NUTRITIONAL PATHWAYS TO LONGEVITY

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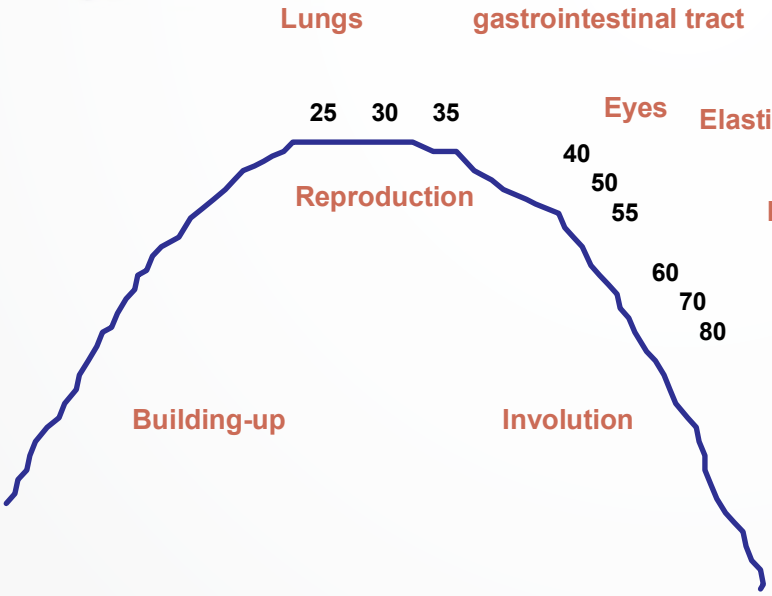
UNDERSTANDING THE AGING PARADIGM

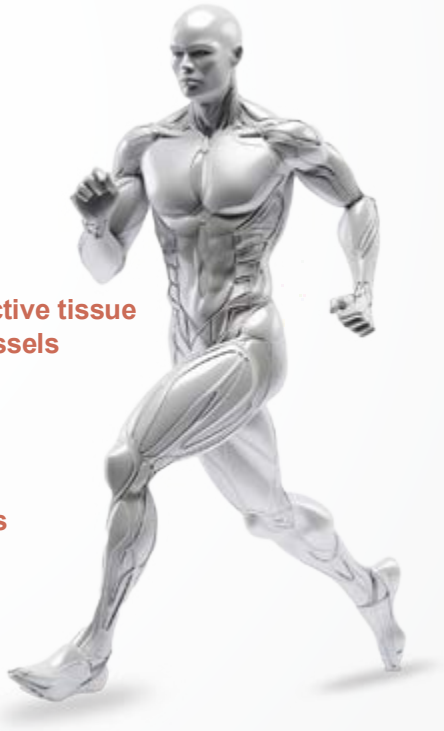
The aging process represents one of the most natural biological phenomena, characterized by progressive physiological decline and increased susceptibility to disease.

This article examines the molecular mechanisms underlying aging, explores the concept of biomorphosis as a natural life transition, and evaluates evidence-based nutritional interventions that may support healthy aging and longevity.

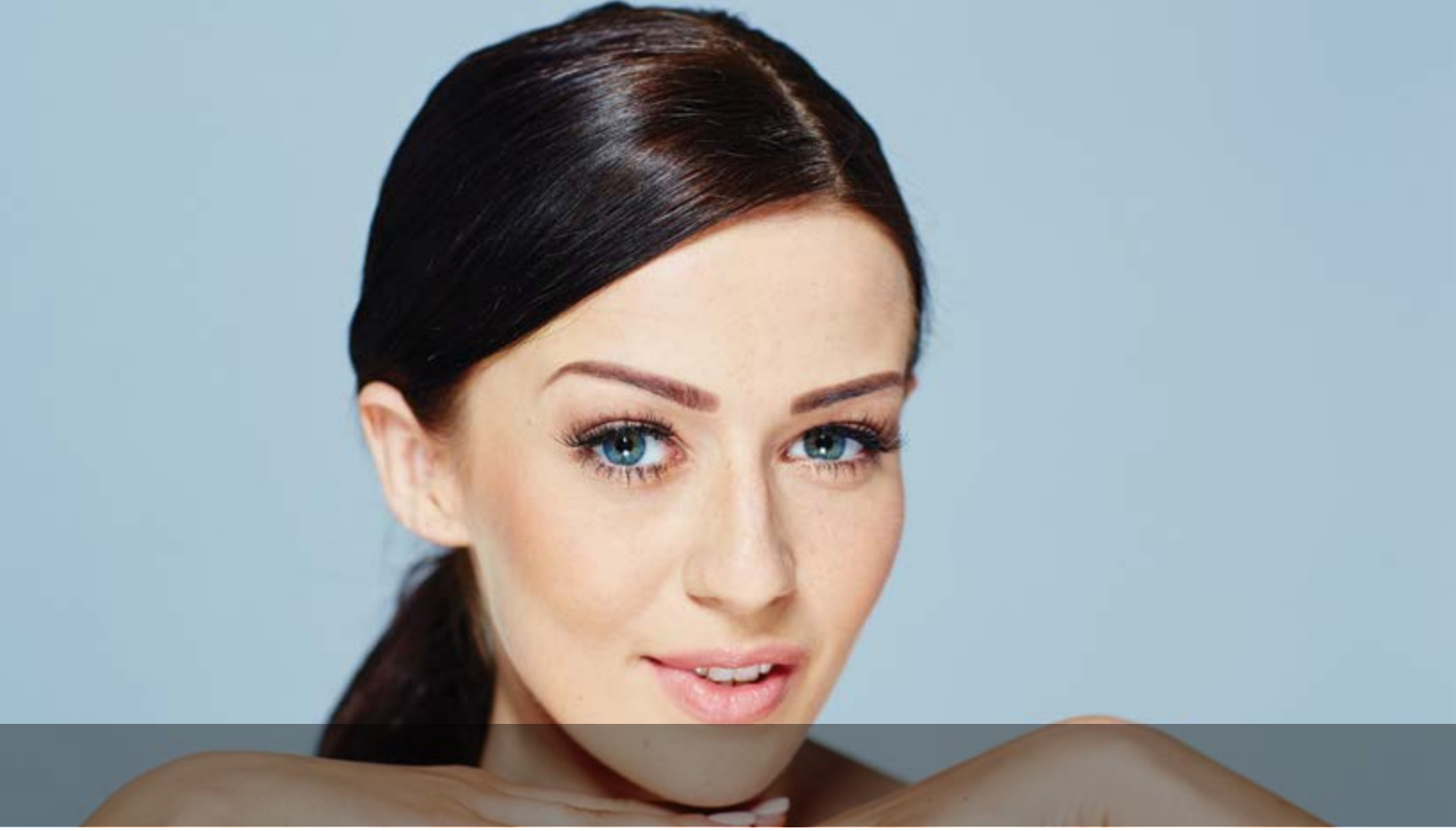
Is Aging a Disease-like State to be Treated or Is It Biomorphosis?

Biomorphosis—The process of aging is the change of form and performance during the course of life





Age-related decline in various organ performance in the course of the life cycle, i.e. building-up, reproduction, involution



A large disparity in lifespan exists in living organisms, ranging from 3 hours in the mayfly to an average of 188 years in the Galápagos tortoise. The human lifespan is somewhere in between, and the longest living human lived for 122 years.

Current trends in the health and wellness marketplace are focused towards the needs of a rapidly increasing population of aging baby boomers who seek lifestyle, nutritional and cosmetic interventions to slow down or mask the aging process, and to potentially extend longevity and lifespan. Recent scientific evidence validates the supportive role of dietary interventions in healthy aging and longevity. Phytonutrients with adaptogenic benefits, probiotics, and micronutrients that supplement dietary sources improve resistance to oxidative stress, enhance the quality of life during aging, and potentially contribute to increased healthspan. At the same time, a growing awareness of healthspan is bridging the generational gap, with younger populations adopting preventive approaches to sustain vitality throughout life.

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AGING AT THE MOLECULAR LEVEL

The molecular biology of aging has been much in focus in recent years, and the process of senescence has been identified and described at the cellular level. Genetic, lifestyle, environmental and other factors influence the molecular biology of aging.

Oxidative stress resulting from free radical pathology is implicated in the aging process. Vital components of the cell such as the mitochondria (the energy centers), functional proteins, lipids and DNA are damaged by free radicals. Cross-linking and glycation of connective tissue proteins, such as collagen, results in the formation of advanced glycation end products (AGEs) which accumulate with age, and induce stiffening of cartilage and

extracellular matrix, resulting in cataracts in the eyes and occasional joint discomfort.

In the cardiovascular system, aging is associated with a decrease in elasticity and an increase in stiffness of the arteries. Glucose tolerance progressively declines with age, and there is a high prevalence of elevated blood sugar in the aging population. Kidney and liver function and sensory perception also deteriorate with age. Malabsorption of vital nutrients in the elderly results in a compromised immune system and lowered resistance to infection. Hormonal imbalances associated with menopause and aging affect bone turnover, muscle mass, strength and mental capabilities. In males, aging is often associated with impaired prostate function.

Recent research findings support the fact that metabolism, gene expression, and aging intersect at the molecular level. The indices of aging have been linked to the morphology of cellular DNA. A telomere is a region of highly repetitive DNA at the end of a linear chromosome that functions as a disposable buffer, which is gradually depleted during continued cell replication. Many age-related health conditions are linked to shortened telomeres.

A major breakthrough in anti-aging research commenced with the identification of a few genetic pathways that are regulatory master keys in the aging process, a major one being the Silent information regulator 2 (Sir2) pathway. Sir2 family of proteins (sirtuins) are NAD-dependent protein deacetylase or ADP-ribosyltransferase that have been shown to regulate aging and longevity in a number of model organisms including yeast and round worms, in response to nutritional and hormonal cues. An analogous gene, SIRT1 was located in humans. Sirtuins play in the modification of nuclear receptors and the corresponding age-associated metabolic diseases. Nuclear receptors sense a variety of environmental triggers, including dietary components and steroid hormones, and influence metabolic functions and the aging process.

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BIOMARKERS OF AGING AND NUTRITIONAL INTERVENTIONS TO SUPPORT HEALTHY AGING

Biomarkers or physiological indices of aging include lean body mass, bone density, strength, BMR (basal metabolic rate), body fat percentage, aerobic capacity, blood pressure, insulin sensitivity, cholesterol/ HDL ratio, memory / cognitive functions, immune functions and body temperature regulation.

There is an increasing amount of scientific evidence to support the beneficial "anti-aging" effects of several phytonutrients at the molecular level. For example, plant flavanoids inhibit the age-related atherosclerotic deposits in animals by influencing vascular cell adhesion molecule-1 (VCAM-1) and monocyte chemotactic protein-1 (MCP-1) gene expression (Lee CH *et al.,* 2001)[1]. The micronutrient mineral selenium, long known to offer antioxidant activity that supports overall cellular and immune health was shown to exert its anti-senescence influence in animal models, at the genetic level. *In vitro* experiments revealed that selenium supplementation significantly increased cellular telomerase activity and hTERT (human telomerase reverse transcriptase) gene expression and augmented telomere length (Liu Q *et al.,* 2003)[2]. **SeleniumSelect®** (L-selenomethionine) and **SelenoForce®** (selenium enriched garlic) are bioavailable sources of organic selenium.

A decline in insulin sensitivity is often observed during aging. Obesity is also known to lower insulin sensitivity (Escriva F *et al.,* 2007)[3]. Dietary and lifestyle measures that contribute to maintaining a healthy body weight have anti-aging benefits as well. Nutritional interventions designed to provide ammunition against oxidative stress and positively influence the physiological indices of aging, are key components of a healthy aging regimen.

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CALORIE RESTRICTION AND LONGEVITY

Calorie restriction (CR) by 30-40% of the daily intake extends lifespan in a wide spectrum of organisms and is the only regimen known to lengthen the lifespan of mammals (Lin SJ *et al.,* 2002)[4]. Studies in rhesus monkeys revealed that CR decreases body weight and fat mass, improves glucoregulatory function, decreases blood pressure and blood lipids, and decreases body temperature. These effects may be responsible for the effects

of CR in delaying the onset of age-related disease and maintaining function later into life (Mattison JA *et al.,* 2003)[5]. Calorie restriction was found to enhance the expression of key metabolic enzymes associated with protein renewal during aging (Spindler SR *et al.,* 2001)[6]. In Emory mice, dietary CR had beneficial effects on lifespan, eye lens cataract prevalence and progression, plasma glucose levels and liver glutathione levels (Taylor A *et al.,*1995)[7]. Other studies suggest that CR may alter gene expression for gluconeogenic, glycolytic, and nitrogen-metabolizing enzymes. CR may decrease enzymatic capacity for glycolysis and increase the enzymatic capacity for hepatic gluconeogenesis and the disposal of byproducts of muscle protein catabolism (Dhahbi JM *et al.,* 1999)[8].

Calorie restriction is reported to reduce the accumulation of advanced glycation end products (AGEs) in animal models (Lingelbach LB *et al.,* 2000)[9]. Age-related increase in oxidative DNA damage to aortic cells in mice is reported to be reduced by food restriction (Guo ZM *et al.,* 2001)[10]. Prevention of excessive glycoxidation is suggested to control tissue alterations occurring in aging (Meli M *et al.;* 2003)[11]. Carbohydrate energy restriction is reported to prevent oxidative damage to brain cells sparked by exhaustive exercise (de Oliveira

SL *et al.,* 2003)[12]. The neuroprotective effect of dietary restriction and the administration of 2-deoxyglucose, a non-metabolizable analog of glucose, in a cerebral ischemia model suggests that outcome following such neuronal events may be improved in individuals who follow a regimen of reduced food intake (Yu ZF *et al.,* 1999)[13].

The 'carnivore connection' is postulated to play a critical role in the glycemic index of dietary carbohydrates in the evolution of insulin resistance and hyperinsulinaemia. Historically, humans consumed diets rich in protein and complex carbohydrates with a low glycemic index, wherein insulin resistance offered advantages to survival and reproduction. The industrial revolution changed the quality of dietary carbohydrates through the milling of cereals. This made starch more digestible and postprandial glycemic and insulin responses increased 2-3 fold compared with coarsely ground flour or whole grains.

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ANTIOXIDANT PHYTONUTRIENTS AND LONGEVITY

Reduced food intake may not be practical while tackling contemporary work and lifestyle demands. Therefore, alternative approaches that mimic the effects of calorie restriction present an attractive option in the quest for longevity. Polyphenolic phytonutrients offer multifunctional benefits in this context.

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NUTRIENT SENSING

Nutrient sensing lies at the core of healthy aging. Nutrient sensing is the body's mechanism for detecting and responding to nutrient availability via conserved pathways such as insulin/IGF-1 signaling, mTOR, AMPK, and sirtuins, which together regulate growth, metabolism, and cellular maintenance. Under nutrient-rich conditions, these pathways promote growth and reproduction, but chronic overactivation accelerates aging by increasing oxidative stress, inflammation, and metabolic strain while reducing cellular repair capacity. Conversely, conditions of moderated nutrient intake such as calorie restriction or the use of nutrient-rich compounds like polyphenols, resveratrol, and curcumins shift the balance toward protective processes including autophagy, mitochondrial biogenesis, DNA repair, and enhanced stress resistance. This adaptive switch helps conserve energy, improve metabolic efficiency, and delay age-associated decline. This explains why dietary interventions and phytonutrient supplementation can positively influence biomarkers of aging and extend healthspan, the period of life spent in good health.

CURCUMINOIDS: ANTIOXIDANT PHYTONUTRIENTS FROM TURMERIC ROOTS

✓ *CURCUMA LONGA*

The antioxidant properties of dietary phytonutrients have been widely studied for their role in supporting cellular health and protecting against oxidative stress*. These include curcumin, resveratrol, ellagic acid, green tea catechins, quercetin and others. Many of these compounds have been studied for their role in supporting normal liver enzyme function, including pathways involved in detoxification and gastro-intestinal metabolic processes.

At the fundamental level, phytonutrients such as quercetin and curcumin have been shown to up regulate antioxidant gene expression in animal models (Shahed AR *et al.,* 2001)[14] Interestingly, curcumin is known to support inflammatory enzymes expression. Cyclooxygenase (COX-2) gene expression is reported to be characteristic of unhealthy cells in the colon region. A non-toxic concentration of curcumin was found to significantly inhibit the expression of the COX-2 gene, suggesting its beneficial role (Goel A *et al.,* 2001)[15].

A number of research institutions including the NCI in the United States, are currently in the advanced stages of evaluating curcumin as a potential therapeutic intervention in several degenerative conditions associated with aging. Several

of these studies use **Curcumin C³ Complex®**, a branded natural extract prepared from turmeric roots containing curcumin, demethoxycurcumin and bisdemethoxycurcumin, collectively known as curcuminoids. Patented for its unique composition ratio and use, research shows that **Curcumin C³ Complex®** is a bioprotectant that effectively inhibits free radical formation* (Majeed M *et al.,* US Patent 5,861,415)[16].

The institutions involved in curcuminoids research include UCLA School of Medicine, University Hospitals of Cleveland, MD Anderson, Rutgers University, Tufts University School of Medicine, Massachusetts General Hospital, Brown University, Penn State University, and others in the United States and worldwide.

The multifunctional health benefits of the curcuminoids are well researched. These antioxidant compounds are potentially useful in supporting a healthy inflammatory response and contribute to cellular health* (Shishodia S *et al.,* 2005)[17]. A common spice used in South Asian cooking, turmeric, and more appropriately the curcuminoids, have been preclinically and/or clinically validated for beneficial effects in a number of conditions.

The antioxidant effects of curcuminoids, combined with their known inhibitory effects on cyclooxygenase 2 (COX-2), render them useful as ingredients in anti-aging formulations and in topical formulations designed to maintain general skin health and integrity*. Oxidative stress and inflammation are major players in the aging process. The role of curcuminoids in a healthy inflammatory response* is well established. Curcuminoids have been shown to inhibit nuclear factor kappaB (NFκB), a transcription factor that triggers inflammatory mediators. NFκB has been implicated in a variety of conditions (Kumar A *et al.,* 2004)[18].

A recent study postulates that curcumin can potentially slow down the aging process (Salvioli S *et al.,* 2007; Nunes YC *et al.*, 2024; He Y *et al.*, 2025)[19,20,21] and potentially delay senescence and the onset or progression of many age-related conditions.

TETRAHYDROCURCUMINOIDS: SIGNIFICANTLY INCREASES LIFESPAN

An innovative, patented, colorless curcuminoids derivative is **Curcumin C^3 Reduct®** (Tetrahydrocurcuminoids, THC). It is an effective bioprotectant composition that also protects the skin and lightens skin tone*. One of the primary molecular mechanisms of action is the inhibition of protein cross-linking, which helps support healthy aging* (Majeed M *et al.,* US Patent No. 6,653,327)[22]. Nutritional and topical benefits include photoprotection, skin lightening effects and a boost in skin luminosity*. Recent research revealed that the THC are more potent antioxidants than the parent curcuminoids attributed to specific structural characteristics present in THC. (Portes E *et al., 2*007)[23]. Tetrahydrocurcuminoids are major metabolites of curcuminoids *in vivo*, as determined in experimental studies (Hoehle SI *et al.,* 2007; Majeed M *et al.,* 2019)[24,25]. The composition contains THC, Tetrahydrodemethoxycurcumin and Tetrahydrobisdemethoxycurcumin.

A research group in Japan explored the potential role of green tea polyphenols and THC in increasing the lifespan of animal models. Their studies revealed that the increase in life expectancy beyond 24 months under the conditions of the experiment was 125.9% in THC-treated mice, and 72.6% in polyphenol-treated animal models, as compared to untreated controls (Kitani K *et al.,* 2004)[26].

In a follow-up study, (Kitani K *et al.,* 2007)[27] the effect of feeding the two natural antioxidants, THC and green tea polyphenols (PPs) on the survival of male C57BL/6 mice, was examined. Mice that started to receive diets containing THC (0.2%) at the age of 13 months had significantly longer average lifespans than control mice (11.7% increase, $p<0.01$). The 10% longest survival was also significantly greater in THC-treated mice (6.5% increase, $p<0.01$). In contrast, mice that started to receive THC in their 19th month of life, showed no significant difference from the control mice in either the average lifespan, or the 10% longest survival.

In mice that received water containing PPs (80 mg/l), the average lifespan was also significantly longer than in the control mice (plus 6.4%, $P<0.05$), although the 10% longest survival was not significantly different from that in the control mice ($P>0.05$). The body weights of the THC (but not PP) fed mice, were slightly (2-4%) but significantly ($P<0.05$) lower than the values for the corresponding ages in the control mice in the first six months of treatment.

RESVERATROL AND LIFESPAN

Other polyphenols, such as quercetin (found in apples and tea) and resveratrol (found in grapes and red wine), were found to increase SIRT1 activity in a laboratory screening. Interestingly, resveratrol was found to increase SIRT1 activity 13-fold (Hall SS *et al.,* 2003)[28]. Resveratrol has been studied for its role in supporting cardiovascular and metabolic health, promoting antioxidant activity, and helping to maintain healthy lipid metabolism and normal cellular function*. These findings support the long-standing observation known as the "French Paradox," where populations with certain dietary patterns, including moderate red wine consumption, appear to maintain cardiovascular health despite a diet traditionally high in saturated fats (Renaud S *et al.,* 1992; Stipp D *et al.,* 2007)[29, 30].

An interesting study performed on short-lived *Nothobranchius furzeri* fish (average lifespan of only thirteen weeks) revealed that if the fish received resveratrol in the early stages of life, their average and maximum lifespan increased significantly in a dose-dependent manner (Valenzano DR *et al.,* 2006)[31].

In an animal model study with three groups of mice, one group was fed a high-calorie diet, a second group received a normal diet, and the third group was given resveratrol along with a high-calorie diet. The results showed that when the high-calorie fed mice reached old age (114 weeks), greater than 50% had died compared to less than 33% of the high-calorie fed mice receiving resveratrol (Baur JA *et al.,* 2006)[32]. Results also showed that mice receiving resveratrol had lower plasma levels of insulin, glucose and insulin-like growth factor (IGF) 1, all of which are biomarkers commonly linked to metabolic balance and glucose regulation. After the mice died, researchers examined their hearts and found that inflammation and deterioration were considerably lower in the resveratrol-supplemented group and normal diet group, as compared to the high-calorie fed mice not receiving resveratrol.

Resvenox® is a resveratrol composition containing >98% trans-resveratrol and blends well with dietary supplement, functional food and cosmetic formulations.

ALPHA-LIPOIC ACID AND HEALTHY AGING

Another biological antioxidant, **alpha-lipoic acid** (thioctic acid) found in living cells and available as a dietary supplement, is also reported to potentially increase lifespan (Majeed M *et al.,* 2003; Shanaida M, *et al*., 2025)[33,34]. Roundworms, such as nematode *C. elegans,* receiving the compound showed a significant increase in their mean and maximal lifespan (Brown MK *et al.,* 2006)[35]. These results corroborate observations from preclinical and clinical studies that the use of lipoic acid later in life helps in improving the quality of life* by preventing free radical damage to proteins (Sethumadhavan S *et al.,* 2006)[36].

SHAGANDHA®: PROMOTES EMOTIONAL WELL-BEING AND RELAXATION*

✓ *WITHANIA SOMNIFERA*

Shagandha® root extract 2.5% USP is a standardized extract from the roots of Ashwagandha (*Withania somnifera*), containing a minimum of 2.5% withanolides and analyzed using the USP method.

Ashwagandha has traditionally been used in Ayurveda as an adaptogen and is considered to have rejuvenating properties. It is known for promoting vitality, endurance, and overall health and longevity. Some of

its well-established uses include promoting a positive mood and relaxation, as well as supporting the body's ability to manage occasional physical and mental stress*.

Preclinical and clinical research suggests that Ashwagandha may help support a healthy stress response by influencing the HPA (hypothalamic-pituitary-adrenal) axis. In a study, it is established that Ashwagandha activates nerve cell receptors for the calming neurotransmitter, GABA, which is associated with relaxation and calmness (Candelario *et al*., 2015)[37].

Human clinical studies have shown that **Shagandha®** helps maintain healthy cortisol levels and support mood, emotional well-being, and sleep quality* in individuals experiencing occasional stress (Majeed M *et al*., 2023; 2024)[38,39].

PTEROSOL® AND SILBINOL® – SUPPORT FOR HEALTHY BLOOD SUGAR METABOLISM*

✓ *PTEROCARPUS MARSUPIUM*

Silbinol® is a standardized extract derived from the heartwood of *Pterocarpus marsupium*, containing 90% pterostilbene. Traditionally, pieces of Pterocarpus wood were soaked in water and consumed the next day as part of wellness practices aimed at maintaining healthy blood sugar levels. This practice evolved into the use of water stored overnight in carved wooden tumblers made from the heartwood.

Pterostilbene, a natural stilbene and structural analogue of resveratrol, present in Pterocarpus is more stable *in vivo* than resveratrol. It is known for its antioxidant properties and its role in supporting cellular health and metabolic function*.

TeroSol® is a water-based extract of *Pterocarpus marsupium*, standardized for C-glycosides such as pterocarposide and samioside. C-glycosides from Pterocarpus have been studied for their potential to support healthy glucose metabolism*, in part through modulation of glucose transport mechanisms, particularly SGLT2 inhibitors.

The health benefits of *Pterocarpus marsupium* extract have been evaluated in several studies by institutions such as the Indian Council of Medical Research (ICMR)[40,41]. In the first study, 69% of study participants taking Pterocarpus extract showed improved markers related to glucose metabolism by 12 weeks. In a second study, researchers observed that Pterocarpus extract was well-tolerated with no significant adverse effects reported. These findings suggest that *Pterocarpus marsupium* extract may support healthy glucose metabolism as part of a balanced diet and healthy lifestyle.

BOSWELLIN® SUPER:
HEALTHY JOINT AND MOBILITY SUPPORT*

✓ *BOSWELLIA SERRATA*

Boswellin® Super is a standardized extract from the gum resin of *Boswellia serrata*, delivering targeted levels of boswellic acids. Traditionally used in Ayurvedic practices, *Boswellia serrata* has long been associated with support for joint health and overall physical well-being.

Clinical studies have shown that **Boswellin® Super** may help support joint flexibility, mobility, and physical function* in healthy adults. In these studies, participants taking **Boswellin® Super** experienced improvements in various measures of joint comfort and quality of life, with good tolerability and no significant adverse effects reported (Majeed M *et al.*, 2016; Majeed A *et al.*, 2024)[42,43]. Preliminary research has also observed reductions in serum levels of certain biomarkers associated with joint health, suggesting a role for **Boswellin® Super** in maintaining a healthy physiological response to everyday physical stress*.

LIVINOL®: SUPPORTS HEALTHY LIVER FUNCTION*

✓ *GARCINIA INDICA*

Livinol® is a standardized extract from *Garcinia indica*, delivering 20% garcinol, a plant-derived compound known for its antioxidant properties. Traditionally used in Ayurvedic practices, *Garcinia indica* has been associated with supporting digestive and metabolic health*.

Preclinical studies suggest that **Livinol®** may help support healthy liver function and maintain healthy metabolic processes*. Animal models have demonstrated that **Livinol®** supports liver health in the presence of common stressors such as alcohol, acetaminophen, and environmental toxins (Majeed *et al.*, 2019)[44]. *In vitro* research has also shown that **Livinol®** may influence fat metabolism pathways by modulating markers related to adipogenesis, such as UCP1 expression, suggesting a potential role in supporting healthy weight management* efforts (Majeed *et al.*, 2020)[45,46].

Additionally, a proprietary combination formula, **LivLonga®**—featuring **Livinol®** along with **Curcumin C³ Complex®** and **BioPerine®**—was evaluated in a clinical study for its effects on markers associated with liver health and metabolic balance. The combination was found to support healthy liver enzyme levels and lipid metabolism when used as part of a healthy lifestyle* (Majeed *et al.*, 2023)[47].

CIRPUSINS®: SUPPORT FOR HEALTHY WEIGHT MANAGEMENT*

✓ *CYPERUS ROTUNDUS*

Cirpusins® is a standardized extract from the rhizomes of *Cyperus rotundus*, rich in naturally occurring stilbenes including picetannol, scirpusin A, and scirpusin B. Preclinical studies suggest that **Cirpusins®** may support healthy body composition and fat metabolism*. In a high-fat diet model, **Cirpusins®** supplementation was associated with reductions in overall body weight and visceral fat mass, alongside favorable effects on markers of metabolic health (Majeed *et al.*, 2022)[48]. *In vitro* findings also demonstrated dose-dependent support for limiting the development of new fat cells (adipogenesis), suggesting a mechanism by which **Cirpusins®** may help maintain a healthy weight when used alongside diet and exercise.

These effects point to **Cirpusins®**, potential in supporting metabolic balance and healthy weight management as part of a wellness-focused lifestyle*.

CURCOUSIN®: SUPPORT FOR METABOLIC HEALTH AND WEIGHT MANAGMENT*

✓ *CURCUMA LONGA/CASSIA*

CurCousin® is a self-GRAS affirmed ingredient containing Calebin A, a naturally-occurring curcumin analogue found in *Curcuma longa/cassia*. It is designed to support key aspects of metabolic health, including healthy lipid metabolism, blood sugar balance, and circulatory function*. In preclinical models, CurCousin® was shown to support normal fat metabolism (lipolysis) and influence lipid composition in liver tissue. These findings also indicated changes in liver histology markers under various dietary conditions (Lai *et al.*, 2015)[49].

In clinical research, CurCousin® has been shown to support healthy body composition by influencing adipogenesis pathways. These outcomes suggest its potential in helping to support metabolic function when combined with a healthy diet and exercise program* (Majeed *et al.*, 2016)[50].

SABEET®: SUPPORTS HEART HEALTH AND CIRCULATORY FUNCTION*

✓ *BETA VULGARIS*

Sabeet® is a standardized beetroot extract (*Beta vulgaris*) rich in naturally occurring dietary nitrates. Clinical research suggests that Sabeet® may help support cardiovascular efficiency and healthy circulation*, particularly when used in conjunction with regular physical activity. In a clinical study involving healthy adult males, daily supplementation with Sabeet® prior to exercise was associated with improved physical performance markers and increased nitric oxide levels, which is an important molecule that supports blood flow and vascular function (Majeed M *et al.*, 2016)[51].

Another clinical study involving postmenopausal women found that Sabeet® supported vascular flexibility and nitric oxide bioavailability, two factors associated with maintaining cardiovascular health as part of healthy aging*. Importantly, these effects were observed without changes in resting blood pressure (Pinheiro VDS *et al.*, 2025)[52].

These findings highlight the role of Sabeet® in supporting heart and circulatory health as part of a balanced lifestyle*.

SABERRY®: SUPPORTS HEALTHY BLOOD SUGAR AND LIPID METABOLISM*

✓ *EMBLICA OFFICINALIS*

Saberry® is a self-affirmed GRAS amla extract derived from Indian gooseberry (*Emblica officinalis*), standardized for β-glucogallin, a powerful antioxidant compound. Rich in phytonutrients and ORAC value, **Saberry®** has been used in dietary supplements for over a decade to support metabolic wellness*. In a 90-day randomized, multicenter, open-label study involving 126 adults, two dosages of **Saberry®** supplementation (1g and 2g daily) were evaluated for their effects on metabolic parameters. The results suggested that **Saberry®** may help maintain healthy blood sugar levels, both fasting and post-meal, as well as support lipid metabolism by helping to maintain healthy levels of total cholesterol and triglycerides (Majeed M *et al.*, 2022)[53].

Findings also indicated that the higher 2g dosage offered greater support for glucose and lipid metabolism compared to the 1g dosage, suggesting a dose-responsive benefit when used as part of a healthy lifestyle.

CONCLUSION

This article provides a few examples of phytonutrient interventions that are potentially helpful in prolonging longevity and lifespan. This selection represents only a small fraction of the plethora of natural ingredients and dietary interventions that support healthy aging and longevity. For additional information on these materials, please contact Sabinsa.

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