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Reference
This article has a lot of personal meaning because it reveals information that could have saved the lives of some of my family members…if only I had known about this sooner.

Here is what the Centers for Disease Control and Prevention reports on the impact of sepsis:

- About **250,000** Americans **die** from sepsis each year.
- More than **1.5 million** Americans get sepsis each year.
- **One in three** patients who **die** in a hospital have sepsis.

Despite these staggering numbers, most people have never heard of sepsis. Sepsis is a complex syndrome characterized by oxidative damage, hyper-inflammation, immune dysfunction, poor tissue oxygenation, and hyper-coagulation, usually brought on by an infectious agent. When susceptible persons are exposed to a pathogen, there can be an uncontrolled inflammatory response that disrupts organ function and blood flow.

Instead of targeting the offending bacteria or virus, the immune system mounts inflammatory reactions that can result in circulatory collapse, multi-organ failure, and eventual death.

In a study published in 2017, a group of 47 hospitalized sepsis patients were treated with intravenous vitamin C, hydrocortisone, and vitamin B1. Compared to sepsis patients treated with conventional therapy, those receiving the intravenous vitamins and hydrocortisone had a striking 87% reduced mortality.4

These impressive small-scale studies have ignited eight new clinical trials in 2018 that will use this three-prong approach, i.e., intravenous vitamin C, vitamin B1, and hydrocortisone.

As you’re about to learn, this kind of approach to sepsis treatment was demonstrated decades ago. Millions may have needlessly succumbed because this therapy was overlooked by the medical establishment.
I recently came across a set of Power Point slides that one of our scientists presented in 1999. It described the staggering costs of hospitalized sepsis patients, along with better ways to treat sepsis that had been published in the 1990s.

Move forward 20 years and virtually none of those published methods to save sepsis patients have been adopted into hospital practice.

Sepsis is a frustrating condition to offer suggestions for from the outside. That’s because the septic patient is confined to a hospital, where the treating physician exerts dictatorial authority.

Over the past decades, we at Life Extension® have tried to assist sepsis patients’ family members who request intravenous vitamin C, thiamine, and glutathione. The ICU physician’s response is consistently “no” and the result too often is agonizing death of the patient.

There has been fierce hostility by many physicians against the use of intravenous vitamins in the hospital setting, despite persuasive evidence of efficacy. This prejudice may soon change.

How Sepsis Kills

Sepsis can strike at any age, but elderly people with compromised immunity are the most vulnerable.

Sepsis often arises from a bacterial infection that results in widespread blood clotting, abnormal immune and inflammatory responses, oxidative stress, and mitochondrial dysfunction.2,3

As inflammatory cytokines destroy endothelial linings, blood abnormally coagulates and organs (lungs, kidneys, brain) lose circulation.

This can lead to a dangerous drop in blood pressure (septic shock) that results in patients dying from multisystem organ failure.5

Sepsis is the most expensive cause of hospitalization in the United States and contributes to 35%-56% of all in-hospital deaths.6,7

It’s the primary reason that older people are admitted to intensive care units (ICU).

Lingering Effects of Sepsis

It used to be thought that if a patient could survive the acute inflammatory response and make it out of the hospital, they would slowly return to normal.

But that is not how it works. It turns out that more than 40% of sepsis patients are readmitted to the hospital within 3 months after going home.8

This creates a chronic problem that becomes costlier and more dangerous as patients get weaker with each new septic-related attack.

Sepsis survivors are at increased risk of dying for months to years after the acute infection is cured.

Better initial and follow-up treatments are urgently needed.

Low Vitamin C in Sepsis Patients

A study published in 2017 looked at vitamin C plasma levels in sepsis patients.9

This study found overall that critically ill sepsis patients had low vitamin C levels with one-third having frank vitamin C deficiency.

Nearly 40% of septic shock patients in this study were deficient in vitamin C compared to 25% of non-septic patients.9 (Septic shock is severe sepsis that often precedes death.)

The doctors who conducted this study noted these low levels of vitamin C despite sepsis patients being given, on average, 125 mg a day of vitamin C by mouth or IV.9
Readers of this magazine know a daily vitamin C dose of 125 mg is trivial. Yet much of conventional medicine still views this as adequate.

This misconception is startling when considering hospitalized patients rapidly use up their vitamin C to suppress acute oxidative reactions brought on by sepsis-induced inflammation.

This is not the first study that identified low vitamin C levels in septic patients. This finding was uncovered more than 20 years earlier.10,11

A 2018 published report titled “Vitamin C: The next step in sepsis management?” describes mechanisms through which vitamin C functions to suppress inflammation and oxidation while improving blood flow to organs.12

Despite making robust arguments for patients presenting with sepsis symptoms to be treated with vitamin C, the conclusions from this 2018 review paper were that “further evidence is needed to support this in practice.”12

When initially reading this, I wondered who the author thinks is going to fund future studies of a non-patentable therapy like intravenous vitamin C? I was gratified to learn there are eight new clinical trials initiating this year (2018) that will study the effects of intravenous vitamin C, thiamine, and hydrocortisone in sepsis patients. Funding is coming largely from philanthropic donors.13

why hydrocortisone + vitamins are effective

The same researchers who showed remarkable survival improvements (87% better) in human sepsis patients sought to clarify why vitamin C + hydrocortisone was so effective in their study. These researchers pursued answers by identifying lethal pathologies of sepsis including endothelial dysfunction and capillary leakage.14

Using endothelial cells from human lungs, the researchers were able to identify how vitamin C and hydrocortisone together enable robust protective effects against inflammatory damage to vascular cells.

This finding showed that vitamin C or hydrocortisone alone was not satisfactory. But when combined before or after inflammation was induced, vitamin C + hydrocortisone demonstrated a dramatic reversal of loss of vascular barrier function, i.e., capillary permeability.

The ability of vitamin C to protect against capillary leakage...
As We See It

He stated there was no evidence of side effects in thousands of patients treated around the world using his protocol of intravenous vitamin C, thiamine and hydrocortisone.

When asked if additional nutrients or drugs might provide greater benefits, Dr. Marik replied: “I believe that our current combo is safe, cheap and very effective...so it’s difficult to beat this.”

He went on to state that there are three new clinical trials using his protocol underway or about to begin in the United States and another five around the world are beginning. With 250,000 Americans perishing each year from sepsis, I am gratified to learn that this protocol of intravenous vitamin C, thiamine and hydrocortisone is being studied and may soon be incorporated into standard medical practice.
As We See It

Example of Cynicism in Year 2018

In response to successful case histories published in 2017, a review of the science behind intravenous vitamin C in sepsis treatment was published in 2018.12

While acknowledging the beneficial mechanisms and findings of efficacy of intravenous vitamin C, the concluding remarks of this 2018 review were:

“The research is required to prove its value in treatment.”12

This conclusion did not surprise me, because it is similar to virtually every other study showing remarkable benefits against sepsis, but insisting that “more” research is needed.

With hundreds of thousands of Americans likely to die from sepsis this year,23 and robust data indicating that large numbers can be saved, it is beyond cruel to deny a septic patient the option of intravenous vitamin C, thiamine plus hydrocortisone.

Economics of Sepsis Treatment

The annual cost of treating sepsis in the United States is $23 billion.24 Sepsis treatment is a huge revenue driver for hospitals.

Patients who present or contract sepsis are confined to the ICU for days, weeks or months, often on ventilators and receiving multiple IVs.

Hospitals can bill Medicare and insurance companies hundreds of thousands of dollars for each septic patient.

There is now a way for people with symptoms that indicate sepsis to potentially prevent it, possibly utilizing intravenous vitamin C and thiamine in outpatient infusion centers.

Even if one is contracting the flu or other infections/trauma, these nutrients may help protect against short- and long-term tissue damage inflicted by inflammation-induced oxidative stress, while improving immune responses.

For those who develop sepsis, Dr. Marik’s protocol of intravenous vitamin C, thiamine plus hydrocortisone may enable most to leave the hospital in days instead of lingering at death’s door for agonizing periods.

With Medicare, Medicaid and private insurers so financially stressed, this represents a unique opportunity to significantly slash the healthcare cost burden.

How to Avoid Becoming a Sepsis Casualty

Anyone over age 60 is likely to suffer some degree of immune senescence leading to higher sepsis risk. Sepsis can strike people of any age, however, including neonates.

In reviewing Dr. Marik’s sepsis protocol that is now being studied in several clinical trials, an intravenous dosage protocol administered in the hospital might consist of:

- **Vitamin C**: 1.5 grams (administered as an infusion over 30 to 60 minutes) every six hours for four days or until ICU discharge;
- **Thiamine**: 200 mg every 12 hours for four days or until ICU discharge;
- **Hydrocortisone**: 50 mg every six hours for seven days or until ICU discharge, followed by a taper over three days.

New Definitions of Sepsis

Recognizing that cases of sepsis are being underreported and undertreated, an article published by the American Medical Association proposed new definitions as follows:17

- **Sepsis** should be defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.
- **Septic shock** should be defined as a subset of sepsis in which particularly profound circulatory, cellular, and metabolic abnormalities are associated with a greater risk of mortality than with sepsis alone.

These new definitions may assist physicians in recognizing sepsis signs and symptoms before irreversible inflammatory/oxidative damage occurs, along with loss of organ function and needless deaths.

But for too many people, progressive treatments (such as high-dose intravenous antioxidants) for sepsis are delayed or not even instituted before the patient “expires.”
The clinical presentation of sepsis is highly variable depending on a wide range of clinically relevant factors.\(^3\)

Common sites of primary infection are respiratory, genital/urinary, gastrointestinal, skin, and soft tissue.

Fever is often the first manifestation of sepsis, with pneumonia being one of the most common presentations leading to sepsis.

Early initiation of therapy decreases in-hospital mortality. Some early indicators of sepsis include:\(^25\)

- Fever
- Hypothermia (lower than normal body temperature)
- Heart rate >90 beats per minute
- Fast respiratory rate
- Altered mental status (confusion/coma)
- Edema (swelling)
- High blood glucose (without diabetes)

Since some of these symptoms might indicate a flu virus or other infection, it might make sense for people developing these symptoms to load up on oral antioxidant nutrients, or ideally, go to a local infusion center for intravenous administration of vitamin C, thiamine, and possibly glutathione.

The physician at the infusion center may also determine if a 50 mg dose of hydrocortisone is warranted.

Prompt treatment might enable one to avoid a hospital setting, assuming symptoms are mild.

If sepsis occurs while in a hospital, one’s choices may be more limited.

My suggestion for Life Extension supporters is to call local hospitals and your doctor and inquire if progressive sepsis protocols (such as intravenous vitamin C, thiamine and hydrocortisone therapy) will be administered on request.

Hospitals (or physicians with hospital privileges) that agree to use this protocol might be the place to go if hospitalization is needed, or if sepsis symptoms occur.

### Vitamin C for Non-Bacterial Sepsis

While bacterial infection underlies most sepsis cases, it can also manifest from viral (influenza) infections and trauma (including wounds inflicted by surgery).

A case report published in 2017 described a 20-year-old girl with acute respiratory distress syndrome treated with high-dose intravenous vitamin C.\(^19\)

The vitamin C was initiated because the girl appeared on the verge of death from septic shock.

The most common risk factor for acute respiratory distress syndrome is sepsis.\(^20,22\)

When respiratory support with mechanical ventilation failed, extracorporeal membrane oxygenation (providing oxygen directly into blood circulated outside the body) was initiated in a desperate attempt to save this young girl.

After 12 hours on extracorporeal membrane oxygenation, her doctors went further by administering intravenous vitamin C.

The doctors report that infusing high-dose intravenous vitamin C into this young girl resulted in “rapid resolution of lung injury” with no evidence of any lung damage just one month later.\(^19\)

Not all septic patients this far advanced are as fortunate.
With **250,000** Americans perishing each year from sepsis,¹ we eagerly await results from **clinical trials** that will study the effects of intravenous vitamin **C**, **thiamine** and **hydrocortisone** on large numbers of **sepsis** patients.

My only regret is that these approaches were not implemented 20 years sooner, as data from the **mid-1990s** indicated a high degree of probable efficacy.

When winter approaches, one might want to bump up their oral vitamin **C** intake by a few thousand milligrams based on consistent data that **sepsis patients** often present with what we consider severe vitamin **C** deficiencies.

For longer life,

William Faloon, Co-Founder
Life Extension Buyers Club

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Fortunately, a flavonoid known as dihydroquercetin functions as a vitamin C “supercharger” that helps maintain its concentration throughout the body.2,3

References
Probiotics Prompt Better Lipids and Blood Pressure

The results of a meta-analysis of 10 randomized, controlled trials found reductions in lipids, blood pressure, and blood glucose among diabetic men and women who received probiotics in comparison with those who did not receive them.*

For their analysis, the researchers selected 10 trials that included 297 participants who received probiotics and 294 participants who served as controls.

Compared to the controls, probiotic treatment was associated with a significant decrease in total cholesterol, LDL cholesterol, triglycerides, systolic blood pressure, diastolic blood pressure, and fasting blood glucose, as well as an increase in HDL cholesterol.

Editor’s Note: “It has been demonstrated that probiotics can ameliorate the state of insulin resistance and regulate lipid metabolism in in-vitro studies or animal models,” write the study authors in their introduction. They add that studies have shown that probiotics can change the intestinal micro-ecosystem and play a positive role in type II diabetes treatment.

New Evidence Links Omega-3 and Lower Heart Rate

An elevated resting heart rate increases cardiovascular and all-cause mortality.

The *European Journal of Clinical Nutrition* published the results of a meta-analysis which affirmed an association between supplementing with omega-3 fatty acids and a decrease in heart rate.*

For their analysis, Khemayanto Hidayat of China’s Soochow University and his associates selected 51 randomized controlled trials that included a total of approximately 3,000 men and women. Thirty-two of the intervention groups consisted of participants with at least one chronic condition, including coronary artery disease, kidney failure, hypertension, and heart arrhythmia.

In comparison with those who received a placebo, participants who received omega-3 experienced a significant reduction in heart rate of 2.23 beats per minute. When the omega-3 fatty acids EPA and DHA were administered separately, a 2.47 beat-per-minute decrease was observed in association with DHA.

***Editor’s Note***: According to the study authors, elevated resting heart rate has emerged as a risk factor for cardiovascular mortality and all-cause mortality. “The HR [heart rate] of the majority of participants included in this meta-analysis was within normal range—the state where reducing heart rate is conventionally not a medical indication,” they note. “At the population level however, such HR reduction may have significant public health implications, as a reduction of 3.2 bpm [beats-per-minute] HR would roughly correspond to 7.5% lower risk of SCD [sudden cardiac death].”*

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Calcium Supplementation May Be Widely Needed

A global map of dietary calcium intake in adults released by the International Osteoporosis Foundation on April 20, 2018, shows that people in many parts of the world fail to consume diets that provide adequate amounts of the mineral, putting these populations at risk of osteoporosis. The map is based on findings from a study published in *Osteoporosis International.*

Although 800-1,000 mg of calcium per day is the usual recommendation for healthy adults, global intake varies significantly. The amount of calcium consumed by adult residents of Nepal averages just 175 mg per day, in contrast with 1,233 mg per day in Iceland. Most African, Asian and South American countries have a daily intake that ranges from to 400 to 700 mg.

“Increasing calcium intake throughout the lifespan is an important strategy to improve bone health,” noted senior author Bess Dawson-Hughes.

Editor’s Note: “For people who may not be able to get enough calcium through their diets, calcium supplementation may be needed to reach the intake requirement of 800 to 1,000 mg/day,” Dr. Dawson-Hughes suggested. “This is particularly important for older adults who do not consume enough calcium-rich foods. In this population group, calcium supplementation combined with vitamin D may lower the risk of broken bones.”

* *Osteoporos Int.* 2017 Dec;28(12):3315-3324.
A study found improvement in female mood as well as sexual desire, orgasm and satisfaction after supplementation with vitamin D.*

Participants with vitamin D deficiency were given 4,000 IU of vitamin D per day, and women with insufficient levels (by definition, not as bad as deficient levels) were given 2,000 IU or no vitamin D. Questionnaires that evaluated sexual function and depressive symptoms were completed before and after the treatment period.

At the beginning of the study, sexual function questionnaire scores were lower (indicating greater impairment) and depression scores were higher (indicating worse depression) in women with deficient vitamin D levels compared to women with insufficiency.

Supplementation with vitamin D was associated with improved sexual desire in both deficient and insufficient women. Among participants with vitamin D deficiency, vitamin D improved total sexual function scores and scores for sexual satisfaction and orgasm, while decreasing total depression scores.

Editor’s Note: The authors remark that “It is possible that genital blood flow, as well as hormonal and neural regulations of sexual function are disturbed in women with hypovitaminosis D and correlate with its severity.”* 

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Bone Restore with Vitamin K2 combines skeletal-strengthening nutrients in one highly absorbable formula.

Bone Restore with Vitamin K2 combines skeletal-strengthening nutrients in one highly absorbable formula.

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One of the most exciting fields of scientific research is focused on the trillions of bacteria that live in our bodies.

Researchers have discovered that these flora play an enormous role in immunity as well as overall health.

Life Extension’s FLORASSIST® products can help maintain that important digestive environment and support healthy function of the heart, throat, mood, digestive tract, oral hygiene, immune system, and nasal passages.

FLORASSIST® GI with Phage Technology
- Provides broad spectrum of healthy bacteria for the digestive tract plus phages that target undesirable intestinal bacterial strains.

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Item #02125 • 30 liquid vegetarian capsules

FLORASSIST® Heart Health
- Supports heart health.

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Item #01821 • 60 vegetarian capsules

FLORASSIST® Prebiotic
- Promotes friendly bacteria.

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Item #02203 • 60 chewable tablets

FLORASSIST® Throat Health
- Probiotic defense for your throat.

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Item #01920 • 30 lozenges

For full descriptions and to order any of these FLORASSIST® products, call 1-800-544-4440 or visit www.LifeExtension.com

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HEALTHY YOU!

**FLORASSIST® Oral Hygiene**
- Supports healthy bacteria in gums.

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Item #02120 • 30 lozenges

**FLORASSIST® Mood**
- Positively influences the nervous system for healthy mood.

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Item #02000 • 60 capsules

**FLORASSIST® Immune Health**
- Protects respiratory system from year-round immune challenges.

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Item #02124 • 30 vegetarian capsules

**FLORASSIST® Nasal**
- Balances immune response to seasonal changes.

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Item #02208 • 30 vegetarian capsules

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The body’s production of digestive enzymes decreases with age, leading to poor digestion and bloating, as well as other discomforts—especially after eating a large meal.

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**Enhanced Super Digestive Enzymes with Probiotics** provides the same enzymes that are in **Enhanced Super Digestive Enzymes**—but with the added benefits of the probiotic *B. coagulans*.

This probiotic creates a protective shield that resists digestion in the stomach, allowing it to fully colonize in the intestines to support digestive health and suppress less beneficial bacteria to improve digestive comfort.1,4

For full product description and to order **Enhanced Super Digestive Enzymes** or **Enhanced Super Digestive Enzymes with Probiotics**, call 1-800-544-4440 or visit [www.LifeExtension.com](http://www.LifeExtension.com).

**References**

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The term “inflammation” is used in so many different ways that the role of chronic inflammation in accelerating degenerative processes remains largely overlooked.

Endless advertisements tout drugs (like ibuprofen) that temporarily relieve localized pain.

Other ads promote immune-modulating drugs that help suppress rheumatoid-like disease, but have deadly side effect risks.

Few realize that normal aging ignites low-level inflammation that causes or contributes to virtually every chronic disease.¹⁻⁴

Most readers of Life Extension Magazine® take definitive steps to reduce their inflammatory burden. This includes avoiding toxic foods and supplementing with curcumin, fish oil, vitamin D, and other nutrients that have specific inflammation-reducing properties.

This article describes published scientific findings as to how gamma-linolenic acid (GLA) and healthier diets can suppress chronic inflammatory reactions that are a leading killer of aging Americans.
Inflammation seems to be the buzzword these days, and for good reason. Chronic inflammation underlies major diseases of aging, from cancer and atherosclerosis, to arthritis and diabetes. Unhealthy dietary patterns contribute to today’s inflammation epidemic.

Getting at root causes of chronic inflammatory disorders can play a major role in achieving maximum longevity and optimal healthspan.

Healthy fats such as gamma-linolenic acid (GLA) and omega-3s work by several pathways to reduce the dangers of inflammation throughout the body.

What is Inflammation?

When most people stub their toe or hit their elbow, they take an aspirin or ibuprofen to suppress the inflammation. These over-the-counter anti-inflammatory medications work by reducing pro-inflammatory substances.

Acute inflammation is beneficial, as it allows for the healing of a cut or wound, which, if left uncontrolled, could lead to infection or even death. Once inflammation is no longer necessary, the body has mechanisms that turn it off.

The body uses two particular fats to “turn on” and “turn off” inflammation:

An omega-6 fat called arachidonic acid forms necessary pro-inflammatory substances like prostaglandin E2.

Omega-3 fats produce anti-inflammatory substances that bring the overall state of inflammation into balance.

Consuming too many omega-6 fats—while not eating enough omega-3s—contributes to uncontrolled systemic inflammation, which can cause chronic degenerative illnesses associated with pathological aging.

One way the body controls inflammation is by balancing anti-inflammatory substances from omega-3s and pro-inflammatory substances from omega-6 fats.

Understanding Dietary Fats

For optimal health, we must ingest both omega-3 and omega-6 fats. While necessary in moderate amounts, most Americans overconsume omega-6-rich foods, while they underconsume foods that provide EPA and DHA.

Omega-6 fats are known for their pro-inflammatory properties.

But not all omega-6 fats are pro-inflammatory. Of particular interest is the omega-6 fat GLA (gamma-linolenic acid), which has remarkable anti-inflammation mechanisms.

GLA is found in trace amounts in some nuts and green leafy vegetables. The body can make small amounts of GLA from linoleic acid. As a result of this small amount of production by the body, GLA has been called a conditionally essential nutrient.
**Rheumatoid Arthritis**

Patients with rheumatoid arthritis have inflamed, swollen, and painful joints due to an overactive immune system. Evidence suggests that the anti-inflammatory effects of GLA can provide benefit to those with this disease.

One study found that supplementing rheumatoid arthritis patients with borage oil (providing 1.4 grams of GLA daily) for six months significantly improved joint tenderness, swelling, and pain.9

Another study in rheumatoid arthritis patients found meaningful improvements in over 75% of participants when given 2.8 grams of GLA a day for 12 months.10

A third study in rheumatoid arthritis patients found that supplementation with 2 grams of GLA/day for six months improved joint tenderness.11

Finally, a study in rheumatoid arthritis patients found that those who were given 540 mg of GLA/day or 450 mg GLA/day plus 240 mg EPA had significant subjective improvement in their disease state and a significant reduction in the use of NSAIDs (anti-inflammatory pain relievers). Moreover, once the patients were switched over to placebo they had a relapse in their disease state.

The authors concluded that GLA and the combination of GLA/fish oil, “...produce a subjective improvement and allow some patients to reduce or stop treatment with NSAIDs.”12

This study indicates that supplementation with GLA and fish oil containing EPA/DHA may be particularly beneficial in those suffering from rheumatoid arthritis.

**Bone Health**

It is estimated that 200 million people worldwide suffer from osteoporosis.13 Osteoporosis primarily affects the elderly, including 30% of postmenopausal women in the United States and Europe.13

Supplementation of GLA and EPA can improve bone health by enhancing calcium absorption and deposition of calcium into bones.

In one clinical study, 65 elderly women with a history of a diet low in calcium were assigned to receive either a combination of GLA plus EPA or a coconut oil placebo for 18 months. In addition, all participants received a calcium supplement.

The supplement combination, GLA/EPA plus calcium, increased the bone mineral density of the femur (the long, thick bone in the thigh) and helped maintain mineral density in the lumbar spine compared to the placebo group. In contrast, women who took the placebo plus calcium lost mineral density in the lumbar spine.14

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**What You Need to Know**

**The Anti-Inflammatory Benefits of GLA**

- GLA is an anti-inflammatory compound that is found in very small amounts in some leafy greens and nuts, while the pro-inflammatory fats linoleic acid and arachidonic acid are present in ample amounts in vegetable oils and chicken, and eggs and meat, respectively.

- Chronic inflammation throughout the body contributes to numerous diseases.

- Supplementing with GLA may reduce chronic low-grade inflammation and provide benefit to patients with rheumatoid arthritis, osteoporosis, cancer, atopic dermatitis, and acute respiratory distress.
This suggests that the correct fats serve as beneficial signaling molecules to help properly orchestrate what happens to vitamins and minerals in your body, including your bones.

Increasing and maintaining bone strength is important over time because our body’s capacity to heal declines with age.

Supplementing daily with GLA and omega-3s may improve bone health in the elderly.14

**Eczema**

Atopic dermatitis, also called eczema, is a common condition, particularly in children.

Symptoms may include red, itchy, scaly rashes and vary in location depending on age (scalp, forehead, and face, including cheeks). While conventional treatments include topical creams and steroids as well as oral antihistamines, these treat symptoms rather than the root of the problem.

One of the underlying causes of atopic dermatitis in infants may be insufficient delta-6-desaturase activity, the enzyme responsible for converting linoleic acid to GLA. Patients with atopic dermatitis or eczema have low levels of GLA but adequate levels of linoleic acid, suggesting impaired conversion of linoleic acid to GLA.15

Additionally, many infant formulas, unlike breast milk, are low in GLA. Thus, formula-fed infants in particular are at risk of GLA deficiency and may benefit from GLA supplementation.16

Numerous studies show that GLA is helpful for patients with atopic dermatitis and eczema.17-25 A meta-analysis of 26 clinical studies in 1,207 patients established that GLA is beneficial for itch/pruritus, crusting, edema, and redness.26

**Diabetic Neuropathy**

Damage to the eyes, kidneys, and peripheral nerves are a common consequence of diabetes. These diabetic microvascular complications may be related to an impairment of delta-6 desaturase, the enzyme that converts linoleic acid to GLA.

Loss of delta-6 desaturase activity is a key factor in aging.27

In animal studies, the combination of GLA and EPA can prevent and may even reverse diabetic neuropathy.28 This may be due to an increase in myelin sheath formation and improved nerve-conduction velocities.

In humans, a randomized trial of 22 diabetic patients with peripheral neuropathy was conducted using 360 mg of GLA a day. After six months, there were clinical improvements in neuropathy symptom scores, whereas those in the placebo group remained unchanged or deteriorated.29

A larger, randomized, double-blind trial, the Gamma-Linolenic Acid Multicenter Trial Group, compared placebo to GLA (480 mg/day) in 111 patients with mild diabetic neuropathy for one year. People in the GLA-supplemented group showed favorable results compared to placebo based on 16 parameters tested.30

**Acute Respiratory Distress and Asthma**

Critically ill patients with acute respiratory distress syndrome caused by sepsis/pneumonia, trauma, or aspiration injury improved when given tube-feeding nutrition that combined GLA, EPA, and antioxidants. This study noted a reduction in the requirement for ventilation, length of intensive care-unit stay, and reduced organ failure.31

Low (750 mg/day GLA + 500 mg/day EPA) and high dose (1,130 mg/day GLA + 750 mg/day EPA) supplementation with GLA plus EPA has been found to benefit mild-to-moderate asthmatics, improving quality of life and decreasing the reliance on rescue medications.32
Cancer

**Breast cancer** patients (34 women with nonmetastatic breast cancer and four with metastatic) were supplemented with GLA (2.8 grams/day) plus 20 mg tamoxifen or tamoxifen alone. In the GLA plus tamoxifen group, there was a faster response to treatment and a greater estrogen-receptor fall compared to those taking tamoxifen alone.33

Another study evaluated nine patients with **grade four recurrent cerebral glioma**, an advanced form of brain cancer. After surgery, radiation, or chemotherapy, a small amount of GLA was delivered directly (by injection) into the brain or the tumor itself for seven consecutive days.

Computed tomography and magnetic resonance imaging showed regression of the brain tumors. The authors concluded that “...**GLA is a safe antitumor agent and higher doses of GLA should be investigated in future studies.**”34

Placement of GLA (1.0-2.5 mg/ml) directly into the bladder through a catheter (intravesical) was tested in a phase II trial in patients with recurrent, superficial bladder cancer, which is found on the surface of the inside lining of the bladder. A single placement of 50 ml of the intravesical GLA retained for one hour resulted in tumor shrinkage in 43% of the patients.35

The authors concluded that intravesical GLA was safe and well-tolerated and had significant cytotoxic effects against early bladder cancer.

Oral supplementation of GLA or injecting GLA directly into cancerous areas may improve treatment of breast cancer as well as brain and recurrent superficial bladder cancers. These types of treatments require further investigation and larger studies.

**Summary**

**GLA deficiency** can be caused by aging, hyperinsulinemia, and a Western diet, which leads to chronic low-grade inflammation and a host of chronic diseases. Supplementing with anti-inflammatory **GLA** may provide benefits to patients with rheumatoid arthritis, osteoporosis, cancer, eczema, acute respiratory distress, asthma, and common degenerative disorders.

If you have any questions on the scientific content of this article, please call a Life Extension® Wellness Specialist at 1-866-864-3027.

**What is the Ideal Dose of GLA?**

The studies reported in this article describe effective **daily** doses of GLA of 360 mg, 450 mg, 480 mg, 540 mg, 1,130 mg, 2,000 mg and in one study extending up 2,800 mg.

Research that Life Extension® uncovered two decades ago indicates that if one supplements with omega-3-rich **fish oil**, then **lower** doses (400 mg) of GLA may be all that are needed.

Also, the addition of **sesame lignans** to a GLA **formula** can enhance its efficacy by guiding GLA down an **anti-inflammatory pathway** (see charts and descriptions on next two pages).

So most of you should consider initiating 400 mg of GLA with **sesame lignans** daily. If there are not noticeable improvements in a week or two, then slowly increase dose until desired results are obtained.

There is nothing wrong with starting off at higher doses, but for most readers of this magazine who supplement with omega-3s, lower doses of GLA (with sesame lignans) may be all that are needed.

**Risk Factors for GLA Deficiency**

- Formula feeding
- Insulin resistance
- Advanced age
- Smoking
- Consumption of alcohol, refined sugars, trans fats, and partially hydrogenated oils
- Deficiency in magnesium and zinc
- Deficiency in vitamins B3, B6, C, and E
**References**


**How Sesame Helps Optimize GLA**

**Gamma-Linolenic Acid (GLA)** reduces inflammation by converting to prostaglandin E1 in the body.36-39

If GLA goes down the wrong pathway and excessively converts to **arachidonic acid**, then greater levels of inflammation may occur.

**Sesame lignans** suppress the enzyme that causes GLA to excessively convert into **arachidonic acid**.37

By blocking the **delta-5 desaturase** enzyme with sesame lignans, more GLA can be converted to beneficial **prostaglandin E1**, which helps suppress inflammatory reactions.36-39

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**Painkiller Drug Price Jumps Astronomically**

In the latest example of out-of-control drug costs, a manufacturer has increased the price of a painkiller to 22 times its original 2013 cost, bringing it to an astounding $2,979 per bottle.*

The Irish company Horizon Pharma’s incredible price-hike of Vimovo is particularly notable because the drug is comprised of **naproxen** and **esomeprazole**, two medications that are available separately for much less—about $36 total.

**Horizon Pharma** insists that the nearly three-grand wholesale price is not passed down to consumers, who usually pay a fraction of that amount. But critics say it exemplifies a wasteful, complicated system that leads to generally higher sick care insurance costs.

In reaction to the hike, Express Scripts and CVS Caremark—pharmacy benefit managers which negotiate with drug manufacturers on behalf of employers and health insurers—initially put Vimovo on their list of excluded drugs. Horizon responded by setting up rebate deals that lower the cost.

Critics say side agreements, confidential rebates and murky deal-making between drug makers, insurers and pharmacy benefit managers make it very difficult to figure out just who is financially benefiting from jacked-up drug prices.

“There is no transparency,” says Annabel Sammy, a Stifel Financial analyst. “It’s a big black box.”

**Editor’s Note:** Horizon claims that Vimovo, while made up of naproxen and esomeprazole, is more than just a combination of the two much-cheaper drugs because it is a “special formulation.”

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The new Mega GLA is 33% more potent than our previous formula, in a smaller softgel.

This means 400 mg of GLA can now be obtained in just one daily softgel.

Mega GLA also provides sesame lignans to optimize benefits inside one’s body.

For full product information and to order Mega GLA with Sesame Lignans, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Coenzyme Q10 (CoQ10) has been reported to reduce cardiovascular risk factors, including improvement of outcomes after a heart attack.

Congestive heart failure patients have shown significant enhancement of clinical measures in response to higher dose CoQ10 supplementation.

Those who rely solely on CoQ10 may be missing a nutrient that most Life Extension® readers obtain in their multi-ingredient formula. This nutrient is the bioactive form of vitamin B6 called pyridoxal 5’-phosphate.

One case-control study found that those with the highest blood levels of CoQ10 and pyridoxal 5’-phosphate had a reduced risk of coronary artery disease.

They also found that coronary artery disease patients had significantly lower levels of CoQ10 and pyridoxal 5’-phosphate compared to controls.¹

Pyridoxal 5’-phosphate costs so little that it can readily be obtained in more advanced multinutrient formulas.
CoQ10 and P5P Boost Cardio Protection

Researchers evaluated blood levels of **CoQ10** and **pyridoxal 5’-phosphate (P5P)** in 45 people with coronary artery disease and compared them with the blood levels in 89 healthy subjects.\(^1\)

The study found that subjects with coronary artery disease had significantly lower levels of CoQ10 and P5P, compared to the healthy people.\(^1\) It also showed that higher levels of CoQ10 resulted in higher levels of P5P. The opposite was also found—lower levels of CoQ10 showed lower levels of P5P.

But the key finding of this study was that people with higher CoQ10 and P5P levels had lower risks of coronary artery disease.\(^1\)

This study points to the connection between CoQ10 and P5P.\(^1\) It also suggests that supplementation with both nutrients would be sensible in people with or at risk for coronary artery disease.

How it Works

How do CoQ10 and B6 levels interact to provide improved protection against coronary artery disease?

Back in the early 1990s, researchers at the University of Texas at Austin were studying immune response in the midst of the AIDS epidemic and found that administering CoQ10 and B6 together increased blood CoQ10 concentrations.\(^21\)

The combination also increased levels of protective antibodies called **IgG** and boosted levels of **T-lymphocytes**, which are immune cells necessary for fighting off infections and for healing.\(^21\)
Activated T-cells also play an important role in healing heart tissue after a heart attack,²² making the CoQ10/B6 combination appealing for its cardioprotective potential.

In a second study, also from the University of Texas at Austin, researchers collected blood specimens from 29 people not supplemented with either CoQ10 or B6.

They found that people with greater B6 activity had higher levels of CoQ10, once again highlighting the relationship between CoQ10 and vitamin B6-induced biochemical activity.²³ This finding suggested the wisdom of CoQ10 users ensuring they also obtain at least 75 mg a day of pyridoxal 5'-phosphate or P5P.

Of interest is research showing that adequate levels of P5P are required for the body's own production (biosynthesis) of CoQ10.²³ While this is not sufficient to counter the sharp drop in CoQ10 that occurs with aging (and statin drug use), it shows how common nutrients can work together to achieve better results.

Anti-Inflammatory Properties

Critically ill patients have sharply elevated markers of systemic inflammation.

Each year, 250,000 Americans die from sepsis, which is a complex syndrome characterized by oxidative damage, hyperinflammation, immune dysfunction, poor tissue oxygenation, and hypercoagulation usually brought on by an infectious agent.

In critically ill patients undergoing extreme chemical stresses, higher P5P levels have been associated with elevated antioxidant enzyme activities.²⁴ This may provide a hint as to how P5P supports the antioxidant functions of CoQ10, which is itself a component of cellular chemical protection systems.

P5P also has direct, independent impact on cardiovascular health. Studies show that people with coronary artery disease have on average 34.2% lower P5P blood levels compared to those without heart problems. This finding may relate to the nutrient’s role in helping to lower levels of homocysteine, a cardiotoxic protein metabolite.²⁵-²⁷

In one study, the combination of high homocysteine and low P5P raised the risk of coronary disease by 330%.²⁶

The connection with homocysteine, which is associated with increased chronic inflammation, suggests that P5P contributes to lower levels of inflammation. This represents a protective response for the heart and blood vessels. Low P5P and high homocysteine are features of chronic inflammatory disorders such as rheumatoid arthritis, which all carry higher risks of heart disease as well.²⁸
Low P5P is associated with chronic inflammation even in the absence of high homocysteine. This has been shown by studies in which mean P5P levels were significantly lower in subjects with the highest levels of inflammation.29 Other studies have shown that breakdown of P5P is higher under conditions of inflammation, a situation that increases coronary artery disease risk.30,31

One intriguing finding regarding P5P and inflammation is with regular use of nonsteroidal anti-inflammatory drugs (NSAIDs). This drug class includes widely used ibuprofen and naproxen and their use is linked to lower P5P levels in human and animal studies.32 This is a paradoxical finding, because the NSAIDs are intended to reduce inflammation, but their suppression of P5P potentially leads to worsening inflammation.

This shows the importance of supplementing with P5P as one good way to avoid the deficiency if NSAID use cannot be avoided. Those with elevated homocysteine should consider supplementing with 75-200 mg a day of P5P, in addition to bioactive folate (5-MTHF) and vitamin B12.

Finally, there is now strong evidence that P5P can directly modulate inflammation and thereby contribute to lower cardiovascular risk.

Canadian researchers have identified binding of P5P to cell surface receptors called PX2, which mediate nerve transmission of pain, as well as cell damage and inflammation.33 By inhibiting PX2 receptors, P5P reduced inflammatory responses and established itself as an important candidate for a PX2-inhibiting drug.

Summary

Coenzyme Q10 is widely recognized for its potential abilities to reduce cardiovascular risks.

Recent research indicates CoQ10’s benefits may be augmented by ensuring one also supplements with P5P, the most active form of vitamin B6.

Vitamin B6 is required for the body to make adequate CoQ10,34 it boosts blood levels of CoQ10, and it makes CoQ10 available for longer to the many body systems that require it.

Both CoQ10 and vitamin B6 have independent value as heart disease risk-reducing supplements.

Using the two supplements together offers more comprehensive protection against America’s leading age-related killer, cardiovascular disease.

References


Magnesium is a critically important mineral, yet most Americans do not obtain enough from their diet.

Magnesium helps:

1. Keep heart rhythm steady.
2. Promote normal blood pressure.
4. Support a healthy immune system.
5. Keep bones strong.
6. Maintain blood sugar levels already within normal range.

The recommended intake of magnesium to maintain vascular health is 500 mg or more a day.

Each Life Extension® Magnesium Cap provides 500 mg of elemental magnesium for 9 cents a day!

For full product description and to order Magnesium Caps, call 1-800-544-4440 or visit www.LifeExtension.com

References

Caution: If taken in high doses, magnesium may have a laxative effect. If this occurs, divide dosing, reduce intake, or discontinue use.

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

- Mitochondrial dysfunction is linked to accelerated brain aging.
- CoQ10 energizes aging cells and enhances mitochondrial function.
- Shilajit works with CoQ10 to increase cellular energy.

Super Ubiquinol CoQ10 combines the energy-activating power of shilajit into a formula that’s more potent than a stand-alone CoQ10.

For full product description and to order Super Ubiquinol CoQ10, call 1-800-544-4440 or visit www.LifeExtension.com
Maintain Youthful HOMOCYSTEINE for Heart Health

HOMOCYSTEINE RESIST supports healthy levels of homocysteine, an unfavorable amino acid that can increase with normal aging.

Just one daily capsule of Homocysteine Resist provides:

- 5-MTHF (activated folate) 5,000 mcg
- Methylcobalamin (activated vitamin B12) 1,000 mcg
- Pyridoxal 5-phosphate (activated vitamin B6) 100 mg
- Riboflavin (vitamin B2) 25 mg

HOMOCYSTEINE RESIST
Item #02121 • 60 vegetarian capsules

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For full product description and to order Homocysteine Resist, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
MacuGuard® Ocular Support provides lutein, trans-zeaxanthin, and meso-zeaxanthin to help maintain structural integrity of the macula and retina.1,5

Alpha-carotene is included based on new evidence that it helps support the macular pigment.1

People supplementing with saffron showed an improvement in vision as measured by them seeing an average of two additional lines on the eye chart commonly used by doctors to test vision.1

This formula provides the optimal dose of saffron along with cyanidin-3-glucoside to support healthy vision.6,8

MacuGuard® Ocular Support with Saffron
Item #01992 • 60 softgels
Retail Price is $25
Your Price is $18.75
4 bottles are only $17.50 each
Each bottle lasts for two months.

For full product description and to order MacuGuard® Ocular Support, call 1-800-544-4440 or visit www.LifeExtension.com

References

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
B vitamins are critical for the production of neurotransmitters in the brain. Insufficiency is associated with cognitive decline.\textsuperscript{1-3}

Folate has a number of mechanisms by which it can enhance cognitive performance. These include lowering inflammation and reducing homocysteine.\textsuperscript{1,4}

Elevated homocysteine and chronic inflammation are linked to degenerative brain disorders.

Perhaps the most far-reaching implication of folate in the brain is its ability to modify gene expression.\textsuperscript{1}

This means that folate plays a role in turning a gene “on” or “off.”

Without enough folate, genes involved in the production of beta-amyloid are “turned on.”\textsuperscript{5,6}

Studies show that adding folate to brain cell cultures can silence—or “turn off”—genes that produce toxic beta-amyloid proteins.\textsuperscript{1,7}

The takeaway from these studies is that folic acid performs a host of functions that support youthful brain cell structure and function.
2. Improvements in markers of DNA methylation

Folate supplementation was shown to beneficially affect genes involved in DNA methylation, thereby assisting the body to metabolize homocysteine.

In the supplemented group, two important blood markers were increased:

- Folate levels
- S-adenosylmethionine levels (SAMe, a natural compound that helps in the production of several key neurotransmitters and alleviates depression)

At the same time, two blood markers associated with poor cognitive outcomes were reduced:

- Homocysteine, a harmful amino acid that can lead to stroke, coronary disease, and dementia
- S-adenosylhomocysteine (SAH) levels, the precursor for homocysteine

The important ratio of SAMe/SAH was also increased, indicating a return to a healthy methylation.

3. Reduced levels of brain-toxic proteins

Toxic beta-amyloid plaques are a hallmark of Alzheimer’s disease. These distorted proteins accumulate in the brain, where they damage brain cells and interrupt the communication between neurons. The result is loss of memory and brain function.

Folate’s Anti-Dementia Properties

The primary sources of folate (vitamin B9) include vegetables like broccoli, asparagus, spinach and Brussels sprouts. Cooking vegetables causes folate loss, which means we consume less of this nutrient than we might think.

One research group has been studying folate supplementation in older adults for half a decade. Their research has demonstrated folate’s beneficial effect on cognitive function.

In their latest study, they explored the cognitive effect of supplementing with folate for an average of two years.

The study included 180 subjects with mild cognitive impairment. Half received folic acid (400 mcg/day), while the other half received standard care (guidance on nutrition and activity aimed at enhancing memory late in life).

After 24 months, the people in the folate group experienced three encouraging results:

1. Improvements in cognitive testing

By the end of the study, the folate group demonstrated significant increases in cognitive test scores, including full-scale IQ (which indicates a person’s average intelligence), verbal IQ, and measures of memory.

Combined treatment scores for the six verbal IQ tests were also significantly higher in the folate group, as was the combined treatment score for all 11 tests (full-scale IQ).
Folate can help prevent beta-amyloid plaques from forming.

This study showed that subjects in the folate group had significantly lower blood levels of molecules involved in forming these brain-damaging plaques. Blood levels of these plaque-forming molecules reflect their accumulation in the brain. The presence of plaque-forming molecules may predict early Alzheimer’s disease or cognitive decline.1,10-12

Overall, this study showed that folic acid supplementation significantly improved cognitive performance as seen by the increases in cognitive test scores. In addition, folic acid also reduced the abundance of beta-amyloid that directly damages brain cells.1

What's interesting about this study is the low-dose of folate used. Many older people are deficient in folic acid and other B vitamins and essential nutrients, meaning their levels of the bioactive form of folate, called 5-MTHF (5-methyltetrahydrofolate), are also perilously low.

People with elevated homocysteine often take 1,000 mcg to 10,000 mcg of 5-MTHF daily along with vitamins B12, B6 and B2. A number of previous studies have shown better results using 5-MTHF than standard folic acid.13-15

Summary

This new study has demonstrated that even low-dose folic acid supplementation produces changes in gene function and in biochemistry that benefit the aging brain.

The favorable change in gene expression results in reduced production of toxic (beta-amyloid) proteins implicated in dementia.

Additionally, folate lowers the high homocysteine levels that often accompany brain aging and dementia. As a result, folic acid supplementation helps preserve cognitive function in adults with mild cognitive impairment.

Slowing the progress of mild cognitive impairment could delay the onset of dementia like Alzheimer’s and Parkinson’s diseases.

There is no reason for people to be deficient in folic acid as it is a remarkable low-cost nutrient.

If you have any questions on the scientific content of this article, please call a Life Extension® Wellness Specialist at 1-866-864-3027.

What You Need to Know

Folate Slows Brain Aging

- Mild cognitive impairment is an early indicator of dementia.
- Up to 15% of people over 65 years old with mild cognitive impairment will proceed each year to develop dementia, compared with less than 2% of those without mild cognitive impairment.16
- Studies show that mitigating mild cognitive impairment can ward off dementia, preserving more youthful cognition.
- A groundbreaking human clinical trial has found that supplementation with folic acid successfully improved cognitive function in adults with mild cognitive impairment.
- Deeper findings of the study show that folic acid reduces production of dangerous Alzheimer’s-associated proteins, while also lowering toxic homocysteine levels.
5-MTHF: The Best Form of Folate Supplementation

In the body, the folate molecule goes through several enzymatic steps to become the active molecule 5-MTHF.17-19

In order to make the conversion from folate to the active 5-MTHF, an enzyme called methylenetetrahydrofolate reductase or MTHFR is necessary—and not everyone has sufficient activity of the gene that codes for this enzyme. It is estimated that between 5% and 10% of the population has a gene variant that reduces MTHFR activity by 70%,20 while nearly 50% of people of European descent have a genetic variation that decreases MTHFR activity by as much as 35%.18,19,21-24

Supplementation with 5-MTHF bypasses the enzyme defect and provides the body with exactly the right molecule it needs.

References

Cognitex® with Pregnenolone & Brain Shield®

Cognitex® is designed to improve cerebral performance and supports brain and nervous system function.

Scientifically formulated Cognitex® contains validated ingredients shown at two weeks to improve:

- Spatial short-term memory 42%
- Recall 15%
- Recognition 11%
- Attention 12%
- Visual learning 33%
- Activities of daily living by over 10%

*J Diet Suppl. 2011 Jun; 8(2):158-68

Caution: Do not take this product if you have breast cancer, prostate cancer, or other hormone-sensitive diseases. If you are taking anticoagulant or anti-platelet medications, or have a bleeding disorder, consult with your health care provider before taking this product.

Sensoril® is protected under US Patents Nos. 6,153,198 and 6,713,092 and is a registered trademark of Natreon, Inc.

Sharp-PS® is a registered trademark of Enzymotec Ltd.

For full product description and to order Cognitex® with Pregnenolone & Brain Shield®, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Promote Tear Production From The Inside Out

Everyday factors can lead to dry, itchy, irritated eyes.

**Tear Support with MaquiBright®** is a unique oral supplement that supports your body’s own tear production for continuous, all-day comfort.

The secret is the maqui berry’s rich source of delphinidins, a source of support for tear-producing glands.

When human subjects took just 60 mg a day of Maqui berry extract, there was a 45% increase in lubricating tear production.¹²

For full product description and to order Tear Support with MaquiBright®, call 1-800-544-4440 or visit www.LifeExtension.com

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MaquiBright® is a registered trademark of MAQUI NEW LIFE S.A, Chile and ORYZA OIL & FAT CHEMICAL CO., LTD., Japan.

References

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Folate helps maintain homocysteine levels within the normal range, thereby promoting cardiovascular health. Folate also supports neurotransmitter synthesis—which in turn helps maintain cognitive abilities.

However, not everyone has sufficient activity of the enzyme required to convert folate to its biologically active form, 5-methyltetrahydrofolate, or 5-MTHF. 5-MTHF requires no enzymatic conversion to become metabolically active—providing maximum support for both cardiovascular and cognitive health.

Optimized Folate provides metabolically active 5-MTHF folate in 1,000 mcg or 5,000 mcg strengths.

References

Optimized Folate (1,000 mcg)
Item #01939 • 100 vegetarian tablets

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High Potency Optimized Folate (5,000 mcg)
Item #01913 • 30 vegetarian tablets

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For full product description and to order either of these Optimized Folate formulas, call 1-800-544-4440 or visit www.LifeExtension.com

Caution: Do not use this product if treated with methotrexate, fluorouracil, phenytoin, phenobarbital, primidone, or levodopa prior to consultation with your personal physician.

These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.
Smaller, Easier-to-Swallow

Clearly EPA/DHA
PURE FISH OIL

• Easier-to-swallow fish oil-only softgel
• Colorless omega-3 blend
• 5-star rating from International Fish Oil Standards Program
• 1,500 mg of EPA and 1,000 mg of DHA daily dose
• Smaller size softgel

For full product description and to order
Clearly EPA/DHA Highly Concentrated Omega-3,
call 1-800-544-4440 or visit www.LifeExtension.com

Note: Super Omega-3 softgels are 25% larger by volume because they provide
different compounds like olive polyphenols, sesame lignans and 5-star rated fish oil. New Clearly EPA/DHA provides same omega-3 potency in easier-to-swallow smaller softgels.

IFOS™ certification mark is a registered trademark of Nutrasource Diagnostics, Inc.
If you are taking anticoagulant or antiplatelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product. Supportive but not conclusive research shows that consumption of EPA and DHA omega-3 fatty acids may reduce the risk of coronary heart disease.

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Advanced Technology
TO OPTIMIZE B12 ABSORPTION

Eligen B12™ helps maintain normal vitamin B12 levels. Eligen® Technology is designed to allow patients to absorb an oral B12 formulation independent of intrinsic factor, a protein required to effectively absorb B12.

Eligen B12™ uses an advanced patented carrier technology to optimize vitamin B12 absorption by chaperoning B12 through the gastric lining directly into the bloodstream within 30 minutes. This enables individuals who are unable to absorb vitamin B12 intestinally to use an oral supplement to help inhibit B12 deficiency.

BENEFITS AT A GLANCE:

- Optimizes B12 absorption, especially among individuals lacking intrinsic factor.
- Helps maintain consistent long-term and predictable healthy B12 blood levels with a single daily dose.
- Helps inhibit B12 deficiency.

ABOUT EMISPHERE

Emisphere is a drug delivery company that utilizes its proprietary Eligen® Technology to develop new oral formulations of therapeutic agents. Emisphere is currently partners with global pharmaceutical companies for the development of new orally delivered therapeutics. For more information, please visit the company’s website at www.emisphere.com.

Eligen B12 30 Tablets
Item Number: 53518  Retail: 45.99  Your Price: 34.49

For full product description and to order Eligen B12™, please call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.
When I was younger, I was afraid of getting old. Turning age 70 would be the beginning of the end, it seemed.

Developing a life-threatening disease like cancer or diabetes was a fearsome prospect. And what about quality of life?

Would my joints be achy and swollen from arthritis or my eyesight dimmed so I could no longer see the world around me in all its glorious detail?

Well, it finally happened: I turned 70 a few weeks ago. To celebrate, I went to my doctor for my annual wellness exam to evaluate key markers of my health.

The results* were an extraordinary birthday present:

- **Blood pressure:** 100/60 mmHg
- **Resting heart rate:** 50 beats-per-minute
- **Total cholesterol:** 97 mg/dL
- **LDL cholesterol:** 47 mg/dL
- **Fasting glucose:** 71 mg/dL

* Results from blood work done at CareMount® Medical, Mount Kisco, New York, ordered by Dr. Jennifer LaPorta and reported February 2018.
Longitudinal Studies?

Some researchers believe that longitudinal studies are required as proof that any form of dietary restriction extends life in humans, but one thing is certain: You can measure objectively how well you are doing. Consider these inspiring stories from members of LivingTheCRWay:

- Ev, 81, lives in Hawaii and joined LivingTheCRWay four years ago with challenges. Having had metastatic melanoma twice, and living with high blood glucose in the 90s and blood pressure higher than optimal, his markers now are more like those of a person considerably younger than 81: blood pressure at 88/53 mmHg, achieved naturally without medication, no recurrence of cancer, and fasting glucose in the 70s.

- Debbie, 60, from Tennessee, is an active woman who lives on a farm. Before she joined LivingTheCRWay, her cholesterol was 216 mg/dL. Her fasting blood glucose was at prediabetic levels. Since joining the CR Way only a few months ago she has lowered her fasting blood glucose to the 70s, and her cholesterol readings are perfect—total cholesterol is 146 mg/dL and LDL is down from 90 mg/dL to 50 mg/dL.

- Dave, 60, from Virginia, works hard daily as a professional landscaper. When not working, Dave and his wife, Jenny, like to go on trips and visit with family and friends. As often happens when one reaches 60, Dave’s blood glucose had crept up to prediabetic levels. Now, after taking The CR Way to Great Glucose Control classes, Dave’s high fasting glucose has fallen into the 70s and low 80s mg/dL.

- Ellen, 65, from Wisconsin, is an RN whose work as a massage therapist is demanding. “I have evolved into better health and dietary habits that are demonstrably improving not just my glucose levels but all aspects of my life. Thank you both and the CR Way for helping me guide my ship in these positive ways.”

- Thomas, 68, from Colorado, summed up how members of the LivingTheCRWay community feel: “I have had a good life and I want more of it!”

No one should promise that life extension is guaranteed. We do, though, expect these and many other CR Way members to continue to live healthy, active lives, as if they were younger than their chronological ages.

I am delighted that a 70-year-old can have biomarkers that are like those of a healthy school-age child.\textsuperscript{1-3} My body mass index (BMI) is 20 and I am strong and energetic. I have no aches or pains and I do not take medications. I read without glasses and my distance vision is 20/10—better than it was in my 50s and better than most people of any age.\textsuperscript{4} I am optimistic that I can look forward to a long, healthy life.

Mediocre Results in my 40s

I wasn’t always so healthy. Flashback 25 years—I was in my forties and my test results were mediocre: Blood pressure was 140/90 mmHg. Fasting blood glucose was at risk levels, in the mid-90s mg/dL. I was on a trajectory to disease. If I hadn’t made significant changes in my approach to health, my life could have gone downhill easily—fast.

“No!” to Age-Related Decline

Having experienced the sadness of losing family loved ones, I knew that in my own life I would not be able to simply accept age-related decline and death. Instead, I made a resolution: to make life extension in good health my life’s mission.

And I started to fight—mustering resources and talent to move life-extension science forward faster. The best way to begin was to understand and practice dietary restriction, a non-genetic, non-pharmacological intervention known to increase active and healthy lifespan in a variety of species.\textsuperscript{5}

Many people think dietary restriction is synonymous with calorie restriction, but it can also include restriction of specific nutrients such as dietary protein or methionine (an amino acid).

As my dietary restriction practice developed, I learned that glucose control could significantly enhance the benefits that I was getting. So I decided to focus on that, because high blood glucose is linked to increased risk for many major diseases such as cancer,\textsuperscript{6} diabetes,\textsuperscript{7} heart disease,\textsuperscript{8} and dementia,\textsuperscript{9} as well as mortality from all causes.\textsuperscript{10}
The CR Way of living helps people achieve such extraordinary health by showing them how to activate the biochemistry associated with extending life and preventing age-related disease.

Lowering mTOR

Standing originally for mammalian Target of Rapamycin (and more recently mechanistic Target of Rapamycin), mTOR is an enzymatic complex that drives growth in humans and other organisms. This is essential in our younger years but can turn dangerous as we age.

You may have heard of rapamycin, a drug used to reduce the immune response in organ-transplant patients in the hope that their bodies will not reject their newly transplanted organ.

Rapamycin’s downregulation of mTOR prompted researchers to give it the name “mammalian target of rapamycin.”

Drugs and nutrients that boost AMPK indirectly suppress mTOR. Another way of lowering mTOR is to reduce one’s calorie intake.

mTOR Activity Accelerates Aging

TORC1 (Target of Rapamycin Complex 1) and TORC2 (Target of Rapamycin Complex 2) are the two parts of the large mTOR molecule. TORC1 has been studied more than TORC2 and is identified as a master regulator of cell growth and metabolism. Whether or not you know every nuance associated with mTOR, you must understand that overstimulating it increases risk of cancer and accelerates aging. You should also know that if you overfeed your body with calories, protein, or glucose-raising foods, your cells will go wild. You will store fat and put on weight, and your risk of disease will soar.

We help new participants in The CR Way to Great Glucose Control to turn down mTOR with diet. It’s easy, really: Make your diet plant-based, and you are halfway there.

Role of AMPK in Cell Energy Metabolism

AMPK (adenosine monophosphate-activated protein kinase) evolved early in the history of living organisms. AMPK fulfills the need to fuel cellular processes when energy (food) supplies become limited.

When you follow the CR Way lifestyle, you manage your glucose levels better in ways that activate your AMPK beneficially. The metabolic changes that take place are extraordinary, as can be seen on the chart on the next page.

Metabolic Changes in Response to Healthier Eating Patterns

In response to consuming healthy foods that are part of the CR Way program, multiple changes occur throughout your body that slash your risk of degenerative illnesses while helping to decelerate aging itself. Below is a summary of just a few of the benefits we’ve seen in people who follow our dietary restriction program:

- **Blood pressure declines:** 100/60 mmHg is normal for CR Way practitioners, a benefit that may be a result of increased eNOS (endothelial nitric oxide synthase) levels.
- **High-sensitivity C-reactive protein (hsCRP) and tumor necrosis factor (TNF)** fall to the low end of the reference range, indicating reduced inflammation.
- **Fat synthesis decreases** and **fat burning increases.** That’s probably why body fat percentages are as low as 12% in CR Way men and 18% to 24% in CR Way women.
• **Triglyceride** levels reduce, running between 45 mg/dL and 65 mg/dL.

• **Cholesterol reduction**—150 mg/dL is routine for CR Way members, and even lower can be normal.

• **IGF-1** is stable at moderate levels.

Moderate dietary restriction is a fundamental starting point for CR Way living. We continue to add complementary aging interventions like meditation and friendly support.

**Begin with Glucose Control**

Many successful CR Way members begin with *THE CR WAY TO GREAT GLUCOSE CONTROL* and for good reason: About 84.1 million Americans¹⁴ and millions more worldwide¹⁵ have **fasting glucose** levels at dangerous prediabetes levels—100 mg/dL or above. If you are one of them and you don’t do anything about it, your likelihood of developing type II diabetes, as well as other diseases, will soar.¹⁵

Hundreds of people have used the CR Way three-month online course—with live teleconferences—to reduce their glucose to healthy levels and improve their prospects for a long, disease-free life.

**Features of THE CR WAY TO GREAT GLUCOSE CONTROL course**

• A five-part e-book, updated with delicious recipes, food suggestions, and ideas for improving your body’s microbiomes

• Weekly participation in the CR Way Support Group, where participants discuss successes and challenges of glucose control and other CR Way practices and get real, practical solutions for day-to-day issues

• Instructional videos, describing key steps for great glucose control

• Six live 30-minute classes by teleconference

• Personalized guidance: Glucose control experts Paul McGlothin and Meredith Averill teach the classes—live!

• Recordings and transcripts of the teleconference classes

• A Great Glucose Control Library on LivingTheCRWay.com where recordings of classes and all instruction materials are available 24/7 for your use

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**Multiple Benefits of Boosting AMPK**

- Eat fewer calories
- Reduce dietary sugars
- Metformin

- **eNOS** *(nitric oxide)*
- Increases

- **AMPK Benefits**
  - More exercise
  - Moderate protein intake
  - AMPK activating nutrients

- **AMPK**

- **Facilitates Mitochondrial biogenesis**

- **Suppresses mTOR - IGF-1**

- **Impedes Cholesterol Synthesis**

- **Reduced Fat synthesis**

- **Triglycerides decrease**

- **Reduced Inflammation**

- **Eat fewer calories**
- **Reduce dietary sugars**
- **Metformin**

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¹⁴ Data from the Centers for Disease Control and Prevention.
¹⁵ Data from the American Diabetes Association.
Growing Older: Wonderful Possibilities

Twenty-five years ago we decided to create The CR Way. It has now blossomed into a community where people make striving for great health fundamental to their way of life. Imagine the potential that offers: As you begin to feel terrific, you enjoy life more. You function well and can take better advantage of life’s possibilities. And you have like-minded people supporting you in your efforts.

With your newfound energy and verve, you could choose to go back to school and learn a new skill, or simply apply your new vigor to the career you already love. With the return of your youthful health, retirement becomes optional rather than necessary.

You’ll again enjoy your life as you once did, and not have to worry about draining your savings because you need expensive medications. This is what LivingTheCRWay offers.

The starter three-month CR Way to Great Glucose Control program retails for $350. We invite you as a Life Extension Magazine reader to take advantage of the collegial pricing of $330. This special price is only available through September 14, 2018.

Enroll today in an upcoming CR Way to Great Glucose Control class.

To order CR Way to Great Glucose Control, call Life Extension at 1-800-544-4440. Item #34144.

Paul McGlothin and Meredith Averill have discovered how to bridge the gap between the scientific research into low-calorie diets and how to practically apply that research. Their work brings real results and longevity benefits to CR Way practitioners. Their CR Way® lifestyle is based on decades of research showing favorable changes in genes, gene expression, and other aging biomarkers. They’ve played a pivotal role in this research on aging at Washington University in St. Louis School of Medicine, and the University of California at both San Francisco and Riverside.

If you have any questions on the scientific content of this article, please call a Life Extension® Wellness Specialist at 1-866-864-3027.

References

Melatonin Timed Release 300 mcg
100 vegetarian tablets
Retail: $12
Your Price: $9
Item # 01787

Melatonin 3 mg
60 vegetarian capsules
Retail: $8
Your Price: $6
Item # 00330

Melatonin Timed Release 750 mcg
60 vegetarian tablets
Retail: $8
Your Price: $6
Item # 01788

Melatonin Timed Release 3 mg
60 vegetarian lozenges
Retail: $8
Your Price: $6
Item # 01786

Melatonin 500 mcg
200 vegetarian capsules
Retail: $18
Your Price: $13.50
Item# 01083

Melatonin 3 mg
60 vegetarian capsules
Retail: $8
Your Price: $6
Item # 00332

Melatonin 1 mg
60 capsules
Retail: $5
Your Price: $3.75
Item# 00329

Melatonin 10 mg
60 vegetarian capsules
Retail: $28
Your Price: $21
Item# 00331

Enhanced Sleep with Melatonin
30 capsules
Retail $22
Your Price: $16.50
Item# 01551

Melatonin 300 mcg
100 vegetarian capsules
Retail: $7
Your Price: $5.25
Item# 01668

Enhanced Sleep without Melatonin
30 capsules
Retail: $22
Your Price: $16.50
Item# 01511

Melatonin IR/XR
60 capsules
Retail: $12
Your Price: $9
Item# 02201

Healthy sleep is one of the best ways to feel revitalized and maintain optimal health. While many people find melatonin helps improve sleep, others take it nightly for its immune protecting effects. Individual doses range from 300 mcg to 10 mg taken 30-60 minutes before going to sleep.

Caution: Consult your health care provider before taking this product if you are being treated for a medical condition (especially autoimmune or depressive disorders). Use caution if combining with alcohol. This product is not intended for children, pregnant or lactating women, or women trying to become pregnant. Do not attempt to drive or operate heavy machinery after taking this product.

ChromeMate®, a patented, biologically active oxygen-coordinated niacin-bound chromium complex, is a registered trademark of Interhealth Nutritional Inc. MicroActive® Melatonin is a registered trademark of Bioactives LLC.

Sweet DREAMS

Choose the Melatonin That’s Right For You

For full product description and to order any of these premium-grade Melatonin supplements, call 1-800-544-4440 or visit www.LifeExtension.com

For occasional sleeplessness.

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The plant compounds in AMPK Metabolic Activator help boost AMPK, a cell enzyme that mitigates mechanisms of aging and promotes vascular function while helping reduce belly fat.

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ActivAMP® is a registered trademark of Gencor.
This supplement should be taken in conjunction with a healthy diet and regular exercise program. Individual results may vary and are not guaranteed.
Milk thistle extract—rich in silymarin—is a powerful weapon to support liver health. Scientific studies demonstrate silymarin’s ability to provide potent protection for your liver.¹,²

Life Extension’s European Milk Thistle contains standardized, top-grade potencies of silymarin, silybin, isosilybin A, and isosilybin B, providing a full spectrum of liver-supportive compounds. This unique formula includes phosphatidylcholine, a nutrient that promotes better absorption of milk thistle extract.³

The silymarin contained in European Milk Thistle is absorbed nearly 5 times better than silymarin alone, and its bioavailability to the liver is 10 times better.

European Milk Thistle Advanced Phospholipid Delivery
Item #01922 • 60 Softgels

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References

For full product description and to order European Milk Thistle Advanced Phospholipid Delivery, call 1-800-544-4440 or visit www.LifeExtension.com

SILIPHOS® is a registered trademark of Indena S.p.A., Italy.

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Glycemic Guard™ contains maqui-berry and clove extract.

These plant extracts help maintain healthy after-meal blood glucose levels and insulin response, and promote healthy HbA1c levels.

ITEM # 02122 • 30 vegetarian capsules • Retail price $42 • Your price $31.50 • 4 bottles $28 each

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DHEA is one of the most important hormones in your body. It supports immune function, mood, sex drive, and lean muscle mass.

DHEA levels markedly decline with age.

Because everyone’s needs are different, Life Extension® offers DHEA in different encapsulated potencies, along with a dissolve-in-the-mouth tablet.

DHEA 15 mg capsules

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Item #00454 • 100 capsules

DHEA 25 mg capsules

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Item #00335 • 100 capsules

DHEA 25 mg tablets

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Item #00607 • 100 dissolve-in-mouth tablets

DHEA 50 mg capsules

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Item #00882 • 60 capsules

Caution: Consult a physician or licensed, qualified healthcare professional before using these products if you have, or have a family history of, breast cancer, prostate cancer, or other hormone-sensitive diseases.

For full product description and to order DHEA, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.
The gut *microbiome* consists of trillions of microorganisms that inhabit the human gastrointestinal tract.

Having an *imbalanced gut microbiome* is associated with cancer, vascular disease, allergies, neurodegenerative disorders, and depression.¹⁻³

In 2017, researchers at *Johns Hopkins Bloomberg School of Public Health* announced a series of discoveries linking disturbances in the microbiome to *diabetes*.⁴

Fortunately, they also found a solution.
Metformin is the most widely prescribed drug to treat type II diabetes.

Since 1995, Life Extension® has recommended metformin to nondiabetics as a possible way to slow biological aging.

Metformin’s primary beneficial mechanism is to increase cellular AMPK.

As people age, AMPK activity declines and sets the stage for a host of degenerative illnesses.

New studies have uncovered another benefit to metformin: It boosts a beneficial intestinal bacterium called Akkermansia muciniphila.4

Studies show that this bacterium has specific actions that combat diabetes and obesity. This study from Johns Hopkins sheds new light on metformin’s role as a microbiome-modifying, anti-diabetic drug.

Akkermansia Improves Metabolic Health

Gut health hinges on having a healthy balance of the right kinds of bacteria. Akkermansia muciniphila is one of the good guys, and its specialty seems to lie in beneficially affecting metabolic health.5

Until 2016, little was known about the organism’s role in human metabolism.3,9 That changed with publication of a French study.5

In a 12-week dietary intervention, the Sorbonne’s researchers studied 49 overweight and obese adults. Subjects undertook six weeks of a calorie-restricted diet followed by six weeks of a diet aimed at weight stabilization.

The study showed that subjects with the highest baseline abundance of Akkermansia muciniphila in their stool had the best parameters associated with metabolic health, including:

• The lowest fasting glucose,
• The lowest waist-to-hip ratios (a measure of central obesity),
• The lowest mean diameter of fat cells, and
• The best metabolic status, as indicated by lower plasma-triglyceride levels and better body-fat distribution.5

Having an abundance of Akkermansia also predicted greater improvements following the calorie-restriction phase of the study. For example, the subjects with higher baseline Akkermansia levels had greater improvements in markers of insulin resistance, blood lipids, and body fat composition after the intervention, compared with those having lower abundance of the organism.3 They also showed less liver-cell damage, a common outcome of excessive liver fat associated with non-alcoholic fatty liver disease (NAFLD).

As an added benefit, having plenty of Akkermansia muciniphila was associated with having an abundance of other microbial species with known benefits to metabolic health.5

Metformin is a derivative of the French lilac (Galega officinalis) with an ever-expanding list of benefits and an excellent safety record.10-12

It has been used for more than 50 years to treat type II diabetes.13

More recently, reports have indicated that metformin’s metabolic benefits might involve alterations to the gut microbiome. Intrigued, researchers at the Johns Hopkins Bloomberg School of Public Health teamed up with colleagues in Colombia to develop a deeper understanding of metformin’s impact on the microbiome.4
The study involved 28 individuals with diabetes and 84 others without diabetes that were matched to the diabetic subjects by sex, age, and body mass index (BMI). Half of the diabetic subjects were taking metformin, while the other half were not.4

What the researchers found was remarkable. Compared with subjects who did not have diabetes, the diabetic subjects taking metformin had higher abundance of *Akkermansia muciniphila*, while diabetics not taking metformin lacked this increase.4

There may be no citizen of the gut microbiome community better suited to protecting us against diabetes—the combination of diabetes and obesity—than *Akkermansia* because of its ability to improve insulin resistance, blood lipids, and body-fat composition.

As an added benefit, the diabetics given metformin also had higher levels of bacteria known for their ability to produce essential short-chain fatty acids (such as butyrate).4 Short chain fatty acids are increasingly being recognized for their anti-inflammatory properties in the intestine and elsewhere in the body.14,15

In sharp contrast, diabetics not taking metformin showed a higher abundance of bacteria in the Clostridiaceae family, which have been associated with higher levels of gut and system-wide inflammation.4,16,17

These beneficial shifts in the diabetic gut microbiome are precisely what one would desire in an antidiabetic therapy: reduction in bacteria associated with inflammation (which promotes insulin resistance and therefore diabetes), and increases in bacteria known to protect gut integrity and soothe inflammation.

**Metformin’s Metabolic Effects**

Another study out in late 2016 vividly demonstrates the important health benefits of metformin as a gut microbiome-modulating drug.18

It found that metformin’s ability to improve the gut microbiome can reverse a condition known to cause everything from digestive issues and hormone imbalances, to skin issues and food allergies, to autoimmune diseases and depression.

The condition is called leaky gut, and it occurs when the otherwise-tight intestinal wall becomes permeable, allowing things like toxins, bacteria, and undigested food to “leak” out of the intestines and travel throughout the body through the bloodstream. The immune system targets them as imposters and attacks them. This leads not only to the effects listed above, but to a body-wide state of low-grade inflammation.18,19

Two primary underlying causes of a leaky gut include a high-fat diet and an unbalanced (dysbiotic) gut microbiome, and it can lead to a cascade of events that have a harmful impact on blood sugar and insulin resistance.20

The chief culprit in this scenario is a ubiquitous, highly-toxic family of compounds called lipopolysaccharides, or endotoxins. When lipopolysaccharides are released into the circulation, they cause a profound inflammatory response, even when present in amounts as miniscule as one-trillionth of a gram.21

One of the most devastating results of lipopolysaccharide-induced chronic inflammation is the development of insulin resistance. This occurs when damaged cells lose the ability to respond to insulin signaling, leading to high blood-sugar levels that damage tissues.19

While it is virtually impossible to avoid these dangerous endotoxins, studies have shown that modulating the composition of the gut microbiome can limit how much of them are absorbed into the circulation—which has beneficial effects on metabolic health.

**Metformin Reverses Leaky Gut**

Another 2016 study found that metformin’s ability to modulate a dysbiotic gut microbiome has a profound impact on leaky gut and its consequences.

For this study, scientists fed mice a high-fat diet for 18 weeks to induce insulin resistance.18
They then treated the mice with either metformin alone, or metformin following injections of lipopolysaccharides to produce high-grade inflammation.

The results showed that metformin treatment:

- **Reversed** gut leakiness induced by a high-fat diet,
- **Lowered** the resulting elevated circulating lipopolysaccharide levels, and
- **Increased** the abundance of beneficial *Lactobacillus* and *Aktheransia* in the gut microbiome.

This study shows that metformin exerts favorable changes on a dysbiotic gut microbiome—a benefit that results in a sharp decrease in pro-inflammatory compounds associated with diabetes and obesity. It also offers additional insights into why metformin is such a potent actor in fighting these disorders.

This study highlights the importance of microbiome composition in metabolic health and strengthens the case for *Aktheransia muciniphila* as a chief guardian of gut balance.

**Summary**

Metformin is a multitargeted drug with broad-spectrum metabolic benefits in diabesity, the deadly combination of diabetes and obesity.

New studies show that some of metformin’s metabolic benefits stem from its impact on the gut microbiome.

These studies show that metformin boosts the amount of *Aktheransia muciniphila*. People with higher levels of *Aktheransia muciniphila* have better metabolic health, lower blood sugar, and healthier body-fat distributions than those with lower levels.

By inducing these beneficial gut microbiome changes, metformin reduces gut leakiness and lowers levels of circulating toxins that induce inflammation throughout the body—effects that help to reduce inflammation-related insulin resistance and elevated blood-sugar levels.

**Probiotics** are one important means of supporting good gut microbiome balance and overall health. Metformin may be considered along with probiotics as a beneficial, gut microbiome-modulating intervention that can promote intestinal as well as metabolic health.

If you have any questions on the scientific content of this article, please call a Life Extension® Wellness Specialist at 1-866-864-3027.

**References**

Geroprotect® Longevity A.I.™ has been formulated using cutting-edge, artificial intelligence (AI) technology to modulate over 90 anti-aging pathways favorably affected by a calorie-restriction mimetic.

Longevity A.I.™ concentrates three unique geroprotective ingredients in one daily softgel.

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Retail Price    Your Price
1 bottle $56    $42
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Item #02133 • 30 softgels

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Researchers at Harvard Medical School and Cleveland Clinic have been investigating omega-7, a fatty acid with body-wide benefits. Their focus has been on how omega-7 promotes a healthy metabolism.

Provinal® Omega-7 is becoming a popular nutrient used to enhance omega-3s by providing the following systemic effects:

- Increases satiety hormones
- Helps smooth arterial walls
- Supports cardiovascular health
- Supports cellular glucose shuttling
- Supports insulin sensitivity
- Supports healthy triglyceride and cholesterol levels already within normal range

Provincial® Purified Omega-7

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Item #01812 • 30 softgels

For full product description and to order Provincial® Purified Omega-7, call 1-800-544-4440 or visit www.LifeExtension.com

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Super R-Lipoic Acid is more bioavailable, stable, and potent, achieving 10-30 times higher peak blood levels. This unique sodium-R-lipoate can help you reach peak plasma concentrations within just 10-20 minutes of supplementation. Suggested dose is one to two capsules daily.

CAUTION: If you are taking glucose-lowering medication, consult your health care provider before taking this product.

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Wellness Profile

Stephanie Carter is the co-founder of Wallaroo Hat Company, which manufactures sun hats, scarves and turbans that provide maximum protection from harmful ultraviolet rays.

But she’s more than an entrepreneur whose headwear protects people around the world. An attorney and mother of three grown children who lives with her husband in Boulder, Colorado, Carter is also an avid amateur athlete. Lending her products and company name to health campaigns that raise awareness of potentially deadly skin cancers and the steps we can take to prevent them, Carter’s professional life is balanced with daily mind/body fitness training.

Life Extension® quizzed her about her passion for health, wellness, and protecting the skin, the largest organ of the body.

LE: How do you define health?

SC: Health is a mind/body condition that we can support and protect through diet and lifestyle-related behaviors. The basis of my health is my meditation practice, which I do for 20 minutes every morning as soon as I wake up. Sometimes it can be challenging to make time for meditation, but the clarity, stress management and strength that it provides makes it worth the effort. I do an India mantra-based meditation, also known as Vedic meditation.
LE: In addition to being a meditator, you’re also an avid amateur athlete. Were you a very sporty girl?

SC: Growing up in Boulder, Colorado, with three older brothers, I was playing sports all year round. We were all on ski teams when we were young. I skied most every winter weekend throughout my youth. In high school, I was a runner and I also did bike racing.

LE: What are your favorite forms of physical exercise?

SC: I love being outside, so I hike several times a week early in the morning. After I’ve done my morning meditation, I go sunrise hiking on Mount Sanitas with a group of friends who live nearby. We meet at 6 a.m. and power up the steep backside of the mountain, and although the trail is only 3.1 miles roundtrip, it’s quite a workout as the climb involves 1,343 feet of elevation gain. We can usually get up to the top in about 45 minutes.

Between climbing in the fresh air, taking in the view with friends and seeing the beauty of the morning light, it’s totally energizing.

LE: Do you stretch before you hike?

SC: I don’t really have the time to do much stretching so early in the morning, but because I do yoga several times a week, I am limber enough to get moving in the dark!

LE: Tell us about your yoga practice.

SC: Vinyasa flow-style yoga is an integral part of my life, and I first got into it when I was a law student at University of Denver law school. I started to do heated flow yoga classes to release stress and relax my body after long hours of reading, writing and sitting at a desk. Law school felt very stressful, particularly during the second year. Yoga came to my rescue because it helps get you out of your head so that you concentrate on breathing and downshift into mental calm.

From my experience, regularly practicing yoga enhances energy levels and endurance.

I deepened my yoga practice by taking some teacher training courses in India and in Boulder to learn more about the technique behind the poses and to learn their Sanskrit and English names. I do Vinyasa yoga anywhere from three to four times a week at Yoga Pod and CORE Power Yoga, which are two fine studios in Boulder.

LE: With so many fitness-oriented citizens, Boulder is also well known for its supportive yoga and meditation community.

SC: Yes, it’s true. I was an original investor in Boulder’s Hanuman Yoga Festival, which in 2018 is celebrating its seventh year. I am also an owner of the festival, which happens every June in Boulder for four days. The festival is a great cross-cultural gathering uniting people of all ages and walks of life. Along with seminars taught by renowned female and male yogis who are teaching everything from Kundalini yoga to Vinyasa flow yoga, the program features musical performances.

LE: What other forms of exercise do you love to do?

SC: In the winter, I ski since it’s second nature for me. I’m on a tennis team for which I train individually with a pro on some mornings before I go to the office. Besides attending group practices in the evenings and on weekends, I also play in tournaments. I enjoy doing stand-up paddleboarding because it’s a low impact exercise that requires coordinating your mind and body to balance. You are constantly using your strength and endurance to paddle or just stand up straight on the board. While it’s
an excellent core workout, your feet, legs, back, shoulders, arms and neck must work together, so really, your whole body benefits.

Every year, I travel with a group of women friends to Baja California, Mexico, to do stand-up paddleboarding and sea kayaking. We go to the Sea of Cortez and visit beautiful islands such as Isla Carmen and Isla Danzante in the Loreto Bay National Marine Park, a protected marine area that’s home to dolphins, sea turtles, manta rays, sea lions, and whales. We camp, paddle, and snorkel around these islands. You can unplug from your daily life and electronic devices as there is zero cell phone reception there.

**LE:** What are your biggest health challenges?

**SC:** I’ve been getting migraine headaches since I was in college at New York University, where I earned my undergraduate degree in French and Spanish. Although they tend to be triggered by hormonal fluctuations, the migraines are also aggravated by alcohol, especially beer, and caffeine. I find that if I get eight hours of sleep, and stay very well hydrated, I’m far less likely to develop a migraine. A few years ago, my acupuncturist suggested I stop eating gluten to see if that might improve the situation. After eliminating gluten from my diet, my headache symptoms reduced in severity. Although I occasionally get migraines with bad occipital pain behind the eyes, they’re not as bad as they used to be. I take *Ginkgo biloba* for enhanced blood circulation to the brain.

**LE:** Given that you’re so physically active, do you get any regular body work?

**SC:** I get a deep tissue massage every other week for muscle mobility, relaxation, and mental health, because it’s therapeutic for me. It’s also important to get a massage to stimulate blood and lymph flow, which helps to flush toxins out of your system.

**LE:** You’re involved in raising awareness of melanoma and various skin cancers. Why is it so important to be informed about these particular health issues?

**SC:** Because protecting your skin and seeing a dermatologist for a full body exam starting in childhood can possibly save your life, or the lives of your friends and family. Most people diagnosed with melanoma are Caucasian men older than 50. Almost one million people in the U.S. have the disease.

It needs to be said that melanoma is not just a skin cancer. In fact, it can develop anywhere on the body: eyes, scalp, nails, feet, mouth, etc.

According to the melanoma.org website: “In 2018, over 178,000 Americans are expected to be diagnosed with melanoma. Of these, approximately 91,000 will be diagnosed with invasive (Stage I, II, III or IV) melanoma and another 87,000 will be diagnosed with melanoma in situ (Stage 0).” Many people are unaware that melanoma is the top cause of cancer death in women ages 25 to 30, and the second most common cause of cancer death in women ages 30 to 35.

**Stephanie’s Supplements**

Carter consumes a morning smoothie drink that’s mixed with 8 grams of dietary fiber and 15 grams of soy or whey protein. This powder also contains Vitamin A, Vitamin B complex, Vitamin C, Vitamin D, Vitamin E, Vitamin K, and Riboflavin. “I take probiotics and antioxidants in varying dosages, plus calcium and magnesium citrate supplement and vitamin C complex, a fish oil supplement and glucosamine and chondroitin sulfate in order to help with joint soreness. It’s good for nourishing cartilage.”
LE: U.S. government figures state that the incidence of people under 30 with melanoma is rising faster than any other age group and has risen by 50% in women since 1980, while about 500 American children are diagnosed with the disease each year. Tell me about how you and your company partners are educating the public about melanoma and skin cancer prevention.

SC: My business, The Wallaroo Hat Company, was founded in 1999, mainly to provide people with stylish hats that will provide maximum sun protection and protection from ultraviolet radiation. We partner with the Melanoma Research Foundation (www.melanoma.org), which is based in Washington, D.C., in addition to other nonprofit community organizations devoted to skin cancer prevention. The Melanoma Research Foundation sponsors running races at Universal Studios every year, and we donate to their silent auction. Recently we made a line of turbans and scarves that we donated to the American Cancer Society, and we also donate products to the University of Virginia where they do skin-cancer screenings.

LE: So what type of hat do you recommend people wear? Is there a minimum brim width?

SC: A wide-brimmed (3-inch or greater) hat covers places where it is difficult to apply sunscreen, such as the scalp and tops of the ears, plus the back of the neck. A tightly woven hat will shade your face and protect the delicate internal structures of the eyes from ultraviolet UVA and UVB rays while also preventing you from squinting in the sun. Wide-brimmed hats and sunscreen provide ideal protection. Baseball caps are not recommended as they offer relatively little protection for the nose, cheeks, tops of the ears, etc.

LE: Is there some kind of internationally recognized and certified rating system?

SC: Wear a hat that has at least a three-inch brim and is certified UPF 50+ by the Skin Cancer Foundation. UPF is a concept that was standardized in Australia in 1999, and while the initials stand for Ultraviolet Protection Factor, the number indicates what percentage of the sun’s ultraviolet rays can penetrate a fabric. This means that a hat or garment with a UPF of 50 allows just 1/50th of the sun’s UV radiation to reach the skin.

LE: What creates the UPF? Is the fabric embedded with chemicals?

SC: UPF is determined by the density of the weave of the fabric and it is this density that creates the UV protection. There are no chemicals involved in UPF. While wearing a hat is your #1 defense against damaging ultraviolet rays, it’s also important to wear sunglasses and sunscreen, even while driving, because light reflects off sidewalks, snow and roads. And while car windows and glass filter out the kind of radiation known as UVB rays, it allows UVA rays to penetrate. It’s a sunny world. Wear a hat!

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Stephanie Carter’s Wallaroo Hat Company can be accessed online at https://wallaroohats.com

If you have any questions on the scientific content of this article, please call a Life Extension® Wellness Specialist at 1-866-864-3027.
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Consumers often spend hundreds of dollars on just one pair of so-called “designer” sunglasses. Life Extension® supporters can obtain superior protection against damaging solar radiation at a fraction of the price of commercially sold sunglasses.

SolarShield® sunglasses are recognized as the number-one doctor-recommended sunglasses in the world, with more than 50 million pairs sold to date. Patented SolarShield® sunglasses with durable polycarbonate lenses and 100% UV protection fit comfortably over prescription eyewear, providing convenient protection from the harmful effects of ultraviolet radiation.

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Compare this low price to sunglasses sold in stores and see savings exceeding 90%!

For full product description and to order SolarShield® sunglasses, call 1-800-544-4440 or visit www.LifeExtension.com.
Enjoy the Outdoors with Broad-Spectrum Shade Factor™ Sun Protection

Shade Factor™ Mineral Sunscreen Lotion contains sunscreen agents to block damaging UV rays AND botanical ingredients to help reduce early skin aging. Its unique formula makes it a great choice for those seeking a safe and effective irritation-free lotion.

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Shade Factor™ Sunscreen Spray is transparent on the skin and easy to apply. It provides broad-spectrum UV protection along with botanical ingredients in a cooling mist.

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For full product description and to order Shade Factor™ Lotion or Spray, call 1-800-544-4440 or visit www.LifeExtension.com
Wrinkling, dryness, and loss of firmness are outward signs of normal aging.

One reason is loss of ceramides that are required for skin to retain its moisture and youthful suppleness.

**Skin Restoring Ceramides** contains wheat-derived ceramide lipids in an oral capsule that hydrate the skin and smooth the appearance of fine lines and wrinkles.

For full product description and to order *Skin Restoring Ceramides*, call 1-800-544-4440 or visit [www.LifeExtension.com](http://www.LifeExtension.com).

Contains wheat. Gluten free.

Ceratiq® is a registered jointTrademark of PLT Health Solutions and Arco, Robertet group, France.

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Dr. Sandra Kaufmann
The Science of Slowing Aging

Sandra Kaufmann, M.D., is Chief of Pediatric Anesthesiology at Joe DiMaggio Children’s Hospital in Hollywood, Fla.

The 49-year-old married mother of two is also an athlete who enjoys running, swimming, and rock climbing. When she hit her mid-40s, Kaufmann decided she didn’t want to succumb to the ravages of time and began exploring ways to fight back against what has always been the inevitable decline of aging.

Armed with years of higher education that not only included her medical degrees but also a masters in ecology and evolutionary biology with an emphasis on cellular plasticity under changing environmental conditions, she scrutinized thousands of scientific studies on hundreds of potentially anti-aging substances.

The results are detailed in her new book, *The Kaufmann Protocol: Why We Age and How to Stop It*, available in e-book form from Amazon.com. In it, she describes the mechanisms of aging on a cellular level and the best substances to retard its progress.

*Life Extension®* caught up with Dr. Kaufmann a few days before she headed off on an expedition to the base camp of Mount Everest.
LE: It seems ironic that a children's doctor should become an expert in aging.

SK: I appreciate the irony but, on the other hand, spending so much time with kids serves to remind me that the clock is always ticking.

LE: How is your book different from the many other anti-aging books and programs on the market?

SK: My book is not about diet and exercise, and has little mention of carbohydrates or ketones. It doesn't include anything about colonic cleansing or any other fad or exotic treatment to prevent aging. My book is based solely on how to maintain cellular health. We are made of cells, and we age because our cells age. You have to look inside the cells, which is what I have done.

LE: What are the mechanics of aging?

SK: Aging consists of seven categories of things that happen to your cells. No. 1: Changes to DNA, including epigenetic modification and telomere length. No. 2: Disruptions in energy production due to mitochondria failure. No. 3: Problems with metabolic pathways, especially the sirtuins, AMPK, and mTOR pathways. No 4: Quality control problems that affect DNA and protein repair. No. 5: Inflammatory issues due to a faulty immune system. No. 6: Not fulfilling the needs of specific cells. No. 7: Incomplete waste management.

To defeat aging, or decelerate the process, you have to take into consideration each of the seven categories.

LE: Are any of those seven categories more important than others?

SK: They are all interrelated and dependent on each other. The ratio of what's important may change over time. For example, when you are young, you have less DNA damage, so the DNA repair mechanisms are less active. As you get older, you have more DNA damage and less capacity to fix it, so that category becomes extraordinarily important. I separated the categories to explain the process. But in practice they are so interrelated it's virtually impossible to separate them.

LE: What's the basis of the Kaufmann Protocol?

SK: For every anti-aging agent I've identified, I've created a numerical system that rates it on a 0 to 3 scale for each of the seven categories of cell aging in the order I've already listed. For example, resveratrol and its more bioavailable cousin, pterostilbene, hits every category, carrying a Kaufmann Rating score of 2.3.3.2.2 for a total of 15. Carnosine, a dipeptide, has a Kaufmann Rating of 0.3.0.0.0.3 for six points.

LE: How does epigenetic modification come into play?

SK: Epigenetics is genetic control on top of your DNA. Every cell carries the same information, but the information you needed as a neonate you may not need as an adult. As the needs change, the methylation pattern of the DNA changes, blocking your body from transcribing that information. It's a control mechanism. You also have epigenetic drift, which is how the environment affects the methylation patterns. Chronic inflammation from things like chemical pollution, alcohol, smoking and UV light causes a negative methylation drift that can lead to aging and cancer. There are also beneficial epigenetic modifiers, such as sulforaphane, resveratrol and curcumin. So you can affect your genes positively by eating good things.

LE: How about telomeres?

SK: Telomeres are the ends of DNA that don't code for anything but act as protective caps. Every time a cell divides, you lose a length of telomeres, on average 50 to 70 base pairs a year. When you lose too much length, the cells can no longer divide. They become senescent, which is the equivalent of a grumpy old man sitting in the corner being obnoxious by spewing out evil cytokines and interleukins and making everything systemically inflamed.

LE: So how do you protect DNA?

SK: The best agents I've found are sulforaphanes, which you find in broccoli and other cruciferous vegetables; the medicinal plant astragalus; and the diabetes drug metformin.

LE: Why do you include a prescription diabetes drug in your protocol?

SK: I tried to include only things that anyone can easily buy, but metformin was too good to pass up. I call it the Clark Kent of the drug world because it looks old and stodgy but is actually Superman. It is an epigenetic modifier that induces genome-wide methylation and stimulates telomere length. It activates endogenous antioxidants to protect mitochondria from oxidative stress. It's an anti-inflammatory, boosts the formation of new nerve cells and, of course, reduces blood glucose. It is amazing in almost every category. One study...
said that metformin has saved more people from cancer than anything else. That's because it lowers both sugar and inflammation, two risk factors for cancer. It also promotes better gut bacteria. It's cheap as dirt and the only common side effect seems to be a bit of indigestion in some people. I think everybody should be taking it whether they have diabetes or not.

LE: What are metabolic pathways and how do they influence aging?

SK: The discovery of metabolic pathways came about from scientists trying to figure out why a calorie-restricted diet increased longevity in organisms pretty much across the board. When the body thinks it is starving, it triggers innumerable processes including turning metabolic pathways on and off. There are many pathways, and new ones being discovered all the time, but the big three are gene/protein combinations called AMPK, sirtuins and mTOR. AMPK is called the body's "metabolic master switch," and it maintains energy homeostasis by regulating the energy flow. There are seven members of the sirtuin family, and they sense the environment and alter the metabolism to promote survival. In part, they accomplish this by activating AMPK. The sirtuin family is dependent on the coenzyme NAD⁺ (nicotinamide adenine dinucleotide), which our bodies produce less of as we age. mTOR (mammalian or mechanistic target of rapamycin regulates growth and development, which is great when you are young. But as you age, excess mTOR activity contributes to inflammation and its numerous problems.

LE: Moving on to mitochondria... why do you call these little power stations "a necessary evil?"

SK: A long, long time ago, mitochondria were their own energy-efficient little cells that became engulfed by bigger cells and, eventually, semi-autonomous organelles within those cells. They're a victim of history because they evolved when oxygen was very rare, and now it's not rare. So mitochondria find themselves extremely vulnerable to free radicals. Mitochondria use oxygen, but get destroyed by it. The more they work, the more they damage themselves. It's kind of sad. Mitochondria make their own endogenous antioxidants, but over time can't make enough. Fortunately, there are several things that can help them out: astaxanthin, curcumin, quercetin, resveratrol or pterostilbene, and nicotinamide. When too many mitochondria are damaged, energy production drops, which affects all of the other categories and is why old people tend to feel tired a lot.

LE: Why is waste management so important?

SK: When you combine excess glucose and oxidative stress, you get advanced glycation end products, known by the wonderful acronym AGEs. AGEs age you because glucose is sticky and gums up the works of everything it latches onto, including DNA and proteins, eventually causing structural failure and dysfunction. It's why our arteries stiffen and skin sags. But several agents can either strip away AGEs or inhibit their formation. Some of the best are carnosine, curcumin, pyridoxamine (a form of vitamin B6), rosmarinic acid and our old friend metformin.

LE: You include 14 anti-aging "molecular agents" in your book. Do people have to take them all?

SK: The more the merrier. Although they may overlap to some degree, the biology is very complex and they sometimes work on different elements of the same problem. To start out, I recommend five agents that can be bought by anyone and touch all of the bases. I call them The Panacea. They all excel at supporting mitochondria, so the regime should give you an energy boost.

Resveratrol and pterostilbene score in every category but do especially well with metabolic pathways and DNA and protein repair. Astaxanthin is a super antioxidant that scavenges free radicals and acts as an anti-inflammatory. NAD (in the form of nicotinamide riboside) is a multitasker that is essential in activating the sirtuin pathways and is also vital in DNA repair. Curcumin, a molecule found in the spice turmeric, is another powerful antioxidant that is also an epigenetic modifier. Carnosine is one of my favorites because of its ability to block AGEs formation. It acts like the body's janitor in cleaning up the waste. Along with these agents, I also recommend that everyone take a good multivitamin because people suffer from micronutrient deficiencies and we don't want to starve our cells from the raw materials they need. Traditionally, we treat diseases. My protocol is designed to avoid diseases. I think this is the way the world will be going eventually.
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Scientists have discovered that quercetin, a compound found in certain foods, can safely remove tired, aging (senescent) cells from the body,\(^1\) thereby making room for younger, more vital cells.

A number of studies suggest that quercetin may slow aging and reduce the risk of age-related factors.\(^2,3\)

### Optimized Quercetin

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Italian cuisine is usually not thought of as health food, associated as it is with pizza, pasta, lasagna, and rich, creamy deserts. But the fact is that vegetables are what make up the backbone of dishes in Italy, largely due to the immense richness of that country’s harvest.

Vegetables From an Italian Garden is a cookbook that focuses on that fact. Compiled from a number of Italian cookbooks going back to 1950, the editors note that “Markets all over the country are stocked with spectacular and colorful displays of tomatoes, bell peppers, globe artichokes, broccoli, fennel bulbs, asparagus, chicory, carrots, eggplants—whatever is in season.”

Accordingly, recipes in the cookbook are arranged into four categories featuring the vegetables that flourish in each season of the year. And it’s worth noting that many of these meals hew closely to the Mediterranean diet, famed for its associations with heart health and longevity.

We’ve selected a sampling of four recipes from among the many in Vegetables From an Italian Garden that are healthy as well as delicious.

—Garry Messick
Cannellini Bean and Spinach Salad With Mustard
(Insalata di Cannellini e Spinaci Alla Senape)

Preparation time: 5 min. • Cooking time: 20 min. • Serves 4

- 2 tablespoons Dijon mustard
- 3 tablespoons red wine vinegar
- scant ½ cup olive oil
- 6 shallots, finely chopped
- 1 ¼ pounds canned cannellini beans, drained and rinsed
- 2 tablespoons chopped thyme
- 2 tablespoons chopped parsley
- 5 ½ cups chopped spinach
- salt and pepper

Combine the mustard and vinegar in a bowl and set aside. Reserve 2 tablespoons of the olive oil and heat the remainder in a wide pan. Add the shallots and cook over low heat, stirring occasionally, for 5 minutes, until softened and translucent. Stir in the cannellini beans and add the mustard-flavored vinegar and reserved olive oil. Season with salt and pepper and add the thyme, parsley, and spinach. Cook, stirring continuously, until the spinach has wilted, then remove from the heat, Serve immediately.

Artichokes With Olive Oil and Garlic
(Carciofi in Casseruola all’Aglio e Olio)

Preparation time: 30 min. • Cooking time: 40 min. • Serves 4

- juice of 1 lemon, strained
- 8 globe artichokes
- olive oil
- 2 cloves garlic, peeled
- salt and pepper

Fill a bowl halfway with water and stir in the lemon juice. Trim the artichoke stems, remove any coarse leaves and the chokes, and cut off the tips of the remaining leaves, then add the artichokes immediately to the acidulated water to prevent discoloration. Drain and pack them tightly into a tall, narrow, pan. Pour in water to come halfway up the artichokes, measuring how much you add. Then add half as much olive oil and garlic, and season with salt and pepper. (The liquid should come three-quarters of the way up the artichokes.) Cover and cook over low heat for about 40 minutes, until the artichokes are tender and almost all the water has been absorbed. Remove from the heat and serve immediately.
Lettuce, Avocado, and Pepper Salad  
(Insalata di Lattuga, Avocado e peperoni)

Preparation Time: 15 min. • Serves 4

- 1 large lettuce heart
- 1 ripe avocado
- juice of ½ lemon, strained
- 5 tablespoons olive oil
- 2 teaspoons strong mustard
- 1 small red bell pepper, seeded and julienned
- salt

Separate the lettuce leaves. Peel and halve the avocado, remove and discard the pit, and thinly slice the flesh. Sprinkle the slices with lemon juice to prevent discoloration. Whisk together the olive oil, mustard, and a pinch of salt in a bowl. Put the lettuce leaves, bell pepper, and avocado slices on a serving dish, pour over the dressing, and serve.

Molise Celery  
(Sedano alla Molisana)

Preparation time: 15 min. • Cooking time: 15 min. • Serves 4

- 2 tablespoons olive oil, plus extra for brushing
- 1 head celery, trimmed and sliced
- 8 scallions, thinly sliced
- 1 scant cup pitted black olives
- 3 tablespoons bread crumbs
- salt and pepper

Preheat the oven to 400° F. Brush an ovenproof dish with olive oil. Bring a pan of salted water to a boil. Add the celery and cook for 10 minutes, then drain, turn into a bowl, and let cool slightly. Meanwhile, heat the oil and 1 tablespoon of water in a pan, add the scallions, and cook over low heat for 5 minutes, until softened, then season with salt and pepper. Put the celery into the prepared dish, top with the scallions and olives, sprinkle with the bread crumbs, and bake for 15 minutes.
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- Rich in distinctive and fruity flavor,
- Documented to have an exceptionally high content of potent polyphenols.

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PQQ (pyrroloquinoline quinone) activates genes involved in the production of cellular energy.\(^1\)\(^5\)

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Chia Seeds

BY GARRY MESSICK

Native to southern Mexico and Central America, chia is a flowering plant that is part of the mint family.

Chia seeds are a popular food, particularly in the south-west U.S. and western areas of Mexico and South America. Historical evidence shows the ancient Aztecs and the Mayans consumed chia seeds as a source of energy, and modern science has uncovered a number of other health benefits for this tasty snack.

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The scientists found that, compared with wheat bran, the chia seeds conferred benefits beyond what was expected from conventional therapy alone, including lower systolic blood pressure and lower C-reactive protein, a marker of inflammation.

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Researchers have found that, just as the ancient Aztecs and Mayans believed, chia seeds work well as energy boosters.

A study comparing sports performance in strenuous events lasting 90 minutes found no statistical difference between subjects who consumed chia seeds and those who ingested typical high-carbohydrate energy drinks.4

The researchers suggested that substituting chia seeds in this manner could allow athletes to reduce their sugar intake.

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<td>MALE LIFE EXTENSION PANEL (LC322582)</td>
<td>$269</td>
<td></td>
</tr>
<tr>
<td>CBC/Chemistry Profile</td>
<td>DHEA-S • PSA (prostate-specific antigen)</td>
<td>Homocysteine • C-Reactive Protein (high-sensitivity) • Apolipoprotein B (ApoB) Free Testosterone • Total Testosterone • Estradiol • TSH for thyroid function • Vitamin D (25-hydroxyvitamin D) • Hemoglobin A1c</td>
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<tr>
<td>MALE ELITE PANEL (LC100016)*</td>
<td>$575</td>
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<tr>
<td>CBC/Chemistry Profile</td>
<td>Free and Total Testosterone • Total Estrogens Estradiol • DHEA-S • Progesterone • Pregnenolone • DHT • FSH • LH • TSH Free T3 • Free T4 • Reverse T3 • Free and Total PSA • IGF-1 • SHBG • HbA1c Vitamin D 25-OH • hs-CRP • ferritin • Homocysteine • Hemoglobin A1c Apolipoprotein B (ApoB)</td>
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<tr>
<td>MALE COMPREHENSIVE HORMONE PANEL (LC100010)*</td>
<td>$299</td>
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<tr>
<td>CBC/Chemistry Profile</td>
<td>DHEA-S, Estradiol • DHT • PSA Pregnenolone • Total and Free Testosterone • SHBG • TSH • Free T3 This panel now includes Free T4 and Cortisol with no increase in price!</td>
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<tr>
<td>MALE BASIC HORMONE PANEL (LC100012)</td>
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<td>CBC/Chemistry Profile</td>
<td>DHEA-S • Estradiol • Total and Free Testosterone • PSA</td>
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<td>FEMALE LIFE EXTENSION PANEL (LC322535)</td>
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<tr>
<td>CBC/Chemistry Profile</td>
<td>DHEA-S • Estradiol • Homocysteine C-Reactive Protein (high-sensitivity) • Progesterone • Free Testosterone Total Testosterone • TSH for thyroid function • Apolipoprotein B (ApoB) Vitamin D (25-hydroxyvitamin D) • Hemoglobin A1c</td>
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<td>FEMALE ELITE PANEL (LC100017)*</td>
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<td>CBC/Chemistry Profile</td>
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<tr>
<td>FEMALE COMPREHENSIVE HORMONE PANEL (LC100011)*</td>
<td>$299</td>
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<tr>
<td>CBC/Chemistry Profile</td>
<td>DHEA-S, Estradiol • Total Estrogens Progesterone • Pregnenolone • Total and Free Testosterone • SHBG • TSH • Free T3 This panel now includes Free T4 and Cortisol with no increase in price!</td>
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<tr>
<td>FEMALE BASIC HORMONE PANEL (LC100013)</td>
<td>$75</td>
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<tr>
<td>CBC/Chemistry Profile</td>
<td>DHEA-S • Estradiol • Total and Free Testosterone • Progesterone</td>
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<tr>
<td>NMR LIPOPROFILE® (LC123810)</td>
<td>$99</td>
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<tr>
<td>The NMR Lipoprobe® directly measures LDL particle size and number as well as HDL particle number, total cholesterol, and triglycerides. It also provides a calculation of one's risk of insulin resistance by assessing abnormalities in lipoprotein markers.</td>
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<td>WEIGHT LOSS PANEL-COMPREHENSIVE (LC100028)</td>
<td>$275</td>
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<tr>
<td>CBC/Chemistry Profile</td>
<td>DHEA-S • Free and Total Testosterone • Estradiol Progesterone • Cortisol, TSH • Free T3 • Free T4 • Reverse T3 • Insulin Hemoglobin A1c • Vitamin D 25-hydroxy • C-reactive protein (high sensitivity) Ferritin</td>
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<tr>
<td>HEALTHY AGING PANEL-COMPREHENSIVE (LC100026)*</td>
<td>$249</td>
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<td>CBC/Chemistry Profile</td>
<td>Vitamin B12 • Folate • Homocysteine • Vitamin D 25-hydroxy • Hemoglobin A1c TSH • Free T3 • Free T4 • Ferritin • Urinalysis • Fibrinogen • Insulin</td>
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<tr>
<td>ADRENAL STRESS PROFILE — SALIVA (LC100070) **</td>
<td>$159</td>
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<td>Check your red flags of adrenal imbalance. This panel contains Cortisol (x4), DHEA, SlgA.</td>
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<tr>
<td>SIBO HOME BREATH KIT (LACTULOSE) (LC100063) **</td>
<td>$249</td>
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<tr>
<td>SIBO stands for small intestinal bacterial overgrowth. Research shows that up to 70% or more of those diagnosed with IBS have SIBO.</td>
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<td>COMPREHENSIVE THYROID PANEL (LC100018)</td>
<td>$199</td>
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<td>TSH, Total T4, Free T4, Free T3, Reverse T3, Thyroglobulin Antibody (ATA), Thyroid Peroxidase Antibody (TPO)</td>
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<tr>
<td>THYROID PANEL WITH REVERSE T3 (LC100044)</td>
<td>$120</td>
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<tr>
<td>TSH, Total T4, Free T4, Free T3, Reverse T3</td>
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<tr>
<td>OMEGA-3 INDEX COMPLETE ** (LC100066)</td>
<td>$99</td>
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<tr>
<td>Beneficial for everyone taking omega-3/fish oil! You want to target a range of 8%-12% for optimal health.</td>
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</tr>
</tbody>
</table>

With Your Healthy Rewards, you earn LE Dollars back on every purchase you make — including blood tests! See www.LifeExtension.com/Rewards for details.

Blood tests available in the continental United States only. Restrictions apply in NY, NJ, RI, and MA. Not available in Maryland. Kits not available in Pennsylvania.
**Amino Acids**
- Arginine & Ornithine Capsules
- Arginine Ornithine Powder
- Branch Chain Amino Acids
- DL-Phenylalanine Capsules
- L-Arginine Caps
- L-Carnitine
- L-Glutamine
- L-Glutamine Powder
- L-Lysine
- L-Taurine Powder
- L-Tyrosine Powder
- Super Carnosine
- Taurine

**Blood Pressure & Vascular Support**
- Advanced Olive Leaf Vascular Support with Celery Seed Extract
- Arterial Protect
- Blood Pressure Monitor Arm Cuff
- Endothelial Defense® with Pomegranate Complete and CORDIART™
- Endothelial Defense™ with GliSODin®
- Optimal BP Management
- NitroVasc with CORDIART™
- Pomegranate Complete
- Pomegranate Fruit Extract
- Triple Action Blood Pressure AM/PM
- VenoFlow™

**Bone Health**
- Bone Restore
- Bone Restore-Sugar Free
- Bone Restore with Vitamin K2
- Bone Strength Formula with KoAct®
- Bone-Up™
- Calcium Citrate with Vitamin D
- Dr. Strum's Intensive Bone Formula
- Strontium Caps

**Brain Health**
- Acetyl-L-Carnitine
- Acetyl-L-Carnitine Arginate
- Blasta™
- Brain Shield® Gastrodin
- Cognitex® Basics
- Cognitex® with Brain Shield®
- Cognitex® with Pregnenolone & Brain Shield®
- Cognizin® CDP-Choline Caps
- DMAE Bitartrate (dimethylaminoethanol)
- Dopa-Mind™
- Focus Tea™
- Ginkgo Biloba Certified Extract™
- Huperzine A
- Lecithin Granules
- Memory Protect
- Migra-Eeze™
- Neuro-Mag® Magnesium L-Threonate
- Optimized Ashwagandha Extract
- PS (Phosphatidylserine) Caps
- Vinpocetine

**Cholesterol Management**
- Advanced Lipid Control
- Cho-Less™
- CHOL-Support™
- Red Yeast Rice
- Thealflavins Standardized Extract
- Vitamin B3 Niacin Capsules

**Digestion Support**
- Digest RC®
- Effervescent Vitamin C - Magnesium Crystals
- Enhanced Super Digestive Enzymes
- Enhanced Super Digestive Enzymes W/Probiotics
- Esophaguard
- Esophaguard Guardian
- Extraordinary Enzymes
- Gastro-Ease™

**Energy Management**
- Ginger Force®
- Pancreat
- Regimin
- Tranquil Tract™
- Trufiber™
- WellBetX PGX plus Mulberry

**Eye Health**
- Astaxanthin with Phospholipids
- Brite Eyes III
- Certified European Bilberry Extract
- Eye Pressure Support with Mirtogenol®
- MacuGuard® Ocular Support
- MacuGuard® Ocular Support with Astaxanthin
- Tear Support with MaquiBright™

**Fish Oil & Omegas**
- OMEGA FOUNDATIONS® Clearly EPA/DHA
- OMEGA FOUNDATIONS® Mega EPA/DHA
- OMEGA FOUNDATIONS® Mega GLA with Sesame Lignans
- OMEGA FOUNDATIONS® Super Omega-3 EPA/DHA with Sesame Lignans & Olive Extract
- OMEGA FOUNDATIONS® Super Omega-3 Plus EPA/DHA with Sesame Lignans, Olive Extract, Krill & Astaxanthin
- OMEGA FOUNDATIONS® Proven™
- Purified Omega-7
- OMEGA FOUNDATIONS® Vegetarian DHA
- Organic Golden Flax Seed

**Food**
- California Estate Extra Virgin Olive Oil
- Kenyan Green Tea Crystal
- Kenyan Purple Tea Crystal
- Rainbow Blend Decaf Ground Coffee
- Rainbow Blend Ground Coffee
- Rainbow Blend Ground Natural Mocha Flavor
- Rainbow Blend Natural Vanilla Flavor
- Rainbow Blend Whole Bean Coffee
- Stevia Sweetener

**Glucose Management**
- ClinSulin® with InSea® and Cromium® 3+
- Glycemic Guard™
- Mega Benfotiamine
- Tri Sugar Shield®

**Heart Health**
- Aspirin (Enteric Coated)
- BioActive Folate & Vitamin B12 Caps
- Cardio Peak™ with Standardized Hawthorn and Arjuna
- Homocysteine Resist
- Optimized Carnitine
- Super Ubiquinol CoQ10
- Super Ubiquinol CoQ10 with PQQ
- Super Ubiquinol CoQ10 with Enhanced Mitochondrial Support™
- Super-Absorbable CoQ10 Ubiquinone with d-Limonene
- TMG Powder
- TMG Liquid Capsules

**Hormone Balance**
- DHEA (Dehydroepiandrosterone)
- Pregnenolone
- Triple Action Cruciferous Vegetable Extract with Resveratrol
- Triple Action Cruciferous Vegetable Extract

**Immune Support**
- AHCC®
- Enhanced Zinc Lozenges
- Immune Modulator with Tirofiban®
- Immune Protect with PARACTIN®
- Immune Seneescence Protection Formula™
- Kinoko® Gold AHCC
- Kinoko® Platinum AHCC
- Kyolic® Garlic Formula 102
- Kyolic® Reserve
- Lactoferin (Apocafolin®) Caps
- N kr Cell Activator™
- Optimized Garlic
- Optimized Quercetin
- Peony Immune
- ProBoost Thymic Protein A
- Reishi Extract Mushroom Complex
- Standardized Cistanche
- Ten Mushroom Formula®
- Zinc Lozenges

**Inflammation Management**
- 5-LOX Inhibitor with AprèsFlex®
- Advanced Bio-Curcumin® with Ginger & Turmerones
- Black Cumin Seed Oil
- Black Cumin Seed Oil with Bio-Curcumin®
- Boswella
- ComfortMax™
- Cytokine Suppres™ with EGCG
- Serrafolinyme
- Specialty-Coated Bromelain
- Super Bio-Curcumin®
- Zyflamed™ Whole Body

**Joint Support**
- Arthro-Immune Joint Support
- Arthromax® Advanced with UC-II® & AprèsFlex®
- Arthromax® Elite
- Bio-Collagen with Patented UC-II®
- Fast-Acting Joint Formula
- Glucosamine/Chondroitin Capsules
- Krill Healthy Joint Formula
- MSM (Methylsulfonylmethané)

**Kidney & Bladder Support**
- Cran-Max® Cranberry Whole Fruit Concentrate
- Optimized Cran-Max® with Ellirose™
- Uric Acid Control
- Water-Soluble Pumpkin Seed Extract

**Liver Health & Detoxification**
- Anti-Alcohol with HepatoProtection Complex
- Calcium D-Glucarate
- Chlorella
- Chlorophyll
- European Milk Thistle
- Glutathione, Cysteine & C
- HepatoPro
- Liver Efficiency Formula
- N-Acetyl-L-Cysteine
- PectaSol® C™
- Silymarin
- SODzyme® with GliSODin® & Wolfberry

**Longevity & Wellness**
- Alpha-Lipoic Acid
- AppleWise Polyphenol Extract
- Berry Complete
- Blueberry Extract
- Blueberry Extract with Pomegranate
- DNA Protection Formula
- Enhanced Berry Complete with Acai
- GEROPROTECT® Ageless Cell™
- GEROPROTECT® Longevity A.I.™
<table>
<thead>
<tr>
<th>Category</th>
<th>Product</th>
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<tbody>
<tr>
<td><strong>Men's Health</strong></td>
<td>Male Vascular Sexual Support</td>
</tr>
<tr>
<td><strong>Minerals</strong></td>
<td>Boron</td>
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<tr>
<td><strong>Miscellaneous</strong></td>
<td>Potassium Iodide</td>
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<tr>
<td><strong>Multivitamins</strong></td>
<td>Children's Formula Life Extension Mix™ Comprehensive Nutrient Packs ADVANCED</td>
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<tr>
<td><strong>Personal Care</strong></td>
<td>Anti-Aging Rejuvenating Scalp Serum</td>
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<tr>
<td><strong>Probiotics</strong></td>
<td>Bifido GI Balance</td>
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<tr>
<td><strong>Skin Care</strong></td>
<td>Adult Bleaching Lotion</td>
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<tr>
<td><strong>Sleep</strong></td>
<td>Bioactive Milk Peptides</td>
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<tr>
<td><strong>Sports Performance</strong></td>
<td>Creatine Capsules</td>
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<td><strong>Weight Management</strong></td>
<td>Optimal Melatonin</td>
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<td>ITEM No.</td>
<td>PRODUCT</td>
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<tr>
<td>01524</td>
<td>ACETYL-L-CARNITINE • 500 mg, 100 veg. caps</td>
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<tr>
<td>01974</td>
<td>ACETYL-L-CARNITINE ARGINATE • 90 veg. caps</td>
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<td>01628</td>
<td>ADRENAL ENERGY FORMULA • 60 veg. caps</td>
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<tr>
<td>01630</td>
<td>ADRENAL ENERGY FORMULA • 120 veg. caps</td>
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<td>01607</td>
<td>ADVANCED APPETITE SUPPRESS • 60 veg. caps</td>
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<td>02012</td>
<td>ADVANCED CORTISOL BALANCE • 30 veg. caps</td>
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<tr>
<td>01828</td>
<td>ADVANCED LIPID CONTROL • 60 veg. caps</td>
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<tr>
<td>00681</td>
<td>AHCC® • 500 mg, 30 caps</td>
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<tr>
<td>24404</td>
<td>AHCC® (KINOKO® PLATINUM) • 750 mg, 60 veg. caps</td>
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<td>29277</td>
<td>AHCC® (KINOKO® GOLD) • 500 mg, 60 veg. caps</td>
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<td>00457</td>
<td>ALPHA-LIPOIC ACID W/BIOTIN • 250 mg, 60 caps</td>
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<td>02207</td>
<td>AMPK METABOLIC ACTIVATOR • 30 veg. tabs</td>
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<tr>
<td>01509</td>
<td>ANTI-ADIPOCYTE FORMULA W/MERATRIM® &amp; INTEGRA LEAN® (Advanced) • 60 veg. caps</td>
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<tr>
<td>02140</td>
<td>ANTI-ALCOHOL W/HEPATOPRO COMPLEX • 60 caps</td>
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<tr>
<td>01625</td>
<td>APPLEWISE 600 mg, 30 veg. caps</td>
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<tr>
<td>01039</td>
<td>ARGININE &amp; ORNITHINE • 500/250, 100 caps</td>
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<tr>
<td>00038</td>
<td>ARGININE/ORNITHINE POWDER • 150 grams</td>
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<tr>
<td>01624</td>
<td>(L)-ARGININE CAPS • 700 mg, 200 veg. caps</td>
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<tr>
<td>02004</td>
<td>ARTERIAL PROTECT • 30 veg. caps</td>
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<tr>
<td>01617</td>
<td>ARTHROMAX® W/HEAFLAVINS &amp; APRÉSFLX® 120 veg. caps</td>
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<tr>
<td>01618</td>
<td>ARTHROMAX® ADVANCED W/UC-II® &amp; APRÉSFLX® 60 caps</td>
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<tr>
<td>02138</td>
<td>ARTHROMAX® ELITE • 30 veg. tablets</td>
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<tr>
<td>01404</td>
<td>ARTHRO-IMMUNE JOINT SUPPORT • 60 veg. caps</td>
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<tr>
<td>01533</td>
<td>ASCORBYL PALMITATE • 500 mg, 100 veg. caps</td>
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<tr>
<td>00888</td>
<td>ASHWAGANDHA EXTRACT (Optimized) • 60 veg. caps</td>
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<tr>
<td>01805</td>
<td>ASIAN ENERGY BOOST • 90 veg. caps</td>
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<tr>
<td>01666</td>
<td>ASPRIN • 81 mg, 300 enteric coated tablets</td>
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<tr>
<td>01923</td>
<td>ASTAXANTHIN WITH PHOSPHOLIPIDS • 4 mg, 30 softgels</td>
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**SUBTOTAL OF COLUMN 1**

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<tr>
<th>ITEM No.</th>
<th>PRODUCT</th>
<th>1 Unit Each</th>
<th>4 Unit Each</th>
<th>10 Unit Each</th>
<th>QTY Total</th>
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<tbody>
<tr>
<td>01945</td>
<td>B-COMPLEX (Bio-Active Complete) • 60 veg. caps</td>
<td>12.00</td>
<td>9.00</td>
<td>8.00</td>
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<tr>
<td>00920</td>
<td>BENEFOTIAMINE W/ THIAMINE • 100 mg, 120 veg. caps</td>
<td>19.95</td>
<td>14.96</td>
<td>13.95</td>
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<tr>
<td>00925</td>
<td>BENEFOTIAMINE (Mega) • 250 mg, 120 veg. caps</td>
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<td>22.50</td>
<td>20.25</td>
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<tr>
<td>01206</td>
<td>BERRY COMPLETE • 30 veg. caps</td>
<td>21.00</td>
<td>15.75</td>
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<tr>
<td>01496</td>
<td>BERRY COMPLETE (Enhanced) • 60 veg. caps</td>
<td>29.00</td>
<td>21.75</td>
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<tr>
<td>00664</td>
<td>BETA-CAROTENE • 25,000 IU, 100 softgels</td>
<td>11.75</td>
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<tr>
<td>01622</td>
<td>BIFIDO GI BALANCE • 60 veg. caps</td>
<td>20.00</td>
<td>15.00</td>
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<td>01873</td>
<td>BILBERRY EXTRACT • 100 mg, 90 veg. caps</td>
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<td>01512</td>
<td>BIOACTIVE MILK PEPTIDES • 30 caps</td>
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<td>13.50</td>
<td>12.00</td>
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<tr>
<td>01631</td>
<td>BIO-COLLAGEN W/PATENTED UC-II® • 40 mg, 60 small caps</td>
<td>36.00</td>
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<tr>
<td>01006</td>
<td>BIOSIL® • 5 mg, 30 veg. caps</td>
<td>19.99</td>
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<tr>
<td>01007</td>
<td>BIOSIL™ • 1 fl oz</td>
<td>31.99</td>
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<tr>
<td>00102</td>
<td>BION • 600 mcg, 100 caps</td>
<td>7.58</td>
<td>5.63</td>
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**SUBTOTAL OF COLUMN 2**
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<th>ITEM No.</th>
<th>PRODUCT</th>
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<tr>
<td>01896</td>
<td>COGNITEX® • W/BRAND SHIELD • 90 softgels</td>
<td>60.00</td>
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<tr>
<td>01897</td>
<td>SUPER-ABSORBABLE COQ10 • 90 softgels</td>
<td>62.00</td>
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<tr>
<td>01421</td>
<td>COGNITEX® BASIC • 60 softgels</td>
<td>38.00</td>
</tr>
<tr>
<td>01659</td>
<td>COGNIZIN® CDP-CHOLINE CAPS • 250 mg, 60 veg. caps</td>
<td>36.00</td>
</tr>
<tr>
<td>02202</td>
<td>COMFORTMAX™ • 30 day supply</td>
<td>44.00</td>
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<tr>
<td>01945</td>
<td>COMPLETE B-COMPLEX (BioActive) • 60 veg. caps</td>
<td>12.00</td>
</tr>
<tr>
<td>02298</td>
<td>COMPREHENSIVE NUTRIENT PACKS ADVANCED • 30 packs</td>
<td>90.00</td>
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<tr>
<td>01949</td>
<td>COQ10 W/4-LIMONENE (Super-Absorbable) • 50 mg, 60 softgels</td>
<td>25.00</td>
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<tr>
<td>01951</td>
<td>COQ10 W/4-LIMONENE (Super-Absorbable) • 100 mg, 60 softgels</td>
<td>30.00</td>
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<tr>
<td>01929</td>
<td>COQ10 (Super Ubiquinol) • 100 mg, 60 softgels</td>
<td>56.00</td>
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<tr>
<td>01733</td>
<td>COQ10 W/POQ (Super Ubiquinol) • 100 mg, 30 softgels</td>
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<tr>
<td>01437</td>
<td>COQ10 W/EHN MITOCHONDRIAL SUPPORT™ (Super Ubiquinol) • 100 mg, 30 softgels</td>
<td>33.00</td>
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<tr>
<td>01426</td>
<td>COQ10 W/EHN MITOCHONDRIAL SUPPORT™ (Super Ubiquinol) • 100 mg, 60 softgels</td>
<td>62.00</td>
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<tr>
<td>01425</td>
<td>COQ10 W/EHN MITOCHONDRIAL SUPPORT™ (Super Ubiquinol) • 50 mg, 100 softgels</td>
<td>58.00</td>
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<tr>
<td>01427</td>
<td>COQ10 W/EHN MITOCHONDRIAL SUPPORT™ (Super Ubiquinol) • 200 mg, 30 softgels</td>
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<td>CRAN-MAX® • 500 mg, 60 veg. caps</td>
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<td>CRAN-MAX® WITH ELLIROSE® (Optimized) • 60 veg. caps</td>
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<td>CREATINE CAPSULES • 120 caps</td>
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<td>00467</td>
<td>CURCUMIN® (Super Bio) • 400 mg, 30 veg. caps</td>
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<td>DHEA COMPLETE</td>
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<td>7-KETO® DHEA METABOLITE • 25 mg, 100 caps</td>
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<td>7-KETO® DHEA METABOLITE • 100 mg, 60 veg. caps</td>
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<td>DHA (Vegetarian) • 30 veg. softgels</td>
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<td>DHEA • 25 mg, 100 tablets (Dissolve in mouth)</td>
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<td>DHEA COMPLETE • 60 veg. caps</td>
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<td>DHEA • 100 mg, 60 veg. caps</td>
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**TO ORDER CALL: 1.954.766.8433 or 1.800.544.4440**

**TO ORDER ONLINE VISIT: www.LifeExtension.com**

**SUBTOTAL OF COLUMN 3**

**SUBTOTAL OF COLUMN 4**

**RECEIVE 25% OFF THE RETAIL PRICE OF ALL PRODUCTS**

**SEPTEMBER 2018**
<table>
<thead>
<tr>
<th>ITEM No.</th>
<th>PRODUCT</th>
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<td>02021</td>
<td>DIGESTIVE ENZYMES (Enhanced Super) • 60 veg. caps</td>
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<td>DIGESTIVE ENZYMES W/PROBIOTICS (Enhanced Super) • 60 veg. caps</td>
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<td>D, L-PHENYLALANINE • 500 mg, 100 veg. caps</td>
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<td>DMAE BITARTRATE • 150 mg, 200 veg. caps</td>
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<td>DNA PROTECTION FORMULA • 30 veg. caps</td>
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<td>DOG MIX • 100 grams powder</td>
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<td>DOPA-MIND™ • 60 veg. tabs</td>
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<td>00321</td>
<td>DR. PROCTOR’S ADVANCED HAIR FORMULA • 2 oz</td>
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<td>DR. PROCTOR’S HAIR SHAMPOO • 8 oz</td>
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<td>ENDOHELIAL DEFENSE™ W/POMEGRANATE COMPLETE AND CORDIARY • 60 veg. caps</td>
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<td>EPA/DHA (Mega) • 120 softgels</td>
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<td>ESOPHACOOL™ • 60 chewable tablets</td>
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<td>ESOPHAGEAL GUARDIAN (Berry flavor) • 60 chewable tablets</td>
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<td>EXTRAORDINARY ENZYMES • 60 caps</td>
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<td>(CALIFORNIA ESTATE) EXTRA VIRGIN OLIVE OIL • 500 ml (16.9 fl. oz.)</td>
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<td>FAST-ACTING JOINT FORMULA • 30 caps</td>
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<td>FAST-C™ W/DIHYDROQUERCETIN • 120 veg. tabs</td>
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<td>FEMMENESSENCE MACAPAUSE® • 60 softgels</td>
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<td>FLORASSIST® IMMUNE HEALTH • 30 caps</td>
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<td>FLORASSIST® NASAL • 30 veg. caps</td>
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<td>FLORASSIST™ PREBIOTIC • Strawberry flavor, 60 chewable tabs</td>
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<td>FLORASSIST® THROAT HEALTH • 30 lozenges</td>
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<td>FOCUS TEA™ • Spearmint flavor, 14 stick packs</td>
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<td>FOLATE HIGH POTENCY (Optimized) • 5,000 mcg, 30 veg. tablets</td>
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<td>FOLATE (Optimized) • 1,000 mcg, 100 veg. tablets</td>
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<td>01842</td>
<td>FOLATE + VITAMIN B12 (BioActive) • 90 veg. caps</td>
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<td>FORSKOLIN • 10 mg, 60 veg. caps</td>
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<td>FUCOIDAN W/MARITECH® 926 (Optimized) • 60 veg. caps</td>
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<td>GAMMA E MIXED TOCOPHEROL/TOCOTRIENOLS • 60 softgels</td>
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<td>GAMMA E MIXED TOCOPHEROL WHAMNEDIC SESAME LIGNANS • 60 softgels</td>
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<td>01394</td>
<td>GARLIC (Optimized) • 200 veg. caps</td>
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**SUBTOTAL OF COLUMN 5**

**SUBTOTAL OF COLUMN 6**
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<td>LIFE EXTENSION MIX (W/ XTRA NIAIN) • 240 tablets</td>
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<td>LIFE EXTENSION MIX • 360 caps</td>
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<td>LIFE EXTENSION MIX POWDER • 12.70 oz</td>
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<td>5-LOX INHIBITOR W/APRÈSFLEX • 100 mg, 60 veg. caps</td>
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<td>L-LYSINE • 620 mg, 100 veg. caps</td>
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<td>00455</td>
<td>LYCOPENE (Mega) • 15 mg, 90 softgels</td>
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<td>MACUGUARD (OCULAR SUPPORT W/SAFFRON) • 60 softgels</td>
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<td>MACUGUARD (OCULAR SUPPORT W/SAFFRON &amp; ASTAXANTHIN) • 60 softgels</td>
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<td>MAGNESIUM CAPS • 500 mg, 100 veg. caps</td>
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<td>MAGNESIUM (CITRATE) • 160 mg, 100 veg. caps</td>
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<td>(EXTEND-RELEASE) MAGNESIUM • 60 mg caps</td>
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<td>MALE VASCULAR SEXUAL SUPPORT • 30 veg. caps</td>
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<td>MEDITERRANEAN TRIM WITH SINETROL (Xpur) • 60 veg. caps</td>
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<td>MEDITERRANEAN WHOLE FOOD BLEND • 90 veg. caps</td>
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<td>MELATONIN • 300 mcg, 100 veg. caps</td>
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<td>MELATONIN • 10 mg, 60 veg. caps</td>
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<td>MELATONIN IR/IXR • 60 caps</td>
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<td>MELATONIN TIMED RELEASE • 300 mcg, 100 veg. tabs</td>
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<td>MELATONIN TIMED RELEASE • 750 mcg, 60 veg. tablets</td>
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<td>MELATONIN TIMED RELEASE • 3 mg, 60 veg. tabs</td>
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<td>MEMORY PROTECT • 36 day supply</td>
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<td>METHYLCALAMIN • 1 mg, 60 veg. lozenges (vanilla)</td>
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<td>METHYLCALAMIN • 5 mg, 60 veg. lozenges (vanilla)</td>
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<td>MIGRA-EZZE (butterbur) • 60 softgels</td>
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<td>MILK THISTLE (European) • 60 veg. caps</td>
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<td>MILK THISTLE (European) • 120 softgels</td>
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<td>MIRAFORTE W/STANDARDIZED LIGNANS (Super) • 120 veg. caps</td>
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<td>MITOCONDRIAL BASICS W/POQ • 30 caps</td>
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<td>MITOCONDRIAL ENERGY OPTIMIZER W/POQ • 120 caps</td>
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<td>MK-7 • 90 mcg, 60 softgels</td>
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<td>0541</td>
<td>PROGESTA-CARE* • 4 oz cream</td>
<td>$36.39 E 27.29</td>
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<td>PROSTATE FORMULA (Ultra) • 60 softgels</td>
<td>$38.00 E 28.50</td>
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<td>PROSTAPOLLEN™ (Triple strength) • 30 softgels</td>
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<td>PROTEIN CONCENTRATE (Whey) Chocolate • 640 gram</td>
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<td>PROTEIN CONCENTRATE (Whey) Vanilla • 500 grams</td>
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<td>PROTEIN ISOLATE (Advanced Whey) Vanilla • 454 grams</td>
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<td>0224</td>
<td>PROTEIN ISOLATE (Whey) Chocolate • 437 grams</td>
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<td>PROTEIN ISOLATE (Whey) Vanilla • 403 grams</td>
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<td>PROTEIN (PLANT) COMPLETE &amp; AMINO ACID COMPLEX • 15.87 oz</td>
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<td>PROVINAL® • PURIFIED OMEGA-7 • 30 softgels</td>
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<td>PS CAPS (Phosphatidylethanolamine) • 100 mg, 100 veg. caps</td>
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<td>PUMPKIN SEED EXTRACT (Water-soluble) • 60 veg. caps</td>
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<td>PYCNOGENOL® FRENCH MARITIME PINE BARK EXTRACT • 100 mg, 60 veg. caps</td>
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<td>PYRIDOXAL 5'-PHOSPHATE • 100 mg, 60 veg. caps</td>
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<td>QUERCETIN (Optimized) • 250 mg, 60 veg. caps</td>
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<td>RAINFOREST BLEND GROUND COFFEE • 12 oz. bag</td>
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<td>RAINFOREST BLEND GROUND COFFEE Natural Mocha • 12 oz. bag</td>
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<td>RAINFOREST BLEND WHOLE BEAN COFFEE 12 oz. bag</td>
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<td>RED YEAST RICE (Bluebonnet) • 600 mg, 60 veg. caps</td>
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<td>REGIMINT • 60 enteric-coated caps</td>
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<td>REISHI EXTRACT MUSHROOM COMPLEX • 60 veg. caps</td>
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<td>REJUVENEX® BODY LOTION • 6 fl. oz.</td>
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<td>REJUVENEX® FACTOR FIRMING SERUM • 1.7 oz.</td>
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<td>REJUVENIGHT® (Ultra) • 2 oz</td>
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<td>0220</td>
<td>RESVERATROL • 100 mg, 60 veg. caps</td>
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<td>0223</td>
<td>RESVERATROL (Optimized) • 60 veg. caps</td>
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<td>RHODIOLA EXTRACT • 250 mg, 60 veg. caps</td>
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<td>0190</td>
<td>RIBOGEN® FRENCH OAK WOOD EXTRACT 200 mg, 30 veg. caps</td>
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<td>0092</td>
<td>(D) RIBOSE POWDER • 150 grams</td>
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<td>(D) RIBOSE TABLETS • 100 veg. tabs</td>
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<td>0128</td>
<td>R-LIPOIC ACID (Super) • 240 mg, 60 veg. caps</td>
<td>$49.00 E 36.75</td>
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<td>0070</td>
<td>RNA CAPSULES • 500 mg, 100 caps</td>
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<td>Saffron W/SATIEREAL® (Optimized) • 60 veg. caps</td>
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<td>0215</td>
<td>SAMe (5-Adenosyl-Methionine) 200 mg, 30 enteric coated tablets</td>
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<td>SAMe (5-Adenosyl-Methionine) 400 mg, 30 enteric coated tablets</td>
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**SUBTOTAL OF COLUMN 9**

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<tr>
<td>0217</td>
<td>SAE (5-Adenosyl-Methionine) 400 mg, 60 enteric coated tablets</td>
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<td>0174</td>
<td>SEA-IODINE™ • 1,000 mcg, 60 veg. caps</td>
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<td>0187</td>
<td>SE-METHYL L-SELENOCYSTINE • 200 mcg, 90 veg. caps</td>
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<td>0038</td>
<td>SERRAFLASYME® • 100 tablets</td>
<td>$18.00 E 13.50</td>
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<td>0162</td>
<td>SEX FOR WOMEN 50+ (Enhanced) • 90 veg. caps</td>
<td>$59.00 E 44.25</td>
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<td>0193</td>
<td>SHADE FACTOR™ • 120 veg. caps</td>
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<td>SHADE FACTOR™ SUNSCREEN LOTION • 4 fl. oz</td>
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<td>0218</td>
<td>SHADE FACTOR™ SUNSCREEN SPRAY • 6 fl. oz</td>
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<td>SILIMENTIN • 100 mg, 90 veg. caps</td>
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<td>0129</td>
<td>SKIN CARE COLLECTION ANTI-AGING SERUM • 1.75 fl. oz</td>
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<td>SKIN CARE COLLECTION BODY LOTION • 6 oz</td>
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<td>SKIN CARE COLLECTION DAY CREAM • 1.65 oz</td>
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<td>0131</td>
<td>SKIN CARE COLLECTION NIGHT CREAM • 1.65 oz</td>
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<td>SKIN RESTORING CERAMIDES 30 liquid veg. caps</td>
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<td>SLEEP (Quiet) • 60 veg. caps</td>
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<td>0145</td>
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<td>SLEEP W/MELATONIN (Enhanced) • 30 caps</td>
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<td>SLEEP W/O MELATONIN (Enhanced) • 30 caps</td>
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<td>SODZYM® W/GLISODIN® &amp; WOLFBERRY® • 90 veg. caps</td>
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<td>0067</td>
<td>SOLARSHIELD® SUNGLASSES • Smoke color</td>
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<td>SOY EXTRACT (Ultra) • 150 veg. caps</td>
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<td>SOY ISOLFLAVONES (Super Absorbable) • 60 veg. caps</td>
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<td>STEVIA® (Better) • 100 packets, 1 gram each</td>
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<td>STEVIA® ORGANIC LIQUID SWEETENER (Better) • 2 oz</td>
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<td>STRESS RELIEF (Enhanced) • 30 veg. caps</td>
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<td>STRONTIUM • 750 mg, 90 veg. caps</td>
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<td>SUPER SELENIUM COMPLEX • 200 mg, 100 veg. caps</td>
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**SUBTOTAL OF COLUMN 10**
### RECEIVE 25% OFF THE RETAIL PRICE OF ALL PRODUCTS

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<td>TRIPLE ACTION CRUCIFEROUS VEGETABLE EXTRACT W/RESVERATROL • 60 veg caps</td>
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<td>VITAMIN B3 NIACIN • 500 mg, 100 caps</td>
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<td>VITAMIN B6 • 250 mg, 100 veg caps</td>
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<td>VITAMIN B12 • 500 mcg, 100 lozenges</td>
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<td>VITAMIN C W/DIHYDROQUERCETIN • 1,000 mg, 60 veg tablets</td>
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<td>VITAMIN C POWDER (Buffered) • 454 grams</td>
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<td>VITAMIN C-MAGNESIUM CRYSTALS (Effervescent) • 180 grams</td>
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<td>VITAMIN D3 • 2,000 IU, 1 fl. oz, Mint flavor</td>
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<td>VITAMIN D3 LIQUID • 2,000 IU, 1 fl. oz</td>
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<td>VITAMINS D AND K W/SEA-IODINE™ • 60 caps</td>
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<td>VITAMIN E (Super) • 400 IU, 90 softgels</td>
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<td>VITAMIN K2 (Low dose) • 45 mcg, 90 softgels</td>
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<td>XYLJWHITE™ MOUTH WASH • 16 oz</td>
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</table>

### SUBTOTAL OF COLUMN 11

**These products are not 25% off retail price.**

**Due to license restrictions, this product is not for sale to customers outside of the USA.**

***Due to license restrictions, this product is not for sale to customers outside of the USA.***

† Due to license restrictions, this product is not for sale to customers outside of the USA and Canada.

†† These products are not 25% off retail price. Due to license restrictions this product is not for sale to customers outside of the USA.

### SUBTOTAL OF COLUMN 12

**Not sure exactly which supplements you need?**

Talk to a Wellness Specialist toll-free at 1-800-226-2370

**SEPTEMBER 2018**
## ORDER SUBTOTALS

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<thead>
<tr>
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<th>SUBTOTAL COLUMN 3</th>
<th>SUBTOTAL COLUMN 4</th>
<th>SUBTOTAL COLUMN 5</th>
<th>SUBTOTAL COLUMN 6</th>
<th>SUBTOTAL COLUMN 7</th>
<th>SUBTOTAL COLUMN 8</th>
<th>SUBTOTAL COLUMN 9</th>
<th>SUBTOTAL COLUMN 10</th>
<th>SUBTOTAL COLUMN 11</th>
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## ORDER TOTALS

**SUBTOTAL OF COLUMNS 1 - 12**

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<th>POSTAGE &amp; HANDLING</th>
<th>C.O.D.s (ADD $7 FOR C.O.D. ORDERS)</th>
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<th><strong>GRAND TOTAL</strong></th>
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<tbody>
<tr>
<td>(Any size order, in the U.S. includes Alaska &amp; Hawaii)</td>
<td><strong>$5.50</strong></td>
<td><strong>UPS OVERNIGHT add $16, UPS 2nd DAY AIR add $7. For Puerto Rico, US Virgin Islands, add $7; CANADA UPS EXPRESS flat rate $17.50; UK flat rate $25 USD. ALL OTHER INTERNATIONAL AIR WILL BE ADDED.</strong></td>
<td>(MUST BE IN U.S. DOLLARS)</td>
</tr>
</tbody>
</table>

**FREE** Unlimited Shipping

**4%** Back on Purchases

### ALL YEAR LONG

- **$50 Bonus Credit**
  - Use now or save for later.
- **Worry Free**
  - No auto-enrollment. Cancel anytime.

**Join Premier Today!** Only $49.95 per year.

Visit LifeExtension.com/JoinPremier.

Call 1-888-210-7256 toll-free.

Use code YRX801A.

Premier service is good for a full 12 months from the date of purchase or renewal, and can only be renewed after 6 months from the date of your last Premier purchase or renewal. Redeem LE Dollars to purchase virtually anything we sell, including products, blood tests, sale items, and even shipping fees! At the rate of 1 LE dollar equal to $1 U.S. Dollar at checkout. FREE unlimited standard delivery (3 to 5 business days) to any mailing address within the 50 U.S. states, excluding U.S. territories. Also includes discounts on non-standard shipping and shipping outside of the U.S. International customers can join Premier for $59.95. Enjoy all the rewards of Premier.

### BILL TO ADDRESS

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<tr>
<td>PHONE</td>
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### SHIP TO ADDRESS

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<tr>
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<td>COUNTRY</td>
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<tr>
<td>PHONE</td>
<td>FAX</td>
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</table>

Prices subject to change without notice. Please notify Life Extension of any address change.
With age, our bifidobacteria levels decline to as little as 5%, creating gut imbalance.¹

Increasing bifidobacteria levels enhances digestion and carbohydrate metabolism.

Strawberry flavored FLORASSIST® Prebiotic Chewable, helps restore healthy bifidobacteria levels in as little as 14 days using XOS prebiotic fiber.²

• 1,000 mg of XOS (xylooligosaccharides) per prebiotic chewable.

References

For full product description and to order FLORASSIST® Prebiotic Chewable, call 1-800-544-4440 or visit www.LifeExtension.com

PreticX™ is a trademark of AIDP, Inc.

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
36  **BOOST COQ10’S PROTECTIVE EFFECTS**
Coronary risks are reduced in people with higher levels of CoQ10 and pyridoxal 5'-phosphate. Most readers of this magazine obtain this bioactive form of vitamin B6 in their nutrient formulas.

56  **CALORIE RESTRICTION UPDATE**
Case histories of people following dietary restriction programs reveal remarkable systemic benefits, including optimizing blood glucose, lipids, and blood pressure.

7  **SEPSIS: IS THERE NOW A CURE?**
Each year about 250,000 Americans die from sepsis. Intravenous treatment with vitamin C, hydrocortisone, and vitamin B1 reduces sepsis mortality by a striking 87%.

26  **EXTINGUISH FIRES OF CHRONIC INFLAMMATION**
Chronic inflammation underlies major disorders of aging. Readers of *Life Extension Magazine*® take steps to reduce their inflammatory burden. Gamma-linolenic acid further suppresses inflammation via unique mechanisms.

46  **NEW ROLE OF FOLATE PROTECTS BRAIN CELLS**
By improving gene expression, folate rebalances markers of brain aging and potentially inhibits beta-amyloid plaque involved in Alzheimer’s dementia.

67  **METFORMIN IMPROVES GUT HEALTH**
Research shows that metformin boosts cellular AMPK and increases a unique gut bacterium that rebalances the gut microbiome.