginseng also contains polysaccharides, proteins, and proteoglycans⁷⁴

American Ginseng supports energy, stamina, and stability of the nervous system. It is particularly known to support lung health. A polysaccharide-rich extract of American Ginseng was found to support respiratory health and recovery from respiratory infection.⁷⁴ Studies demonstrate a positive influence on the cardiovascular system. Extracts are found to exert both antioxidant and anti-inflammatory activity. American Ginseng benefits the immune system and promotes immune cytokine production.⁷⁵⁻⁷⁸

Traditionally, American Ginseng is found helpful for nervous dyspepsia (weak stomach) and for those with mental exhaustion from overwork. It modulates the HPA axis response, increases endurance, and reduces fatigue after exercise.⁷⁴ Extracts of American Ginseng are found to normalize blood sugar and to protect against renal damage in diabetics.^{74,79} Studies find it reduces inflammation in the colon and may exert a beneficial influence on the colon microbiome.⁸⁰

A large amount of research shows multiple neurocognitive benefits for American Ginseng. Extracts are found to be neurotrophic, neuroregenerative, and neuroprotective.^{74,81} It also demonstrates cytoprotective and hepatoprotective capacity.⁷⁴

Rhodiola Root (*Rhodiola rosea*)

Rhodiola, also known as Golden or Arctic root, grows prolifically in the cold, northern part of Russia and Siberia. In Siberian mountain villages, Rhodiola roots were given to couples about to be married as a sign of good health and fertility. Chinese emperors sent expeditions to Siberia to bring back the “golden roots” prized for medicinal use. Active constituents unique to *Rhodiola rosea* that are considered responsible for its adaptogenic qualities are two glycosides, particularly a group called rosavins.⁶ Rhodiola contains flavonoids, volatile essential oils, and triterpenes. It also contains 17 amino acids along with vitamins, minerals, and trace elements.⁸²⁻⁸⁵



Rhodiola (*Rhodiola rosea*)

Rhodiola is valued for its ability to enhance mental and physical performance and stamina.⁸⁶ Several human and animal studies found that Rhodiola increases physical work capacity and dramatically shortens recovery time between rounds of high-intensity exercise.^{82,87}

It exerts profound protective effects on the nervous and endocrine systems.^{82;87-89} Rhodiola enhances resistance to stress, helps eliminate fatigue, and improves resistance to stress.^{82;87-89} It harmonizes the neuroendocrine system and improves HPA axis recovery from stress.^{6,82;87-90} Rhodiola demonstrates the ability to reduce stress-induced depression and decrease levels of anxiety.^{82;87-89} It benefits concentration, focus, memory, and learning capacity.^{82;87-89}

Rhodiola exerts antioxidant activity.^{90,91} Rhodiola extract is found to enhance anabolic activity, including protein synthesis, in the muscles. It supports ATP (adenine triphosphate) and glycogen production in both the muscles and liver.⁹² Rhodiola is found to be cardioprotective. It helps normalize the heart rate after intense exercise and some studies indicate it helps normalize conditions of stress and arrhythmia.⁹³⁻⁹⁶

Reishi Mushroom (*Ganoderma lucidum*)

Reishi is revered as an elixir of longevity and immortality in Chinese medicine where it has been used for over 2,000 years. It is a popular motif in Chinese and Taoist art, often portrayed in the hands of Chinese sages. This woody mushroom is a glossy, deep reddish-brown. The Chinese name is *Ling Zhi*, which is translated as “Plant of Immortality” or “Herb of Spiritual Potency”.



Reishi Mushroom (*Ganoderma lucidum*)

Reishi is known for its powerful nourishing and restorative ability. Chinese herbalists value it particularly to nourish the deep reserve, or root, energy of the Kidneys. It is traditionally used for conditions of overall weakness (asthenia) to vitalize energy and strengthen overall function. Reishi modulates homeostasis and supports the body’s adaptive capacity. It enhances vital energy and restorative sleep. Reishi is known to strengthen cardiac function and enhance memory.⁹⁷

The active constituents of Reishi include polysaccharides, triterpenoids, proteins, lectins, and plant sterols.^{97,98} Reishi is especially rich in the polysaccharides and triterpenes, the latter of which gives Reishi its bitter taste. Reishi contains a number of minerals including a significant amount of germanium, a mineral also present in ginseng, aloe, and garlic. Germanium is found to exert immunopotentiating, antioxidant, antimutagenic, and antitumor activity.⁹⁷

Reishi contains bioactive peptidoglycans known to exert antiviral and immunomodulatory influence.^{97,98} It exerts a wide range of activity including anti-inflammatory and antioxidant effects, and is cytoprotective.⁹⁷ Reishi is used in China to treat hyperlipidemia, hepatitis, and conditions related to the heart and lungs.⁹⁹

Reishi is found to be chemoprotective and radioprotective. It helps ameliorate the negative effects of these agents while supporting the normal function and vital energy of the individual.^{99,100} It is used in Chinese hospitals for these reasons.

Reishi exerts potent antitumor influence through its cytoprotective influence and other mechanisms. These include modulation of cell signaling, inhibition of cell growth, and cell migration.¹⁰¹⁻¹⁰⁷

Cordyceps (*Cordyceps sinensis*)

The renowned sixteenth century herbalist Li Chih Shen praised Cordyceps for its ability to invigorate and tone the entire body.¹⁰⁸ Chinese herbalists revere it as a respiratory tonic that supports healthy lung function and overall vitality and stamina.



Cordyceps (*Cordyceps sinensis*)

Cordyceps is naturally found in the highlands, above 10,000 feet elevation in China, Tibet, and Nepal where it has been highly prized for centuries. It is known in China as “winter worm, summer grass” or the “caterpillar mushroom” because Cordyceps is a parasitic fungus that grows on the larvae of caterpillars and other hosts. These provide a growth medium for the mycelia which becomes Cordyceps. The Cordyceps CS-4 strain, which is highly researched, is made from cultured mycelia grown on cultured organic brown rice. This form offers an effective and sustainable alternative that is commonly used today.

Cordyceps first gained international attention when it was discovered that Chinese Olympic athletes included Cordyceps as part of their daily herbal training formula. Studies confirm that Cordyceps increases endurance, vigor, and athletic performance.^{109,110}

Cordyceps is rich in polysaccharides that contribute to its immunomodulatory influence.¹⁰⁸ Recognized for its liver- and kidney-protective qualities, Cordyceps is reported to be especially beneficial for those with chronic kidney disease.¹¹¹⁻¹¹⁴ Cordyceps extract is found to inhibit brain aging and modulate endocrine function.¹⁰⁸ It helps restore sexual function with the ability to replenish sperm and support healthy testosterone levels.^{115,116}

Ashwaganda Root (*Withania somnifera*)

Ashwaganda has been revered in Ayurvedic medicine as a potent rejuvenative for over 5,000 years. Often called Indian Ginseng, it belongs to an elite class of Ayurvedic restorative herbs, known as Rasayana. The name *Ashwaganda* means *the smell of a horse*, referring to the strong smell of the root. It also refers to the traditional belief that Ashwaganda root confers the vigor, virility, and strength of a stallion.



Ashwaganda Root (*Withania somnifera*)

Ashwaganda, also called Winter Cherry, is a woody shrub in the *Solanaceae* family that grows in diverse areas including Africa, India, and the Mediterranean. Active compounds in Ashwaganda root include alkaloids, steroidal lactones, saponins, and iron.¹¹⁷

Historically used to enhance longevity and protect from disease, this ancient herb possesses significant adaptogenic activity. Ashwaganda is restorative to all systems of the body and supports the adaptive stress response.^{118,119} A recent study of Ashwaganda extract in high concentration found that it increases telomerase activity. Telomerase is a ribonucleo-protein associated with a healthy lifespan.¹²⁰

Ashwaganda supports healthy anabolic activity and nourishes those in a weakened physical or mental condition. Chinese medicine reveres it as a warming tonic used to promote longevity and health. Modern studies find that Ashwaganda helps normalize glucose levels, supports healthy aging, and enhances male sexual function.^{118,119}

Ashwaganda extract can prevent depletion of vitamin C and cortisol in subjects under stress. Its anti-stress and anabolic activity is considered similar to that of Panax Ginseng.¹²¹ It normalizes biological markers induced by stress including blood sugar, cortisol levels, and adrenal function.¹²¹ Ashwaganda is also found to exert antioxidant and anti-inflammatory activity.¹²²

Ashwaganda enhances nervous system restoration and supports healthy brain function.¹²³⁻¹²⁷ One study reports a 80% reduction in cell degeneration in the brain of stressed animals.¹²³ Another discusses the ability of an isolate of Ashwaganda to positively influence regeneration of neurons and synapses in damaged neurons and neural circuits – vital components of the nervous system and brain.^{126,128,129}

Schisandra Berry & Seed (*Schisandra chinensis*)

The beautiful orange-red Schisandra berry has a long history of medicinal and food use in China,

Japan, Korea, Tibet, and Russia. Throughout time, hunters in the wilds of Siberia used the dried berries chewed or prepared as a tea, to provide energy, stave off exhaustion, and improve night vision during long trips.¹³⁰

Known as the “Five Flavor Fruit”, Schisandra berry is considered a valuable tonic to benefits all five energetic/organ systems according to Chinese medical principles, where each flavor relates to a specific organ and functional system. However, they particularly use Schisandra to nourish the Lungs, support Liver function, and to benefit the eyes.⁵⁶



Schisandra Berry (*Schisandra chinensis*)

Russian adaptogenic formulations utilize both Schisandra fruit and seed extract. The seeds and berries also contain tannins, triterpenoids, lipids (linoleic, linolenic, and oleic fatty acids), organic acids (including malic, citric, and ascorbic), vitamin E, and several minerals. The fruit is especially high in organic acids, pectins, sugars, flavonoids, catchins, anthocyanins, and tannins.^{131,132} Russian research finds the seed extract contains a higher content of lignans known as schisandrins.¹³³⁻¹³⁵

Most Russian research on the adaptogenic qualities of Schisandra were done using the seed extract. The combination of the seed and fruit extract is found to stimulate the CNS without causing over-excitation. Schisandra seed is widely used to treat stress-induced nervous system exhaustion and is found to improve physical and mental capacity, motor coordination, and efficiency.^{133,135,136} Studies show that Schisandra seed extract enhances physical performance and facilitates recovery time.^{135,137} Schisandra is found to improve visual acuity, increase adaptation to darkness, and widen the borders of the visual field.¹³⁸

In multiple studies, Schisandra is found to increase mitochondrial glutathione redox status.¹³⁸ It protects the liver and DNA from damage due to chemicals such as carbon tetrachloride.^{139,140}

Aralia Root (*Aralia mandshurica*)

Aralia has been utilized in Russian phytotherapy for decades as an adaptogenic tonic to enhance stamina, memory, work capacity, and immune function. Aralia grows in eastern Russia and is in the same botanical family as Panax Ginseng and Eleuthero.

High in triterpenoid saponins and steroidal compounds similar to those found in Panax Ginseng, Aralia also contains tannins, resins, and flavonoids. Aralia is found to increase the antioxidant activity of glutathione sulfur transferase (GST), an important antioxidant.¹⁴¹

Valued as a restorative for appetite and vitality, Aralia facilitates resistance to stress. It enhances immune response and central nervous system function. Aralia stimulates glucocorticoid function of the adrenal glands, supports healthy adrenal response, and helps normalize glucose levels.¹⁴²

Aralia is found beneficial for disorders of the nervous system, particularly depression and mental fatigue.¹⁴³ Aralia is restorative in conditions of hypoxia and is found to improve cognitive ability and long-term memory.¹⁴⁴⁻¹⁴⁵ It enhances physical and mental performance and recovery after prolonged physical and mental activity.¹⁴⁴⁻¹⁴⁵

PART III: Anabolic Botanicals

Historic Context of Anabolic Botanicals

Ben Tabachnik, PhD (1940 – 2008) was a senior scientist for the National Research Institute of Sport in Moscow during the 1970s and 1980s. He specialized in sports physiology for over 30 years and coached the Soviet Olympic sprinting team. In 1990 he immigrated to the United States where he worked as a coach and sports medicine consultant for elite athletes and with several nationally-known sports teams. He was especially interested in herbal alternatives to anabolic steroids and was among the first to introduce the concept of using specific botanicals as natural anabolic agents to improve athletic performance.

When he met professional clinical herbalist Donald Yance in the 1990s, they further developed this concept working together. They realized that the catabolic processes of the prolonged stress response also occur during high-performance athletic training. Together and individually they made numerous contributions to the study, understanding, and clinical use of adaptogenic compounds to enhance health, athletic performance, and to support recovery from chronic and degenerative illness.

The therapeutic use of the more nonspecific, harmonizing, and restorative adaptogenic botanicals is often enhanced through combining them with herbs that work more directly to promote and restore anabolic function. A skillful blending of herbs appropriate for the individual optimizes the healing process and formulations are revised as the person progresses through the restorative process.

Therapeutic Use of Anabolic Botanicals

Promote Anabolic Processes; Restore Metabolic Homeostasis

The anabolic botanicals in this section are not traditionally classified as adaptogens. What they share in common is the ability to restore and support metabolic homeostasis through promoting healthy anabolic processes. As we saw in the metabolic model of stress and recovery, promoting anabolic function is essential to restoration of metabolic homeostasis. The most potent herbs to promote anabolic function include Rhaponticum, Ajuga, Cissus, and Shilajit. The herbs Rhaponticum and Ajuga are especially rich in ecdysterones, which are naturally-occurring anabolic ecdysteroids. Russian researchers such as Ben Tabachnik were particularly excited about these compounds in regards to their ability to promote athletic endurance, stamina, and enhance recovery time from intense training regimens.

Anabolic Botanicals:

- enhance metabolic homeostasis
- support normal anabolic function
- stimulate and promote dynamic function

Deer Antler Velvet/Pantocrine (*Cornu cervi parvum*)

In Asia, deer antler is attributed legendary restorative powers. Deer antler velvet is rich in nutrients including collagen, amino acids, essential fatty acids, enzymes, vitamins, minerals, and trace minerals.¹⁴⁶ Deer antler is the only mammalian organ that regenerates itself in an annual rhythm. Each spring, male deer cast off the hard antler from the previous year and the growth of a new antler begins. It starts as a soft, velvet material and regenerates at an amazing pace.

Pantocrine is a humanely-harvested extract of deer antlers. Studies find pantocrine improves athletic

performance of healthy athletes and increases work capacity, strength, and stamina. It helps enhance sexual health and supports healthy heart function.¹⁴⁷

Pantocrine decreases the rate of muscle fatigue, enhances muscular strength, and possesses anti-catabolic activity. It also increases red and white blood cell production and accelerates healing and recovery.¹⁴⁸⁻¹⁵¹

Pantocrine demonstrates an anabolic/anti-catabolic effect in elderly animals, stimulating lean muscle, bone, cartilage, and nerve growth.¹⁵² As an anabolic agent, Pantocrine promotes protein synthesis by building lean muscle and tissue.^{151,153,154} It is found to enhance both testosterone and IGF-1 (insulin-like growth factor-1), an important growth hormone which is related to human growth hormone. Studies find a correlation between deer velvet and circulating levels of somatomedin C.¹⁵⁵

Rhaponticum Root (*Rhaponticum carthamoides*)

The root and underground stems of *Rhaponticum* are valued as powerful medicines in Siberian folk medicine where it has been used for centuries to treat fatigue, anemia, and impotence. *Rhaponticum* helps prevent the catabolic state seen with chronic stress¹⁵⁶⁻¹⁵⁸ and is noted for its ability to support recovery from disease.^{159,160}



Rhaponticum's biological activity is attributed to its high content of naturally-occurring anabolic ecdysteroids (ES).^{157,159-162}

Rhaponticum contains a large number of ES including ecdysterone and turkesterone.¹⁶³ Turkesterone is found to provide the most potent anabolic activity of any known plant-ES.¹⁶⁴⁻¹⁶⁶ Because it is such a rich source of ES, *Rhaponticum* has been researched for over 30 years.

Studies find that *Rhaponticum* extract (RE) increases protein anabolism to build lean muscle and enhance loss of body fat.^{160,166-168} It is used by athletes to support strength and endurance.¹⁶⁰ RE is noted for its ability to enhance physical and mental work capacity along with physical performance and endurance.^{156,157,60,161,166,168}

Rhaponticum powerfully improves adaptive capacity and normalizes function in many physiological systems. It is found to enhance sleep, appetite, and mood¹⁶⁸, as well as cardiovascular function.^{160,161} RE is found to increase muscle tone, normalize body weight, and improve muscle work capacity even in those with protein synthesis disorders.¹⁶⁹ It is found to increase ATP production in the liver, supporting an increased rate of oxidative phosphorylation.^{167,168,170}

Rhaponticum is high in flavonoids, lignans, tannins, resins, and polysaccharides. These compounds contribute to its powerful immunomodulatory and antioxidant activity.^{159-163;171-175}

Ajuga (*Ajuga turkestanica*)

This member of the Mint family is found to be especially rich in the biologically active compounds known as ecdysteroids (ES). *Ajuga* contains a number of ES along with pectins and tannins. Research finds that the ES in *Ajuga* exert a powerful influence on metabolism, enhance healthy anabolic metabolism, and improve adaptation to stress. *Ajuga* was used by Russian athletes as an anabolic tonic to enhance their training.

Turkesterone, one of the ES in Ajuga, is said to provide the greatest anabolic activity.¹⁶⁵ ES in Ajuga are found to support healthy body weight and muscle-to-fat ratio, including that of skeletal muscles. Ajuga is found to significantly enhance protein synthesis in muscle cell cytoplasm by increasing protein assembly from amino acids. ES are found to increase protein synthesis by as much as 190%. Ajuga helps stabilize cells during recovery from cortisol damage. It is found to normalize ATP production. Some studies show that Ajuga helps increase total protein and glycogen in muscles.^{176,177}



Ajuga (*Ajuga turkestanica*)

Shilajit aka Mumie (*Asphaltum bitumen*)

Ayurvedic medicine values Shilajit as a rejuvenative herb that slows the aging process and prolongs a healthy life. The Sanskrit name Mumie translates as “destroyer of weakness”.¹⁷⁸ Shilajit is found in the Himalayas, in other areas of Asia, and in Norway. The word *Shilajit* means “something which has won over rocks”. It is gathered in small quantities from steep rock faces at altitudes between 1000 and 5000 meters.^{178,179} This substance has a history of use as a rejuvenative and adaptogenic compound for thousands of years.¹⁸⁰ Shilajit is found to exert significant adaptogenic activity comparable to Panax Ginseng.¹⁸¹

Shilajit exerts pronounced anabolic activity, accelerates protein and mineral metabolism, increases lean muscle mass, and helps build bone density. The Russians have researched Mumie since 1910. Because of their findings, it was used as a restorative and anabolic tonic for elite Russian athletes.¹⁸²

Shilajit is sometimes called mountain rock juice or balsam of rock.¹⁸⁰ It contains about 80% decomposed resin-bearing plants. Humus contains fulvic and humic acids which are high in phenolic compounds. It also contains benzoic acids, flavonoids, sterols, and microelements, along with minerals including calcium, magnesium, and silica.¹⁸³

In traditional Russian and Ayurvedic medicines, Mumie is known as a powerful anabolic that also stimulates bone regeneration. Data suggests that because Mumie is a potent stimulator of osteoblastic differentiation of mesenchymal stem cells and an inhibitor of osteoclastogenesis, it may be of clinical benefit in the treatment of osteoporosis in humans.¹⁸⁴⁻¹⁸⁷

Cissus (*Cissus quadrangularis*)

Ayurvedic medicine valued Cissus for its ability to support healthy bones, ligaments, and tendons. It contains ketosterones, which are found to enhance healthy anabolic metabolism. Studies find that Cissus acts as an anabolic restorative with androgenic capacity.^{188,189}

This ancient medicinal plant is native to Ceylon, India, and Africa. In Ayurvedic medicine, Cissus is known to speed healing from bone fractures. Modern research attributes this to its action as a glucocorticoid antagonist.¹⁸⁸ Although most of the research on Cissus centers around bone healing, the possibility exists that Cissus may act to improve the healing rate of connective tissue in general, including tendons.¹⁹⁰

Considered to be anti-osteoporitic, Cissus benefits bone remodeling and increases bone tensile strength. Clinical trials find that healing time from fractures increased from 33% to 55% higher than

the control group. It is also found to benefit bones weakened from use of cortisol.^{191,192}

Epimedium Leaf (*Epimedium sagittatum*)

Epimedium is a powerful herb with an ancient history and is highly researched in modern times. Famously known as “horny goat weed”, Epimedium has long been used as an aphrodisiac to enhance both sexual energy and erectile function. The famous Chinese herbal book of remedies, Shennong Ben Cao Jing, written around 1,200 BC, describes the use of Epimedium for impotence. Known as Yin Yang Huo in Chinese medicine, Epimedium is traditionally combined with other herbs to ameliorate its very strong action as Kidney warming tonic.



Epimedium Leaf (*Epimedium sagittatum*)

Valued to support energy, youthful vigor, and a healthy libido, Epimedium is most often included in longevity tonics such as the famous Two Immortals formula of Chinese medicine.

Epimedium supports androgenic balance.¹⁹³ Clinically, it is found beneficial for impotence, fatigue, low sperm count, low libido, spermatorrhea, and sterility.¹⁹⁴ In several studies, Epimedium extract was found to increase muscle function and integrity and to support health and vigor.¹⁹⁵

Epimedium is especially rich in flavonoids and also contains polysaccharides, natural sterols, and fatty acids. Epimedium flavonoids are found to possess the ability to influence profound regeneration of adrenocortical pathways when there is HPA axis dysfunction. They also assist HPA axis response and hormonal recovery after long-term stress or glucocorticoid exposure.^{196,197}

Epimedium and its flavonoid, icariin, are found to be protective against oxidative stress at the cellular level, supporting healing and repair of aging cells.¹⁹⁸⁻²⁰² Epimedium demonstrates anabolic and bone protective effects. Studies find that Epimedium promotes bone formation and mineral content, and thus contributes to bone density and architecture.^{197,199}

Conclusion

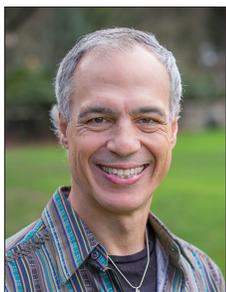
For thousands of years in Chinese and Ayurvedic medicine, a special group of herbs has been used to promote longevity and restore health after illness. This group of herbs is now referred to as adaptogens because of their ability to help the body adapt to the ongoing challenges of life and illness.

Adaptogenic botanicals elicit a non-specific (general) response while normalizing and stabilizing function. They work to promote allostasis and can safely be used long-term by most people. Adaptogenic botanicals are traditionally and most appropriately combined in formulations with synergistic and complementary herbs to address the specific needs of the individual.

Botanicals noted for their ability to promote anabolic activity and restore metabolic homeostasis can offer the ideal complementary action when combined with adaptogenic herbs. Skillful blending of these herbs can help enhance recovery from illness, promote healthy aging, and offer physiological support during times of stress and challenge.

For more information, please call 1-888-628-8720 or email info@naturahhealthproducts.com.

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Suzanne E. Sky, L.Ac., MTOM has been a Chinese medicine practitioner since 1989 and involved with herbs, nutrition and the healing arts since the mid-70s. She worked with Donald Yance as clinical associate for five years until 2004 and since then often as a writing associate.

With Chinese medicine as her framework, Suzanne integrates herbal, nutritional and lifestyle recommendations along with gentle energy work (Jin Shin Jyutsu) or acupuncture. Blending ancient Chinese wisdom with modern knowledge, her work focuses on supporting and nourishing each person's innate healing and regenerative capacity. Her clinic, Ashland Acupuncture, is located in Ashland, Oregon. She teaches Qi Gong and Chinese medicine classes.

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