## More Vitamin C

![Image of a slice of orange](Image)

**24 HOURS A DAY**

**PLUS: PAGE 24**

**Nutrients that Combat Joint Discomfort**

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### Feature Articles

<table>
<thead>
<tr>
<th>Page</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Misconceptions about Vitamin C</td>
</tr>
<tr>
<td>24</td>
<td>Enhance Your Joint Mobility</td>
</tr>
<tr>
<td>34</td>
<td>Sage Boosts Short-Term Memory</td>
</tr>
<tr>
<td>44</td>
<td>Whole-Body Impact of Vitamin K</td>
</tr>
<tr>
<td>54</td>
<td>Combat Sore Throats</td>
</tr>
<tr>
<td>63</td>
<td>Boron’s Anti-Cancer Effects</td>
</tr>
<tr>
<td>68</td>
<td>Reduce Atherosclerotic Risk</td>
</tr>
<tr>
<td>77</td>
<td>Taurine Helps Resist Infections</td>
</tr>
</tbody>
</table>
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17 IN THE NEWS
Tea may lower risk of cardiovascular disease; lifestyle + diet changes reduce biological age; melatonin increases survival in men with metastatic prostate cancer; omega-3s linked to fewer migraines.

77 RESEARCH UPDATE: TAURINE
A study finds that taurine metabolites feed beneficial gut microbiota to potentially combat dangerous intestinal bacteria.

7 ON THE COVER
MISCONCEPTIONS ABOUT VITAMIN C
Vitamin C is only partially absorbed at doses above 200 mg and is then rapidly used up.

A liposomal “hydrogel” formula elevates vitamin C blood levels 6.8 times more and provides 24-hour protection with one daily dose.

24 BOOST JOINT MOBILITY AND REDUCE PAIN
In a clinical trial of non-arthritic men and women, two plant extracts improved walking distance and speed, knee range-of-motion, and joint pain.

34 SAGE BOOSTS BRAIN FUNCTION
Older adults taking a sage extract had an approximate 60% better performance in a composite measure of memory and about a 2.5-fold increase in a measure of attention. Results were seen within hours.

44 WHOLE-BODY BENEFITS OF VITAMIN K
Vitamin K has demonstrated multifunctional effects throughout the body to reduce heart disease, build stronger bones, promote brain health, and lower inflammation. A human study published by the American Heart Association shows that higher vitamin K intake lowered risk of cardiovascular disease and hospitalizations.

54 PROBIOTIC HELPS PREVENT STREP THROAT
Strep throat can have complications such as rheumatic heart disease and kidney damage. In human trials, a novel probiotic reduced the incidence of strep throat by 84% in adults and 97% in children.

63 WHAT IS BORON?
The trace mineral boron provides profound anti-cancer effects, in addition to maintaining stronger bones.

68 REDUCE ATHEROSCLEROTIC RISK
New human data further validate how two plant extracts can slow and reverse atherosclerosis.

81 SUPER FOODS
Low-calorie spinach contains calcium, magnesium, iron, vitamin K, nitrates, and lutein. It may help slow cognitive decline, improve blood flow, and protect against age-related blindness.

85 WELLNESS PROFILE
Fitness expert and TV celebrity Jillian Michaels shares her personal health and anti-aging journey, her recommendations for a diet and exercise program, and key ways to age well.
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With each new discovery, the tragic mistakes of the past become brutally apparent.

In the March 2014 issue of Life Extension® Magazine, an article was published titled:

“When Technology Goes in Reverse.”

The article revealed that cardiopulmonary resuscitation was described in the Hebrew scriptures, gained acceptance amongst some medical groups, but then its use stopped and started repeatedly over thousands of years.

It was not until the late 1950s that “revival of dead persons” using chest compression and other techniques became universally accepted.

Even more egregious errors were made in finding a cure for scurvy.

Scurvy was so prevalent that shipowners assumed a 50% death rate from scurvy for their sailors on any long voyage.2

Yet scurvy “cures” were demonstrated many times, but then discredited because of mistakes, such as using boiled lime juice that was devoid of vitamin C.2,3

Dr. Linus Pauling is often considered one of the greatest scientists of all time, having won two undivided Nobel Prizes. Much of what we take for granted today in the field of biochemistry is attributable to Dr. Pauling’s pioneering research.4

Above-ground nuclear bomb testing was halted by virtue of Dr. Pauling’s tireless efforts in alerting the world about the dangers of radioactive fallout.5,6

Forty years after Dr. Pauling persuaded Russia and the United States to ban it, the federal government admitted that 15,000 Americans died of cancer caused by exposure to nuclear bomb fallout.7 In the early 1960s, our government denied this risk and sought to imprison Pauling for his efforts to ban above-ground nuclear testing.6

Linus Pauling’s final mission was to identify the benefits of vitamin C that extend beyond curing scurvy.

Analogous to the persecution Dr. Pauling endured in his efforts to ban nuclear bomb testing, much of what he advocated about vitamin C was ridiculed. Serious mistakes were then made when testing vitamin C in humans.

This editorial brings out new information about optimal use of vitamin C, some originating from what Linus Pauling espoused decades ago.
When one eats processed foods containing nitrosamine precursors (hot dogs, bacon, ham, sausage), vitamin C can help neutralize this carcinogen in the stomach.\(^8,9\)

Beyond this benefit, the purpose of ingesting vitamin C-rich foods and supplements is to achieve consistent levels of vitamin C in the blood.

The challenge is that vitamin C is only partially absorbed at doses above 200 mg and then rapidly utilized throughout the body.

A typical vitamin C supplement provides a few hours of elevated blood levels that then return to baseline.

One way of partially overcoming this obstacle is to take vitamin C several times throughout the day, which creates a compliance issue for most people.

**Figure 1:** The red line on the chart below shows a sharp increase in blood (plasma) vitamin C levels at 200 mg daily dosing. The blue line depicts the smaller additional increases in response to higher vitamin C doses (400-2,500 mg).\(^10\)

For intakes of vitamin C up to 200 mg, 70%-90% of the ingested vitamin C is absorbed as indicated by the plasma levels achieved.

At doses greater than 200 mg, the proportion of absorbed vitamin C decreases.

Therefore, although higher doses (400-2,500 mg) result in greater plasma levels, the proportion of the dose that is absorbed is significantly diminished.

A new formulation overcomes this limitation, resulting in a greater proportion of the vitamin being absorbed and remaining at a higher and sustained blood plasma level throughout the day.

**Higher Doses Only Partially Work**

What some people do is take higher vitamin C doses (1,000-2,500 mg) that provide a slightly longer degree of acting protection.

These higher doses, however, do not increase vitamin C blood levels at the same rate that occurs with the initial 200 mg dose.

To put this in perspective, the body rapidly absorbs the initial 200 mg of vitamin C swallowed, and partially absorbs some of the excess beyond 200 mg. The remainder is removed through the bowels, sometimes in the form of diarrhea.

Some people use high-dose vitamin C powder combined with magnesium and/or potassium as a laxative.

The primary objective, however, is to achieve higher and sustained vitamin C levels in the bloodstream and cells.

**Figure 1** on this page shows vitamin C plasma levels spiking sharply higher with the first 200 mg taken daily, with only modest plasma increases at doses ranging from 400-2,500 mg.
Most Animals Make Their Own Vitamin C—But Humans Don’t!

The need for vitamin C is so critical that most species have a built-in mechanism to internally convert glucose into vitamin C.\(^{11}\)

If you observe gorillas or chimps in the wild or a zoo, you may notice they frequently eat vitamin C-rich fruits/vegetables.

Doing so provides their bodies with a continuous flow of vitamin C.

Humans, guinea pigs and most primates are among the few mammals that cannot produce vitamin C internally\(^{11}\)—it must be obtained from food, supplements, and/or infusions.

If vitamin C is not included in guinea pig chow, they die of scurvy, the same way humans do when they are severely vitamin C deficient.

What are Optimal Vitamin C Doses?

Vitamin C was discovered in the 1920s and first synthesized in 1933.\(^{12}\)

The ability to precisely dose vitamin C enabled scientists to ascertain minimum levels of ascorbate (vitamin C) to eradicate scurvy in modern societies.

Conclusive proof of vitamin C’s efficacy resulted in Hungarian biochemist Albert Szent-Györgyi being awarded the Nobel Prize in Physiology for Medicine in 1937.\(^{13}\)

This breakthrough ended the controversy as to what caused scurvy and the only effective therapy, which is vitamin C.

Hundreds of scurvy treatment attempts were made over many centuries. The cure turned out to be adequate vitamin C, found in most fresh fruits and vegetables.

As knowledge of vitamin C’s other effects arose, lively debates erupted as to how many milligrams of vitamin C are needed to obtain optimal benefits.

The federal government has increased the daily value of vitamin C most Americans should ingest to 75 mg to 90 mg.\(^{14}\) While this dose prevents scurvy, it appears inadequate to fully garner vitamin C’s other lifesaving effects.

Horrors in Those Who Survived

Historic accounts of scurvy reveal it caused some of the worst medical disasters faced by sailors at sea.

A 16\(^{th}\) century surgeon describes his ordeal with scurvy as follows:\(^{2}\)

“It rotted all my gums, which gave out a black and putrid blood. My thighs and lower legs were black and gangrenous, and I was forced to use my knife each day to cut into the flesh in order to release this black and foul blood. I also used my knife on my gums, which were livid and growing over my teeth...

When I had cut away this dead flesh and caused much black blood to flow, I rinsed my mouth and teeth with my urine, rubbing them very hard... And the unfortunate thing was that I could not eat, desiring more to swallow than to chew...

Many of our people died of it every day, and we saw bodies thrown into the sea constantly, three or four at a time.”

If only we could travel back in time to enlighten these sailors that scurvy could be eradicated by ingesting just a few fruits and vegetables.

Our challenge, however, would be the same as it was for others who were ridiculed for showing that citrus protected against scurvy.

Millions needlessly perished from scurvy when the cure was so tantalizingly close.
**Vitamin C Holds Our Body Together**

Our skin, bones, teeth, gums, ligaments, blood vessels, and other body structures are held together by collagen.¹⁵

**Vitamin C** is **required** for continual renewal of collagen throughout our body.¹⁵ I emphasize “required” because our structure literally falls apart without adequate vitamin C.

Vitamin C performs many functions, including promoting immunity and creating certain brain neurotransmitters.¹⁶,¹⁷

But for simplicity’s sake, when one realizes that our body undergoes continuous renewal that is **vitamin C dependent**, the desirability of maintaining sustained ascorbate blood levels throughout the day becomes strikingly apparent.

One of the leading causes of disability and death in the U.S. is cardiovascular disorders.¹⁸

By enhancing collagen synthesis and supporting nitric oxide production, vitamin C offers protection and improves the function of the inner lining of cells in our blood vessels or endothelium.¹⁹

If one looks at virtually all health problems inflicted by aging, be it tooth loss, osteoporosis, atherosclerosis, organ dysfunction, and wrinkled skin, **vitamin C** plays a critical role in a biochemical symphony that sustains our life.²⁰-²⁴

Published data suggest that doses **higher** than the 90 mg a day of vitamin C recommended by the federal government can yield greater benefits.²¹,²⁵,²⁶

**Modern Day Research Mistakes**

Research published in the 1950s showed that taking **500 mg of vitamin C** three times a day for only two to six months, reduced arterial plaques, which are associated with coronary artery disease, in **60%** of human study subjects with atherosclerosis.²⁷

More recent findings have identified specific mechanisms by which vitamin C improves vascular health.²⁶

Yet studies utilizing single daily-dose vitamin C supplements have not always yielded reductions in **heart attack** risk.

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**Figure 2:** A new “hydrogel” liposomal formula yields elevated vitamin C blood levels with once-a-day dosing. It reduces the need for higher doses that cause some people gastrointestinal upset. This graph shows total vitamin C plasma exposure increased almost **seven times** in response to this new hydrogel formula compared to regular vitamin C.²⁸
One obvious reason is that there are over 17 independent risk factors that cause arteries to clog during normal aging. Expecting vitamin C by itself to prevent strokes and heart attacks is irrational.

Another reason why vitamin C has not demonstrated more robust results is that taking a single daily dose provides only limited protection. Within a few hours of ingesting vitamin C, blood levels return to where they were before the supplement was taken.

Up until now, the only way of achieving continuous vitamin C blood levels was to ingest it in food or supplement form throughout the day and night, something that is impractical for most people.

To put this into perspective, most mammals synthesize vitamin C internally 24 hours a day. Humans don’t synthesize any vitamin C.

Perhaps the greatest blunder made in research that seeks to identify vitamin C’s other benefits is dosing it just once or twice daily. This leaves the body with less-than-optimal ascorbate levels throughout most of the day and night.

Figure 3: When looking at the half-life of vitamin C in plasma, taking one capsule daily of a new hydrogel-encased liposomal vitamin C will result in significantly higher vitamin C plasma levels that persist for 24 hours. The chart to the right is a simulated model based on the half-life of vitamin C in blood plasma, precisely measured in a clinical study that compared liposomal hydrogel-encased vitamin C to regular vitamin C.

A Practical Solution

Many of you take supplements several times a day and obtain more consistent vitamin C blood levels compared to people who take a multivitamin just once a day.

Scientists at Life Extension® have spent the past several years searching for ways to formulate a supplement that provides sustained vitamin C blood levels.

We’ve been aware of companies that offer “liposomal” vitamin C supplements. We’ve been unable to validate if they provide long-acting protection.

If you look at figures 2 and 3, a new liposomal “hydrogel” formula not only elevated blood-plasma vitamin C exposure 6.8 times more than regular vitamin C, but it also achieved higher levels over an extended period.

Based on daily use of this novel formula, one can obtain sustained, accumulated higher vitamin C blood levels providing all-day/all-night protection.

Model is based on clinical data from single dose study with 1 gram of liposomal hydrogel providing 350 mg of vitamin C and 1 gram of unformulated vitamin C providing 350 mg of vitamin C.
Look Forward to Future Research Findings

Life Extension® donates supplements to physician-scientists who use them in clinical trials to ascertain efficacy against a wide range of degenerative disorders. In 2021, a study was published using 20 mg melatonin capsules that Life Extension® specially formulated to study on non-small-cell lung cancer patients. We also provided identical-looking placebo capsules for this outside research group.

The box on this page highlights the improved survival in those receiving 20 mg of melatonin compared to placebo.

We look forward to donating this first-of-its kind vitamin C formula to scientists in upcoming trials to see if providing people with 24-hour higher vitamin C blood levels yields greater benefits.

I also look forward to adding this new formulation to my personal program to see if there are improvements in my clinical measures of biological aging.

For longer life,

William Faloon, Co-Founder
Life Extension

References


Daily evening melatonin prolongs survival among patients with advanced non-small-cell lung cancer

• 20 mg melatonin as an adjunctive to standard chemo treatment.
• Reduced risk of death by 39%.
• Individuals with normal baseline sleep had a median survival of 17.6 months with evening melatonin compared to 10.4 months in the placebo group.

Acknowledgments: We would like to thank William Faloon of Life Extension for providing melatonin and placebo for this study.

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In the News

Tea May Protect Against Coronary Artery Disease

A review of randomized trials published in the journal Clinical Nutrition ESPEN, concluded that regular intake of green tea and its active components may help reduce the risk of cardiovascular disease.*

Among the effects revealed by the trials, regular tea consumption was associated with lower blood pressure and enhanced bioavailability of nitric oxide, which indicate a beneficial effect for tea on endothelial function. In some studies, tea was associated with lower markers of oxidative stress and inflammation, both of which also suggest improved endothelial function.

Editor’s Note: “The reduction of oxidized low-density lipoprotein and C-reactive protein levels could be a sign of improved endothelial function in individuals at increased risk of developing CVD,” the authors stated.

* Clin Nutr ESPEN. 2021 Feb;41:77-87.
The journal *Aging* published the results of an eight-week randomized clinical trial which resulted in a reduction in biological age among men who participated in lifestyle changes and consumed nutritional supplements.*

In this eight-week diet and lifestyle treatment program, the Horvath **DNA methylation age** (DNAmAge) test was used to assess biological age. This DNAmAge test is considered the most accurate method to assess whether an intervention(s) is slowing or reversing biological aging.

The Horvath DNAmAge clock evaluates DNA methylation patterns as a marker of biological age.

The “Horvath Clock” is named after Steve Horvath, Professor in Human Genetics and Biostatistics researcher at UCLA.

Eighteen men, aged 50 to 72, consumed a plant-based, low carbohydrate diet that included limited animal proteins and was supplemented with a vegetable and fruit powder and a probiotic.

The healthy diet/lifestyle group had scores averaging **1.96 years younger** at the end of the program than at the beginning, while control participants averaged **1.27 years older** at the end.

The difference between the healthy diet/lifestyle group and the controls was **3.23** biological years.

**Editor’s Note:** The lifestyle group was advised to do a minimum of 30 minutes of physical exercise daily and to perform breathing exercises twice daily to reduce stress.

* *Aging (Albany NY)*. 2021 Apr 12;13(7):9419-9432.*
Melatonin Helps Prostate Cancer Patients

Research published in *Oncotarget* found an increase in survival among prostate cancer patients with a poor prognosis who were treated with melatonin, the sleep-promoting hormone.*

For men with a poor prognosis who did not use melatonin, overall survival was **64 months**. For those treated with melatonin it was **153.5 months**. Men who had a favorable or intermediate prognosis did not significantly differ in median overall survival during follow-up.

At a five-year median follow-up, patients who received melatonin had survived an average of **13 months longer** than those who did not receive it.

*Editor’s Note:* The retrospective study included 955 men who received standard treatment for prostate cancer between 2000 and 2019.

Fewer Migraines with Diet Rich in Omega-3 Fatty Acids

Fewer migraine headaches occurred among 182 patients who consumed a diet richer in omega-3 fatty acids than a control group, *The BMJ* reported.*

Participants were given either a high-omega-3 diet that provided 1,500 mg per day EPA and DHA, a high-omega-3/reduced-omega-6 diet, or a control diet that provided average U.S. intakes of EPA and DHA and 7.2% of daily calories from the omega-6 fatty acid linoleic acid for 16 weeks.

Headache frequency declined by **two days** per month in the high-omega-3 diet group and by **four days** in the high-omega-3/reduced-omega-6 group.

**Editor’s Note:** Time spent daily with a headache was lowered by **1.3 hours** in the high-omega-3 group and by **1.7 hours** in the high-omega-3/reduced-omega-6 group.

*BMJ.* 2021;374:n1448.
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BOOST JOINT MOBILITY AND REDUCE JOINT PAIN

BY MICHAEL DOWNEY
Joint pain is common among adults, even those without arthritis.¹

Persistent discomfort makes it difficult to perform day-to-day activities.²⁴ And of course, pain reduces quality of life.

Pain and stiffness can also lead to decreased daily physical activity, which is detrimental to overall health.

Pain relief medications are not designed for long-term use, and often come with side effects.⁵⁶

Scientists have identified two plant extracts that have demonstrated joint-health benefits.

In a trial of people with non-arthritic knee joint pain following exercise, subjects who took the plant extracts were able to walk a remarkable 118 feet farther in six minutes than those taking a placebo.⁷

The plant extract group also had a significant increase in range of motion and reduction in joint pain.⁷
**Joint Pain and Medications**

**Joint pain** can be a symptom indicating underlying inflammation.

In some cases, joint pain and/or inflammation are the result of deteriorating cartilage that covers the ends of the bones where they come together to form joints. In some cases, joint pain and/or inflammation are the result of deteriorating cartilage that covers the ends of the bones where they come together to form joints. Common pain medications can help in the short term, but are proving even more dangerous than previously thought.

A meta-analysis found that ibuprofen (Motrin® or Advil®) can raise heart attack risk by 48% in less than a week. The same analysis found a week of naproxen (Aleve®) use increased heart attack risk by 53% compared to non-users.

Aware of these risks, scientists searched for safe treatment for joint pain. They identified two nutrients that work together to reduce joint stiffness and discomfort.

In a clinical trial, these ingredients allowed patients to walk farther, faster, and with improved knee joint flexibility and range of motion.

**Tamarind Reduces Inflammation**

Researchers identified the leaves and seeds of tamarind as a nutrient for joint health.

This fruit-bearing tree has long been safely used in traditional Indian and African medicine for its anti-inflammatory effects.

Tamarind has also been traditionally used for fever reduction, liver ailments, and digestive support, among other health issues.

Tamarind is rich in procyanidins, a group of polyphenols with antioxidant and anti-inflammatory properties. It also contains the minerals phosphorus, potassium, calcium, and magnesium.

To most effectively target the pain and limitations that often accompany joint aging, scientists combined the anti-inflammatory plant tamarind with an additional compound also known for anti-inflammatory activity.

**Turmeric Limits Inflammation**

The turmeric plant has been used in traditional medicine for almost 4,000 years. Its rhizome, or underground stem, is a rich source of a group of polyphenols called curcuminoids.

The best-known curcuminoid, curcumin, is well-established in the scientific and medical literature as a particularly powerful anti-inflammatory.

One review paper presented data on six human trials and concluded that curcumin was safe and that it has anti-inflammatory activity.

Curcumin is also a free-radical scavenger and can influence the expression of antioxidant enzymes in different cell lines.

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**Turmeric + Tamarind = Joint Pain Relief**
A Rigorous Clinical Trial

Scientists developed a blend of tamarind seed and turmeric rhizome extracts in a 6:3 ratio. A team of researchers from the Netherlands, the U.S., and India tested this blend in a randomized, controlled clinical trial that took place at two sites in India.

The team enlisted healthy, non-arthritic adult volunteers who experienced knee joint discomfort caused by physical activity. Men and women were included, with an average age of 45.

The 90 participants were divided into three groups:

- **Group 1** was given 125 mg of the blend twice daily (total 250 mg daily).
- **Group 2** was given 200 mg of the blend twice daily (total 400 mg daily).
- **Group 3** was given a placebo.

The trial continued for 90 days. To thoroughly assess joint function and pain following exercise, the scientists performed a range of tests:

**Primary Endpoint:**
- Six-Minute Walk Test, which measures distance walked in a six-minute period.

**Secondary Endpoints:**
- Stair-Climb Test, timing how long it takes to walk up and down nine steps,
- Visual Analog Scale, in which participants rate how much pain they’re experiencing,
- WOMAC Scale (Western Ontario and McMaster Universities Arthritis Index), which consists of 24 questions assessing pain, stiffness, and physical functioning, and
- Range-of-Motion Knee Flexion, which evaluates the mobility of the knee.

**Easing Pain and Boosting Function**

*Every outcome measured* was improved by taking the tamarind-turmeric blend.

As far as the study’s secondary endpoints, on the WOMAC and Visual Analog scales, treated participants reported significant improvement in both pain relief and musculoskeletal functions compared to those taking a placebo.

The physical functions evaluated by the WOMAC Scale included normal daily activities such as shopping, doing domestic chores, using stairs, rising from sitting, bending, getting in or out of a car, putting on socks, and others.

Taking tamarind and curcumin improved the ability to perform these daily functions.

The Stair-Climb Test further confirmed that those taking the blend were able to go up and down steps in less time.

Results of the study’s primary outcome, the Six-Minute Walk test, were even more impressive.
Greater Distance Walked

The Six-Minute Walk Test showed that both treatment groups increased their walking distance in just 14 days. By that time, both groups outperformed the placebo group in distance walked.

By 90 days, the subjects who took 400 mg of the blend daily were able, in six minutes, to walk:

- 40 feet farther than those who took 250 mg daily, and
- 118 feet farther than the placebo group.

Compared to the distance walked before treatment began, the distance walked after 90 days of treatment increased by:

- 7.4% for the group taking 250 mg daily, and
- 10.4% for the group taking 400 mg daily.

Improved Walking Speed

Both treatment groups also increased their walking speed over the first 60 days and maintained this higher speed at the end of 90 days:

- The volunteers taking 250 mg daily increased their average walking speed by 0.18 mph, and
- The volunteers taking 400 mg daily increased their average walking speed by 0.25 mph (a 10% improvement), from 2.5 mph to 2.75 mph.

These are not minor improvements. In one study of men over age 70, scientists noted that there were no deaths during a 53.9-month period among those who could walk about 3.0 mph. The same study found that, in those men, the ability to walk faster than 1.8 mph was associated with a 23% reduced risk of dying.

Wider Range-of-Motion

Another important assessment of joint improvement was range of motion.

The Range-of-Motion Knee Flexion test measures the angle in degrees that the knee can be bent away from a straightened position.

At the end of the study, participants who supplemented with the plant extract blend daily showed up to a 4.34% improvement in knee flexion from baseline. The placebo group showed a mere 0.82% improvement. This represents more than five-times greater improvement in the tamarind-turmeric group!

The authors of this study concluded that this tamarind-turmeric blend substantially relieved knee pain after exercise and improved joint function in non-arthritic adults.
Working Together

Inflammation is often a key factor in joint pain and stiffness.

There are two key enzymes involved with inflammation:

- The enzyme 5-LOX (5-lipoxygenase) transforms arachidonic acid into pro-inflammatory compounds known as leukotrienes, and
- The enzyme COX2 (cyclooxygenase 2) transforms arachidonic acid into pro-inflammatory mediators such as prostaglandin E2.

Tamarind and turmeric inhibit these two enzymes involved in the production of inflammatory compounds.\textsuperscript{10,16-19}

The clinical study described earlier showed that a blend of tamarind and turmeric extracts significantly increased range of motion and reduced joint pain in people with non-arthritis knee joint pain following exercise.\textsuperscript{7}

The blend also delivers antioxidants that help to protect joint cells and tissues.

Together, this blend can significantly improve walking speed, functional limitations, and joint range-of-motion and pain.

Resolving Inflammation After It Has Developed

Tamarind and turmeric extracts inhibit inflammation before it can contribute to joint pain.\textsuperscript{7}

But research has shown that resolving inflammation after it has flared up may be just as important.\textsuperscript{20,21}

Scientists have identified compounds produced in the body that help resolve inflammation, returning inflamed tissues to their healthy state. They are known as pro-resolving mediators or PRMs.

PRMs are a family of naturally occurring lipid mediators, sometimes also referred to as Specialized Pro-resolving Mediators (SPMs).

For years, it has been known that omega-3 fatty acids found in fish oil have anti-inflammatory properties, but it was not fully understood why.

As it turns out, PRMs are fat- or lipid-based compounds. They are produced from oily substances, including the omega-3 fatty acids found in fish oils (such as DHA and EPA).

Adequate intake of these omega-3s is required for the production of adequate levels of PRMs in the body.

To optimally resolve inflammation, higher amounts of PRMs than may be available from fish oil alone can be considered.

Scientists demonstrated that taking an enriched fish oil supplement containing omega-3 plus a combination of PRM precursors, including 18-HEPE, 17-HDHA, and 14-HDHA was effective at raising blood levels of PRMs.\textsuperscript{22}

Taking PRM precursors in addition to anti-inflammatory compounds may be the best way to put an end to harmful, ongoing inflammation.
Summary

Joint stiffness and pain can limit physical activity and reduce quality of life.

One of the factors involved in many cases of joint pain is inflammation.

Deteriorating joint cartilage combined with inflammation are other common causes of joint pain.

Scientists have combined extracts of two plants, tamarind and turmeric, long known for their anti-inflammatory effects.

A clinical trial of non-arthritic men and women demonstrated a remarkable improvement in functional abilities such as walking distance and speed, knee range-of-motion, as well as joint pain, all within 90 days.

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

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SAGE
Boosts Memory and More

BY CHANCELLOR FALOON
Sage is an herb being studied for its brain-boosting effects in human adults.\(^1\)

But not all sage is the same.

European scientists have identified a form of sage with benefits that go beyond traditional sage extracts.

In one clinical study, healthy, older adults taking this sage extract had an approximate 60% better performance in a composite measure of memory, compared to those who received placebo.

This study also demonstrated an approximate 2.5-fold enhanced performance in a composite measure of attention.\(^2\)

These improvements were noted within hours of taking the extract.\(^2\)
Fighting Alzheimer’s Disease

Sage inhibits an enzyme in the brain called acetylcholinesterase.2 This enzyme breaks down acetylcholine, which is a neurotransmitter responsible for memory and motor control.

Sage can also act on proteins used in the creation and repair of brain cells called neurotrophins.3,5

Circulating levels of one neurotrophin, brain-derived neurotrophic factor, are reduced in those with Alzheimer’s disease. An active component of sage (rosmarinic acid), prevented reductions in brain-derived neurotrophic factor in animal studies.6

Lab experiments have shown that rosmarinic acid increases brain-derived neurotrophic factor levels in crucial non-neuronal cells in the brain and spinal cord.6

In a clinical trial, patients with mild-to-moderate Alzheimer’s disease were randomized to receive either sage extract or a placebo. Patients were assessed by a neurologist at baseline and throughout the study.7

After four months of treatment, those who received sage had significantly better scores than the placebo group on two scales used to assess cognitive function.

Brain Benefits for Adults

As we age, our cognitive function tends to decline, even without having dementia.

A clinical study enlisted healthy, older adults to study the effects of sage on their cognitive function. Compared to a placebo, those taking the sage extract had an approximate 60% better performance in a composite measure of memory and an approximate 2.5-fold better performance in a composite measure of attention.2

That improvement was noted just hours after taking the sage extract.

Anti-Aging Potential

Sage has demonstrated impressive results in recent preclinical studies that suggest it could increase lifespan and delay symptoms of aging in humans.

C. elegans is a type of roundworm used to study longevity due to its relative short lifespan.

In one study, worms exposed to a sage extract had an average 12% increase in lifespan.8
Summary

Sage has demonstrated an impressive ability to improve measures of memory and attention in older adults.

Preclinical research suggests that it also has potential to boost longevity and delay symptoms of aging.

Taken with other neuroprotective nutrients, such as phosphatidylserine, blueberry, vinpocetine, pregnenolone, and ashwagandha, it can be part of a comprehensive approach to cognitive and brain 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.

WHAT YOU NEED TO KNOW

Sage’s Impact on the Brain

- Sage has been recognized for its numerous health benefits for centuries.
- European researchers have identified a unique form of sage that improves cognitive function. One clinical trial showed that healthy older adults taking sage extract had an approximate 60% better performance in a composite measure of memory and an approximate 2.5-fold better performance in a composite measure of attention, compared to placebo.²
- Preclinical studies show that sage may increase lifespan.⁵
- Sage extract can help support brain health, especially if taken with other supplements with proven brain benefits.
OTHER NUTRIENTS FOR BRAIN HEALTH

Sage extract is just one of several nutrients known to protect and enhance brain health. Taking it with others that complement its activity may maximize cognitive benefits.

PHOSPHATIDYLSERINE

Phosphatidyserine is a phospholipid component of nerve cell membranes and the myelin sheath that covers and protects nerve cells, including brain cells. The myelin sheath supports the conduction of nerve impulses throughout the nervous system.\textsuperscript{11-13}

Taking phosphatidyserine can help preserve cognitive function and may reduce the structural deterioration in the nervous system that occurs with age. In studies, people who took it scored higher on short-term memory and concentration tests.\textsuperscript{13}

BLUEBERRY

Blueberries are packed with anthocyanins, powerful compounds present in a variety of fruits and vegetables. Anthocyanins exert a broad range of health-promoting effects, including defense against oxidative stress, as well as modulation of gene expression and cell-signaling pathways.\textsuperscript{14}

Recent human trials have demonstrated that blueberries improve memory and other aspects of cognitive performance in older subjects, and boost mood and cognition in children and young adults.\textsuperscript{15-19}

VINPOCETINE

Vinpocetine, a compound derived from the periwinkle plant, has been reported to have benefits for cognition and degenerative disorders of the brain, such as Alzheimer’s and Parkinson’s diseases.

Vinpocetine helps to dilate (widen) blood vessels to the brain, improving blood flow and stimulating brain metabolism.\textsuperscript{20}

PREGNENOLONE

Studies in animals and humans have shown that pregnenolone, a hormone produced by the adrenal gland, appears to be a neuroprotectant, defending the brain from various forms of injury.\textsuperscript{21,22}

It has also been found to have positive effects on mood, memory, and other aspects of cognition.\textsuperscript{23}

ASHWAGANDHA

Ashwagandha is an Indian herb, also referred to as “Indian ginseng.” It has been used in traditional Indian medicine as a nerve tonic for thousands of years.

In modern research, ashwagandha has demonstrated neuroprotective effects and supplementation has resulted in improvements in mood and cognition.\textsuperscript{24,25} One study in patients suffering from mild cognitive impairment found that ashwagandha intake led to improvements in memory, attention, and decision making.\textsuperscript{24}
References


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References

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The Whole-Body Benefits of VITAMIN K

BY PAZ ETCHEVERRY, MS, PHD
Research released in 2021 by the American Heart Association reveals that higher vitamin K intake lowered risk of atherosclerotic cardiovascular disease and hospitalizations.¹

This 2021 study published in the Journal of the American Heart Association¹ corroborates data that have accumulated since the late 1990s showing that vitamin K reduces arterial calcification.²⁻⁶

In addition, vitamin K has also been found to:

• Strengthen bones and reduce fracture risk,
• Lower risk of developing diabetes,
• Promote brain health, and
• Reduce inflammation.

In one study, adults aged 55 and older with the highest intake of vitamin K2 had a 57% lower risk of death from coronary heart disease over 10 years—and a 26% lower risk of death from any cause.⁷

Readers of this publication began supplementing with higher-potency vitamin K in 1999.
What is Vitamin K?

Vitamin K is a fat-soluble vitamin that is required to activate many proteins in the body, known as vitamin K-dependent proteins.

There are two main types of vitamin K.

**Vitamin K1** is present in green leafy vegetables.⁸,⁹ It is best known for its ability to promote healthy blood clotting and prevent abnormal bleeding.¹⁰,¹¹ It works by activating vitamin K-dependent coagulation proteins.

In the U.S., the American Academy of Pediatrics recommends that all newborns receive a vitamin K1 injection shortly after birth to prevent potentially lethal vitamin K deficiency bleeding.¹²

**Vitamin K2** is known as menaquinone and has several subtypes. It plays vital roles in the health of bones, the heart, the brain, the immune system, and more.¹³

Types of Vitamin K2

Vitamin K2 exists in several forms.¹⁴,¹⁵ Among these, menaquinone-4 (MK-4) and menaquinone-7 (MK-7) have received the most attention.

**MK-4** is found mainly in dairy foods like butter, milk, and cheese, and can also be formed by conversion of dietary vitamin K1 (phylloquinone).¹⁶,¹⁷

**MK-7** is primarily present in fermented foods, such as some cheeses, kefir (fermented milk), sauerkraut, and natto (fermented soy). MK-7 can also be produced by bacteria in the intestinal tract.¹⁶,¹⁷

Building Stronger Bones

Vitamin K2 improves bone quality and strength, which may reduce the risk of fractures and hospitalizations.

It does this mainly by activating a vitamin K-dependent protein known as osteocalcin,¹³ which binds to calcium and promotes bone formation.¹⁸,¹⁹

In 2020, Chinese researchers evaluated the effects of vitamin K2 intake on bone mass. The study showed that taking 90 mcg of vitamin K2 daily in the form of MK-7 for one year significantly reduced bone loss in postmenopausal women.²⁰

In another study, healthy Japanese women receiving 1,500 mcg per day of vitamin K2 in the form of MK-4 for four weeks had higher osteocalcin levels than those who received a placebo. The researchers concluded that MK-4 may help maintain bone health in postmenopausal women.²¹

The combined effects of vitamin D and vitamin K2 on bone health may be greater than either vitamin alone. That’s because vitamin D is essential in the expression of vitamin K-dependent proteins such as osteocalcin, while vitamin K2 activates them. Vitamin D also increases the intestinal absorption of calcium, which is then used in bone mineralization by osteocalcin.²²,²³

A clinical study of postmenopausal women confirmed that high dose MK-4 (45,000 mcg) plus vitamin D was more effective at increasing bone mineral density than either MK-4 or vitamin D on its own.²⁴

The use of both vitamins together represents a viable approach to adjunctive osteoporosis treatment.⁹
Protecting the Heart

Vitamin K2 also protects against cardiovascular disease. It activates matrix Gla protein, a vitamin K-dependent protein that helps inhibit calcium from entering soft tissues like arterial walls and forming calcified plaques.\(^{13,25}\)

A study focusing on vitamin K intake in 564 post-menopausal women found that higher dietary intake of vitamin K2 was associated with protection against dangerous calcification of coronary arteries.\(^{26}\) Those with the highest intake had a 20% lower rate of calcification than those with the lowest intake.

And in a study that followed more than 4,800 adults over age 55 for up to 10 years, those with the highest intake of vitamin K2 had a 57% lower rate of death due to coronary heart disease—and a 26% lower rate of death from any cause.\(^7\)

The synergy between vitamin K2 and vitamin D also appears to have benefits for cardiovascular health.\(^{23}\)

A 2015 study evaluated the effects of vitamin K2 on the progression of atherosclerosis in patients with chronic kidney disease. After approximately nine months, those who received 90 mcg of MK-7 plus 400 IU (10 mcg) of vitamin D daily had less progression of atherosclerosis than those who received only vitamin D.\(^{27}\)

WHAT YOU NEED TO KNOW

The Protective Effects of Vitamin K2

- There are two forms of vitamin K: vitamin K1 and vitamin K2.
- Vitamin K1 has been used to safely promote healthy blood clotting for nearly 100 years.
- Vitamin K2 is a multifunctional vitamin that helps build stronger bones and may help prevent diabetes, reduce inflammation, lower body fat, and promote brain health.
- Vitamin K2 has shown particularly strong protective effects against heart disease. In one study, adults with the highest intake of vitamin K2 had a 57% lower risk of death from coronary heart disease—and a 26% lower risk of death from any cause.
- Vitamin K2 appears to work synergistically with vitamin D. Together, they may have greater benefits for bone and heart health, for example, than either does alone.
- MK-4 and MK-7 have been the most frequently studied forms of vitamin K2. Oral intake of both forms, along with vitamin K1, is ideal for optimal health.
After eight weeks, the women who received the combination had higher insulin sensitivity and lower insulin resistance than those who took the placebo—in addition, the combination led to a decrease in triglycerides and VLDL cholesterol. 

Researchers have argued that the dual intake of vitamins D and K might benefit diabetics by regulating insulin secretion from the pancreas and upregulating insulin receptor genes in the body. 

**Brain Benefits**

Vitamin K2 may play a role in helping to prevent neurological diseases. 

MK-4 is the predominant form of vitamin K present in the brain. It appears to be involved in the production of sphingolipids, a group of complex fat molecules that are components of cell membranes and present in the central and peripheral nervous system. These molecules are central to cell growth, structure, and signaling. 

Studies have found that people with Alzheimer’s or Parkinson’s disease have reduced levels of vitamin K2 and potentially harmful changes in sphingolipid metabolism. 

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**Help for Diabetics**

**Vitamin K2** intake may be associated with lower risk of developing type II diabetes and may potentially be helpful for people living with the disease. 

The vitamin’s effects on glucose homeostasis may be due in part to the activation of osteocalcin. In addition to its role in bone mineralization, osteocalcin stimulates healthy insulin and adiponectin expression. 

In healthy young men, taking 30,000 mcg per day of vitamin K2 (MK-4) for four weeks increased insulin sensitivity. Researchers believe that these benefits are in part due to osteocalcin’s actions. 

By improving glucose and lipid metabolism, vitamin K2 may also help reduce body weight. 

Researchers gave postmenopausal women either 180 mcg per day of MK-7 or a placebo. After three years, those who took vitamin K2 and experienced increased circulating levels of activated osteocalcin also had higher levels of adiponectin and decreased abdominal fat mass. 

In another study, researchers gave vitamin D-deficient women with the hormonal disorder polycystic ovary syndrome either a placebo or a combination of calcium (1,000 mg per day), vitamin D (400 IU per day), and vitamin K (180 mcg per day).
The anti-inflammatory properties of vitamin K1 may also benefit brain health. A study published in 2020 in Nutritional Neuroscience concluded that higher dietary vitamin K1 intake among Irish adults was associated with reduced inflammation and improved cognition.\(^{37}\)

**Reducing Damaging Inflammation**

Vitamin K2 has been shown to beneficially modulate the immune system. It inhibits several pathways involved in inflammation and in the release of pro-inflammatory cytokines.\(^{38,39}\)

A clinical study of women with polycystic ovary syndrome showed that oral intake of calcium, vitamin D, and vitamin K2 (MK-7) reduced markers of oxidative stress and inflammation.\(^{40}\)

**Summary**

Vitamin K has been shown to provide whole-body health benefits.

MK-4 and MK-7, the two main forms of vitamin K2, play crucial roles in preventing bone loss, protecting the heart, and potentially reducing type II diabetic risk.

These two forms of vitamin K2 (MK-4 and MK-7) may also promote healthy brain function, reduce inflammation, and help reduce vascular calcification. •

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

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**Vitamin K Reduces Atherosclerotic Cardiovascular Disease Risk, Hospitalization**

Research published in 2021 in the *Journal of the American Heart Association*\(^1\) found that people whose diets were higher in vitamins K1 and K2 had significantly lower risk of atherosclerotic cardiovascular disease (ASCVD), and hospitalizations.

Data from 53,372 participants with a median age of 52-60, and no prior ASCVD, were studied for more than two decades.

The individuals completed a food-frequency questionnaire at baseline, from which intakes of vitamins K1 and K2 were estimated, and they were followed up for hospital admissions for ASCVD: ischemic heart disease, ischemic stroke, or peripheral artery disease.

Those people with the highest intakes of vitamin K1 had a 21% lower risk of an ASCVD-related hospitalization compared to those with the lowest intakes. Similarly, for participants with the highest intakes of vitamin K2 the risk was 14% lower than for those who had the lowest intakes.

This lower risk was seen for all types of heart disease related to atherosclerosis. For peripheral artery disease the risk was reduced by 34% for those with the highest intake of vitamin K1.

The authors of the study concluded that these results:

“...highlight the potential importance of vitamin K for atherosclerotic cardiovascular disease prevention.”
THE WHOLE-BODY BENEFITS OF VITAMIN K

References


A Bodyguard for Your Brain

People tend to live longer in areas where lithium is abundant in the drinking water.*

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SILIPHOS® is a registered trademark of Indena S.p.A., Italy.
HEALTHY BONES = HEALTHY HEART

THREE WAYS TO GET VITAMIN K

<table>
<thead>
<tr>
<th>SUPER K</th>
<th>SUPER K ELITE</th>
<th>MEGA VITAMIN K2</th>
</tr>
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<tbody>
<tr>
<td><strong>SUPER K</strong> is the best-selling vitamin K formula for bone and heart health. It costs only <strong>25 cents</strong> a day and provides in one softgel:</td>
<td><strong>Super K Elite</strong> provides 2 additional forms of vitamin K and even <strong>higher</strong> potencies of K1, MK4, and MK7. <strong>Super K Elite</strong> costs <strong>60 cents</strong> a day and provides in one softgel:</td>
<td><strong>Japanese physicians use high-dose vitamin K2 for those with challenges in maintaining healthy bone density. Mega Vitamin K2 costs <strong>95 cents</strong> a day and provides in one daily capsule:</strong></td>
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<tr>
<td><strong>Vitamin K1</strong> 1,500 mcg (converts to K2 in some people)</td>
<td><strong>Vitamin K1</strong> 2,000 mcg (converts to K2 in some people)</td>
<td><strong>Vitamin K2 (MK-4)</strong> 45,000 mcg (for bone &amp; vascular health)</td>
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<td><strong>Vitamin K2 (MK-4)</strong> 1,000 mcg (for bone &amp; vascular health)</td>
<td><strong>Vitamin K2 (MK-4)</strong> 1,500 mcg (for bone &amp; vascular health)</td>
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<tr>
<td><strong>Vitamin K2 (MK-7)</strong> 100 mcg (long-acting protection)</td>
<td><strong>Vitamin K2 (MK-7)</strong> 181 mcg (long-acting protection)</td>
<td><strong>Vitamin K2 (MK-9)</strong> 43 mcg (added cardiovascular support)</td>
</tr>
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</table>

**Vitamin K1** 2,000 mcg (converts to K2 in some people)
**Vitamin K2 (MK-4)** 1,500 mcg (for bone & vascular health)
**Vitamin K2 (MK-7)** 100 mcg (long-acting protection)
**Vitamin K2 (MK-9)** 43 mcg (added cardiovascular support)

For full product description and to order these VITAMIN K formulas call 1-800-544-4440 or visit www.LifeExtension.com

**CAUTION:** If you are taking a vitamin K antagonist (e.g. warfarin), consult your healthcare practitioner before taking this product.

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A PROBIOTIC HELPS PREVENT STREP THROAT

BY MICHAEL DOWNEY
A sore throat, sudden fever, swollen lymph nodes.

If these symptoms come without a cough and runny nose, you may have strep throat.1,2

Strep throat accounts for up to 15% of sore throat infections in adults and up to 30% in children.

It’s caused by bacteria called Streptococcus pyogenes, also known as group A Streptococcus.3

Researchers in New Zealand identified a probiotic called Streptococcus salivarius that secretes compounds that can control growth of the bacteria that causes strep throat.

Clinical trials have shown that oral intake of this probiotic may safely prevent strep throat.4-9

It can also help protect against tonsillitis caused by the same bacteria.4-9

In one clinical trial, adults who took S. salivarius K12 daily for 90 days had an 84% reduction in their incidence of strep throat or tonsillitis, compared with the previous year.6

In another trial, children who took the probiotic daily for 90 days had a 97% reduction in strep throat compared with the previous year.8

In the same trial, this probiotic also reduced the incidence of viral sore throats by 80%.8
Strep is Serious

Strep throat is marked by a painful sore throat, swollen lymph nodes, and the sudden onset of fever.1,2 Most sore throats, like those associated with a cold, are caused by a virus.10 These cases seldom have dangerous complications and are generally left to run their course.

Strep throat is different. It gets its name from the bacteria that cause it—group A Streptococcus (or S. pyogenes). Strep throat can lead to serious consequences if not treated properly. It may:11

- Spread to surrounding tissues, causing sinus or ear infections,
- Produce a toxin that causes a scarlet fever rash,
- Lead to rheumatic fever, inflaming joints and potentially damaging valves of the heart, and
- Cause kidney inflammation (glomerulonephritis), that can trigger chronic kidney problems.

To avoid these complications, and because strep throat is highly contagious, it may be best to promptly treat it with antibiotics.

But it would be far better to prevent strep throat in the first place.

Scientists have now shown that there is a safe and effective way to help block strep-causing bacteria from taking hold and causing infection.

A Novel Probiotic

A strain of Streptococcus salivarius has the ability to inhibit the growth of bacteria that causes strep throat. Scientists analyzing S. salivarius K12 found that it produces compounds called lantibiotics.12

These peptides (strings of amino acids) inhibit strains of disease-producing bacteria, including group A Streptococcus.12 S. salivarius K12 produces a specific peptide called salivaricin A2 that targets group A Streptococcus to inhibit growth.13-15 This lantibiotic works like a drill, forming holes in the cell walls of the targeted bacteria, causing them to break apart and die.16-18
A PROBIOTIC HELPS PREVENT STREP THROAT

Researchers enlisted adult volunteers with a history of recurrent strep throat or bacterial tonsillitis (caused by the same bacteria) for a clinical trial. All participants were symptom-free at enrollment. They were given either no treatment or a daily lozenge containing probiotic *S. salivarius* K12 organisms for 90 days. The results found:

- Adults who took *S. salivarius* had an 84% reduction in their incidence of strep throat or tonsillitis, compared with the previous year.

- During a six-month, no-treatment follow-up, patients who had taken *S. salivarius* K12 still had a 62% reduction in episodes of strep throat or tonsillitis, compared with the untreated group.

This study demonstrated that preventive probiotic use with *S. salivarius* K12 successfully and significantly reduced the rate of recurrent strep.

**Effective in Children**

Scientists were eager to determine whether this probiotic afforded the same protection to children, who tend to suffer from strep throat more often than adults. A study was conducted on children ages 3-13 years with recurrent strep throat. They were given either a lozenge containing no fewer than one billion colony-forming units of *S. salivarius* K12 or no therapy for 90 days.

Children who took the probiotic had a 97% reduction in strep throat, from an average baseline of 3.1 infections per child in the previous year to just 0.1 per child on average. No significant change was seen in the untreated group.

In addition, children who took *S. salivarius* had an 80% decrease in the incidence of viral throat infections. This reduction may be related to the ability of *S. salivarius* K12 to reduce inflammation and increase levels of antiviral compounds.
Summary

Strep throat is a bacterial infection that afflicts children and adults. It can have dangerous complications, including rheumatic heart disease and kidney damage.

The probiotic strain S. salivarius K12 helps control the growth of bacteria that cause strep throat and may reduce the incidence of the condition itself.

Clinical studies have demonstrated that oral intake of S. salivarius K12 helped prevent strep infections in adults and children.

This probiotic has also shown an ability to confer protection against viral throat infections.

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

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Systemic support for immune function, bone health, and normal blood-sugar levels.

CAUTION: Individuals consuming more than 50 mcg (2000 IU)/day of vitamin D (from diet and supplements) should periodically obtain a serum 25-hydroxy vitamin D measurement. Do not exceed 10000 IU per day unless recommended by your doctor. Vitamin D supplementation is not recommended for individuals with high blood calcium levels.

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References

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Flavored with
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What is Boron?

Boron is a trace mineral found in the earth’s crust and in water. Its importance in human health has been underestimated.

Boron has been shown to have actions against specific types of malignancies, such as:

- **CERVICAL CANCER:** The country Turkey has an extremely low incidence of cervical cancer, and scientists partially attribute this to its **boron-rich** soil.\(^1\) When comparing women who live in boron-rich regions versus boron-poor regions of Turkey, **not a single woman** living in the boron-rich regions had any indication of cervical cancer.\(^2\) (The mean dietary intake of boron for women in this group was **8.41 mg/day**.)

  **Boron** interferes with the life cycle of the **human papillomavirus** (HPV), which is a contributing factor in approximately **95%** of all cervical cancers.\(^1\)

  Considering that HPV viruses are increasingly implicated in **head and neck cancers**,\(^3,4\) supplementation with this ultra-low-cost mineral could have significant benefits in protecting against this malignancy that is increasing in prevalence.

- **LUNG CANCER:** A study conducted at the University of Texas MD Anderson Cancer Center between 1995 and 2005 found that increased **boron intake** was associated with a **lower risk of lung cancer** in postmenopausal women who were taking hormone replacement therapy.\(^5\)

- **PROSTATE CANCER:** Studies point to boron’s ability to inhibit the growth and spread of prostate cancer cells.

  In one study, when mice were exposed to boric acid, their tumors shrank by as much as **38%**.\(^6\) One analysis found that increased dietary boron intake was associated with a **decreased risk of prostate cancer**.\(^7\)
Several human and animal studies have confirmed the important connection between boron and bone health.

Boron prevents calcium loss, while also alleviating the bone problems associated with magnesium and vitamin D deficiency. All of these nutrients help maintain bone density. A study in female rats revealed the harmful effects a deficiency in boron has on bones, including:10

- Decreased bone volume fraction, a measure of bone strength,
- Decreased thickness of the bone’s spongy inner layer, and
- Decreased maximum force needed to break the femur.

And in a study of post-menopausal women, supplementation with 3 mg of boron per day prevented calcium loss and bone demineralization by reducing urinary excretion of both calcium and magnesium.8 In addition to its bone and anticancer benefits, there are nine additional reasons boron is an important trace mineral vital for health and longevity. It has been shown to:1

1. Greatly improve wound healing,
2. Beneficially impact the body’s use of estrogen, testosterone, and vitamin D,
3. Boost magnesium absorption,
4. Reduce levels of inflammatory biomarkers, such as high-sensitivity C-reactive protein (hs-CRP) and tumor necrosis factor α (TNF-α),
5. Raise levels of antioxidant enzymes, such as superoxide dismutase (SOD), catalase, and glutathione peroxidase,
6. Protect against pesticide-induced oxidative stress and heavy-metal toxicity,
7. Improve the brain’s electrical activity, which may explain its benefits for cognitive performance, and short-term memory in the elderly,
8. Influence the formation and activity of key biomolecules, such as S-adenosyl methionine (SAM-e) and nicotinamide adenine dinucleotide (NAD+), and
9. Potentially help ameliorate the adverse effects of traditional chemotherapeutic agents.

Because the amount of boron varies in the soil, based on geographical location, obtaining enough boron through diet alone can be difficult. Supplementing with low-cost boron is an effective way to maintain adequate levels of this overlooked micronutrient.

Most Life Extension® supporters obtain 3 mg to 6 mg of boron in their multi-nutrient supplements. Those who want to supplement with additional boron can affordably do so because the cost is so low (around four pennies a day).

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

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Brite Eyes III provides a well-established lubricant in every drop, soothing eye discomfort without irritation.

N-acetylcarnosine is used as a stabilizing agent.

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Each capsule provides 3 mg of boron divided into three bioavailable different forms:

- Boron citrate
- Boron aspartate
- Boron glycinate

There are 3 mg of boron in the daily dose of each of the following Life Extension® formulas:

- Two-Per-Day
- Bone Restore
- Ultra Prostate Formula
- Life Extension Mix™

The suggested daily dose for most adults is 6-9 mg of boron.1,2 If you are already obtaining this potency in your multi-nutrient formulas, you may not need additional boron.

References

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

BY MICHAEL CORTEZ
Normal aging, along with cardiovascular risk factors, cause a buildup of **plaque** inside **arteries** called **atherosclerosis**.

As these plaques grow, they choke off blood flow.

If they rupture and/or cause a blood clot, a **heart attack** or **stroke** may result.

New **human** data corroborate that two **plant extracts** help control the progression of atherosclerosis and reduce risk of adverse cardiovascular events.¹⁻⁴

In a three-year study, **22%** of control subjects had a major cardiovascular event like a **heart attack** or **stroke**.

In the group taking the **plant extracts** plus low-dose aspirin, less than **4%** suffered a major cardiovascular event.¹

Human studies published in **2020** corroborate these findings.
Atherosclerosis and Cardiovascular Disease

Every year, about 660,000 Americans die from heart disease. Most cardiovascular disease is driven by atherosclerosis, that causes arteries to narrow and reduce blood flow.

Atherosclerotic plaque in the coronary arteries can lead to chest pain, need for stenting or bypass procedures, and/or heart attack.

Atherosclerosis can also cause abnormal blood clots to form inside of arteries.

When a clot blocks a coronary artery, a heart attack results. When an artery supplying blood to the brain is blocked by a clot, it leads to a stroke.

Risk factors for the development of atherosclerosis and cardiovascular disease include:

- Advancing age,
- High blood pressure,
- Abnormal blood lipid levels, including elevated LDL cholesterol, high triglycerides, and low HDL cholesterol,
- Elevated blood glucose,
- Obesity and sedentary lifestyle,
- Poor diet,
- Smoking, and
- Family history of cardiovascular disease.

Two Plant Extracts That Help

Centella asiatica (also known as Gotu Kola) is an herbaceous flowering plant native to Asia. It has been used in traditional medicine for various disorders and to treat wounds. Extracts from the Centella plant contain compounds which have anti-inflammatory properties called triterpenes.

French maritime pine bark extract was first studied more than 50 years ago. Like Centella, it contains antioxidant and anti-inflammatory compounds that promote arterial health.

Fighting Atherosclerosis

Two clinical trials were conducted using Centella asiatica and French maritime pine bark on people with atherosclerosis but no symptoms.

In both studies, researchers separated subjects into a number of groups. Each group received a different treatment including aspirin alone (or a similar medication if aspirin-intolerant), varying doses of French maritime pine bark alone, French maritime pine bark with aspirin, or French maritime pine bark and Centella (100 mg of each daily).

All patients also received standard management care, which included being advised on exercise and diet.

In one of these studies, the patients started with relatively small plaques. Atherosclerotic plaque buildup significantly worsened in the standard management group, the low dose (50 mg daily) of French maritime pine bark group, and aspirin alone group.

In the groups that received 100 mg of French maritime pine bark each day, alone or with aspirin, there was significantly less progression of plaque buildup than in those with only standard management or aspirin alone.

The greatest response was seen with the combination of pine bark and Centella. While 21.3% of plaques of those in the standard management group worsened to a more severe Class V, only 1.1% of plaques worsened in individuals receiving the Centella and French maritime pine bark.
The second trial evaluated advanced Class V plaques that were blocking at least 50% of the diameter of the artery.4

In the standard management group, nearly 50% of subjects progressed to the point of having symptoms during 42 months of follow-up. The rate of progression was 7.4 times lower in the group receiving French maritime pine bark and Centella.

What’s more, 16% of those receiving standard care had a significant cardiovascular event (such as hospitalization for chest pain, heart attack, or stroke), compared to only 4.4% of the combination (French maritime pine bark and Centella) group.

Stabilizing Plaques

A number of other studies have demonstrated the benefits for atherosclerosis of these plant extracts.1,2,10-13

In one study, scientists prescribed 150 mg of French maritime pine bark and 450 mg of Centella daily for patients with asymptomatic complex atherosclerotic plaques and atherosclerosis risk factors (mildly high blood pressure and elevated cholesterol).11

They used a type of ultrasound to evaluate atherosclerotic plaque structure.11 This allowed them to identify which plaques were more stable and less likely to progress or rupture and lead to acute heart attacks.

In patients who received standard management, plaque structure and stability did not change significantly over six months. In those taking the plant extracts, the index of plaque stability doubled, meaning the atherosclerotic plaques were more stable, less likely to form arterial clots, and less likely to acutely rupture.

Plaque thickness, length, and overall number of plaques also decreased significantly in the treatment group. This indicates that French maritime pine bark and Centella can slow the progression of atherosclerosis, even in the presence of risk factors.

Protecting Stented Arteries

Patients with a narrowed or blocked coronary artery often undergo angioplasty and stenting. In this technique, a balloon is used to expand the artery and a metal stent holds it open.

But the diseased artery can continue to progress, and plaque can redevelop over time.

In a year-long study, researchers evaluated whether atherosclerotic plaque progression in stented arteries could be prevented with a French maritime pine bark-Centella blend.10

Subjects with standard management had their plaques progress in almost 60% of cases, but only 9% progressed in people treated with the French maritime pine bark + Centella blend.
New Studies Published in 2020

In 2020, the results of two more trials were published. Both used a combination of 150 mg of French maritime pine bark and 450 mg of Centella daily plus 100 mg of low-dose aspirin.\(^1,2\)

One study followed asymptomatic patients with atherosclerotic plaque over a period of three years.\(^1\)

All subjects received standard management, which included diet, exercise, and lifestyle counseling. One group received no additional treatment, a second took 100 mg/day of aspirin, and a third received the aspirin + French maritime pine bark + Centella extracts.

In subjects who only received standard management, 22% had major cardiovascular events like a heart attack or stroke, requiring hospitalization. Fewer than 4% of those taking the plant extracts + aspirin did.\(^1\)

The progression of plaques was halted in the group receiving the plant extracts, while the plaques in the other two groups worsened.

In the second study, researchers looked at the presence of calcification—calcium deposits that can be associated with more high-risk plaques—in the coronary arteries of asymptomatic individuals.\(^2,14\)

For this study, all subjects received standard diet, exercise, and lifestyle counseling and took 100 mg/ a day of aspirin.

Calcification increased by 35% over 12 months in those with standard management. Those taking the French pine bark + Centella extracts had a 10% reduction in number of calcifications.

Summary

Cardiovascular disease is the leading cause of death in the U.S. It is most often the result of atherosclerosis.

Clinical evidence has found that a combination of French maritime pine bark + Centella asiatica extracts (alone or with aspirin) can significantly slow the development and progression of atherosclerotic plaque. This combination also reduces heart attacks, strokes, and other cardiovascular events associated with atherosclerosis and heart disease. ●

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

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13. Luzzi R, Belcaro G, Ippolito E. Carotid plaque stabilization induced by the supplement association Pycnogenol(R) and centella asiatica (Centellicum(R)). Minerva Cardioangiol. 2016 Dec;64(6):603-9.
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**Senolytic Activator®** contains nutrients designed to target senescent cells for normal elimination.

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The **Senolytic Activator®** formula provides the following nutrients:

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- **BIO-QUERCETIN** (ultra-absorbable form)
- **APIGENIN** (a natural flavonoid)
- **BIO-FISETIN** (up to 25 times greater bioavailability)

The suggested dose of the **Senolytic Activator®** is 3 capsules once a week. Each bottle lasts 3 months and costs very little.
Glycemic Guard™ contains 250 mg of polyphenol-rich clove extract and 200 mg of maqui berry extract. These plant extracts help maintain healthy after-meal blood glucose and A1c levels.

Suggested dose is one capsule a day or as recommended by a healthcare practitioner.

If you are taking blood glucose lowering medication, consult your healthcare provider before taking this product.

Delphinol® is a registered trademark of MNL.
Clovinol® is a registered trademark of Akay USA LLC.

Item #02122 • 30 vegetarian capsules
1 bottle $31.50 • 4 bottles $28 each

For full product description and to order Glycemic Guard™, 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.
Maintain Endothelial Plaque Stability with
Arterial Protect

Arterial Protect can help stabilize endothelial plaque and promote healthy blood flow throughout the body.*

Just one capsule a day provides the patented French Maritime pine bark extract along with standardized Centella asiatica extract.

Item #02004 • 30 vegetarian capsules
1 bottle $33 • 4 bottles $29 each

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

Reference

Pycnogenol® and Centellicum® are registered trademarks of Horphag Research and the use of this product is protected by international patents.

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.
Hate Broccoli… But You Don’t Have To

Kids

Your mom told you to eat your greens. And she was right. If you didn’t listen, we have good news.

Just one daily Optimized Broccoli and Cruciferous Blend tablet provides health-promoting benefits of fresh, young vegetables. For maximum absorption each enteric coated tablet contains three layers:

- **Glucoraphanin** (sulforaphane precursor) from broccoli, watercress, cabbage and rosemary.
- **Myrosinase** to release **sulforaphane** in the small intestine.
- **DIM** (3, 3-diindolylmethane) to promote healthy estrogen balance.

Item #02368 • 30 enteric coated vegetarian tablets
1 bottle $28.50 • 4 bottles $26.50 each

For full product description and to order Optimized Broccoli and Cruciferous Blend, 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.
Taurine’s Role in Resisting Infections

BY JAN NEWTON

Our gut microbiota plays an important role in fighting off infection.¹

A new study in the journal Cell reveals that taurine helps create resistance to infection in mice.

It does this by releasing sulfur compounds in the gut that are harmful to dangerous bacteria. This may help defend the body from infectious invasion.

The Gut Microbiota

The intestines are home to trillions of bacteria and other microorganisms.² These organisms are known as the gut microbiota, and are critical to optimal digestive and whole-body health.³

Researchers recently discovered in a preclinical study that, after ingestion of a potential pathogen, the microbiota built up resistance to future exposure and infection.

¹ Our gut microbiota plays an important role in fighting off infection.
² A new study in the journal Cell reveals that taurine helps create resistance to infection in mice.
³ It does this by releasing sulfur compounds in the gut that are harmful to dangerous bacteria. This may help defend the body from infectious invasion.

The Gut Microbiota

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Researchers recently discovered in a preclinical study that, after ingestion of a potential pathogen, the microbiota built up resistance to future exposure and infection.
Here’s what they found: A minor group of beneficial bacteria, called the Deltaproteobacteria, increased following exposure to the first pathogenic bacteria, Yersinia. These Deltaproteobacteria and various other members of a healthy microbiome thrive by feeding on the sulfur-containing amino acid taurine. As they metabolize taurine, sulfur compounds are released that are harmful to dangerous bacteria like K. pneumonia.

After further research, the scientists made an extraordinary discovery: Simply adding taurine to the mice’s drinking water had the same effect. In other words, there was no need to expose the mice to a first, harmful pathogen. Taurine alone made the mouse microbiome resistant to colonization by K. pneumonia.

This is known as colonization resistance. It means that previous exposure of the microbiota to harmful bacteria builds up a form of immunity against future exposures to disease-causing bacteria.

To confirm that the microbiota played a major role in this resistance to infection, scientists transferred bacteria and the other types of microorganisms that comprise the microbiota of exposed mice to pathogen-free mice. These mice also gained resistance to K. pneumonia colonization in the intestines.

The scientists next set out to investigate exactly what led to resistance to infection. They discovered that it had to do with the amino acid taurine.

Colonization Resistance

An article published in 2021 described research done at the National Institutes of Health (NIH) in Bethesda, MD. For their study, scientists introduced a bacterium known as Klebsiella pneumoniae (K. pneumonia) to mice. This type of bacteria is a common pathogen in humans. It can cause pneumonia, meningitis, and other infections.

When mice were given K. pneumonia by mouth, the bacteria colonized their gut as expected. But when mice were first exposed to a different pathogenic bacterium, Yersinia pseudotuberculosis, several weeks before being given K. pneumonia, the pre-exposure bolstered their defenses. The K. pneumonia were not able to colonize the gut of these mice and did not cause infection.
**Other Benefits of Taurine**

While small amounts of taurine are made in the body, levels decrease with age. The best way to maintain healthy levels of taurine is through diet or oral intake. Taurine has been found to have numerous other health benefits.

For example, studies show that taurine is needed for the optimal functioning of mitochondria, the cellular “powerhouses” that supply the energy needed for cells to run smoothly.

Taurine has also been found to have anti-aging benefits, particularly for maintaining brain health.

Thanks to the work of researchers at the NIH, we now know taurine may be vital in maintaining a healthy gut microbiome.

**Summary**

A recent mouse study found that after introduction to disease-causing bacteria, the gut microbiota is better able to resist colonization by other harmful bacteria in the future.

The first pathogenic bacteria spur the growth of healthy bacteria that consume the amino acid taurine. Byproducts of this taurine metabolism inhibit the growth of other potentially dangerous bacteria.

The researchers went on to demonstrate that taurine alone was sufficient to protect the mice against colonization by harmful bacteria.

Taurine is one of the most abundant amino acids in the body. It is important for protecting and maintaining cells.

We look forward to further research on the benefits of taurine in improving gut and overall health.

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**References**


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If you have any questions on the scientific content of this article, please call a Life Extension Wellness Specialist at 1-866-864-3027.
Fisetin has a range of benefits that may increase lifespan. Most impressively, it’s better than other plant compounds at clearing out senescent cells that are no longer functioning effectively.

Our Bio-Fisetin formula is up to 25 times more bioavailable than other fisetin formulas—another reason to jump for joy!*
Spinach

Spinach is a leafy green vegetable with health benefits as rich as its history.

Known as the “Persian vegetable,” spinach originated in Persia and was sent to China as a gift in the seventh century. By the time it was introduced to Europe in the 12th century, it was dubbed “the chieftain of the leafy greens.”

Its nutrient profile and health benefits make it worthy of this nickname.

Spinach contains just seven calories per cup, but is a good food source of calcium, magnesium, iron, and vitamin K.

One study found that consumption of green leafy vegetables was associated with slower cognitive decline.¹

Spinach also contains plant-derived nitrates, which are compounds known to help dilate blood vessels and improve blood flow.

In a study published in The Journal of Nutrition, people who consumed nitrate-rich drinks—including a spinach drink—saw an increase in blood nitrate levels and lower blood pressure.² Their diastolic blood pressure remained lower for five hours after consuming the drink.

And because spinach contains lutein, it could be beneficial for anyone at risk of age-related macular degeneration, the leading cause of blindness in older adults.³

Spinach can be eaten raw or cooked, and is available fresh, frozen, or canned. It can be used in soups, casseroles, or omelets, added to sandwiches or wraps, sautéed with olive oil and garlic, or added to smoothies.

Anyone taking warfarin should be aware that spinach contains vitamin K, which plays a role in blood clotting.

The anticoagulant Coumadin® (warfarin) is a vitamin K antagonist; ingesting vitamin K from food or supplements can interfere with the treatment effect of this drug, but newer anti-coagulant drugs like Eliquis®, Pradaxa®, or Xarelto® do not antagonize vitamin K, and therefore vitamin K from food and diet does not interfere with the treatment effect of these drugs.

References
ONCE-DAILY HEALTH BOOSTER

WITH TOCOTRIENOLS!

- Mixed tocotrienols to support arterial health, cellular apoptosis, and normal lipid profiles.
- Broad-spectrum Vitamin K with four vitamin K2 subtypes (MK-4, MK-6, MK-7, MK-9) plus vitamin K1 to keep calcium in bones and out of arteries.
- Macuguard® including zeaxanthin, lutein, and meso-zeaxanthin to support macular density.
- Lycopene to maintain healthy cell division.
- Chlorophyllin to protect against environmental DNA damage.
- Saffron to support visual health.

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

The same nutrients sold separately would cost 2-3 times more money!

Caution: If you are taking warfarin (Coumadin®) or related medications, consult with your healthcare provider before taking this product.

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Taurine is one of the most abundant amino acids in your body, but levels decline over time. Be proactive and give your heart and brain powerful support with high-quality Taurine from Life Extension®!

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

*Also available in an unflavored powder that mixes easily into your favorite healthy beverage.

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.
Restore Youthful Cellular Energy with PQQ

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

Studies show PQQ supports heart health and cognitive function, complementing CoQ10.6,7

In fact, just 20 mg per day of PQQ plus CoQ10 promotes memory and attention in aging individuals.8

This formulation contains 20 mg of PQQ per capsule, which is the recommended daily dose.

For full product description and to order PQQ or any other PQQ-containing formulas, call 1-800-544-4440 or visit www.LifeExtension.com

Item #01647 • 30 vegetarian capsules
1 bottle $24 • 4 bottles $18 each

Also available are 10 mg PQQ caps (Item #01500) and 100 mg Super Ubiquinol CoQ10 with PQQ (Item #01733).

References
Jillian Michaels
World Renowned Fitness Expert Shares
Her Keys to Health and Longevity

BY LAURIE MATHENA

Jillian Michaels is one of the world’s foremost fitness experts, working with big-name celebrity clients like Julia Roberts, Pink, and Maria Shriver.

She starred on NBC’s television show The Biggest Loser for more than 10 seasons as a personal trainer, has written eight New York Times best-selling books, and has released 20 fitness DVDs that have sold over 100 million copies.

Most recently, Michaels has become passionate about another critical wellness topic: anti-aging.

Michaels promotes a balanced approach to health and longevity, stressing a combination of physical fitness, healthy diet, taking supplements, and intermittent fasting.

Here, Michaels shares her own personal health journey, her recommendations for a diet and exercise program, and key ways to age well.
At 28 years old, Michaels opened her own sports medicine and personal training facility called Sky Sport and Spa in Beverly Hills, where she earned a reputation as a no-nonsense trainer who got results.

And by the time she was 30, Michaels became a household name when she became a trainer on NBC’s hit show The Biggest Loser, a TV show where obese individuals competed to lose the most weight.

According to Michaels, The Biggest Loser “really helped give me an international platform to get out a bigger message of health and wellness.”

Michaels’ Longevity Plan

In her most recent book, The 6 Keys: Unlock Your Genetic Potential for Ageless Strength, Health, and Beauty, Michaels details six body processes that determine how we age—and more importantly, how to combat them.

This includes taking steps to minimize damage to macromolecules like DNA and proteins, controlling
factors that affect your genes (epi-genetics), preventing chronic inflammation (inflammaging), and delaying the shortening of your telomeres.

“Time has nothing to do with age, and genetics have very little to do with age,” said Michaels. “Aging is a component of accumulated damage from daily living. So how we live our life is what determines how we age. Period.”

One practical way to fight aging is to practice intermittent fasting, which Michaels incorporates into her personal life by leaving a 12-14-hour window between dinner and breakfast the next day.

“The benefits are really about overall health—not weight loss. When you give your body a window where it isn’t focused on breaking down food, you free your system up to do housekeeping—clearing out dead and senescent tissue,” said Michaels. “Plus, it helps with insulin-related health conditions, and it boosts longevity by how it affects metabolic pathways and their connection to our longevity genes (sirtuins).”

Michaels is also a self-proclaimed ‘supplement nut.’

“Even though I try to eat the most balanced suite of foods when it comes to both macro nutrients (protein, fat, carbs) and micronutrients (vitamins and minerals), it’s still difficult to get all the nutrients in their optimal amount for optimal health. I use supplements as a catch-all safety net to ensure I get the recommended daily allowance (RDA) of everything I need.”

She says she also uses supplements to give her an “edge” when it comes to fitness, metabolism, and longevity.

As part of her personal regimen, Michaels takes a multi-collagen peptide supplement with MSM, glucosamine and chondroitin, an organic green superfood blend with adaptogens, a red superfood blend, a blend of probiotics and prebiotics, krill oil, a precursor of NAD+, resveratrol, and a multivitamin.

“Her workouts have gained a reputation for being tough, results-oriented programs—but they are not one-size-fits-all, and they are not designed for any specific age group. In fact, Michaels cautions against basing a fitness program solely on age alone.

“Exercise programs are not built around age. It’s about fitness level, fitness goals, and pre-existing injuries or conditions,” said Michaels. “I strongly suggest consulting with your doctor and a fitness professional to tailor a program based on your personal needs. Maybe you need to focus on increasing mobility or boosting bone density. There simply is no one-size-fits-all here.”

Over the years, people wanting to train with Michaels have turned to one of her 20 fitness DVDs, which have sold over 100 million copies worldwide.
Jillian Michaels is an American personal trainer, businesswoman, and health and wellness expert. She starred on NBC’s The Biggest Loser, has written eight New York Times best-selling books, and has sold over 100 million fitness DVDs. More recently, Michaels has launched an app for smartphones and tablets called The Fitness App by Jillian Michaels—putting the decades of Michaels’ expertise right at your fingertips. The Fitness App has personalized workout programs to help you meet any goal, satisfy any exercise preference, and suit any fitness level,” said Michaels. “You can train at home, in the gym, or outside—no equipment needed.”

The app also features an advanced meal planner that individualizes your meal plans. Launching this app is yet another way that Michaels helps people achieve their goals—something she says gives her a sense of purpose. “I love playing a role in someone’s journey to a better life—giving them tools to become happier and healthier,” said Michaels. “This brings so much meaning in my life. I can’t imagine doing anything else.”

If you have any questions on the scientific content of this article, please call a Life Extension® Wellness Specialist at 1-866-864-3027.
Quercetin has demonstrated significant health benefits, but higher doses are often required to achieve optimal results.

A novel phytosome delivery technology markedly increases absorption to deliver more quercetin throughout one’s body.

For daily quercetin supplementation, take just one of the highly absorbable Bio-Quercetin Phytosome capsules.

One small 10 mg quercetin dose of Bio-Quercetin provides a 500 mg equivalent dose of standard quercetin!*

Item #02302 • 30 vegetarian capsules
1 bottle $9 • 4 bottles $8 each

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

* Supplier Internal Study. Data on File. 2017

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.
Neuro-Mag® Magnesium L-Threonate was specifically formulated by MIT scientists to be uniquely absorbable by brain and nerve cells.

The number of synapses that connect brain cells decline with aging.

Magnesium L-Threonate has been shown to improve synaptic density and other structural components of the brain.*


Magtein® is a registered trademark of Magceutics, Inc. and is distributed exclusively by AIDP, Inc. Magtein® is protected under U.S. patents 8,178,118; 8,142,803; 8,163,301 and other patents pending.

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A tannin-rich extract derived from the edible fruit of the *Terminalia bellerica* tree helps keep uric acid levels within healthy range.

This patent-pending, standardized extract from *Terminalia bellerica* supports healthy expression of two critical enzymes involved in uric acid metabolism:

- **Xanthine oxidase**

The name of this standardized *Terminalia bellerica* extract is **Ayuric**®. The suggested dose is one capsule twice a day.

For full product description and to order **Uric Acid Control**, 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.
### ACTIVE LIFESTYLE & FITNESS

| 01529  | Creatine Capsules                              |
| 02318  | Keto Brain and Body Boost                     |
| 02020  | Super Carnosine                                |
| 02023  | Tart Cherry with CherryPURE®                  |
| 02146  | Wellness Bar–Chocolate Brownie                 |
| 02147  | Wellness Bar–Cookie Dough                      |
| 02246  | Wellness Code® Advanced Whey Protein Isolate Vanilla |
| 02221  | Wellness Code® Muscle Strength & Restore Formula |
| 02127  | Wellness Code® Plant Protein Complete & Amino Acid Complex |
| 02146  | Wellness Code® Advanced Whey Protein Isolate Vanilla |
| 02147  | Wellness Code® Advanced Whey Protein Concentrate Vanilla |
| 02246  | Wellness Code® Advanced Whey Protein Isolate Chocolate |
| 02260  | Wellness Code® Advanced Whey Protein Concentrate Vanilla |
| 02243  | Wellness Code® Whey Protein Isolate Chocolate  |
| 02242  | Wellness Code® Whey Protein Isolate Vanilla    |

### AMINO ACIDS

| 01039  | Arginine & Ornithine Capsules                 |
| 00038  | Arginine Ornithine Powder                     |
| 01253  | Branched Chain Amino Acids                     |
| 01829  | Carnosine                                      |
| 01671  | D,L-Phenylalanine Capsules                    |
| 01624  | L-Arginine Caps                               |
| 01532  | L-Carnitine                                   |
| 00345  | L-Glutamine                                   |
| 0141  | L-Glutamine Powder                            |
| 01827  | Taurine                                       |
| 00133  | Taurine Powder                                |
| 00326  | Tyrosine Tablets                              |

### BLOOD PRESSURE & VASCULAR SUPPORT

| 01824  | Advanced Olive Leaf Vascular Support          |
| 02004  | Arterial Protect                              |
| 70000  | Blood Pressure Monitor Arm Cuff               |
| 02497  | Endothelial Defense™ Pomegranate Plus         |
| 02320  | NitroVasc™ Boost                              |
| 00984  | Optimal BP Management                         |
| 01953  | Pomegranate Complete                          |
| 00956  | Pomegranate Fruit Extract                     |
| 02024  | Triple Action Blood Pressure AM/PM            |
| 02102  | VenoFlow™                                     |

### BONE HEALTH

| 01726  | Bone Restore                                  |
| 02123  | Bone Restore Chewable Tablet                  |
| 02416  | Bone Restore Elite with Super Potent K2       |
| 01727  | Bone Restore with Vitamin K2                  |
| 01725  | Bone Strength Collagen Formula                |
| 00313  | Bone-Up™                                      |
| 01963  | Calcium Citrate with Vitamin D                |
| 01506  | Dr. Strum’s Intensive Bone Formula            |
| 02417  | Mega Vitamin K2                               |
| 01476  | Strontium Caps                                |
| 02422  | Vegan Vitamin D3                              |

### BRAIN HEALTH

| 01524  | Acetyl-L-Carnitine                            |
| 01974  | Acetyl-L-Carnitine Arginate                   |
| 02419  | B12 Elite                                     |
| 02321  | Cognitex® Basics                              |
| 02396  | Cognitex® Elite                               |
| 02397  | Cognitex® Elite Pregnenolone                  |
| 01540  | DMAE Bitartrate                               |
| 02006  | Dopa-Mind™                                    |
| 02413  | Dopamine Advantage                            |
| 02212  | Focus Tea™                                    |
| 01658  | Ginkgo Biloba Certified Extract™              |
| 01527  | Huperzine A                                   |
| 00020  | Lecithin                                      |

### CHOLESTEROL MANAGEMENT

| 02101  | Memory Protect                                |
| 00709  | Migra-Eeze™                                   |
| 01603  | Neuro-Mag® Magnesium L-Threonate Caps          |
| 02032  | Neuro-Mag® Magnesium L-Threonate Powder        |
| 00888  | Optimized Ashwagandha                         |
| 01676  | PS (Phosphatidylserine) Caps                   |
| 02406  | Quick Brain Nootropic                         |
| 01327  | Vinpocetine                                   |

### DIGESTION SUPPORT

| 53348  | Betaine HCl                                   |
| 02412  | Bloat Relief                                  |
| 30747  | Digest RC™                                    |
| 07136  | Effervescent Vitamin C - Magnesium Crystals   |
| 02021  | Enhanced Super Digestive Enzymes              |
| 02022  | Enhanced Super Digestive Enzymes and Probiotics |
| 02033  | EsophaCool™                                   |
| 01737  | Esophageal Guardian                           |
| 01766  | Extraordinary Enzymes                         |
| 02100  | Gastro-Ease™                                  |
| 01122  | Ginger Force™                                 |
| 00605  | Regimint                                      |
| 01386  | TruFiber™                                     |

### ENERGY MANAGEMENT

| 01628  | Adrenal Energy Formula • 60 veg capsules      |
| 01630  | Adrenal Energy Formula • 120 veg capsules     |
| 00972  | D-Ribose Powder                               |
| 01473  | D-Ribose Tablets                              |
| 01900  | Energy Renew                                  |
| 01544  | Forskolin                                     |
| 01805  | Ginseng Energy Boost                          |
| 00668  | Metabolic Advantage Thyroid Formula™          |
| 01869  | Mitochondrial Basics with PQQ                 |
| 01868  | Mitochondrial Energy Optimizer with PQQ       |
| 01904  | NAD+ Cell Regenerator™ 100 mg, 30 veg capsules |
| 02344  | NAD+ Cell Regenerator™ 300 mg, 30 veg capsules |
| 02348  | NAD+ Cell Regenerator™ and Resveratrol        |
| 01500  | PQK Caps • 10 mg, 30 vegetarian capsules      |
| 01647  | PQK Caps • 20 mg, 30 vegetarian capsules      |
| 00889  | Rhodiola Extract                              |
| 02003  | Triple Action Thyroid                         |

### EYE HEALTH

| 01923  | Astaxanthin with Phospholipids                |
| 00893  | Brite Eyes III                                |
| 02323  | Digital Eye Support                           |
| 01514  | Eye Pressure Support with Mirtogenol®         |
| 01992  | MacuGuard® Ocular Support with Saffron        |
| 01993  | MacuGuard® Ocular Support with Saffron & Astaxanthin |
| 01873  | Standardized European Bilberry Extract        |
| 01918  | Tear Support with MacuBright®                |

### FISH OIL & OMEGAS

<p>| 02311  | Clearly EPA/DHA Fish Oil                      |
| 01937  | Mega EPA/DHA                                  |
| 02218  | Mega GLA Sesame Lignans                       |
| 01983  | Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans &amp; Olive Extract • 60 softgels |
| 01988  | Super Omega-3 Plus EPA/DHA Fish Oil, Sesame Lignans, Olive Extract, Krill &amp; Astaxanthin |</p>
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<td>01513 Optimized Fucoidan with Maritech® 926</td>
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<td>02230 Optimized Resveratrol</td>
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<tr>
<td>01637 Pycnogenol® French Maritime Pine Bark Extract</td>
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<td>02210 Resveratrol</td>
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<td>00070 RNA (Ribonucleic Acid)</td>
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<td>02301 Senolytic Activator*</td>
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<tr>
<td>01208 Super R-Lipoic Acid</td>
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<tr>
<td>01919 X-R Shield</td>
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<tr>
<td><strong>MEN’S HEALTH</strong></td>
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<tr>
<td>02209 Male Vascular Sexual Support</td>
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<td>00455 Mega Lycopene Extract</td>
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<tr>
<td>02306 Men’s Bladder Control</td>
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<tr>
<td>01789 PalmettoGuard® Saw Palmetto and Beta-Sitosterol</td>
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<tr>
<td>01790 PalmettoGuard® Saw Palmetto/Nettle Root Formula and Beta-Sitosterol</td>
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<td>01837 Pomi-T®</td>
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<tr>
<td>01373 Prelox® Enhanced Sex for Men</td>
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<td>01940 Super MiaForte with Standardized Lignans</td>
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<td>01909 Triple Strength ProstaPollen™</td>
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<td>02029 Ultra Prostate Formula</td>
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<td><strong>MINERALS</strong></td>
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<td>01661 Boron</td>
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<td>02107 Extend-Release Magnesium</td>
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<td>01677 Iron Protein Plus</td>
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<td>02403 Lithium</td>
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<td>01459 Magnesium Caps</td>
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<td>01682 Magnesium (Citrate)</td>
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<td>01328 Only Trace Minerals</td>
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<td>01504 Optimized Chromium with Crominex® 3+</td>
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<tr>
<td>02309 Potassium with Extend-Release Magnesium</td>
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<td>01740 Sea-Iodine™</td>
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<td>01879 Se-Methyl L-Selenocysteine</td>
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<td>01778 Super Selenium Complex</td>
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<td>00213 Vanadyl Sulfate</td>
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<td>01813 Zinc Caps</td>
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<td><strong>MISCELLANEOUS</strong></td>
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<td>00577 Potassium Iodide</td>
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<td>00657 Solarshield® Sunglasses</td>
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<td><strong>MOOD &amp; STRESS MANAGEMENT</strong></td>
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<td>02312 Cortisol-Stress Balance</td>
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<td>00987 Enhanced Stress Relief</td>
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<td>01683 L-Theanine</td>
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<tr>
<td>02175 SAMe (S-Adenosyl-Methionine) 200 mg, 30 enteric coated vegetarian tablets</td>
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<tr>
<td>02176 SAMe (S-Adenosyl-Methionine) 400 mg, 30 enteric coated vegetarian tablets</td>
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<tr>
<td>02174 SAMe (S-Adenosyl-Methionine) 400 mg, 60 enteric coated vegetarian tablets</td>
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<td><strong>MULTIVITAMINS</strong></td>
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<td>02199 Children’s Formula Life Extension Mix™</td>
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<tr>
<td>02498 Comprehensive Nutrient Packs ADVANCED</td>
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<tr>
<td>02354 Life Extension Mix™ Capsules</td>
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<tr>
<td>02364 Life Extension Mix™ Capsules without Copper</td>
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<tr>
<td>02356 Life Extension Mix™ Powder</td>
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<td>02355 Life Extension Mix™ Tablets</td>
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<td>02357 Life Extension Mix™ Tablets with Extra Nicin</td>
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<tr>
<td>02365 Life Extension Mix™ Tablets without Copper</td>
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<tr>
<td>02292 Once-Daily Health Booster • 30 softgels</td>
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<tr>
<td>02291 Once-Daily Health Booster • 60 softgels</td>
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<tr>
<td>02133 One-Per-Day Tablets</td>
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<tr>
<td>02428 Plant-Based Multivitamin</td>
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<tr>
<td>02317 Two-Per-Day Capsules • 60 capsules</td>
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<td>02314 Two-Per-Day Capsules • 120 capsules</td>
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<tr>
<td>02316 Two-Per-Day Tablets • 60 tablets</td>
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<td>02315 Two-Per-Day Tablets • 120 tablets</td>
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<tr>
<td><strong>NERVE &amp; COMFORT SUPPORT</strong></td>
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<tr>
<td>02202 ComfortMAX™</td>
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<td>02303 Discomfort Relief</td>
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<td><strong>PERSONAL CARE</strong></td>
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<tr>
<td>01006 Biosil™ • 5 mg, 30 veg capsules</td>
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<td>01007 Biosil™ • 1 fl oz</td>
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<tr>
<td>00321 Dr. Proctor’s Advanced Hair Formula</td>
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<td>00320 Dr. Proctor’s Shampoo</td>
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<td>02322 Hair, Skin &amp; Nails Collagen Plus Formula</td>
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<td>01278 Life Extension Toothpaste</td>
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<td>00408 Venoton</td>
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<td>00409 Xyliwhite Mouthwash</td>
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<td>02304 Youthful Collagen</td>
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<td>02252 Youthful Legs</td>
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<td><strong>PET CARE</strong></td>
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<td>01932 Cat Mix</td>
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<td>01931 Dog Mix</td>
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<td><strong>PROBIOTICS</strong></td>
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<td>01622 Bifido GI Balance</td>
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<td>01825 FLORASSIST® Balance</td>
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<td>02421 FLORASSIST® Daily Bowel Regularity</td>
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<td>02125 FLORASSIST® GI with Phage Technology</td>
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<td>01821 FLORASSIST® Heart Health</td>
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<td>02250 FLORASSIST® Mood Improve</td>
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<td>02208 FLORASSIST® Immune &amp; Nasal Defense</td>
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<td>02120 FLORASSIST® Oral Hygiene</td>
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<td>02203 FLORASSIST® Prebiotic</td>
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<td>02400 FLORASSIST® Winter Immune Support</td>
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<tr>
<td>52142 Jarro-Dophilus® for Women</td>
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<td>00056 Jarro-Dophilus EPS® • 60 veg capsules</td>
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<td>21201 Jarro-Dophilus EPS® • 120 veg capsules</td>
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<td>01038 Theralac® Probiotics</td>
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<td>01389 TruFlora® Probiotics</td>
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<td><strong>SKIN CARE</strong></td>
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<tr>
<td>80157 Advanced Anti-Glycation Peptide Serum</td>
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<td>80165 Advanced Growth Factor Serum</td>
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<td>80170 Advanced Hyaluronic Acid Serum</td>
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<td>80154 Advanced Lightening Cream</td>
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<td>80155 Advanced Peptide Hand Therapy</td>
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<td>80175 Advanced Probiotic-Fermented Eye Serum</td>
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<td>80177 Advanced Retinol Serum</td>
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<td>80152 Advanced Triple Peptide Serum</td>
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<td>80140 Advanced Under Eye Serum with Stem Cells</td>
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<td>80137 All-Purpose Soothing Relief Cream</td>
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<td>80139 Amber Self MicroDermAbrasion</td>
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<tr>
<td>80118 Anti-Aging Mask</td>
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PRODUCTS

80151 Anti-Aging Rejuvenating Face Cream
80153 Anti-Aging Rejuvenating Scalp Serum
80179 Brightening Peptide Serum
80176 Collagen Boosting Peptide Cream
80156 Collagen Boosting Peptide Serum
02408 Collagen Peptides for Skin & Joints
80180 CoQ10 and Stem Cell Rejuvenation Cream
80169 Cucumber Hydra Peptide Eye Cream
02423 Daily Skin Defense
80141 DNA Support Cream
80163 Eye Lift Cream
80123 Face Rejuvenating Anti-Oxidant Cream
80109 Hyaluronic Facial Moisturizer
80110 Hyaluronic Oil-Free Facial Moisturizer
80138 Hydrating Anti-Oxidant Facial Mist
00661 Hydroderm
55495 Intensive Moisturizing Cream
80103 Lifting & Tightening Complex
80168 Melatonin Advanced Peptide Cream
80114 Mild Facial Cleanser
80159 Multi Stem Cell Skin Tightening Complex
80122 Neck Rejuvenating Anti-Oxidant Cream
80174 Purifying Facial Mask
80150 Renewing Eye Cream
80142 Resveratrol Anti-Oxidant Serum
01938 Shade Factor™
02129 Skin Care Collection Anti-Aging Serum
02130 Skin Care Collection Day Cream
02131 Skin Care Collection Night Cream
80166 Skin Firming Complex
02096 Skin Restoring Ceramides
80130 Skin Stem Cell Serum
80164 Skin Tone Equalizer
80143 Stem Cell Cream with Alpine Rose
80148 Tightening & Firming Neck Cream
80161 Triple-Action Vitamin C Cream
80162 Ultimate MicroDermabrasion
80173 Ultimate Peptide Serum
80178 Ultimate Telomere Cream
80160 Ultra Eyelash Booster
80101 Ultra Wrinkle Reliever
80113 Under Eye Refining Serum
80104 Under Eye Rescue Cream
80171 Vitamin C Lip Rejuvenator
80129 Vitamin C Serum
80136 Vitamin D Lotion
80102 Vitamin K Cream

SLEEP
01512 Bioactive Milk Peptides
02300 Circadian Sleep
01551 Enhanced Sleep with Melatonin
01511 Enhanced Sleep without Melatonin
02234 Fast-Acting Liquid Melatonin
01669 Glycine
02308 Herbal Sleep PM
01722 L-Tryptophan
01668 Melatonin • 300 mcg, 100 veg capsules
01083 Melatonin • 500 mcg, 200 veg capsules
00329 Melatonin • 1 mg, 60 capsules
00330 Melatonin • 3 mg, 60 veg capsules
00331 Melatonin • 10 mg, 60 veg capsules
00332 Melatonin • 3 mg, 60 veg lozenges
02201 Melatonin IR/XR
01787 Melatonin 6 Hour Timed Release
300 mcg, 100 veg tablets

01788 Melatonin 6 Hour Timed Release
750 mcg, 60 veg tablets
01786 Melatonin 6 Hour Timed Release 3 mg, 60 veg tablets
01721 Optimized Tryptophan Plus
01444 Quiet Sleep
01445 Quiet Sleep Melatonin

VITAMINS
01533 Ascorbyl Palmitate
00920 Benfotiamine with Thiamine
00664 Beta-Carotene
01945 BioActive Complete B-Complex
00102 Biotin
00084 Buffered Vitamin C Powder
02229 Fast-C® and Bio-Quercetin Phytoosome
02075 Gamma E Mixed Tocopherol Enhanced with Sesame Lignans
02070 Gamma E Mixed Tocopherol & Tocotrienols
01913 High Potency Optimized Folate
01674 Inositol Caps
02244 Liquid Vitamin D3 • 50 mcg (2000 IU)
02232 Liquid Vitamin D3 (Mint) • 50 mcg (2000 IU)
01936 Low-Dose Vitamin K2
00065 MK-7
00373 No Flush Niacin
01939 Optimized Folate (L-Methylfolate)
01217 Pyridoxal 5'-Phosphate Caps
01400 Super Absorbable Tocotrienols
02334 Super K
02335 Super K Elite
01863 Super Vitamin E
02028 Vitamin B5 (Pantothenic Acid)
01535 Vitamin B6
00361 Vitamin B12 Methylcobalamin
01536 Vitamin B12 Methylcobalamin • 1 mg, 60 veg lozenges
01537 Vitamin B12 Methylcobalamin • 5 mg, 60 veg lozenges
02228 Vitamin C and Bio-Quercetin Phytoosome • 60 veg tablets
02227 Vitamin C and Bio-Quercetin Phytoosome • 250 veg tablets
01753 Vitamin D3 • 25 mcg (1000 IU), 90 softgels
01751 Vitamin D3 • 25 mcg (1000 IU), 250 softgels
01713 Vitamin D3 • 125 mcg (5000 IU), 60 softgels
01718 Vitamin D3 • 175 mcg (7000 IU), 60 softgels
01758 Vitamin D3 with Sea-Iodine™
02040 Vitamins D and K with Sea-Iodine™

WEIGHT MANAGEMENT & BODY COMPOSITION
00658 7-Keto® DHEA Metabolite • 25 mg, 100 capsules
02479 7-Keto® DHEA Metabolite • 100 mg, 60 veg capsules
01509 Advanced Anti-Adipocyte Formula
01807 Advanced Appetite Suppress
02207 AMPK Metabolic Activator
02478 DHEA Complete
01738 Garcinia HCA
01292 Integra-Lean®
01908 Mediterranean Trim with Sinetrol™ -XPur
01432 Optimized Saffron
00818 Super CLA Blend with Sesame Lignans
01902 Waist-Line Control™

WOMEN'S HEALTH
01942 Breast Health Formula
01626 Enhanced Sex for Women 50+
01894 Estrogen for Women
01064 Femmenessence MacaPause®
02204 Menopause 731™
02319 Prenatal Advantage
01441 Progesta-Care®
01649 Super-Absorbable Soy Isoflavones
Uncomfortable after eating?

Digestive enzymes are specialized proteins that help you break down the foods you eat. **Enhanced Super Digestive Enzymes** combines 10 vegetarian-friendly enzymes to help you break down hard-to-digest foods and encourage a healthy gastrointestinal balance...so you can feel good *after you eat*!

*Item #02021* • 60 vegetarian capsules
1 bottle $16.50 • 2 bottles $15.75 each

For full product description and to order **Enhanced Super Digestive Enzymes**, 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.*
CoQ10 helps fuel energy production at the cellular level—and ubiquinol absorbs up to eight times better than standard CoQ10. This means you’ll have the body energy you need to power your brain, liver, kidneys, and heart.

For full product description and to order Super Ubiquinol CoQ10 with Enhanced Mitochondrial Support™, call 1-800-544-4440 or visit www.LifeExtension.com

Item #01426 • 100 mg, 60 softgels
1 bottle $46.50 • 4 bottles $39 each

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.
7 MISCONCEPTIONS ABOUT VITAMIN C
Achieving steady-state vitamin C blood levels is challenging. A novel liposomal formula provides 24-hour vitamin C protection with one daily dose.

24 IMPROVE JOINT MOBILITY AND REDUCE PAIN
Two plant extracts improve walking distance and speed, knee range-of-motion, and joint pain in non-arthritic men and women.

34 SAGE BOOSTS BRAIN FUNCTION
Older adults taking a sage extract had an approximate 60% better performance in a composite measure of memory and about a 2.5-fold increase in a measure of attention.

44 WHOLE-BODY BENEFITS OF VITAMIN K
Vitamin K builds stronger bones, promotes brain health, and lowers inflammation. An American Heart Association study shows that higher vitamin K intake lowered risk of cardiovascular disease and hospitalizations.

54 PROBIOTIC HELPS PREVENT STREP THROAT
In human trials, a novel probiotic reduced the incidence of strep throat by 84% in adults and 97% in children.

68 REDUCE ATHEROSCLEROTIC RISK
New human data further validate how two plant extracts can slow and reverse atherosclerosis.