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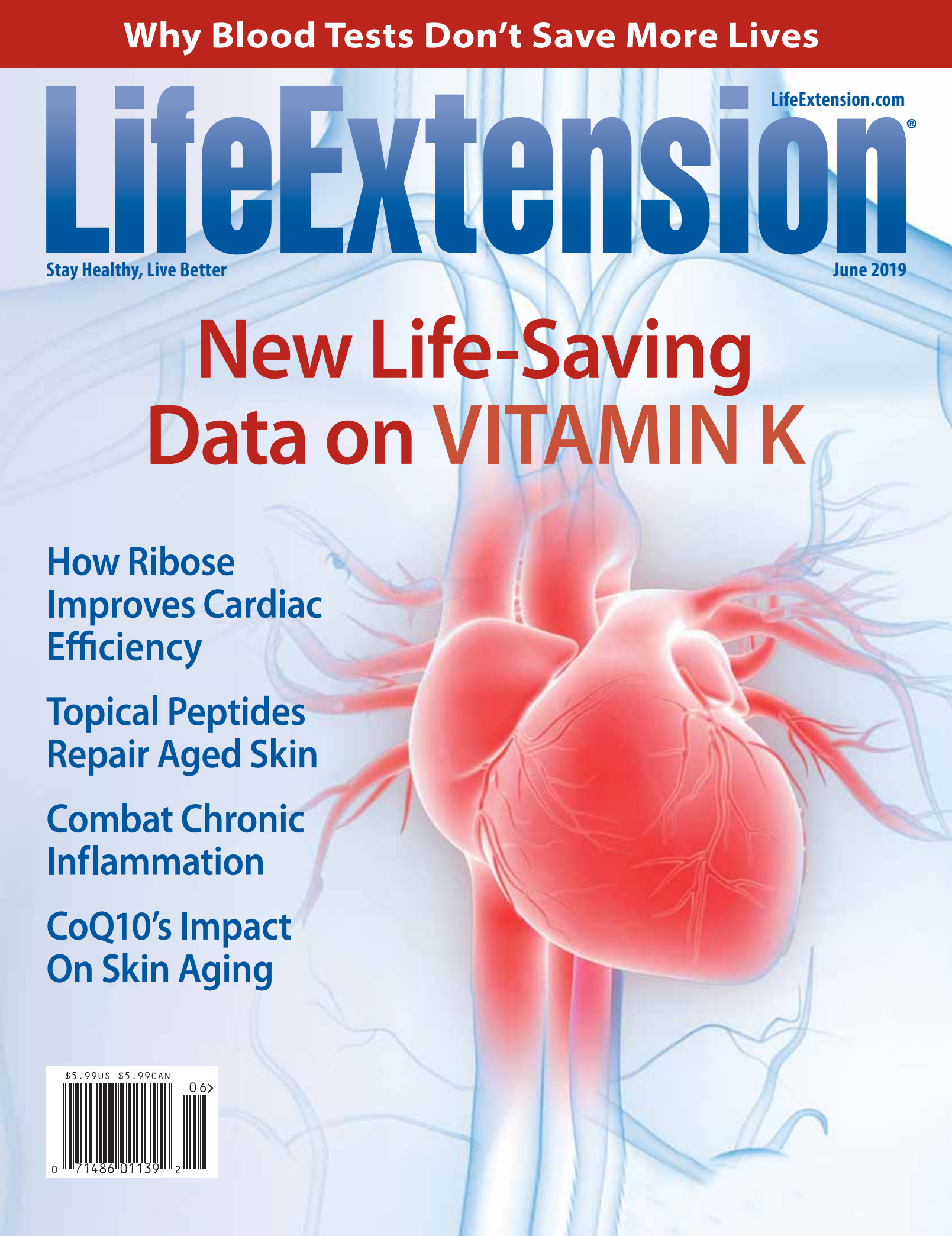

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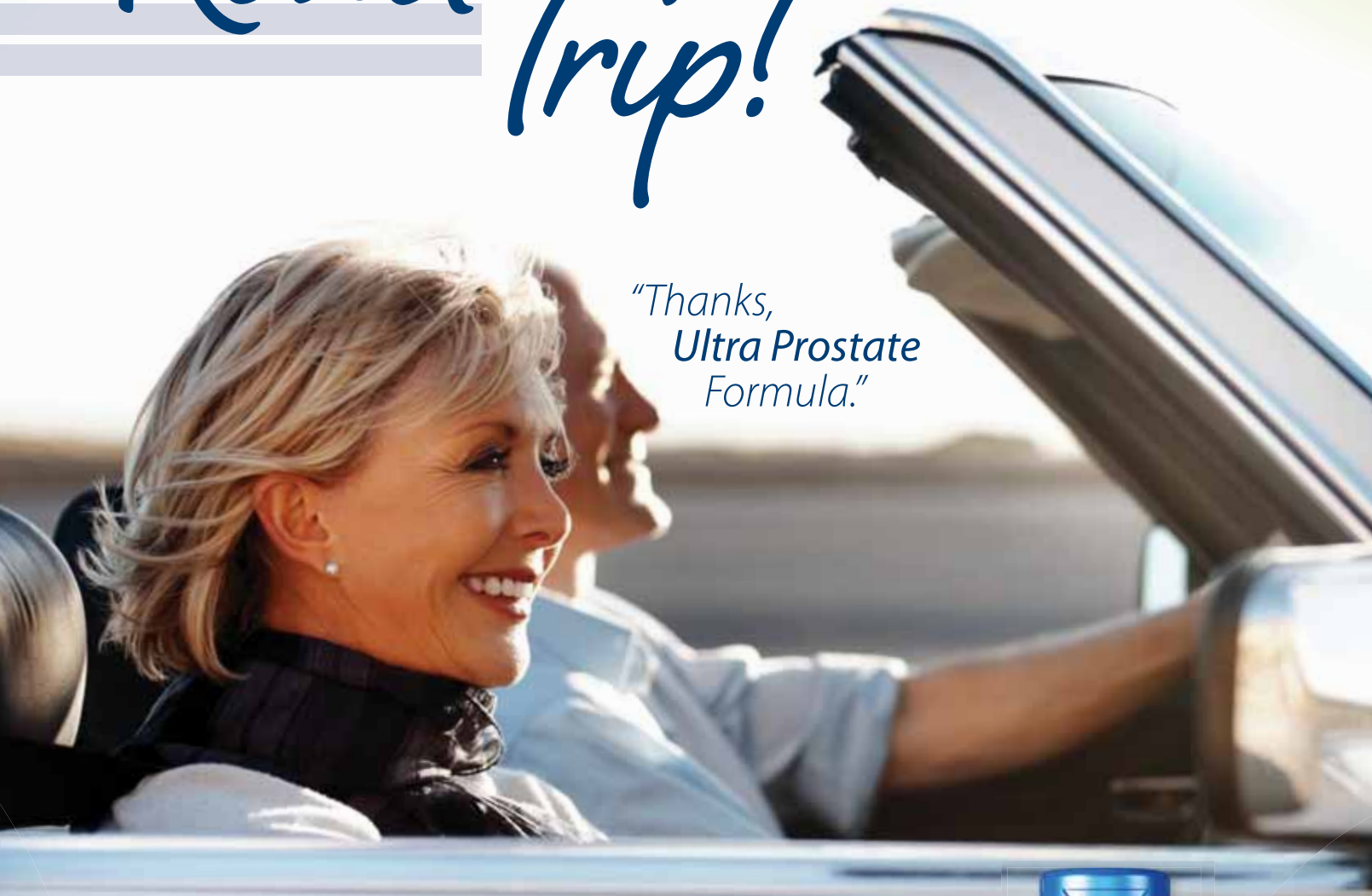

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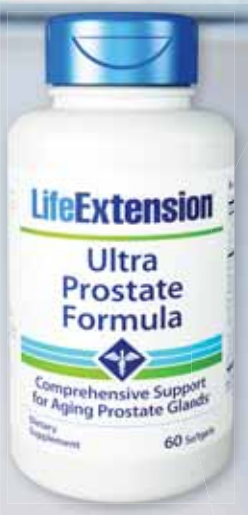

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LifeExtension Magazine

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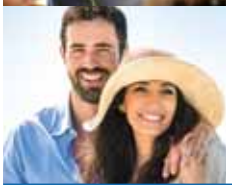

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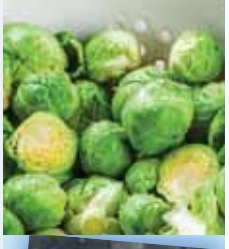

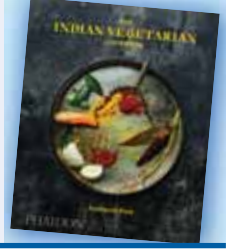

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Why Blood Tests Are Not Saving More Lives

BY WILLIAM FALOON

Back in the 1950s, a scientist uncovered the link between **LDL cholesterol** and **atherosclerosis**.[1,2]

Critics argued that **heart attacks** occurred in some people who did not have excess **LDL**.

What was not known in early years is that there are different types of **LDL** particles.

If your **LDL** surface contains high levels of a protein called **apolipoprotein B**, it is more likely to damage arterial walls and set the stage for **atherosclerosis**.

In some populations, those who maintain low lifetime **apolipoprotein B** levels have an approximately **90%** decreased risk of **coronary artery** disease.[3]

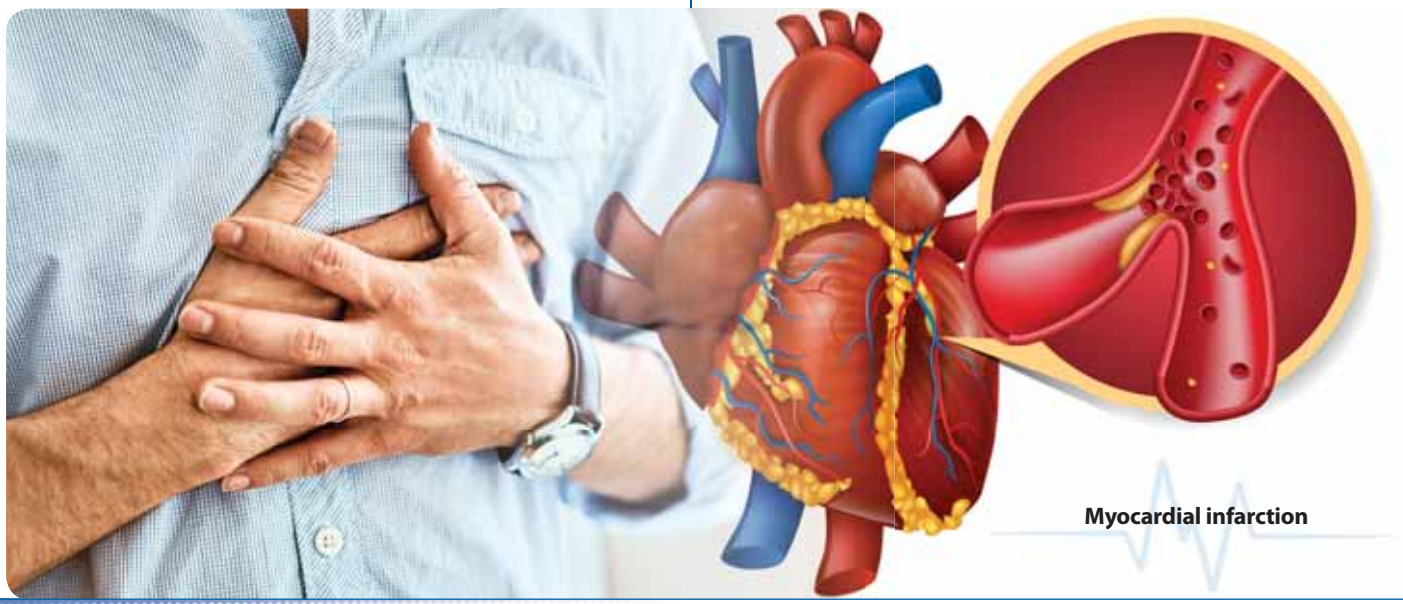
What impresses us is evidence showing **regression** of **arterial plaque** when **apolipoprotein B** blood levels are reduced.[4]

Despite intensive educational efforts, **apolipoprotein B** blood tests are not routinely incorporated into primary care medicine. The tragic result is a failure to prevent heart attacks, strokes, and other occlusive arterial diseases.

For ***Life Extension®*** readers, this problem was resolved when **apolipoprotein B** was added to comprehensive **blood tests** they undergo each year.

We know today that **atherosclerosis** is a result of a myriad of risk factors. These include elevated **glucose**, **insulin**, **homocysteine**, **triglycerides**, and **inflammation**,[5,6] along with **hormone** imbalances.

This article reveals how coronary artery stenting, bypass surgery, and sudden death can be reduced via inclusion of **apolipoprotein B** in annual **blood test** panels.



Heart attack incidence peaked in the year **1968**, accounting for **37%** of all deaths in the United States.[7,8]

The epidemic was alarming, as it often targeted otherwise healthy people at the peak of their careers.

Advances in **prevention** and **treatment** led to marked reductions in sudden death and improved survival in those stricken.

While **heart disease** remains the leading killer, it is responsible for **25%** of American deaths today compared to **37%** in **1968**.[9,10]

As **blood testing** evolves to better detect artery-damaging factors, further declines in coronary artery disease and ischemic stroke are likely.

Role of Lipoproteins

Apolipoprotein B is linked to the initiation and propagation of atherosclerosis.[11]

High levels of **apolipoprotein B** penetrate the **inner arterial wall** (the **endothelium**) and set the stage for **blockage** of blood flow.[12-14]

Those whose **blood test** shows elevated **cholesterol** and **apolipoprotein B** are especially at risk.[15-17]

To put this in perspective, higher **apolipoprotein B** levels have been associated with a **60%** increase in coronary heart disease when **total cholesterol** and **HDL** are in safer ranges.[18]

In people with *higher* levels of **cholesterol** and **apolipoprotein B**, along with lower **HDL**, there is a **160%** increased incidence of coronary disease.[18]

Elevated **apolipoprotein B** is a more reliable marker for cardiovascular disease than **LDL**, **HDL,** and **total cholesterol**.[19-22]

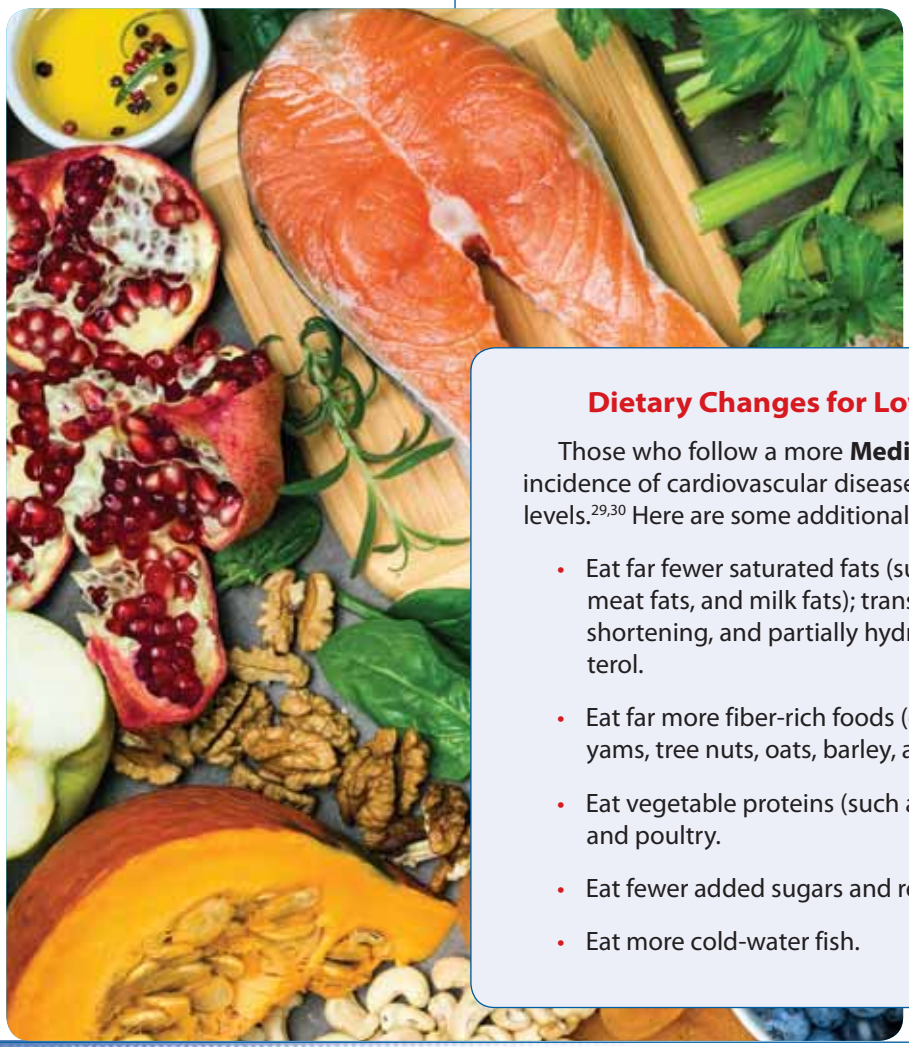
The good news is that **apolipoprotein B** can be easily tested in one's blood and reduced to safe ranges if need be.

Eat Walnuts

A myriad of studies associates **walnut** consumption with reduced risk of coronary heart disease.[23-26]

A study assessed a range of cardiovascular risk markers in response to a diet containing about **1.52 ounces** of walnuts daily for eight weeks compared to a typical Western diet.[23]

Two benefits of walnut consumption in this trial were a modest non-HDL cholesterol reduction and a more pronounced **5.5%** reduction in **apolipoprotein B**.[23]



Dietary Changes for Lowering Apolipoprotein B

Those who follow a more **Mediterranean** style diet have a reduced incidence of cardiovascular disease and lower **apolipoprotein B** blood levels.[29,30] Here are some additional dietary suggestions:

- Eat far fewer saturated fats (such as butter, palm oil, coconut oil, meat fats, and milk fats); trans fats (such as margarine, vegetable shortening, and partially hydrogenated oils); and dietary cholesterol.
- Eat far more fiber-rich foods (especially soluble fiber from beans, yams, tree nuts, oats, barley, and berries).
- Eat vegetable proteins (such as tofu and beans) in place of meat and poultry.
- Eat fewer added sugars and refined grains (such as white flour).
- Eat more cold-water fish.

These findings led the researchers to conclude that the observation of reduced cardiovascular events in people who eat walnuts may be explained in part by reduced non-HDL **cholesterol** and **apolipoprotein B**.[23]

A follow-up analysis looked at previous studies that evaluated consumption of tree nuts and found reductions in **apolipoprotein B** in type II diabetics who consumed higher amounts of tree nuts.[27]

Avoid Sugar

An investigation looked at associations of **apolipoprotein B** blood levels with education, lifestyle factors, and dietary patterns.[28]

The intake of **sucrose** and foods containing **added sugar** (such as pastries, sweets, jam and sugar-sweetened beverages) correlated with *higher* **apolipoprotein B** levels.[28]

This study identified other unhealthy factors such as smoking, obesity, and low physical activity with unfavorable **lipoprotein profiles**.

Exercise Training

A one-year study of overweight, healthy men found a reduction in **apolipoprotein B** (but not LDL cholesterol) in response to exercise training.[31]

This led the authors of the study to postulate that exercise might make **LDL** less atherogenic by reducing **apolipoprotein B**.

Importance of Sleep

A Chinese study looked at the relationship of **sleep duration** and **apolipoprotein B** blood levels using data from 7,381 subjects.[32]

The participants were divided into three categories according to sleep duration: less than six hours, seven to eight hours, and more than nine hours.[32]

The study found that **short sleep** duration (under 6 hours) in **women** was associated with **1.75-fold** greater odds of elevated **apolipoprotein B** compared to women who got 7-8 hours of sleep per night.[32]

Longer sleep duration in **men** was associated with decreased **apolipoprotein B**. The study authors concluded:

"Sleep hygiene management could serve to treat and prevent cardiovascular diseases by altering unfavorable apolipoprotein profile."[32]

Thyroid Hormones and Lipoproteins

People with insufficient **thyroid hormones** can have elevated cholesterol, LDL, triglycerides and **apolipoprotein B**.[33-35]

In some cases, people are prescribed statin drugs to lower cholesterol when the appropriate use of a thyroid hormone medication would normalize their lipid profile.

One of several studies on this topic concluded by stating:

"A reduction in lipid and lipoprotein levels after thyroid hormone replacement in our study cohort resulted in a less atherogenic profile."[36]

Effects of Fish Oil

The effects of **fish oil** (**1,800 mg** of EPA and **1,200 mg** of DHA a day) were studied on 10 healthy males for four weeks.[37]

The result was about a **30%** reduction in production of **apolipoprotein B** and reductions in other vascular risk factors like triglycerides and VLDL.[37]

Note that this **EPA/DHA** dose of **3,000 mg** a day is much ***higher*** than many fish oil studies that sometimes use less than **1,000 mg** a day.

Acute Risk of Excess Apolipoprotein B

A review of factors that underlie **acute heart attack** revealed a startling finding.

Amongst those with the greatest risk were current **smokers** and people with elevated blood ratios of **apolipoprotein B** to apolipoprotein A1.[38] (Apolipoprotein A1 is the major protein component of beneficial HDL.)

This comprehensive analysis identified other known causes of **heart attack** such as **hypertension** and **diabetes**. It then listed **protective factors** including daily consumption of **fruits** and **vegetables**, **exercise,** and modest consumption of alcohol.[38]

Study participants who were non-diabetic, did not smoke, and had no lipid abnormalities, including high blood ratio of **apolipoprotein B** to apolipoprotein A1, showed large reductions in **acute heart attack** risk.[38]

A separate study found that the **cruciferous vegetable** extract **I3C** (indole-3-carbinol) reduced **apolipoprotein B** secretion from liver cells as much as **56%**.[39] This may be a mechanism by which plant foods like broccoli reduce cardiovascular risks.

Drugs That Lower Apolipoprotein B

Prescription drugs that lower **cholesterol** and **LDL** also reduce blood levels of **apolipoprotein B**.[40]

A potentially beneficial mechanism of **statin** drugs and the new **PCSK-9 inhibitors** (like Repatha®) is that they can lower LDL down to around **30 mg/dL**. Normal target goals for **LDL** are below **70-100 mg/dL**.[41]

Some people tolerate statin drugs, while others encounter unbearable side effects.[42]

We are intrigued by the potential of drugs like **Repatha®** to potentially reverse atherosclerosis by driving **lipoproteins** down to the levels of those seen in healthy teenagers. The problem is that even at a reduced price of **$5,900** a year, Repatha is cost-prohibitive and seldom covered by insurance.

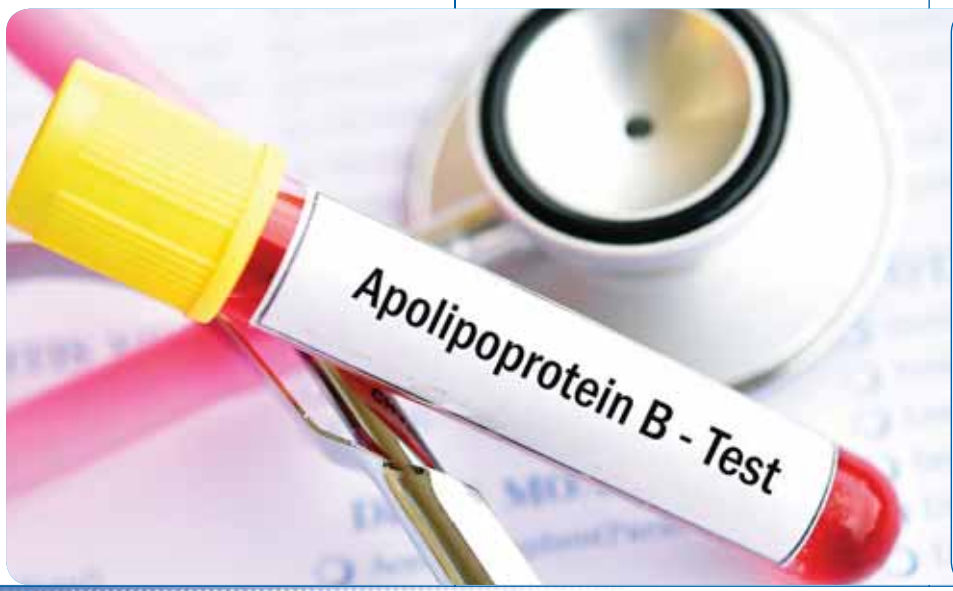
I know most readers of ***Life Extension Magazine*** seek **non-drug** solutions whenever possible.

With the availability of **apolipoprotein B** blood tests, one can choose to utilize some of the natural interventions described so far and verify efficacy with follow-up **blood tests**.

Apolipoprotein B and Fasting Insulin—No Added Cost!

Those with high **apolipoprotein B** blood levels are at greater risk for coronary artery disease.[47]

Last year we added the **apolipoprotein B** to the **Male** and **Female Blood Panels** at no additional cost.



What is Apolipoprotein B?

Apolipoprotein B is found on all cholesterol particles except **HDL**.[43]

This includes **LDL** and **VLDL** (very-low-density-lipoproteins).

High levels of **VLDL** increase the synthesis and secretion of **apolipoprotein B**.[44]

Higher **apolipoprotein B** generally equates to a higher amount of glycated and oxidized **LDL** particles, which are initiators of arterial plaque.[45,46]

If an **apolipoprotein B** blood test result shows high levels, steps can be initiated to correct this.

This year we added **fasting insulin** to the **Male** and **Female Panels** and kept our same low price. High fasting insulin levels may indicate that type II diabetic complications are manifesting.

High **insulin** levels may also interfere with one's ability to lose weight.

Annual Lab Test Super Sale

The high cost of conventional blood testing precludes many people from availing themselves of this life-saving diagnostic.

We resolved this 23 years ago by enabling our readers to order low-cost **blood tests** direct, and then to visit a **drawing station** in their area at their **convenience**.

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This year's lab test super sale expires on **June 3, 2019**.

To view the extensive array of tests included in these comprehensive panels, please see the full description by turning this page.

To order the new **Male** or **Female Blood Panels** (that include **apolipoprotein B**) for **$199**, call **1-800-208-3444** or log on to:

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What Are Optimal Blood Levels of Apolipoprotein B?

A number of published studies have identified what **apolipoprotein B** blood levels place people at greater risk of cardiovascular events.

The chart below is for people without preexisting vascular disease, diabetes or other major risk factors. The chart lists optimal **apolipoprotein B** as under **80 mg/dL**.

Those at high risk of arterial occlusion, however, should attempt to reduce **apolipoprotein B** to under **60 mg/dL**. This will likely require dietary modifications and use of certain drug therapies.

When it comes to ideal **apolipoprotein B** levels, the lower the better. The following reference ranges reflect **Life Extension's** general guidance for **apolipoprotein B** status when you get your blood test results back:

Optimal	**<80 mg/dL** **<60 mg/dL** (For those with high risk of arterial occlusion)
Borderline	**80-99 mg/dL**
High	**100-120 mg/dL**
Very High	**≥120 mg/dL**

If your **apolipoprotein B** levels are not in **optimal** ranges, there are natural and pharmaceutical approaches to lowering them described in this article.

For longer life,

William Faloon, Co-Founder
Life Extension Foundation
Buyers Club

P.S. Turn this page to view all tests included in the **Male** and **Female Blood Panels**.

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Comprehensive Blood Tests at Low Super Sale Prices

The value of the **Male** and **Female Blood Panels** improves as more tests are added at no additional cost. Last year, **apolipoprotein B** was added to better measure **vascular** risk. This year, **fasting insulin** has been added to provide a clearer picture of one's metabolic status. If elevated, steps to reduce **fasting insulin** can help assist with **weight loss** and achieving better **glucose** control.

Compare **Life Extension** *to* **Quest Diagnostics**

QUEST DIAGNOSTICS

TEST NAME	RETAIL PRICE
Chemistry Panel	$ 88.07
LDH	$ 51.74
GGT	$ 50.62
Iron	$ 46.12
Lipid Panel Standard	$ 148.00
Complete Blood Count	$ 45.50
Free/Total Testosterone	$ 283.46
Estradiol	$ 223.85
DHEA-S	$ 213.72
Vitamin D 25-Hydroxy	$ 241.84
Homocysteine	$ 227.22
C-Reactive Protein (high sensitivity)	$ 59.00
Apolipoprotein B	$ 25.00
Insulin	$ 29.41
HbA1C	$ 74.25
TSH	$ 130.49
PSA	$ 148.48
Draw Fees	$ 21-22
TOTAL	**$ 2,086.77**

LIFE EXTENSION $199

Shop around…
NO ONE can beat our
Annual Lab Test Sale prices!

MALE PANEL

CARDIAC MARKERS
Apolipoprotein B
Homocysteine
C-Reactive Protein (high sensitivity)

METABOLIC PROFILE
Glucose
Insulin NEW
Hemoglobin A1c
Kidney function tests: creatinine, BUN, uric acid, BUN/creatinine ratio
Liver function tests: AST, ALT, LDH, GGT, bilirubin, alkaline phosphatase
Blood minerals: calcium, potassium, phosphorus, sodium, chloride, iron
Blood proteins: albumin, globulin, total protein, albumin/globulin ratio

LIPID PROFILE
Total Cholesterol
LDL (low-density lipoprotein)
HDL (high-density lipoprotein)
Triglycerides

COMPLETE BLOOD COUNT (CBC)
Red Blood Cell count including: hemoglobin, hematocrit, MCV, MCH, MCHC, RDW
White Blood Cell count including: lymphocytes, monocytes, eosinophils, neutrophils, basophils
Platelet count

CANCER MARKER
PSA (Prostate Specific Antigen)

HORMONES
Free and Total Testosterone
DHEA-S
Estradiol (an estrogen)
TSH (thyroid function)
Vitamin D (25-hydroxyvitamin D)

FEMALE PANEL

CARDIAC MARKERS
Apolipoprotein B
Homocysteine
C-Reactive Protein (high sensitivity)

METABOLIC PROFILE
Glucose
Insulin NEW
Hemoglobin A1c
Kidney function tests: creatinine, BUN, uric acid, BUN/creatinine ratio
Liver function tests: AST, ALT, LDH, GGT, bilirubin, alkaline phosphatase
Blood minerals: calcium, potassium, phosphorus, sodium, chloride, iron
Blood proteins: albumin, globulin, total protein, albumin/globulin ratio

LIPID PROFILE
Total Cholesterol
LDL (low-density lipoprotein)
HDL (high-density lipoprotein)
Triglycerides

COMPLETE BLOOD COUNT (CBC)
Red Blood Cell count including: hemoglobin, hematocrit, MCV, MCH, MCHC, RDW
White Blood Cell count including: lymphocytes, monocytes, eosinophils, neutrophils, basophils
Platelet count

HORMONES
Progesterone
Estradiol (an estrogen)
Free and Total Testosterone
DHEA-S
TSH (thyroid function)
Vitamin D (25-hydroxyvitamin D)

Lab Test Super Sale • March 25 – June 3, 2019.

Retail price: $400 • Your Price: $199

To obtain these comprehensive Male or Female Panels at these low prices, call 1-800-208-3444 or log on to www.LifeExtension.com/blood to order your requisition forms.

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Then–at your convenience–when you have the form, you can visit one of the blood-drawing facilities provided by LabCorp in your area or at the **Life Extension Nutrition Center** in Ft. Lauderdale.

Blood testing services are available only in the continental United States and Anchorage, AK. Not available in Maryland. Restrictions apply for residents of MA, NY, NJ, RI, and PA.

Maintain Endothelial Plaque Stability with

ARTERIAL PROTECT

1 DAILY

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

Just one capsule a day provides the patented **pine bark extract** used in clinical studies along with ***Centella asiatica***.

	Retail Price	Your Price
1 bottle	$44	**$33**
4 bottles		**$29 each**

Item# 02004 • 30 vegetarian capsules

Reference

* *Int Angiol.* 2014 Feb;33(1):20-6.

Note: Do not change dosing or discontinue cardiovascular medications unless advised to do so by your physician.

NON GMO LE CERTIFIED

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

Maintain Youthful HOMOCYSTEINE LEVELS

FOR BRAIN, HEART, AND HEARING HEALTH

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

Item #02121 • 60 vegetarian capsules
Retail Price is $26 • **Your Price is $19.50**
4 bottles are only $17.50 each

Just one daily capsule of **Homocysteine Resist** provides:

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

1 DAILY

NON GMO

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

Don't Weight Around

Maintain Optimal Hormone Levels

7-Keto® is a metabolite of **DHEA** ideal for weight management.

Maintaining youthful DHEA levels can help support immune function, circulatory health, mood, libido, and more.

DHEA Complete delivers **7-Keto® DHEA** (**100 mg**) and regular **DHEA** (**25 mg**), plus extracts from curcumin, green tea, and whole red grapes.

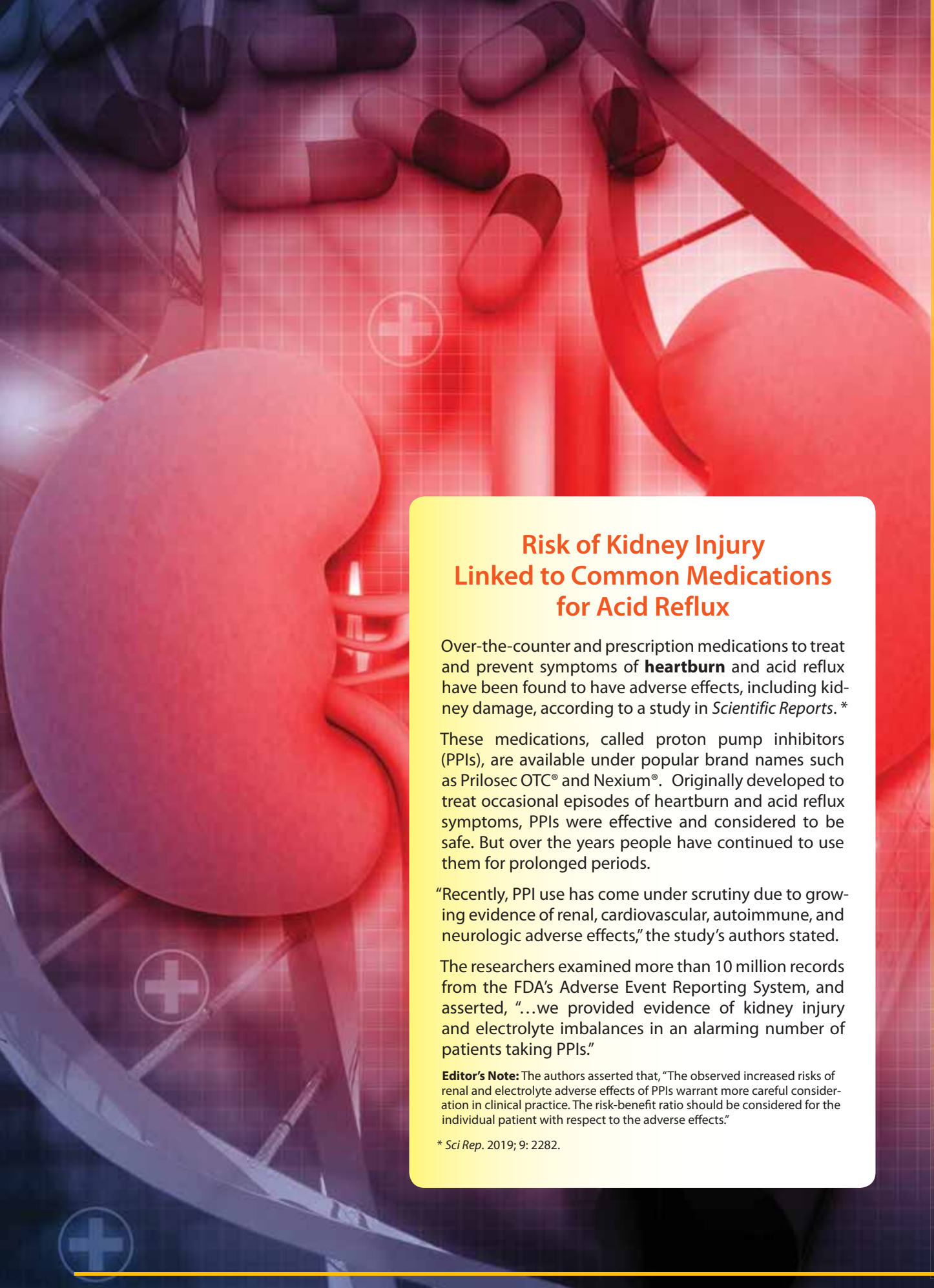
For full product description and to order **DHEA Complete**, call **1-800-544-4440** or visit **www.LifeExtension.com**

NON GMO LE CERTIFIED

	Retail Price	Your Price
1 bottle	$48	**$36**
4 bottles		**$32.40 each**

Item #01478 • 60 vegetarian capsules

This supplement should be taken in conjunction with a healthy diet and regular exercise program. Individual results may vary and are not guaranteed.



Risk of Kidney Injury Linked to Common Medications for Acid Reflux

Over-the-counter and prescription medications to treat and prevent symptoms of **heartburn** and acid reflux have been found to have adverse effects, including kidney damage, according to a study in *Scientific Reports*. *

These medications, called proton pump inhibitors (PPIs), are available under popular brand names such as Prilosec OTC® and Nexium®. Originally developed to treat occasional episodes of heartburn and acid reflux symptoms, PPIs were effective and considered to be safe. But over the years people have continued to use them for prolonged periods.

"Recently, PPI use has come under scrutiny due to growing evidence of renal, cardiovascular, autoimmune, and neurologic adverse effects," the study's authors stated.

The researchers examined more than 10 million records from the FDA's Adverse Event Reporting System, and asserted, "…we provided evidence of kidney injury and electrolyte imbalances in an alarming number of patients taking PPIs."

Editor's Note: The authors asserted that, "The observed increased risks of renal and electrolyte adverse effects of PPIs warrant more careful consideration in clinical practice. The risk-benefit ratio should be considered for the individual patient with respect to the adverse effects."

* *Sci Rep*. 2019; 9: 2282.

Eating Fewer Calories, or Only Once a Day, Can Lead to Longer Life

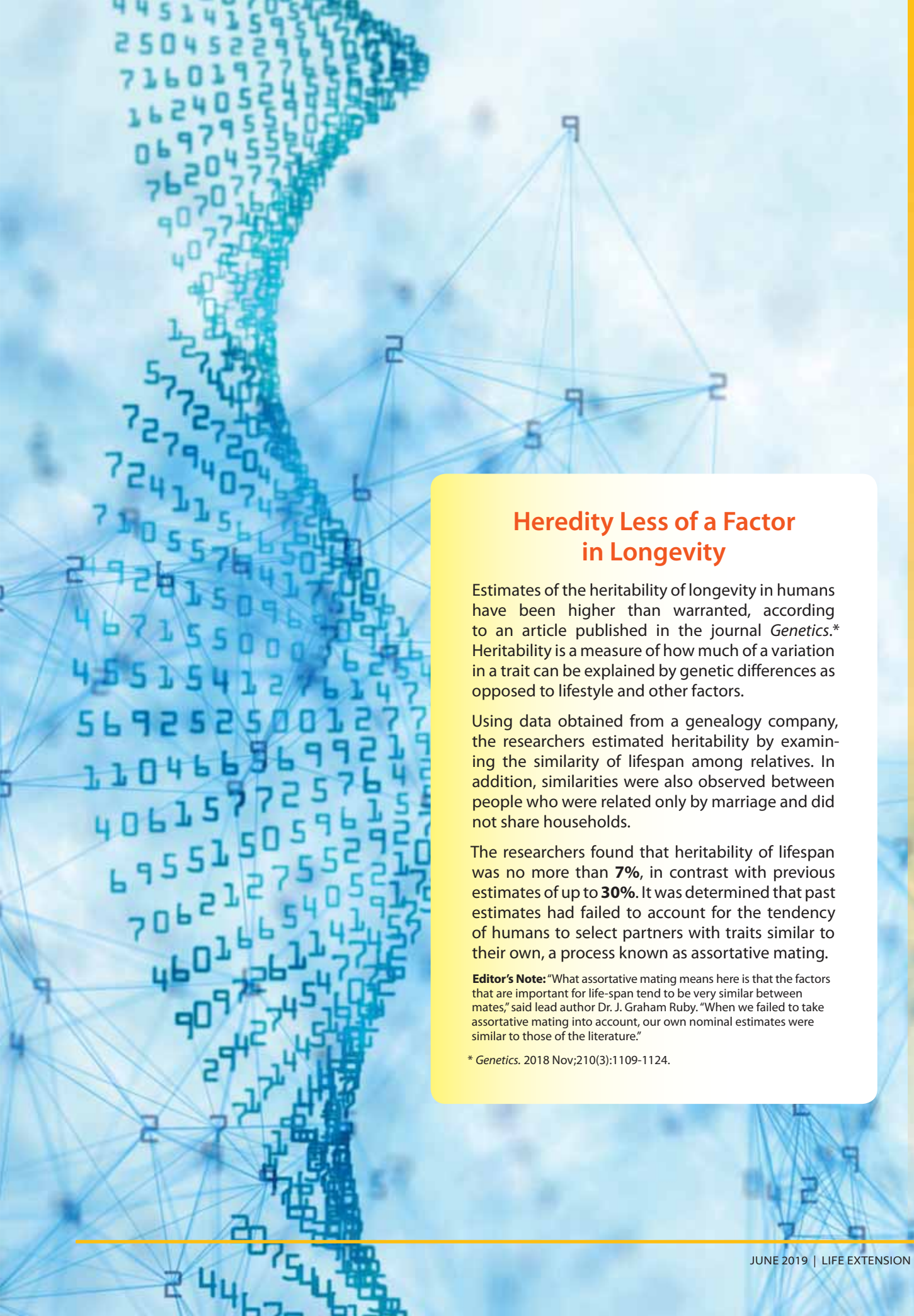
An article published in *Cell Metabolism* found that there was greater longevity in mice who were fed fewer calories or only one time daily. *

Two groups, totaling 292 male mice, were divided to receive one of two diets. One diet was naturally-sourced, lower in fat and added sugar, and higher in protein and fiber than the other. Each group was further divided into three subgroups that received either unlimited access to food, **30%** fewer calories than the first group, or one meal per day that contained the same number of calories consumed by the first group.

Calorie-restricted mice and mice fed once daily survived longer than the animals who ate as much as they liked. Restricted animals also experienced delays in the development of age-related damage to the liver and other organs. Diet composition was not found to affect the lifespan of these groups.

Editor's Note: "Increasing daily fasting times, without a reduction of calories and regardless of the type of diet consumed, resulted in overall improvements in health and survival in male mice," said the study's lead author, Rafael de Cabo, PhD.

* *Cell Metab.* 2019 Jan 8;29(1):221-228.e3.



Heredity Less of a Factor in Longevity

Estimates of the heritability of longevity in humans have been higher than warranted, according to an article published in the journal *Genetics*.* Heritability is a measure of how much of a variation in a trait can be explained by genetic differences as opposed to lifestyle and other factors.

Using data obtained from a genealogy company, the researchers estimated heritability by examining the similarity of lifespan among relatives. In addition, similarities were also observed between people who were related only by marriage and did not share households.

The researchers found that heritability of lifespan was no more than **7%**, in contrast with previous estimates of up to **30%**. It was determined that past estimates had failed to account for the tendency of humans to select partners with traits similar to their own, a process known as assortative mating.

Editor's Note: "What assortative mating means here is that the factors that are important for life-span tend to be very similar between mates," said lead author Dr. J. Graham Ruby. "When we failed to take assortative mating into account, our own nominal estimates were similar to those of the literature."

* *Genetics.* 2018 Nov;210(3):1109-1124.

Omega 3-Fatty Acid EPA Linked to Healthy Aging

Having a higher level of the omega-3 fatty acid EPA, found in fish and seafood, is associated with a greater likelihood of healthy aging among older men and women, concluded a study in *BMJ*.* Healthy aging was defined as survival without chronic diseases such as cardiovascular disease, cancer, lung disease, and kidney disease, as well as the absence of physical and cognitive dysfunction after the age of 65.

The study included 2,622 men and women with a mean age of 74, enrolled in the U.S. Cardiovascular Health study from 1992 to 2015. Annual clinical examinations conducted through 1999 and semi-annual phone interviews ascertained health status and other factors. Blood samples collected at three time points were analyzed for the omega-3 fatty acids EPA, DHA, DPA, and ALA.

Among those whose EPA levels placed them among the **top 20%** of participants, the risk of unhealthy aging was **24%** lower than the subjects whose levels were among the lowest **20%**.

Editor's Note: The authors concluded that, "These findings support guidelines for increased dietary consumption of n3-PUFAs [omega 3 polyunsaturated fatty acids] in older adults."

* *BMJ.* 2018 Oct 17;363:k4067.

CoQ10 Benefits Patients with Chronic Kidney Disease

Supplementation with the antioxidant **coenzyme Q10** (CoQ10) provided several metabolic benefits for patients with chronic kidney disease, according to a review and meta-analysis published in the journal *Current Pharmaceutical Design*.*

Researchers selected seven randomized, controlled trials that included a total of 384 men and women with chronic kidney disease. Metabolic profiles evaluated during the trials included measurements of triglycerides, total cholesterol, low density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, glucose, insulin, insulin resistance, C-reactive protein, malondialdehyde (MDA), a marker of oxidative stress, and creatinine (which is elevated in kidney disease).

The daily dosage of **CoQ10** in the trials ranged from **30 mg** to **200 mg** administered for periods of **4** to **12 weeks**. Pooled analysis of the subjects determined that CoQ10 supplementation was associated with a decrease in total cholesterol, LDL-cholesterol, malondialdehyde and creatinine (a standardized mean difference of -1.65, meaning that **CoQ10** improved creatinine levels in those with *chronic kidney disease*).

If **creatinine** is elevated above **1 mg/dL**, this serves as an indictor of kidney impairment. (The standard reference range for elevated **creatinine** starts at **1.27 mg/dL**, but **Life Extension**® views any level above 1.00 as an indicator to cut back on pain relieving (NSAID) drugs, reduce consumption of meat, or look at other risk factors such as hypertension and diabetes.)

Blood levels of **creatinine** are included in most **CBC/Chemistry blood test** panels.

CBC/Chemistry tests are included in the comprehensive **Male** and **Female Panels** many readers of this magazine have done annually.

A far more accurate **blood test** to assess **kidney function** is called **cystatin-C**.

To order any of these **blood tests** call **1-800-208-3444** or visit **www.LifeExtension.com/blood**.

Editor's Note: Circulating concentrations of CoQ10 have been decreased in patients with chronic kidney disease, suggesting that CoQ10 supplementation may be an ideal antioxidant therapy for these patients, the authors noted.

* *Curr Pharm Des*. 2018;24(31):3710-3723.

HEALTHY FLORA

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

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

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

FLORASSIST® GI with Phage Technology

- Provides broad spectrum of healthy bacteria for the digestive tract plus phages that target undesirable intestinal bacterial strains.

	Retail Price	Your Price
1 bottle	$33	**$24.75**
4 bottles		**$22.50 each**

Item #02125 • 30 liquid vegetarian capsules

FLORASSIST® Heart Health

- Supports heart health.

	Retail Price	Your Price
1 bottle	$32	**$24**
4 bottles		**$21 each**

Item #01821 • 60 vegetarian capsules

FLORASSIST® Prebiotic Chewable

- Promotes friendly bacteria.

	Retail Price	Your Price
1 bottle	$20	**$15**
4 bottles		**$13 each**

Item #02203 • 60 chewable tablets

FLORASSIST® Throat Health

- Probiotic defense for your throat.

	Retail Price	Your Price
1 bottle	$20	**$15**
4 bottles		**$13.50 each**

Item #01920 • 30 lozenges

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

HEALTHY YOU!

FLORASSIST® Oral Hygiene

- Supports healthy bacteria in gums.

	Retail Price	Your Price
1 bottle	$20	**$15**
4 bottles		**$13 each**

Item #02120 • 30 lozenges

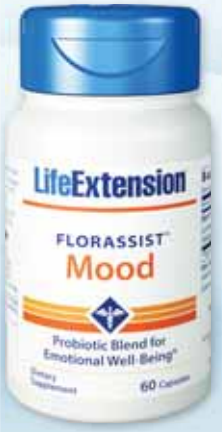
FLORASSIST® Nasal

- Balances immune response to seasonal changes.

	Retail Price	Your Price
1 bottle	$36	**$27**
4 bottles		**$24 each**

Item #02208 • 30 vegetarian capsules

1 DAILY



FLORASSIST® Mood

- Positively influences the nervous system for healthy mood.

	Retail Price	Your Price
1 bottle	$33	**$24.75**
4 bottles		**$22.50 each**

Item #02000 • 60 capsules

FLORASSIST® Immune Health

- Protects respiratory system from year-round immune challenges.

	Retail Price	Your Price
1 bottle	$26	**$19.50**
4 bottles		**$18 each**

Item #02124 • 30 vegetarian capsules

Don't Forget!

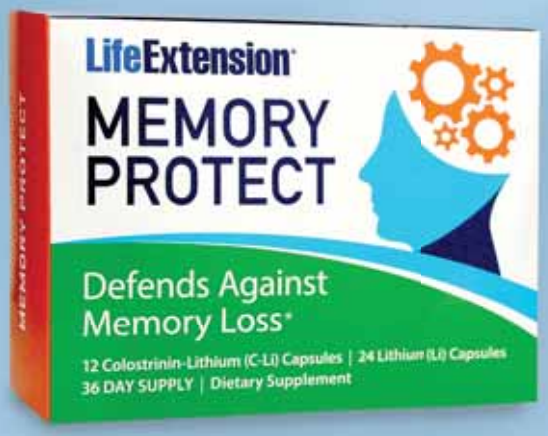
MEMORY PROTECT

Supports Memory and Youthful Brain Function

Human studies demonstrate robust neurological benefits in response to low-dose **lithium** and colostrum-derived **proline-rich polypeptides**.

Memory Protect has been formulated with these two nutrients to support healthy structure of brain cells, normal memory, and recall function.

Each box enables you to take these on the identical dosage schedule used in successful clinical trials.



Memory Protect
Item #02101 • 36 capsules

	Retail Price	Your Price
1 box	$24	**$18**
4 boxes		**$16 each**

EASY-TO-ACCESS DOSAGE PACKS!

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

Compare **TWO-PER-DAY** *to* the Leading Brand **CENTRUM®**

The **Two-Per-Day** multinutrient formula is superior to commercial multivitamins because it provides vastly ***higher*** potencies of **vitamins**, **minerals** and **plant extracts**.

Centrum® Can't Compete

TWO-PER-DAY provides:

- **50 times the vitamin B1**
- **25 times the vitamin B6**
- **12 times the vitamin B12**
- **10 times the biotin**
- **10 times the selenium**
- **8 times the vitamin C**
- **2.5 times the vitamin B3**
- **2 times the vitamin D**
- **2 times the vitamin E**
- **2 times the zinc**

Two-Per-Day Capsules

Item #02314 • 120 capsules (2-month supply)

	Retail Price	Your Price
1 bottle	$24	**$18**
4 bottles		**$16 each**

Two-Per-Day Tablets

Item #02315 • 120 tablets (2-month supply)

	Retail Price	Your Price
1 bottle	$23	**$17.25**
4 bottles		**$15.50 each**

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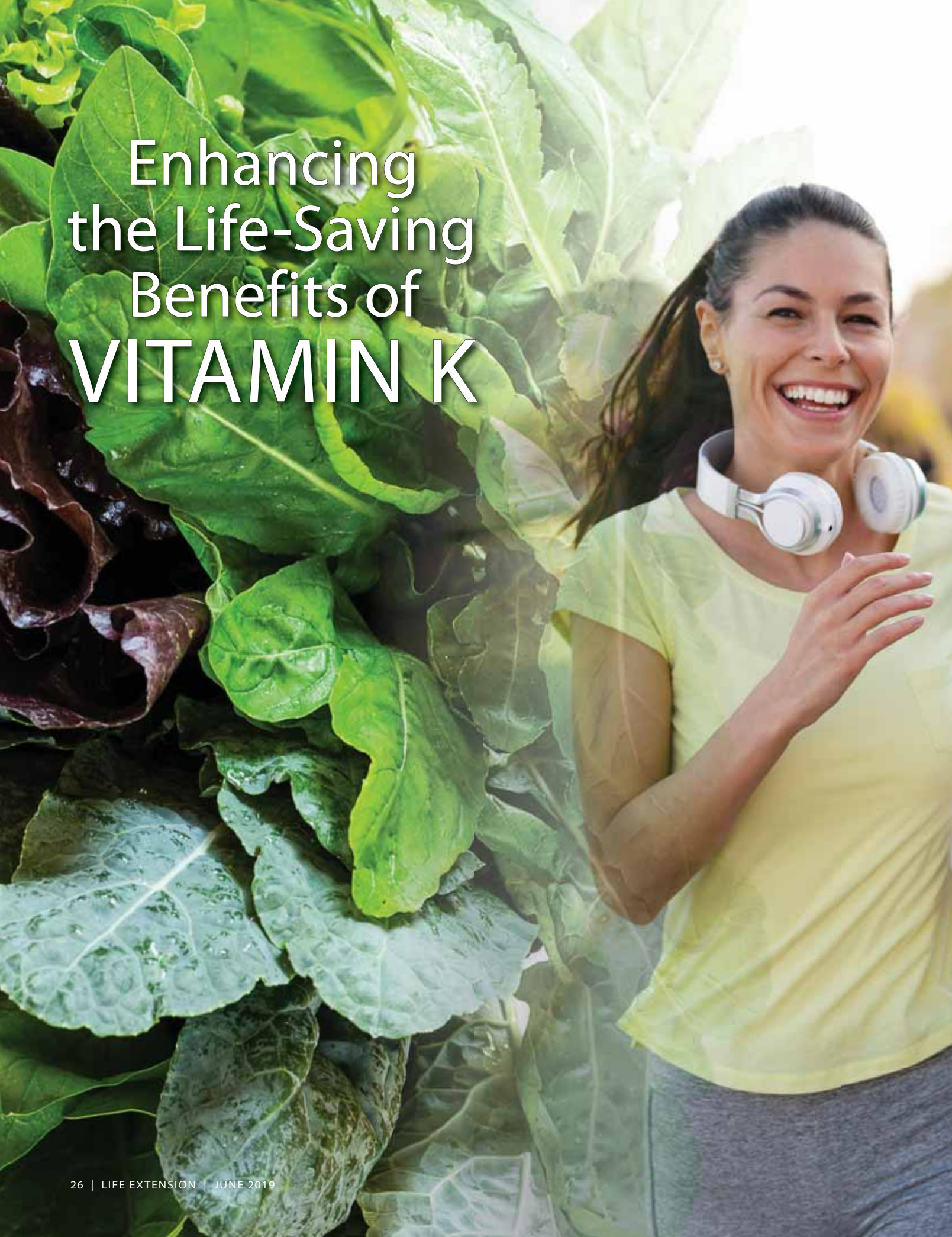
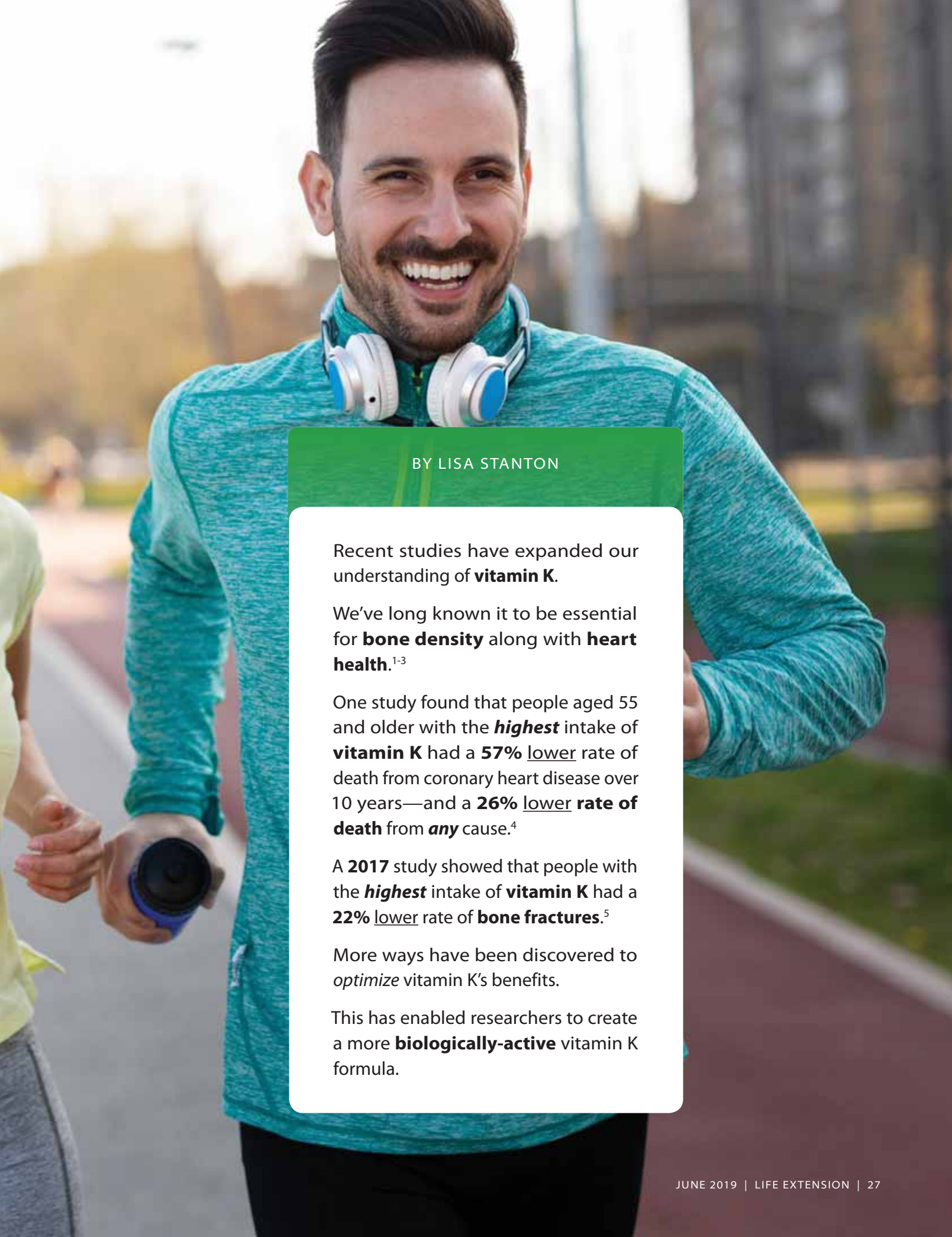
For full product description and to order **call 1-800-544-4440** or visit **Life Extension.com**

Enhancing the Life-Saving Benefits of VITAMIN K





BY LISA STANTON

Recent studies have expanded our understanding of **vitamin K**.

We've long known it to be essential for **bone density** along with **heart health**.[1-3]

One study found that people aged 55 and older with the ***highest*** intake of **vitamin K** had a **57%** lower rate of death from coronary heart disease over 10 years—and a **26%** lower **rate of death** from ***any*** cause.[4]

A **2017** study showed that people with the ***highest*** intake of **vitamin K** had a **22%** lower rate of **bone fractures**.[5]

More ways have been discovered to *optimize* vitamin K's benefits.

This has enabled researchers to create a more **biologically-active** vitamin K formula.

Vitamin K in Food

Scientists have identified different forms and amounts of **vitamin K** that are found in foods.

This work provides crucial insights into the types of vitamin K we should be consuming.

It also reveals limitations in relying on food to supply the types and levels of vitamin K associated with peak bone and cardiovascular health.

Forms of Vitamin K

Vitamin K in food comes in two general forms:

1) **Vitamin K1** (or **phylloquinone**), found primarily in leafy green vegetables.

2) **Vitamin K2**, found in natto or fermented soy, and in animal products such as eggs, meat, milk, and cheese.[6]

Vitamin K2 has several subtypes denoted by a number, such as **MK-4**, **MK-6**, and **MK-7**.

MK stands for **menaquinones**, which are forms of vitamin K that vary in their organic structure.

One epidemiological study showed that some forms of menaquinone, such as MK-7 and MK-9, appear to be most powerful in preventing coronary heart disease.[7]

MK7 is a long-acting form of vitamin K that has been available as a dietary supplement for many years. **MK-9** has only recently become available in supplement form.

Limits to Dietary Intake of Vitamin K

Studies show that there are problems in relying on diet to supply all these forms of vitamin K.

Vitamin K1 in foods has **low** bioavailability.[8] This means that even if you eat a large amount of leafy green vegetables, you may not *absorb* adequate amounts of vitamin K1.

Vitamin K2 is found in highest concentrations in many foods that people try to limit, such as foods high in saturated fat.[9] One would have to consume massive amounts of cheese to achieve the optimal **K2** levels that are supported by human clinical trials. And low-fat versions of these foods often have much less vitamin K2 content, or even none at all.[9]

Supplementation is a more efficient and practical way of increasing vitamin K intake. But what are the optimal doses of the various types of vitamin K that we should be consuming daily?

New Studies, New Dosing

Several recent clinical trials in humans have demonstrated that adequate vitamin K supplementation can have a significant impact on bone and cardiovascular health.

Vitamin K1 Dosing

A one-year, randomized, controlled trial evaluated vitamin **K1** supplementation in adults with **calcification** in their **aortic valve**, one of four valves that regulate blood flow through the heart.[10] Degenerative heart valve disease such as this can lead to impaired heart function and heart failure if it progresses.[11]

Subjects received either **2,000 mcg** of vitamin K1 daily or a placebo. Those who received vitamin K1 benefited from a *reduction* in the progression of aortic valve **calcification**, based on both imaging and biochemical markers. Disease progression was cut by **more than half** by vitamin K1 supplementation.[10]

It's a remarkable result. One would have to eat almost **14 cups** of spinach a day to achieve this level of vitamin K1 intake.[12]

Aortic stenosis is a narrowing of the heart's aortic valve. Some people have this problem due to a congenital defect (i.e. bicuspid valve), but most develop it as a result of aging, with calcification and/or fibrotic scarring of the valve.

Age-related aortic stenosis usually starts in the sixth decade of life, and early treatment can reduce the risk of progression of the narrowing, which can lead to heart failure if left untreated.

The only definitive treatment is surgery, either valve repair or valve replacement. An exciting new approach called **transcatheter aortic valve replacement (TAVR)** can allow valve replacement without the need for open-heart surgery. However, **TAVR** may pose a greater risk of stroke in some patients.

Vitamin K2 Dosing: MK-4

Research has helped establish dosing levels that maximize the benefits of the MK-4 form of vitamin K2 on bone health.

Two recent trials used a dose of **1,500 mcg** of MK-4 per day in healthy, postmenopausal women, and compared them to a group receiving a placebo.[13,14] Postmenopausal women are at high risk for developing loss of bone density, osteoporosis, and subsequent risk for bone fractures.[15]

Both studies demonstrated a significant improvement in bone density in the group receiving vitamin K2. They had higher levels of the active form of **osteocalcin**, indicating more new bone formation.[13,14]

In one of the studies, subjects receiving MK-4 also had a stabilization of their forearm **bone mineral density**, while those in the placebo group continued to show progressive *loss* of bone density over the year of the study.[14]

Vitamin K2 Dosing: MK-7

Another group of researchers followed 244 healthy postmenopausal women for three years and examined the effects of the **MK-7** form of vitamin K2 on both bone and cardiovascular health. The results of their findings were published in two separate publications.[16,17]

Participants took either **180 mcg** of MK-7 daily or a placebo. Again, researchers found improvements in markers of both bone *and* blood vessel health in the supplemented group.[16,17]

Additionally, the ratio of inactive to active osteocalcin improved by **58%**. (Only active osteocalcin helps to synthesize bone.) Furthermore, bone mineral content, bone mineral density, and bone strength were all significantly improved in the group taking MK-7.[17]

Broad-Spectrum Vitamin K

- **Vitamin K is an essential vitamin found in two general forms, K1 and K2.**
- **Research has revealed that vitamin K is important not only for blood clotting but also for bone and cardiovascular health.**
- **Research has also helped clarify the ideal doses of vitamin K1 and K2 needed to optimize bone and heart health.**
- **Due to poor bioavailability and high fat content of foods containing the most vitamin K, obtaining adequate vitamin K in the diet is problematic.**

What You Need to Know

Vitamin K and Clotting: What You Need to Know

Although vitamin K is critical to the normal process of blood clotting, supplementation with vitamin K is *not* associated with any increased risk of abnormal, harmful clotting, such as that associated with heart attack and stroke.

Even studies with very high doses of vitamin K have demonstrated its safety, without any adverse events.[10,22,23]

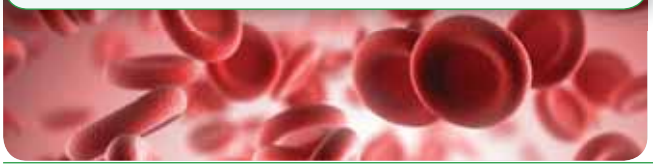
But there *is* one extremely important caveat to consider when starting a vitamin K supplement.

Powerful **anticoagulant medications** such as **warfarin** (brand name **Coumadin®**) and other related drugs act by blocking vitamin-K-dependent pathways, decreasing the ability of the body to produce several important blood clotting factors. These drugs are used in patients who are at high risk of dangerous, abnormal clotting. For example, they may be used in patients being treated for atrial fibrillation, heart valve disease, deep vein thrombosis, and/or pulmonary embolism.

Vitamin K acts as an *antagonist* to the anti-clotting effect of warfarin and similar drugs. Therefore, taking higher levels of vitamin K can interfere with the desired clinical effect and increase the chance of clotting in these patients.

Patients taking warfarin (Coumadin®) or related medications should **consult their prescribing doctor** before taking any vitamin K supplement.

But vitamin K does not in any way interact with newer/novel, oral anticoagulants like Xarelto® (rivaroxaban), Pradaxa® (dabigatran), or Eliquis® (apixaban). These newer, oral anticoagulants work by inhibiting venous clotting through thrombin or Factor Xa, independent of vitamin K. Vitamin K supplementation can be used safely with these drugs since there is no potential for interaction. In addition, there are available antidotes to bleeding with the newer drugs. Dangerous or life-threatening bleeding with Pradaxa® can be reversed by Praxbind® (idarucizumab). Recently (May, 2018), Andexxa® (andexanet alfa) was approved to reverse life-threatening bleeding with Xarelto® and Eliquis®.



In terms of blood vessel health, vitamin K2 supplementation helped to preserve the flexibility of arteries by *reducing* arterial stiffness. While those receiving a placebo had worsening arterial stiffness, those taking vitamin K not only preserved arterial flexibility, but *decreased* stiffness by about **6%**.[16]

Those individuals with more advanced arterial stiffness at the start of the study improved the most.[16] This indicates that vitamin K not only preserves blood vessel health, it also appears to be able to help ***reverse*** existing **blood vessel disease**.

Novel Vitamin K2 Subtypes

Food sources of vitamin K2 provide an assortment of other MK forms as well, including **MK-6** and **MK-9**. Although clinical trials have not yet been performed for most of these forms, observational studies suggest many benefits.

For example, a study followed a group of more than 16,000 individuals to evaluate the impact of intake of specific vitamin K forms on risk of coronary heart disease.[7] It found that those who consumed *higher* levels of vitamin K *reduced* their risk of heart disease. Much of this effect could be attributed to the longer MK forms, such as MK-7 and MK-9.

The study also found that the risk of coronary heart disease was reduced by **9%** for every additional **10 mcg** of vitamin K2 consumed per day in individuals aged 49 to 70.[7]

Vitamin K's Role in Bones and Blood Vessels

The effect of vitamin K on the production of **blood clotting** factors crucial for normal clotting has been well understood. But research has just recently revealed its impact on bones and blood vessels.

Several proteins have been discovered in both bone and blood vessels that are **vitamin K-dependent**. This means that they *require* adequate levels of vitamin K to function.[2,3]

Vitamin K is essential for producing active **osteocalcin**, a bone hormone involved in new **bone** formation and often used as a biochemical marker of overall skeletal health.

Vitamin K supports the deposition of **calcium** in **bone**.

In blood vessels vitamin K has the opposite effect of helping to *prevent* excess calcium deposition. Calcification in arteries is common in older age and is associated with arterial stiffening, atherosclerotic plaque, and increased risk for heart and kidney disease.[3]

Vitamin K and Cardiovascular Disease

Several other studies have shown benefits of vitamin K for cardiovascular health.[2-4,7,18]

A study of vitamin K intake in 564 postmenopausal women found that higher vitamin K2 levels were associated with protection from coronary artery calcification.[18] Those with the *highest* intake had a **20%** lower rate of calcification than those with the lowest intake.

And in a study that followed 4,807 adults aged 55 and older, for up to 10 years,[4] several negative cardiovascular outcomes were shown to be less common in those subjects with the *highest* intake of vitamin K2, compared to those with the lowest intake.

The rate of new diagnoses of coronary heart disease during follow-up was **41%** lower in those with the ***highest*** intake of vitamin K2. Most dramatically, death due to coronary heart disease was **57%** lower in those with the highest intake, and **death by *any* cause** was **26% lower**.[4]

Reduced Fracture Risk

Several other studies have found that various forms of vitamin K supplementation improve the osteocalcin status of participants, an important marker of new bone formation and overall bone health.[13,14,17,19-22]

But it is important to ask whether the **rate of bone fractures** is reduced with increased vitamin K dietary intake.

A study published in the journal *Medicine* in **2017** investigated just that question.[5] Researchers performed an extensive meta-analysis, pooling data from close to *81,000* individuals. Overall, they found there was a **22%** lower **rate of fractures** in those individuals with the *highest* intake of vitamin K, confirming a protective effect of vitamin K against fractures.

In addition, the scientists found a dose-response relationship, with a **3%** *lower* rate of fracture for every **50 mcg** of vitamin K consumed per day.[5]

Summary

Vitamin K is an essential nutrient that is being recognized for more health benefits than just aiding blood clotting.

Scientific research demonstrates that adequate intake of vitamin K is crucial for optimal bone, heart valve, and blood vessel health.

New studies reveal the importance of new **forms** of vitamin K that are associated with reduced risk of age-related outcomes.

Using this knowledge, scientists have created a broad-spectrum vitamin K formula, with beneficial MK-6 and MK-9 compounds, along with **K1**, **MK-4**, and **MK-7**. ●

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

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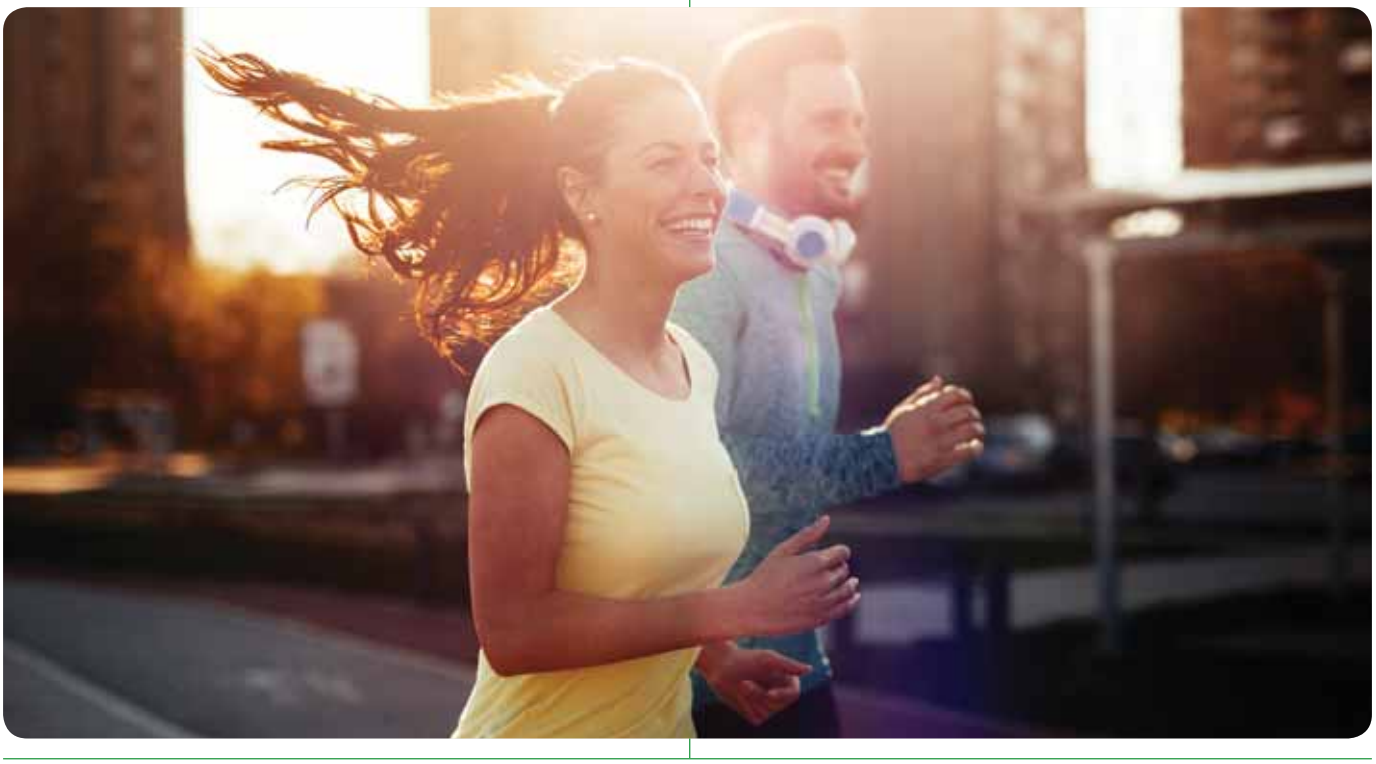

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Ginger & Turmeric Roots

A Formidable *Anti-Inflammatory* Pair

BY RICHARD MAYER

Many disorders of advancing age are linked to a common problem: **chronic inflammation**.

Inflammation damages tissues and contributes to a variety of ailments, including atherosclerosis and cardiovascular disease, stroke, diabetes, Alzheimer's and other forms of dementia, arthritis, and cancer.[1-4]

If we can impede chronic inflammation, we may delay the onset of many age-related diseases.

Scientists have discovered that two closely related plant roots, **ginger** and **turmeric**, have **anti-inflammatory** properties.[5-9]

Working together, the active components in these plants, such as **gingerols**, **curcumin**, and **turmerones**, provide a potent "1-2 punch" to chronic inflammation, helping to maintain healthy tissues.

Inflammation Contributes to Aging

Chronic, low-grade inflammation doesn't just increase the risk of disease—it has been identified as one of the key contributors to the aging process itself.[1,3,4,10,11]

Inflammation plays such a central role in age-related ailments that scientists have coined the term **inflammaging** to describe its effects.[1]

There are many different causes of this type of chronic inflammation.

With advancing age, many cells become **senescent**. That means they no longer divide or support tissues. Senescent cells also spew out harmful compounds that activate inflammation and cause tissues to age more rapidly.[4]

In overweight or obese individuals, excess fat cells release compounds that promote inflammation throughout the body.[1,3]

Other contributors to inflammation include diet, gut microorganisms, pollution, hormone imbalances, stress, and more.[1,3,4,10]

Plant-Based Solutions to Inflammation

For centuries, **ginger** and **turmeric** have been recognized as powerful anti-inflammatory plants. They both contain beneficial compounds that reduce inflammation and offer other health benefits.

They also have antiviral and antibacterial properties that help to bolster the immune system's defense against pathogens. Ginger and turmeric have also demonstrated anti-cancer properties.[12,13]

Ginger: An Anti-Inflammatory Powerhouse

Ginger is a flowering plant whose underground stem or rhizome, also known as **ginger root**, has been used in cooking and as a natural medicine.

Ginger root is the source of a cocktail of beneficial compounds, including **gingerols**, that have free-radical scavenging and anti-inflammatory properties.[14]

Leukotrienes contribute to dangerous inflammatory reactions. Compounds in ginger have been found to *inhibit* enzymes that produce **leukotrienes**.[5,6]

Ginger also works to reduce inflammation by affecting several other compounds and cellular pathways, including:

- Reduction in levels of inflammatory mediators, such as **tumor necrosis factor-alpha**, **C-reactive protein**, **interleukin-1β** and **interleukin-6**,[15-20]
- Inhibition of **nuclear factor kappa B (NF-kB)** pathways, which are involved in the *initiation* of chronic inflammation.[16,21,22]

Turmeric: A Golden Anti-Inflammatory

Turmeric, a close relative of the ginger plant, has a bright yellow-orange rhizome. Like ginger, turmeric is a source of both spices and medicine.

Curcumin and other **curcuminoids** are compounds derived from turmeric that have been the most-studied. There is a robust research record

showing their efficacy in fighting inflammation. Most extracts of turmeric on the market primarily contain isolated curcumin.

Other compounds found in turmeric, such as **turmerones**, offer their own health benefits, many of which help to *augment* the effects of curcumin.[23]

Turmeric's anti-inflammatory effects are, like ginger's, inhibition of **leukotrienes** and other pro-inflammatory pathways, as discussed on the previous page. Turmeric has additional effects that go beyond what ginger can do, including:

- Support of **sirtuin 1** expression, which is associated with healthy aging and longevity,[24]
- Neuroprotective capabilities, by reducing neuroinflammation and by protecting against the toxic effects of **beta-amyloid** accumulation associated with Alzheimer's disease, and[25-27]
- Activation of **heme oxygenase-1** and other pathways of protection from oxidative damage.[24,28]

In addition, **STAT3** signaling, which is associated with inflammation and development of some cancers, has been shown to be suppressed by turmeric.[29,30]

Specific Conditions for which Ginger and Turmeric are Beneficial

Although turmeric and ginger contain different compounds, they offer overlapping anti-inflammatory properties *and* complementary effects. In other words, they complement each other.

Together, these two plant roots and their extracts offer superlative anti-inflammatory effects. Scientific studies have shown that ginger and turmeric can help fight a wide range of age-related disorders and conditions that include practically every system and organ in the body.

The following are a few of the conditions for which extracts of ginger and turmeric can be beneficial.

Metabolic Disorders

Obesity, diabetes, and metabolic syndrome are increasingly common and are risk factors for many other problems, such as cardiovascular disease.[31,32] Inflammation is strongly associated with these disorders, and is a primary driver of the health problems to which they lead. [33]

Research shows that both ginger and turmeric help alleviate many of the metabolic abnormalities that characterize these disorders.[15,18,22,34-39]

What You Need to Know

Curcumin and Ginger Fight Inflammation

- **Chronic inflammation increases throughout the body as we age.**
- **Many sources contribute to this harmful inflammation, which does damage to our organs and tissues.**
- **This long-term damage builds up to cause age-related disease and loss of function, contributing to the development of almost all age-related disorders, from cardiovascular disease to cancer.**
- **Natural compounds in ginger and turmeric work by means of several different complementary mechanisms to deliver powerful anti-inflammatory effects.**

Mice fed high-fat and/or high refined-carbohydrate diets normally suffer from dangerous changes in body composition and metabolism, including obesity, abnormal blood lipid levels, and systemic inflammation. Compounds in ginger *prevent* these changes, by helping to maintain healthy weight and lipid levels, and reducing inflammation.[34,35]

In animal studies, ginger also provided protection to organs (kidneys and brain) commonly affected in diabetics.[36,37]

Human studies show that supplementation with ginger and turmeric can *reverse* many of the metabolic abnormalities seen in prediabetics.[15,18,22,39] Daily supplementation with ginger powder helps to control blood sugar levels, triglycerides, and LDL ("bad") cholesterol, while raising healthy HDL cholesterol and improving insulin sensitivity.[15,18,22]

Cardiovascular Disease and Stroke

The abnormalities associated with metabolic disease and diabetes are strong risk factors for blood vessel disease that can lead to heart disease, stroke, and other related conditions.

Preclinical studies show that both ginger and turmeric *reduce* the risk for these diseases by improving glucose and lipid control. They also contribute to blood vessel health by blocking inflammation that leads to **atherosclerosis** (hardening and narrowing of the arteries).[24,28,40-42]

Studies in animal models that include ginger and turmeric have shown that both compounds reduce vascular inflammation and protect blood vessels from the damage that high blood pressure and abnormal cholesterol levels can cause.[40,41] This suggests a reduction in the risk for atherosclerosis and its dangerous consequences, including heart attacks and strokes.

Osteoarthritis

A common cause of loss of mobility in older age, **osteoarthritis** occurs when the protective cartilage on the ends of the bones wears down. Human studies have now documented the ability of curcumin and ginger to help *reduce* its symptoms.[43,44]

Improvement of several clinical markers of arthritic disease has been observed, including lower levels of pro-inflammatory compounds, improved physical function, and better quality of life.[19,43,44]

Curcumin and ginger have also been shown to be beneficial for **rheumatoid arthritis**, an autoimmune form of arthritis that starts when the immune system targets the joint linings.[45-47]

One study assessed treatment with a combination of ginger and turmeric for rheumatoid arthritis in a rat model. The ginger-turmeric combination was found to help preserve the structure of joints, reduce inflammation, and prevent many other changes that can occur in rheumatoid arthritis such as impaired kidney function and anemia.[46]

Alzheimer's, Parkinson's, Cognitive Decline and Dementia

Turmeric and curcumin are recognized for their ability to protect against many of the age-related changes that occur in the brain and contribute to loss of cognitive function. They protect against biochemical pathways of neuroinflammation, which are involved in the development of neurodegenerative diseases like **Alzheimer's** and **Parkinson's disease**. In preclinical models they reduce the damage done by abnormal proteins like beta-amyloid.[26,27,48]

Ginger has similar benefits. Not only do compounds found in ginger reduce brain damage caused by amyloid abnormality and inflammation, they have been found to inhibit **acetylcholinesterase**, an enzyme that breaks down the neurotransmitter **acetylcholine**.[49,50] This helps *boost* brain levels of acetylcholine, which is essential for processing memory and learning. Most pharmaceutical drugs used to treat the symptoms of Alzheimer's disease do just this.

Taken together, the combination of ginger and curcumin may help both *prevent* the progression of these common brain diseases and *reduce* their symptoms.

Cancer

Inflammation is a major contributor to the formation of most cancers. By fighting inflammation along with other mechanisms, ginger and curcumin have been shown in many studies to help inhibit the growth of tumors. Together they promise to be significant weapons in the fight against cancer.[2,14,29,51-56]

Summary

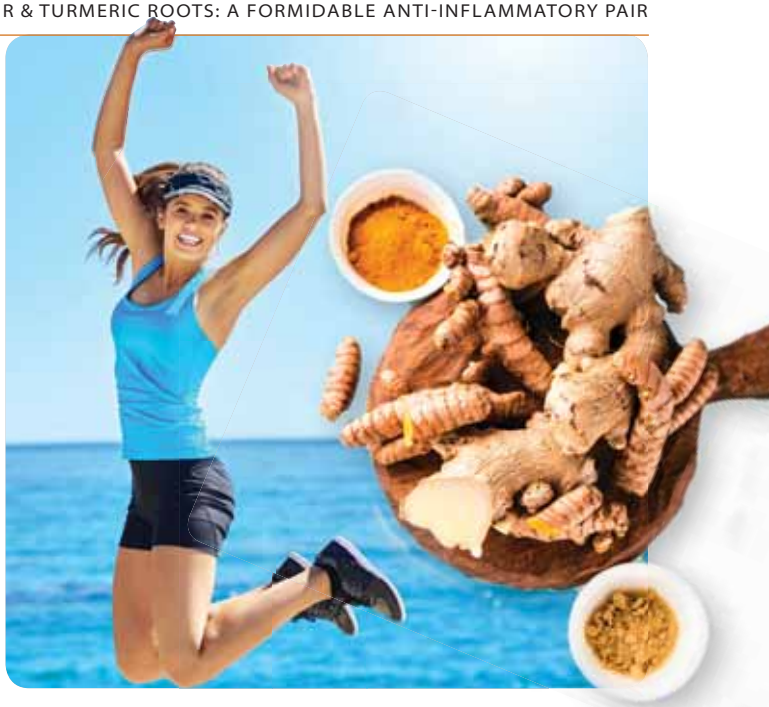
Chronic, low-grade inflammation has many causes. It is a major contributor to the loss of function and risk for disease that become more prevalent as we age.

In fact, almost all age-related changes and disorders can be tied to inflammation, from arthritis and diabetes to dementia and cancer.

Natural compounds found in the rhizomes of two related plants, **ginger** and **turmeric**, have demonstrated anti-inflammatory properties. They act by means of multiple, complementary mechanisms to reduce harmful inflammation while protecting normal immune function.

Experimental, animal, and human studies have demonstrated significant benefits. ●

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



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CoQ10 Protects Skin Mitochondria from Aging

BY KATHY WISE

As we age, we tend to tire more quickly. This loss of energy is reflected not only in how we feel but how we look.

When cells are unable to maintain and repair themselves properly, it leads to skin wrinkles, sagging, and other outward signs of age.[1,2]

A new study[3] shows that we can ***fight skin aging*** by using a familiar and vital nutrient:

Coenzyme Q10

The Role of Mitochondria

According to the ***mitochondrial theory of aging***, energy loss is a causative factor in degenerative aging.[4]

Mitochondria are the tiny power plants of our cells. They burn food molecules and generate **adenosine triphosphate** (**ATP**), which delivers energy to the cells.

Over time, the mitochondria are damaged.[3-6] There are many causes, including oxidative stress, toxins, and infections. And *some* of the oxidative stress comes directly from the mitochondria's own energy-generating activity.[7]

Damaged mitochondria are less efficient and produce less ATP from food. That leaves us with an **energy deficit**.

In our **skin**, *insufficient* **ATP** means inadequate cell maintenance and repair. One result is visibly wrinkled and sagging skin.[1,2]

Studies showed long ago how CoQ10 can *heal* mitochondria and boost mitochondrial function.[8-10] Scientists at a top university in Germany set out to examine how this would impact aging skin.

Testing Aging Skin for CoQ10 Benefits

Researchers took **skin biopsy** samples from donors of varying ages to measure the effects of **mitochondrial function** on skin aging.[3]

They kept the skin samples alive in cell culture medium and tested each one for mitochondrial function, including oxygen consumption rate (more consumption means more mitochondrial activity) and ATP production (more ATP means more active mitochondria).

Next, they supplemented the culture medium of the biopsies with either CoQ10 or a control solution and measured the impact on mitochondrial function. Oxygen consumption and ATP production were again measured.

CoQ10 Restores Energy

Two major findings emerged.

First, researchers demonstrated the **mitochondrial theory of aging**—and showed that it applies to **human skin**—by demonstrating that oxygen consumption and ATP production declined with age.[3]

Samples from older people had lower rates of mitochondrial activity and, as a result, lower rates of energy production. In fact, the scientists found a reliable and severe decline in mitochondrial activity of about ***10% per decade***.[3]

Second, the study revealed a role for **CoQ10** in the *prevention* of age-associated mitochondrial dysfunction.

The researchers found that when CoQ10 was added to the skin biopsies, there was a marked ***increase*** in **mitochondrial activity**. This was measured by examining the oxygen consumption rate, since mitochondria use oxygen to generate ATP.

Skin biopsies supplemented with CoQ10 ramped up their oxygen consumption rate by close to **30%** compared with the unsupplemented ones.[3]

The study indicates that supplementation with CoQ10 can significantly restore **mitochondrial energy** production. This has important implications for reducing skin aging. It shows that by restoring mitochondrial energy production, skin tissue **repair** and **maintenance** are improved. This gives CoQ10-nourished cells a boost in fighting the ravages of aging.

This finding is important for those concerned about skin aging. It has implications for other organs and systems, all of which rely on mitochondria to function properly.

Human Study Shows CoQ10 Helps Combat Visible Skin Aging

Researchers at the Institute of Cosmetics in Ljubljana, Slovenia, set out to examine the potential benefits of CoQ10 on visible signs of skin aging as measured by skin thickness, hydration, elasticity, and wrinkles. The study was done during the cold winter months when skin problems tend to be most evident.[11]

Thirty-three women aged 45-60 were enrolled and told to continue their routine skin-care and dietary habits.

This group was subdivided randomly to receive one of the following:

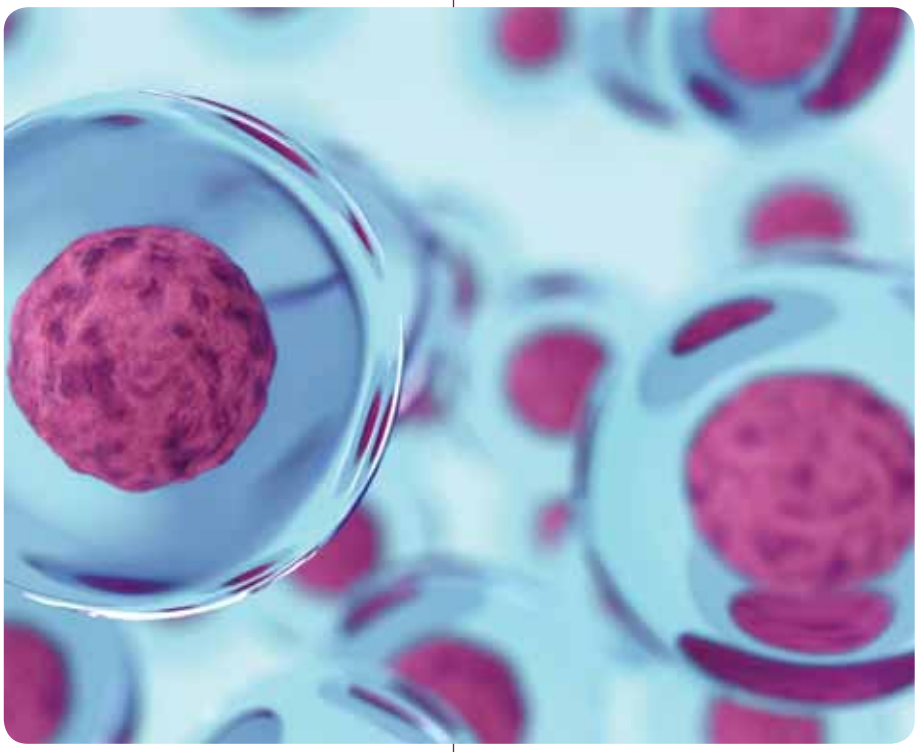
- Placebo,
- **50 mg** each day CoQ10 supplement, or
- **150 mg** each day CoQ10 supplement.

The study lasted 12 weeks, and skin quality measurements were conducted at baseline, and at six and 12 weeks of supplementation.

The study showed that:[11]

- **Wrinkles** (measured in the area around the eyes) did not change in the placebo group, while both CoQ10-supplemented groups had significant ***reductions in wrinkles***.
- **Skin elasticity** decreased by nearly **25%** over 12 weeks in placebo subjects, but remained unchanged in both CoQ10 groups, resulting in significant differences between treated and placebo subjects.
- **Smoothness:** Expert evaluation (blinded to study group) revealed significant improvement in CoQ10-treated groups' **skin smoothness** by **70%-82%**, with no significant changes in the skin of placebo recipients.

This human study is among the first to demonstrate the clinical benefits of oral CoQ10 supplements for reducing **skin aging**.



How It Works and Why It Matters

Cells require efficient, clean-running mitochondria to function properly—and when mitochondria suffer, so do the tissues in which they reside.

At the core of the energy-converting process is the ***electron transport chain***, a sort of power line that transfers electrons from food-derived molecules (mainly carbohydrates and fat) to ATP molecules. Cells then use ATP to power themselves.

As this process occurs, toxic byproducts are produced, including free radicals.[6,12-14] The resulting oxidative damage causes the mitochondria to gradually deteriorate. In skin tissue, that leads to visible defects in skin quality.[15-17]

CoQ10 plays an essential role in the electron transport chain, facilitating the efficient transfer of electrons. It also acts as a free radical scavenger, reducing oxidative damage.

But CoQ10 levels *drop* with advancing age. This leaves cells relatively unprotected, and causes mitochondria to burn their fuel inefficiently, wasting energy and producing *more* toxic byproducts.[6,12-14]

In the skin biopsy study, adding CoQ10 acted as a "fuel additive" that *enhanced* electron transport to overcome the consequences of ailing mitochondria.[3]

What all this means is:

a) CoQ10 supplementation may be an important step in maintaining **healthy skin** into advanced age, and

b) Other tissues in the body are likely to receive similar benefits from CoQ10.

Summary

One aspect of aging involves accumulated cellular damage and dysfunction.

One of the biggest contributors is the increase of **dysfunctional mitochondria** in our cells.

A study shows that skin cells supplemented with CoQ10 have healthier mitochondria. Adding to this is evidence from a **clinical trial** showing oral CoQ10 supplementation improved the appearance and youthfulness of aging skin.

These findings suggest that CoQ10 supports youthful function in tissues throughout the body. ●

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

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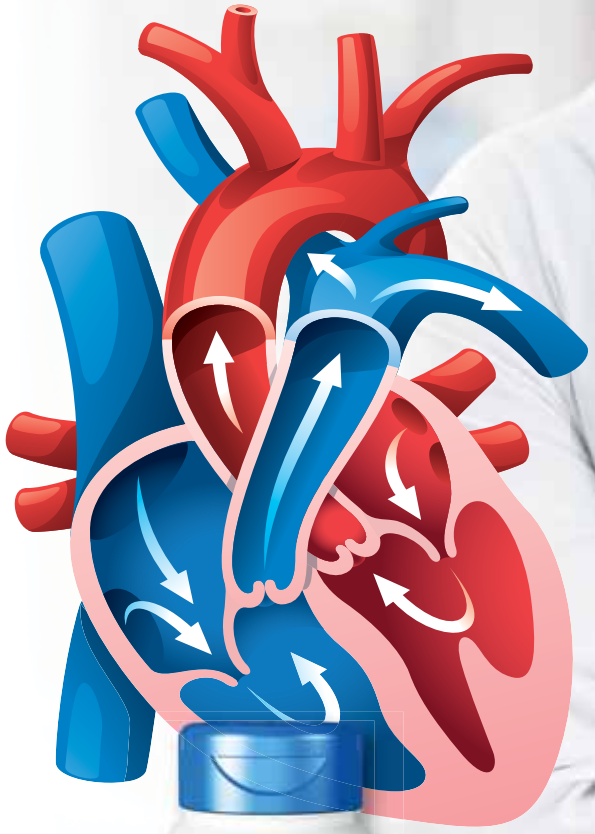

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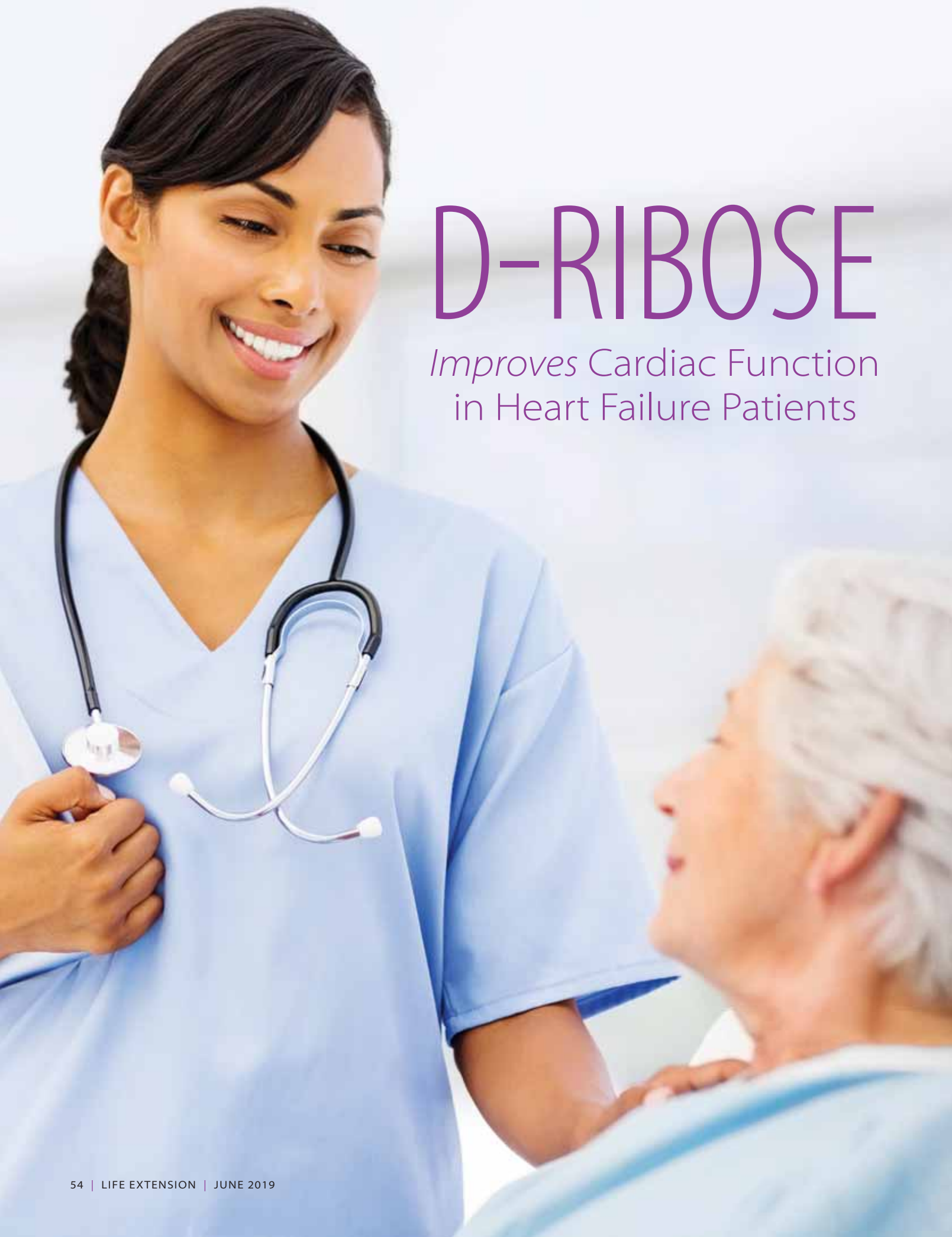


D-RIBOSE

Improves Cardiac Function in Heart Failure Patients

BY JULIE STEIN

When it comes to heart failure, the statistics are chilling.

More than 870,000 new cases are diagnosed in the U.S. each year in people aged 55 and older.[1-4]

One in five people who are currently 40 years old will go on to develop heart failure in their lifetimes. By **2030** it is expected that more than **eight million** Americans will be affected by the disease.[1-3]

Heart failure occurs when the heart fails to pump enough blood to support the whole body.[1] It is a debilitating and progressive condition.

Clinical trials have shown that supplementation with ***D-ribose***, which is produced in the body, can ***improve*** **heart function** following damage to the heart muscle.

It helps the heart muscle manage energy, offering a potential solution to the slow-motion **cardiac energy crisis** that is heart failure.[5-7]

But how does **D-ribose** achieve these results?

The answer has to do with the way energy is released and converted into ***adenosine triphosphate*** (ATP). This universal "energy currency" then transfers energy to cells in a form they can use to do their cellular work.

Here, we review the compelling clinical studies that reveal the power of D-ribose in heart failure, and then explain precisely how it works to feed the energy-hungry, failing heart.

D-Ribose Improves Heart Function

D-ribose is a building block of ***ATP***,[8] the energy source for every cell. Research has demonstrated that D-ribose supplementation can support the heart's ability to extract energy and store it in the form of ATP, improving the function of the heart even if it's been damaged.[7]

Human studies show the following potential of D-ribose to reduce the symptoms of heart failure when given orally at a dose of **5 grams three times daily**:

- ***Improved blood flow through the heart.*** Heart failure results in *slower* flow of blood through the heart, *raising* the amount of work the heart muscle must do to push the blood through the body. Fifteen patients with chronic coronary artery disease and heart failure were randomly assigned to receive **D-ribose** or a **placebo** for three weeks, and after a one-week "washout" period, were switched to the opposite therapy.[7] During the D-ribose supplement phases subjects had significantly enhanced filling of the left ventricle and other signs of reduced cardiac loading that *eased* the workload on the ailing heart muscle, and significantly *improved* measures of quality of life. No such changes were seen during placebo phases.

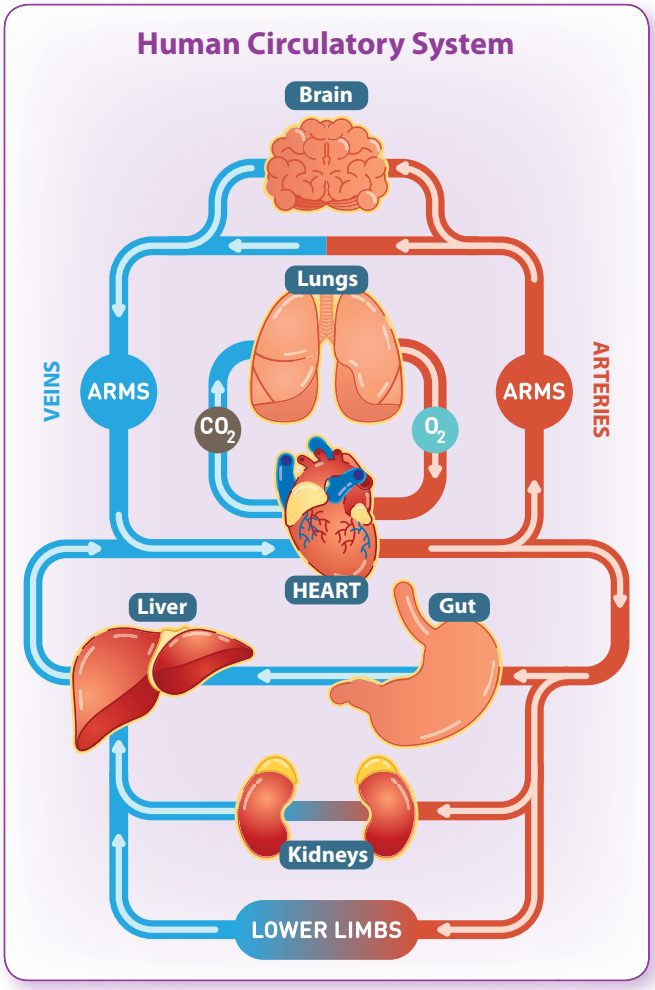
- ***Improved blood flow in the body.*** Heart failure *reduces* the amount of blood the heart can pump with each beat, slowing down the body's whole circulation, imperiling organs that need ample blood supply. Eleven patients with New York Heart Association Class II-IV (mild to severe) heart failure were supplemented with D-ribose for six weeks.[5] At the end of the six-week supplementation period, **improved blood flow** in tissues was shown by Doppler ultrasound in **64%** of patients. This improvement lasted through nine weeks—three weeks *after* the end of supplementation.

- ***Improved exchange of oxygen and CO_2 through the lungs.*** Heart failure *increases* how hard the heart-lung system must work to rid the body of carbon dioxide and take in oxygen. Sixteen people with New York Heart Association Class III-IV heart failure (among the most severe) were treated in a trial of D-ribose for eight weeks.[6] All patients had a significant improvement in their breathing parameters, which are so often impaired in heart failure.

  D-ribose supplementation significantly increased ***ventilatory efficiency*** (how much air needs to be moved to eliminate metabolically-produced carbon dioxide from the body) by **16%**. Ventilatory efficiency is a strong predictor of survival in heart failure patients, so this demonstrates a direct reduction in the risk of dying.[6] Measures of oxygen uptake efficiency, oxygen flow through the lungs, and amount of oxygen pumped per heartbeat also improved, by **25%**, **19%**, and **16%**, respectively, demonstrating marked increases in the ability of the heart-lung system to take up oxygen and rid the body of carbon dioxide.

Together, these and other studies show the value of adding a D-ribose supplement, **5 grams three times daily**, to improve heart failure symptoms and quality of life in heart failure patients.

A deeper look into what happens in the muscles of a failing heart has opened an entirely new chapter in ***metabolic cardiology***, the study of how the heart's own energy flow affects its pumping capacity.[9,10]



D-Ribose Supports Cardiac Energy Metabolism

After a hard workout or physical labor, our muscles are tired and weak. That's because, at the cellular level, they've used up much of the available molecules of ATP that provide the energy for the cellular work of moving. We rest after exercise or hard work in order to give our muscles time to burn *more* glucose to make *more* ATP.

The same situation occurs in the heart, with one vital difference: The heart muscle *can't* stop to rest and re-energize itself with more ATP. When ATP levels fall, the heart muscle simply operates with increasing weakness, pumping less blood with each beat.

If we can figure out a way to *boost* ATP levels, we can re-energize the heart muscle and may prevent or even *reverse* the symptoms of heart failure.

To understand how D-ribose benefits the heart, we need to look at the makeup of ATP itself.

The ATP molecule consists of three major parts, as seen in **Figure 1** on the next page.

Adenine is a nucleotide, one of the building blocks of DNA.

Adenosine is simply adenine chemically bonded to a molecule of ***D-ribose***.[8] D-ribose is a structural component of the vital ATP molecule.[9]

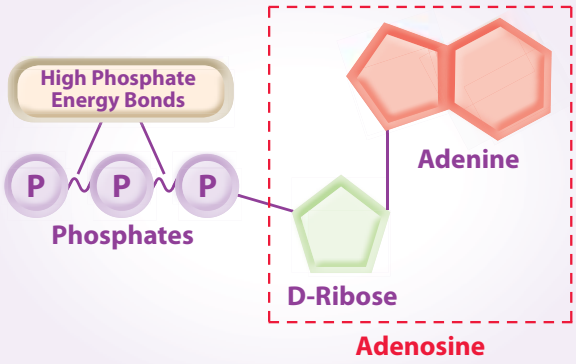
The ***D-ribose*** portion of adenosine binds tightly to a series of ***phosphate molecules***, with each

Energize Your Heart with D-Ribose

- **Heart failure means the heart muscle is failing to pump enough blood to meet the body's metabolic requirements.**
- **Its incidence is rising, but there are no good, long-term medications available that truly treat heart failure and reverse its debilitating effects.**
- **The field of *metabolic cardiology* suggests that fundamental energy requirements go unmet in muscle cells of a failing heart, leading to significant drops in ATP, the energy-carrying molecule that supports all cellular work.**
- **One source of low ATP in heart failure is a diminished supply of the sugar *D-ribose*, which ailing heart cells cannot manufacture fast enough to meet energy requirements.**
- **Studies now show that supplemental D-ribose, 5 grams three times daily, can significantly improve heart muscle function in heart failure, resulting in better pumping action and reduced workload on heart and lungs.**

What You Need to Know

Figure 1: ATP Molecule Structure



Structure of the high-energy molecule adenosine triphosphate, or ATP.[12] Large red portion is adenine, which, when bound to D-ribose, is called adenosine. Opposite side of D-ribose portion binds tightly to up to three phosphate groups, with each chemical bond holding large amounts of energy that can be released when phosphates are broken away, first to adenosine **di**phosphate (one phosphate gone), and then to adenosine **mono**phosphate (AMP, with two phosphates gone).

chemical bond between the phosphate groups containing energy extracted from the metabolism of glucose and fat. ATP, with **three** such bonds, contains more stored energy than adenosine monophosphate (AMP), which has just **one**.

A maximum of *three* high-energy phosphate groups can be bound to a single adenosine molecule, producing adenosine ***tri***phosphate, or ATP. When cells require energy, they release phosphates from ATP to carry out useful work by harvesting the newly-released energy.[8,11]

But in heart failure, a ***cellular energy deficiency*** arises in which D-ribose production falls in heart muscle cells.[12] This leads directly to a *decrease* in **ATP** production in the very cells that need energy the most. Without ample **D-ribose**, cells cannot capture metabolic energy, and almost literally starve themselves into weakness.[8]

The obvious solution, then, is to provide extra ***D-ribose*** in the form of an oral supplement, which bypasses the overwhelmed cellular D-ribose-producing machinery and permits creation of many *new* ATP molecules.[8]

And it works. One of the first studies of supplemental D-ribose was done in dogs back in 1989. It showed that ATP levels are depressed by about **50%** following loss of blood flow (***ischemia***) in the heart muscle. But when the dogs were supplemented with D-ribose intravenously, during and after the ischemic event, ATP levels rebounded to **85%** of their normal levels within 24 hours, a benefit not seen in the unsupplemented animals.[13]

In other words, **D-ribose replenishes low cardiac muscle energy levels**, improving cardiac function during ischemia.[6]

The evidence for D-ribose as a heart muscle energizer is so great that scientists have proposed treating it as a ***conditionally essential nutrient***. This means that, under certain conditions, like heart failure, D-ribose is so important that its levels *must* be supported by external supplementation.[14]

Summary

Heart failure is increasing, with an estimated **eight million** sufferers expected by **2030**.

Currently, drugs for heart failure are only marginally effective and act by forcing the heart muscle to work *harder*, even as it is being deprived of sufficient ATP to perform extra work.

An alternative approach, called ***metabolic cardiology***, offers a more natural and physiologically sound way to improve heart muscle performance.

Researchers have found that we can improve the conditions that lead to ATP production within the heart muscle itself by providing D-ribose as a vital "substrate" for ATP production.

Studies in animals, and now in humans, have shown that increasing available D-ribose, the "scaffold" on which ATP is built, can dramatically restore energy to the heart, enabling it to carry out its vital work with greater power and efficiency.

Regular supplementation with D-ribose is one proven means of feeding the starving heart muscle and producing real improvements in cardiovascular function. ●

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

What *Is* Heart Failure, Anyway?

"Heart failure," despite its dramatic-sounding name, is not a sudden, fatal event.

The term refers to a situation in which the heart muscle cannot keep up with the body's demands for ample blood flow. In other words, the heart "fails" to provide adequate supplies of blood. As a result, a host of organs and systems run on insufficient fuel, leading to gradual, systems-wide malfunctions.

Heart failure doesn't appear out of nowhere. Generally, either the heart muscle is damaged (by a heart attack, for example), or the workload faced by the heart muscle rises sharply (as with severe high blood pressure).[15]

Regardless of the cause, heart failure typically results in an overstretched, thickened, and enlarged left ventricle (the main pumping chamber), which overburdens the heart's ability to work efficiently.[9,16]

The outcome is that there is a reduction in the volume and pressure the ailing heart muscle can pump with each contraction. That causes both an insufficient forward flow, and a backup of blood that can't get back to the heart for recirculation.

These factors produce the common ***symptoms of heart failure***, which worsen as the condition becomes more severe.[17,18]

In early heart failure, patients may experience *no symptoms* at all. As heart failure progresses, people may be comfortable at rest, but find that ordinary physical activity produces ***fatigue, heart palpitations, trouble breathing, or chest pain***.

In later stages, symptoms markedly limit physical activity. In the most severe stage (Stage D, in the American Heart Association's classification), people with advanced heart failure may have symptoms at rest and are unable to carry out *any* physical activity without discomfort or a sharp increase in symptoms. These patients require aggressive medical therapy just to survive.

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New Study to Evaluate D-Ribose, CoQ10 Combination in Heart Failure

Metabolic cardiology focuses on preventing and treating cardiovascular disease at the cellular level, by preserving and promoting the production of ATP. It holds the promise of reducing death and disability from heart failure.

The approach described in this article, providing supplemental D-ribose to boost available ATP in heart muscle, is one of the most important contributions of metabolic cardiology to date. But it is not the only one.

In a planned study by researchers at the University of Kansas School of Nursing and Department of Molecular and Integrative Physiology, subjects with heart failure will be randomly assigned to receive either a placebo, D-ribose **(15 grams/daily)**, a form of **coenzyme Q10 (CoQ10)** called ***ubiquinol* (600 mg/day)**, or a combination of both D-ribose *and* ubiquinol.[3]

The study will continue for 12 weeks, and will measure multiple outcomes, including symptoms, vigor, echocardiographic measurements of heart chamber sizes and function, and walking endurance. Measures of ATP production in mitochondria will also be taken.

This is just one example of a marked shift in researchers' attitudes and approaches to heart failure. Instead of drugs that "whip" the heart muscle to do more work with less energy, supporting cardiac energy levels with D-ribose and CoQ10 offers the chance to genuinely improve heart muscle function.

Heart Failure Protocol

Decades ago **Life Extension**® identified studies in Japan showing heart failure patients improving in response to **3,000 mg** a day of the amino acid **taurine**.[19]

Japanese research on **CoQ10** led a pioneering American cardiologist, Peter Langsjoen, MD, to develop a protocol for heart failure patients that involved high-dose **ubiquinol** (**580 mg** on average and after a few months reduce the ubiquinol dose to about **400 mg** daily).[20]

Dr. Langsjoen's dosing of ubiquinol is based on each patient's **blood levels** of CoQ10. **Life Extension** offers CoQ10 blood testing to help those who need to achieve higher blood concentrations. To inquire about **CoQ10 blood testing**, call **1-800-208-3444** (24 hours) or visit **www.LifeExtension.com/blood**

For healthy people not supplementing with CoQ10, Dr. Langsjoen suggests starting with **300-400 mg** per day for the first month to fully saturate your cells. People can then back down to a daily dose of **100-200 mg** per day to maintain high cellular CoQ10 levels.[21,22]

A recent animal model study indicates that heart failure patients might benefit by boosting the **NAD**$^+$ levels.[23] This can be accomplished by taking **250-500 mg** a day of **nicotinamide riboside**. NAD$^+$ is required for healthy cell energy functions.

There are also indicators that heart failure patients might benefit from taking **senolytic** compounds that selectively remove **senescent cells**. The accumulation of senescent cells damages healthier heart cells by spewing protein-degrading enzymes and igniting persistent inflammatory reactions.

So an updated heart failure protocol might include:

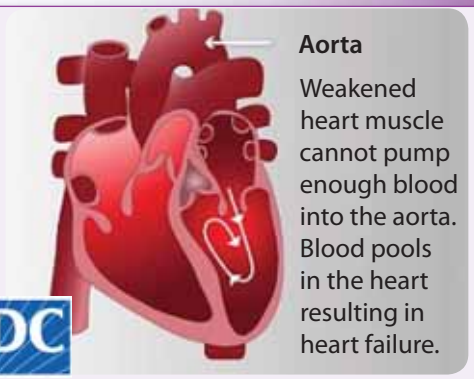
- **5,000 mg** of **D-ribose** powder 3 times daily (15,000 mg total per day)
- **3,000 mg** a day of **taurine** (a low-cost supplement)
- **200-600 mg** of **ubiquinol** (dose can be based on blood test results)
- **250-500 mg** a day of **nicotinamide riboside**
- **500 mg** a day of **magnesium**
- **1,000 mg** a day of **carnosine**
- **Senolytic** protocol of your choice

These approaches are NOT meant to substitute for conventional **prescription drugs** that are extending lives of heart failure patients. Their efficacy is evidenced by a **44%** decline in sudden death rates of heart failure patients that occurred between **1995-2014** with more intelligent use of these drugs by conventional cardiology.[24] This period is also associated with surging use of **CoQ10** that heart failure patients often take.

The next page features some Power Point slides that were used to describe recent findings on the potential of **NAD**$^+$ and **senolytics** to improve heart muscle **function**, along with a listing of **prescription drugs** often prescribed for **heart failure** patients.

Note: Take **CoQ10** with a fatty meal to further improve **absorption**.

Recent Findings on NAD+ and Senolytics Relating to Heart Failure



Aorta

Weakened heart muscle cannot pump enough blood into the aorta. Blood pools in the heart resulting in heart failure.

January 8, 2019

Heart Failure Fact Sheet

- Heart failure happens when the heart cannot pump enough blood and oxygen to support other organs in your body.
- About half of people who develop heart failure die within 5 years of diagnosis.
- 8 million Americans suffer heart failure.

https://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_heart_failure.htm

British Heart Foundation

February 8, 2019

Newcastle University Scientists are Killing Zombie Cells to Reverse Age-Related Damage in the Heart

"... **senescent cells** – also known as zombie cells – form in the heart during aging and lead to heart failure."

"Newcastle scientists, in collaboration with researchers in the Mayo Clinic... have not only discovered how this process takes place in the heart, but also how it can be reversed or treated."

American Heart Association.

May 21, 2018

NAD+ May Improve Heart Function

"Stabilizing the intracellular NAD+ level represents a promising therapeutic strategy to improve myocardial bioenergetics and cardiac function."

"In this issue of *Circulation*, Diguet et al report exciting data suggesting that supplementation with a NAD+ precursor, nicotinamide riboside, reduces cardiac dysfunction in preclinical models of heart failure."

Sharp Decline in Heart Failure Death Rates

- Clinical trials spanning 1995 to 2014 show:
- 44% decline of sudden death rates in heart failure patients.
- Marked improvement in just 19 years!

The NEW ENGLAND JOURNAL of MEDICINE

"Declining Risk of Sudden Death in Heart Failure." *New England Journal of Medicine*; 2017;377(1):41-51.

Proper Medication Use Buys Heart Failure Patients Extra Years

Combinations of the following drugs treat heart failure under cardiologist supervision:

- **Beta Blockers (carvedilol, metoprolol)**
- **ACE Inhibitors (lisinopril, captopril)**
- **Angiotensin Receptor Blockers (losartan)**
- **Digoxin (Lanoxin)**
- **Hydralazine and Nitrates (Apresoline, Nitrobid, Imdur, Isordil)**

Without innovative approaches, heart failure eventually results in death.

https://wa.kaiserpermanente.org/healthAndWellness/index.jhtml?item=%2Fcommon%2FhealthAndWellness%2Fconditions%2FheartDisease%2FchfMedications.html

Senolytics to Treat Heart Failure Need Human Validation

What we learned from this 2019 published study:

- Senescence involving cardiomyocytes (i.e. cardiac muscle cells) appears to be associated with age-linked fibrosis and hypertrophy of the heart.
- Pharmacologic and genetic removal of p16-positive (senescent) cells in mice appears to ameliorate (or improve) the level of age-induced fibrosis and hypertrophy in senescent cardiac muscle cells, and may support regeneration of cardiomyocyte.

Clinical trial on existing senolytic compounds urgently needed!

EMBO J. 2019 Mar 1;38(5). pii: e100492.

What Are Senolytics?

- **"Seno" refers to senescent cells**
- **"Lytic" refers to destruction**

Senolytics selectively destroy senescent cells.

Medical Xpress

February 11, 2019

"Scientists believe it may be possible to reverse the heart damage caused by aging"

"We saw that removing senescent cardiomyocytes from the hearts of aged mice, both genetically and using drugs, was able to restore cardiac health – essentially removing the damage caused by aging.

These data provide critical support for the potential of using medicines to kill zombie cells. If this is validated through clinical trials it would provide us with a new way of treating cardiac diseases."

Rhys Anderson et al. Length-independent telomere damage drives post-mitotic cardiomyocyte senescence, *The EMBO Journal* (2019). DOI: 10.15252/embj.2018100492t

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References

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4 jars $18.56 each

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Caution: Because these producst may lower blood glucose, consult your healthcare provider before taking these products if you are taking glucose lowering medication.

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.

HOW WHEY PROTEIN Fights Aging

BY MICHAEL DOWNEY

Whey protein is widely assumed to be a supplement just for athletes seeking to add additional muscle mass.

That's just a small part of the picture. Studies reveal that whey has anti-aging benefits.

Research shows that whey reduces **muscle wasting** in the elderly, inhibits **weight gain**, may help prevent **cardiovascular disease**, and more.[1-11]

Whey is a food source studied for maximizing production of **glutathione**,[12,13] one of the body's main internally produced, free radical scavengers.[14,15]

Glutathione levels drop with age, and this could play a role in neurodegenerative disease, reduced immunity, and a host of other age-related conditions.[16-20]

Whey, made from the liquid part of milk that separates during cheese production, is not just a source of protein, but also of nutrients including branched-chain amino acids, immunoglobulins, and bio-active protein sub-fractions such as **lactoferrin**.

These benefits show why whey is increasingly viewed as a food that can prevent frailty and promote healthy longevity.

Whey Keeps Muscles from Weakening

About **45%** of older individuals in the general population, and more than **84%** in residential care facilities, are *not* adequately nourished.[21,22] This happens, among other reasons, because older people often have reduced appetites and eat less, while nutrients aren't absorbed as well as we age.[22-24]

An insufficient intake of quality protein can lead to **loss of muscle mass**. For most people, this muscle loss begins around age 40, with an estimated **8%** loss of muscle mass per decade. After age 70, muscle mass decreases by about **15%** per decade.[24]

Approximately **5%-13%** of people aged 60 or over experience age-related muscle-wasting that is so severe, it increases the risk of falls and disability.[25-27]

Inadequate protein consumption among older individuals is associated with reduced strength, decreased bone mass, low immunity, cognitive impairment, and delayed recovery from wounds and surgery.[28] In fact, low protein intake is associated with **frailty**,[29] when the body is so weak it becomes unable to cope with stress or injury. Frailty is a strong predictor of mortality in the elderly.[21,30]

Loss of muscle mass is *not* inevitable but does require some active countermeasures to prevent it.

Whey protein delivers an abundance of **branched-chain amino acids (BCAAs)**, essential nutrients that reduce muscle breakdown and stimulate the building of protein in muscle.[31]

Of the three BCAAs found in whey, ***leucine*** is the most metabolically active, helping to build muscle by activating a signaling pathway that controls the body's anabolic (growth-promoting) drive.[2,32-35] Aging muscle ordinarily becomes resistant to leucine stimulation, but taking leucine-rich whey can overcome this, stimulating muscle synthesis.[33-37]

One study focused on hospitalized elderly men and women who had been classified as frail and assessed the effects of whey on rehabilitation outcomes. The intervention group received whey supplements daily for the duration of their hospital stay.[6]

Compared to patients who didn't receive whey, those who took it showed significant *improvements* in grip strength and knee extensor force. Scientists concluded that whey improves the nutritional status *and* rehabilitation outcomes among frail and elderly people.[6]

Whey Boosts Lean Muscle Mass

Whey has valuable potential to help prevent age-related muscle loss. But the benefits go even further. Recent studies have shown that whey significantly *increases* lean muscle mass—and not just among athletes.

In a randomized, controlled trial, researchers divided 81 healthy, older women, aged 65-80, into three groups for a 24-week program. One group

exercised twice weekly, the second group took whey protein supplements but didn't exercise, and the third group took whey protein after exercising.[4]

The increase in skeletal muscle mass was significantly *higher* for the whey-and-exercise group than for either of the two other groups. There was also a significant increase in grip strength and walking speed.[4]

Researchers next turned to *inactive* older individuals, conducting a study to assess whey's effects on muscle during recovery from periods of *inactivity*, such as hospitalization. In this controlled trial, men and women in their late sixties consumed a diet in which **45%** of their protein intake came from either whey or a source of animal peptides.[1]

After a week of habitual activity and energy balance, they spent another week in energy restriction, during which 500 fewer daily calories were consumed per day. The number of steps they took daily was then reduced for another two weeks. Finally, they returned to normal activity for the last week (recovery).[1]

During the periods of reduced activity, lean leg mass declined in both groups. But during the recovery week, lean leg mass increased—*only* in the whey protein group.[1] The branched-chain amino acids found in whey play an essential role in supporting lean muscle mass, especially among older adults.[38,39]

Whey Helps Stop Age-Related Weight Gain

Whey doesn't just affect the muscles. As we age, metabolism slows, and we start to put on weight more easily, increasing our risk of everything from heart disease to diabetes to strokes. This used to seem like an inevitable part of life.

Not anymore. Research shows that whey is an effective way to fight fat, helping to **maintain weight** and lean body mass as we age.[40]

Scientists reviewing many previous studies concluded that whey may even be an effective therapeutic **treatment for obesity**.[40]

When other groups of researchers set about trying to understand why whey protein supplementation works in this way, they discovered that the proteins, peptides and minerals in whey boost satiety (the feeling of fullness), influence glucose homeostasis (the regulation of blood sugar levels in the body), and optimize lean body mass, all of which help fight weight gain.[41-45]

In one recent study, scientists assigned 100 men with what's known as **sarcopenic obesity**, aged 70 or over, to one of three groups. Sarcopenic obesity is characterized by low lean mass and high fat mass. One group served as a control and received no treatment.

Whey Protein and Aging

- **Whey protein is not just for athletes seeking to build muscle mass.**
- **Whey supplementation has been shown to help prevent the loss of muscle mass in aging individuals, inhibit weight gain, and reduce risk factors for cardiovascular disease.**
- **This potent protein helps prevent frailty, obesity, and heart disease, while promoting longevity.**

What You Need to Know

Another used an exercise technology called whole-body electromyostimulation (WB-EMS), in which muscles are contracted with electrical impulses. The third took **1.7 grams** to **1.8 grams** of whey protein per kilogram of body weight, daily.[10]

After 16 weeks, total body fat, trunk body fat, and waist circumference were significantly reduced in the group receiving electrical stimulation *and* were also reduced in the group taking whey supplements, but not in the control group. Whey protein supplementation, the study concluded, can help treat obesity.[10]

Also, in a meta-analysis of randomized, controlled trials conducted in overweight and obese participants, investigators reported that there was a significant **improvement** in both body weight and total fat mass in those who supplemented with whey protein.[11]

Whey Helps Prevent Heart Disease

By contributing to an overall diet and exercise fitness program, whey can protect against a long list of diseases linked to increased weight gain. But whey protein has also been shown to *specifically* target a key risk factor for **cardiovascular disease**.

Hypertension is one of the main factors contributing to cardiovascular disease.[46] Research shows that whey-based peptides may help reduce this risk factor.[47,48] (Peptides are chains of amino acids that are smaller than proteins.) And food-derived peptides like the kind found in whey are far safer than anti-hypertension drugs.

In one study, researchers asked 27 adults with **mild hypertension** to eat a high-fat breakfast and lunch along with **28 grams** of whey protein. This was later repeated with **28 grams** of calcium caseinate (a protein produced from casein in skim and sometimes **1%** milk). It was again repeated with **27 grams** of maltodextrin (a type of carbohydrate made from starch).[5]

Compared with the other supplements, whey was found to *reduce* systolic blood pressure, by an average of **15.2 mmHg**, for up to five hours after ingestion. Compared to maltodextrin, whey *improved* arterial stiffness. These results all show whey's potential to improve cardiovascular risk factors.[5]

Another group of scientists reviewed whey's effects on the cardiovascular risk factors of *overweight and obese* patients. They found whey protein supplementation resulted in a reduction in body weight *and* reduced multiple risk factors for cardiovascular disease in those patients. Improvements were found in systolic blood pressure, diastolic blood pressure, glucose levels, and in HDL and total cholesterol.[11]

Summary

Whey protein isn't just for athletes and bodybuilders. Whey supplementation has now been shown to help prevent several common effects of aging, including loss of lean muscle mass and excessive weight gain. It also lowers cardiovascular risk and blood pressure. It is a powerful tool to prevent frailty and heart disease and to boost longevity. ●

What Type of Whey Protein Supplement is Right for You?

Whey protein is commonly available in **three** forms:

- **Concentrate**,
- **Isolate**, and
- **Isolate with added creatine and glutamine**.

Whey concentrate is whey, but with the water removed. It is rich in both branched-chain amino acids (BCAAs) and glutamine. The concentrate form of whey is a powder that mixes easily for a smooth-textured protein shake. High-quality whey concentrates contain no animal growth hormones. Most whey concentrates contain about **80%** protein. It is the ideal protein to help build muscle size and aid in recovery. Overall, whey concentrate may be the most economical form of protein for the human body to digest and use, which is why it is among the world's most popular sports supplements.

Whey isolate goes through additional processing steps and filtration that remove some of the carbohydrate, lactose, and fat, providing a purer protein as the end product. Whey isolate contains about **90%** protein. In high-quality whey isolate, **98%** of the protein content is in the bioavailable, un-denatured form similar to concentrates and it retains essential bioactive subfractions in their natural ratios. It, too, is free of animal growth hormones. (Those who are lactose-intolerant should note that, like whey concentrate, whey isolate contains a small amount of lactose.)

Whey isolate with added creatine and glutamine is a premium isolate option for those seeking *greater* strength and exercise performance.

- ***Creatine*** supports energy storage by tissues, increases levels of ATP (the molecule that stores and transports energy within cells) in mitochondria, and helps maintain healthy muscle mass, which generally declines with aging.[49-51] Studies show that creatine helps build muscle and strength in explosive, short-duration activities such as resistance exercise training.[52,53]
- ***Glutamine*** is considered a conditionally essential amino acid[54] that is abundant in muscles, but levels are reduced after prolonged and high-intensity exercise, which can affect the immune system if supplies are not replenished.[55-58] Glutamine encourages recovery after intense exercise, increases glycogen fuel synthesis, and helps inhibit protein breakdown in muscle tissue.[59-61] It can inhibit blood ammonia accumulation during prolonged exercise,[62,63] a key factor in physical fatigue.[64] Glutamine is also essential to gut integrity, as it provides metabolic fuel for digestive tract cells, helps regulate cellular reproduction, aids in the maintenance and repair of the lining of the gastrointestinal tract, and has anti-inflammatory properties.[65,66]

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

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Topical Peptides Rebuild Youthful Skin

BY ROBERT GOLDFADEN AND GARY GOLDFADEN, MD

Peptides are amino acids naturally present in **young** skin.

As we age, there is **decreased** production of these **peptides**.

When applied to older skin, **peptides** promote growth, organization, and maintenance of cells. The result is restoration of more youthful skin structure and function.[1,2]

An advance in topical skin rejuvenation has been the discovery of specific peptides called **growth factors**.[3]

These growth factor **peptides** have been found to repair and reverse chronological and environmental skin damage.[4]

Growth Factors: Master Regulators of Skin Repair

Young skin efficiently repairs damage from internal and external insults, thanks to the inner workings of **growth factors**.

When skin is damaged, there is a natural release of **growth factors** that initiate and coordinate reparative processes. These growth factors accomplish this by communicating with other cells, like keratinocytes and fibroblasts.[5-7]

Scientists have zeroed in on five key **growth factors** that modulate skin repair and protect against premature aging.

Here is how each **growth factor** functions:

- **Fibroblast growth factor (FGF)** stimulates proliferation of dermal fibroblasts responsible for producing major skin matrix constituents such as collagen, elastin, and fibronectin.[8,9]
- **Vascular endothelial growth factor (VEGF)** helps boost the delivery of oxygen and vital nutrients.[10,11]
- **Acidic fibroblast growth factor (AFGF)** increases the growth and differentiation of epidermal keratinocytes to renew the skin's surface.[12,13]
- **Epidermal growth factor (EGF)** attenuates the strong inflammatory and oxidative stress response following skin damage.[14]
- **Insulin-like growth factor (IGF-1)** triggers new production of collagen and protects against its breakdown by down-regulating collagenase.[15,16]

These **growth factors** control cellular growth, proliferation, and differentiation, to give skin the capacity to renew itself completely in our youth. This is why young individuals are able to temporarily combat the detrimental effects of sun exposure, air pollution, and advanced glycation end products (AGEs).

As we grow older, decreased production of **growth factors** compromises the skin's ability to preserve structural integrity and function.[17,18] This finding prompted researchers to investigate the impact on aging skin of replenishing **growth factors**.

Clinical Efficacy of Topical Growth Factors

Human trials show that topical preparations with one or more (but not all) of the **growth factors** described so far function to boost **collagen** and **elastin** synthesis, promote **epidermal thickening**, and **quell inflammation**. Findings from these studies reveal improvements in skin that was aged and photodamaged.[19-23]

When all five growth factors are *physiologically balanced* in one topical formula, the results are more impressive. In one human study, female participants who applied a topical cream containing all five **growth factors** daily for four weeks experienced the following:[4]

- Decreased wrinkles under the eyes by **46%**
- Reduced appearance of crow's feet by **21%**
- Increased skin elasticity by **47%**
- Enhanced skin hydration by **64%** (improved by **83%** immediately after applying)

Accelerate Epidermal Regeneration

Epidermal stem cells are responsible for self-renewing the skin's surface.

These stem cells manufacture basal keratinocytes that travel upward to form the "brick and mortar" structure that acts as a barrier against the external environment.[24,25]

As we age, epidermal turnover rate slows down as stem cell activity decreases. This causes thinning of the epidermis, making it more susceptible to external threats, and allowing vital moisture to escape.

Sea fennel is a flowering plant whose stem cells allow it to adapt and thrive in salty coastal areas of Europe. When researchers tested the impact of sea fennel (*Crithmum maritimum)* extract on aged **human** skin cells, they found that it increased the viability of skin cells by **120%** compared with untreated controls. This rapidly increased the density and thickness of the epidermis, enabling the extract-treated group to achieve complete epidermal regeneration significantly faster than the non-treated group.[26]

These *in-vitro* findings led to a human study in which 12 healthy volunteers with a mean age of 56 applied **sea fennel** extract or a placebo daily to their forearm skin for two weeks before undergoing a toxic protocol that induced epidermal damage.

Unique Peptide Blend Repairs Aged and Damaged Skin

- **Growth factors are dynamic peptides that activate cell-signaling pathways to orchestrate the repair of chronological and environmental skin damage.**
- **Decreased concentration of growth factors as we age compromises the skin's healing capacity, setting the foundation for wrinkles, age spots, and sagging skin.**
- **Topical replenishment of five key growth factors has been shown to stimulate epidermal and dermal regeneration to reverse visible signs of aging.**
- **Two plant extracts—sea fennel (*Crithmum maritimum*) and date palm fruit (*Phoenix dactylifera* L.)—further support skin renewal and maintenance.**
- **All of these compounds have been incorporated into one unique, topical formula that results in healthier, more youthful and radiant skin.**

What You Need to Know

Researchers observed that within 96 hours, the group treated with **sea fennel** extract had significantly lower transepidermal water loss than the placebo group, indicating faster recovery of epidermal structure and function.[27]

Research also shows improvements in skin radiance, tone, and firmness with topically applied **sea fennel** extract.[28]

Fade Hyperpigmentation and Wrinkles

Date palm (*Phoenix dactylifera* L.), a plant native to southern Asia and North Africa, confers anti-inflammatory activity due to its abundance of polyphenols, tannins, and carotenoids.[29]

Hyperpigmentation is a common skin disorder that stems from excessive production of the pigment melanin in response to cumulative sun exposure. It manifests as age spots, dark patches, and melasma that contribute to older looking skin.[30]

In a clinical trial, female volunteers topically applied a facial cream with **date palm extract** daily for eight weeks. Compared to baseline, researchers observed an aproximate **25%** reduction in melanin output, thereby demonstrating **skin lightening** effects. This was accompanied by a decrease in erythema, as well as increases in skin elasticity and hydration, which left participants with even-toned, younger-looking skin.[31]

Date palm fruit extract has also delivered anti-wrinkle activity. Topical application of a facial cream containing **date palm extract** twice daily for five weeks reduced the total surface area of wrinkles by **27.6%** and the depth of wrinkles by **3.52%** compared to a placebo in a group of women aged 46 to 58.[32] These potent wrinkle-reducing effects might be attributed to the presence of phytoestrogens which induce collagen formation for dermal renewal.[33,34]

Summary

Scientists have identified five key **growth factors** that activate natural repair pathways in the skin to offset damage from chronological aging and external stressors.

Clinical research verifies that replenishing growth factor **peptides** restores skin elasticity, tone, and hydration, while reducing wrinkles.

These **growth factors** have been combined with **sea fennel** and **date palm fruit** to support more youthful skin structure. ●

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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.

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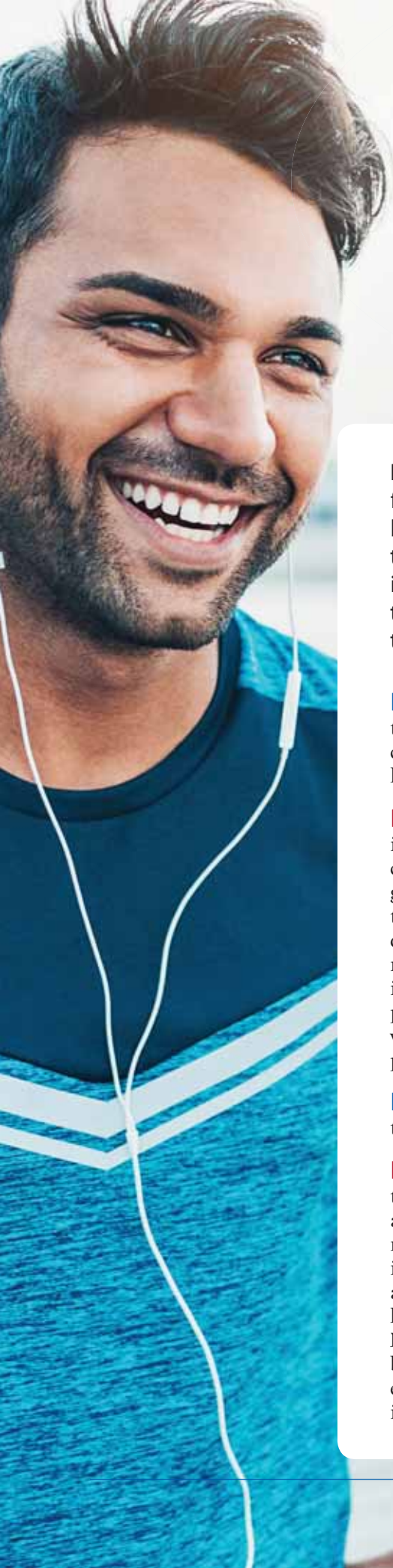


DR. SHANTI ALBANI

Neurotransmitter Testing:
A Window to the Brain

People suffering from problems like anxiety, depression, fatigue, and insomnia often struggle to figure out what's behind those issues. But now, Dr. Shanti Albani explains, there's an innovative **neurotransmitter** test that can identify imbalances in the body and brain that may be to blame—and that can provide you with the next steps to help get back on the path to optimal health.

LE: Back in 2016, **Life Extension**® made neurotransmitter testing available to our customers. This test was, and has continued to be a popular test. What accounts for the popularity of the Neurotransmitter Panel?

Dr. Albani: Neurotransmitter testing provides insight into imbalances that may be occurring in the body and brain and can shed light on related symptoms. Basic blood work is great for evaluating blood sugar, cholesterol, and organ function, but often turns up little when individuals are trying to determine why they have symptoms such as anxiety, insomnia, depression, or poor cognition. Neurotransmitter testing is a window to our brain function that no other testing can provide. Ideally, people would also test their hormones along with their neurotransmitters, since hormones are also key players in mood and energy.

LE: It's fascinating that we can measure neurotransmitters in the urine. Could you explain how this works?

Dr. Albani: Neurotransmitters are the chemicals that facilitate the transmission of signals from one neuron to the next across a synapse, or from a neuron to target cells such as muscles or glands. They are produced in the brain, but also in other areas of the body. For example, our intestines have a vast neural network and produce neurotransmitters to help coordinate digestion and intestinal motility. The urinary Neurotransmitter Panel provides a measurement of whole-body neurotransmitter production. Studies and clinical experience have also established that the levels measured in urine correlate with both mental and physical symptoms.

LE: You mentioned testing hormones. How are hormones and neurotransmitters related?

Dr. Albani: Both hormones and neurotransmitters powerfully influence mood and energy, so I encourage people to have their hormones and neurotransmitters tested together. Hormones can also influence neurotransmitters, and vice versa. For example, the hormone estrogen can increase activity of the neurotransmitters serotonin and dopamine, while the hormone progesterone increases the calming action of the neurotransmitter GABA. For their part, neurotransmitters can influence hormone production via their communication with the pituitary gland in the brain, which in turn controls hormone production.

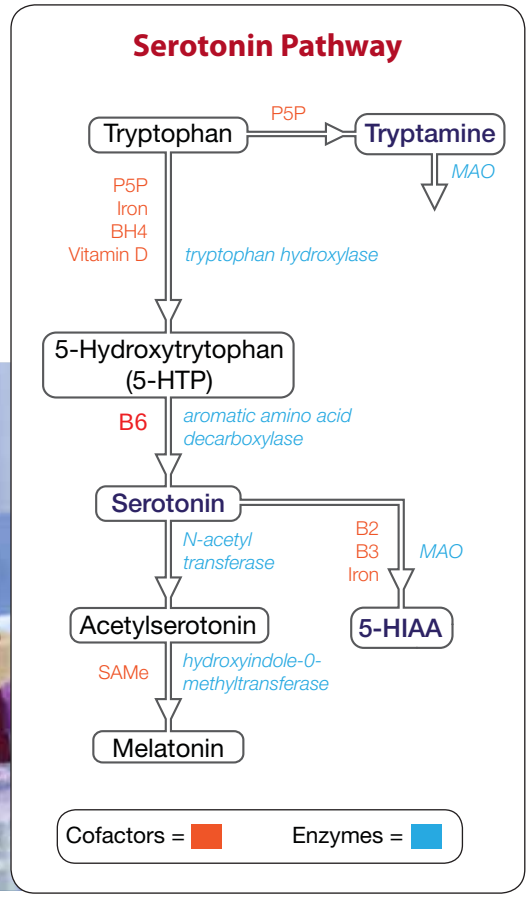
When functioning properly, neurotransmitters and hormones work in harmony to sustain good mental and physical health. However, alterations in neurotransmitters and hormones can play a significant role in contributing to symptoms such as cognitive disorders, depression, anxiety, diminished drive, fatigue and sleep difficulties, cravings, addictions, and pain.

LE: Once people test their neurotransmitters and identify imbalances, how does this information assist them on the path to health?

Dr. Albani: This is the exciting part! Fortunately, vitamins, minerals, amino acids, hormones, and botanical medicine can be used to rebalance our brain chemistry. Our understanding of neurotransmitters has advanced so much that we know which nutrients are needed as cofactors for the enzymes that create, or break down, each neurotransmitter. Vitamin B6, for instance, is needed for the conversion of the amino acid 5-HTP into serotonin, so individuals who have low serotonin should ensure they are getting enough B6. And since we know that neurotransmitters are created from amino acids, we can use amino acid therapy to support neurotransmitter production in a targeted way. For example, we know that tryptophan is the amino acid precursor to serotonin. Therefore, taking tryptophan supports serotonin production. Our understanding of how hormones and botanical medicines influence brain biochemistry can also help us to balance neurotransmitters.

LE: Have there been any upgrades to the Neurotransmitter Panel?

Dr. Albani: Yes. There's a Basic Neurotransmitter Panel, which tests for nine neurotransmitters: PEA (phenylethylamine), dopamine, norepinephrine, epinephrine, serotonin, glutamate, GABA (gamma-aminobutyric acid), glycine, and histamine. But we now also offer a Comprehensive Neurotransmitter Panel. The Comprehensive Neurotransmitter Panel tests for the nine neurotransmitters I mentioned, along with the neuroactive amino acid taurine and several neurotransmitter precursors and metabolites, namely, tyrosine, tyramine, DOPAC, 3-MT, normetanephrine, metanephrine, tryptamine, and 5-HIAA.



Neurotransmitter Panel – Comprehensive

Analyte	Result	Unit per Creatinine	L	WRI	H	Reference Interval
Phenethylamine (PEA)	8	nmol/g				32 - 84
Tyrosine	24	µmol/g				32 - 80
Tyramine	2.1	µmol/g				2.0 - 4.0
Dopamine	149	µg/g				125 - 250
3,4-Dihydroxyphenylacetic acid (DOPAC)	2388	µg/g				390 - 1500
3-Methoxytyramine (3-MT)	126	nmol/g				90 - 210
Norepinephrine	14.9	µg/g				22 - 50
Normetanephrine	207	µg/g				85 - 300
Epinephrine	1.2	µg/g				1.6 - 8.3
Metanephrine	103	µg/g				45 - 119
Norepinephrine / Epinephrine ratio	12.4					< 13
Tryptamine	0.67	µmol/g				0.20 - 0.90
Serotonin	66.7	µg/g				60 - 125
5-Hydroxyindolacetic acid (5-HIAA)	2539	µg/g				2000 - 8000
Glutamate	16	µmol/g				12.0 - 45.0
Gamma-aminobutyrate (GABA)	4.8	µmol/g				2.0 - 5.6
Glycine	1121	µmol/g				450 - 2200
Histamine	18	µg/g				14 - 44
Taurine	864	µmol/g				320 - 1000
Creatinine	61	mg/dL				30 - 225

Neurotransmitter Panel – Comprehensive

LE: What is the advantage of the Comprehensive Neurotransmitter Panel? How does measuring taurine and the additional neurotransmitter precursors and metabolites provide further benefits?

Dr. Albani: The Comprehensive Neurotransmitter Panel provides significantly greater detail on where in the creation or metabolism of our neurotransmitters there may be an imbalance. For example, the Basic Neurotransmitter Panel may identify that an individual has low dopamine. But the Comprehensive Neurotransmitter Panel can help identify if that is because of low levels of the amino acid tyrosine, because of over-activity of the MAO or COMT enzymes (which break down dopamine), or because of some other factor (see dopamine pathway figure on the next page). This level of detail can allow us to be even more targeted with our therapeutic suggestions for neurotransmitter balance.

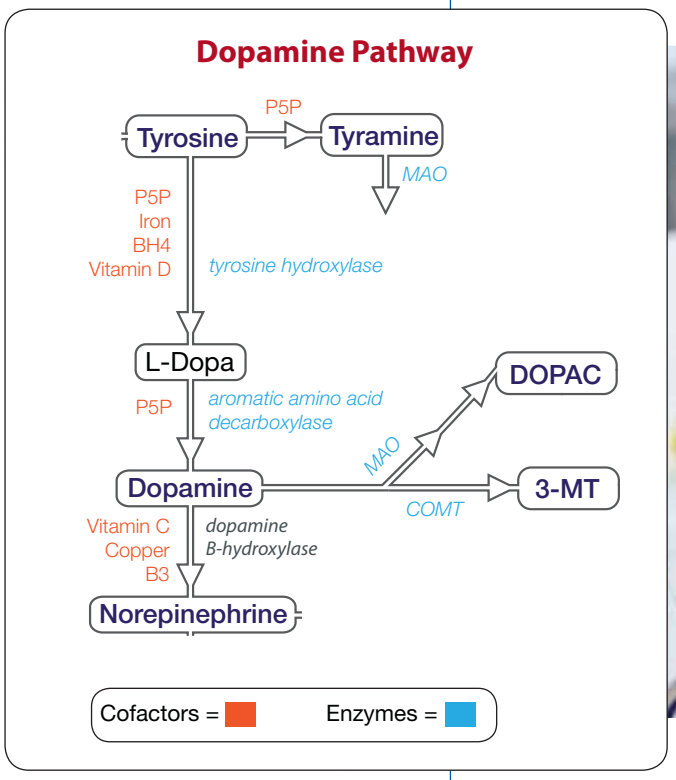
Ultimately, both neurotransmitter tests are extremely valuable, but the Comprehensive Panel provides more detail for those who want or need it.

LE: Who should have this test done?

Dr. Shanti: This test is especially valuable for individuals who have mental and emotional symptoms that evade identification with conventional testing. Some examples of symptoms which can indicate neurotransmitter imbalances are:

- Depressed mood
- Anxiety
- Fatigue
- Poor sleep
- Loss of mental focus
- Attention deficit disorder (ADD) and attention-deficit/hyperactivity disorder (ADHD)
- Addiction or dependency
- Loss of appetite control
- Compulsive behavior
- Cravings
- Low libido
- Altered pain response
- Poor mental performance

Many individuals who suffer from these symptoms may compound their health issues by using food, caffeine, chocolate, alcohol, nicotine, medications, and other neuroactive substances to try to obtain relief from their symptoms. When functioning properly, there is a balance between the excitatory and inhibitory neurotransmitters.



Restoring this balance can help individuals enjoy life again and feel less dependent on the substances I just mentioned to maintain daily function.

LE: If people are interested in testing their neurotransmitters, how should they proceed?

Dr. Albani: Many conventional doctors are not familiar with urinary neurotransmitter testing. Some innovative, forward-thinking physicians may offer the test through specialty labs. For customers who are unable to obtain the test through their doctor, **Life Extension** has partnered with a lab that uses the gold standard testing method of liquid chromatography combined with tandem mass spectrometry (LC-MS/MS) to provide neurotransmitter testing.

LE: How is the test collection done?

Dr. Albani: Collection is easy and requires only a single, morning urine sample. The test comes in the form of a home collection kit, so the urine collection is non-invasive and can be done in the comfort of your own home. Once the collection is complete, it is sent to the lab using the pre-paid shipping label provided.

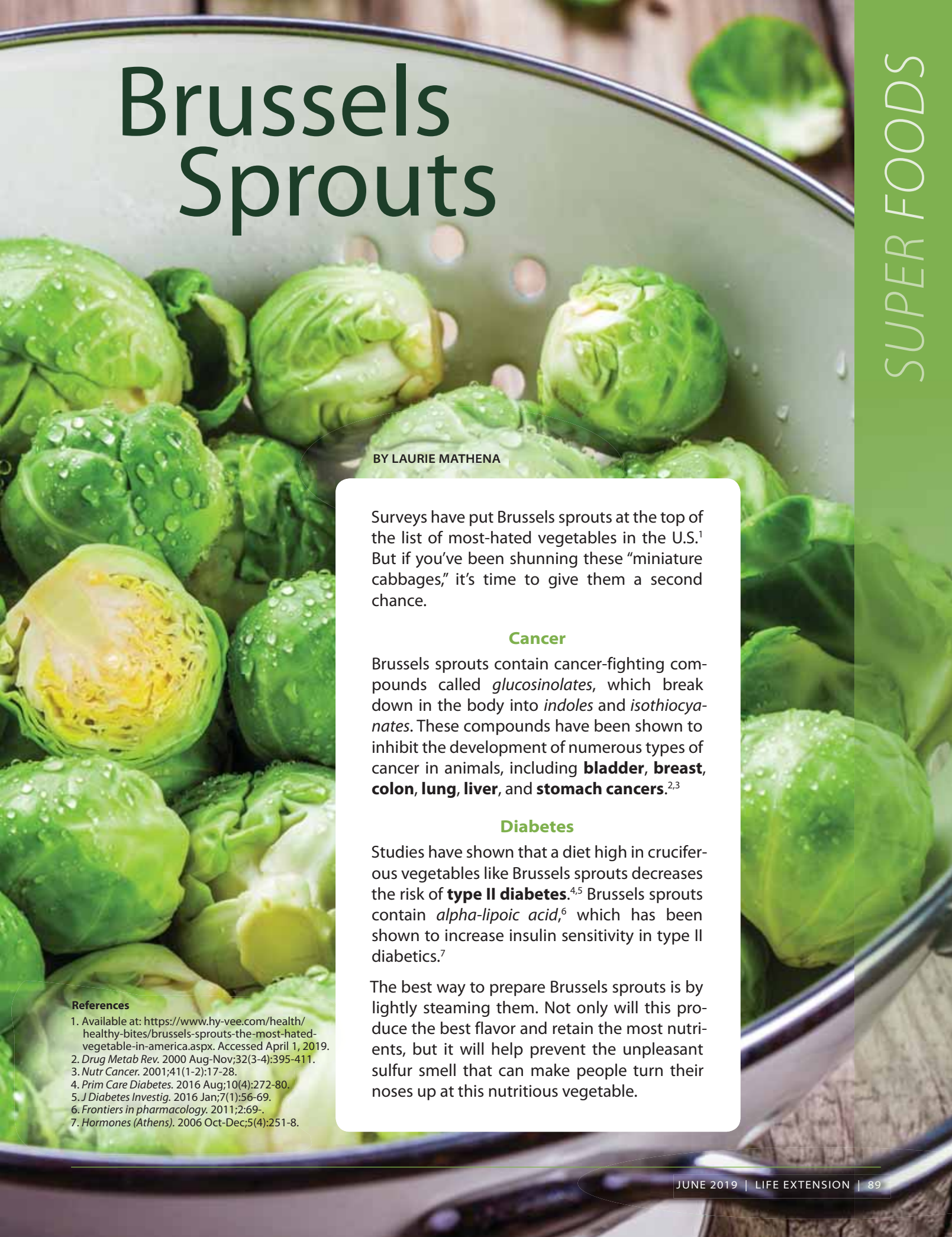
LE: Once someone has the test results, how can they be used to effect health improvements?

Dr. Albani: All test results come with an explanation of what the results may mean, along with nutrient suggestions to balance neurotransmitters. In addition to the useful information provided with the results, individuals can work directly with their doctors or call to speak with one of our trained **Life Extension** Wellness Specialists. Our team of wellness specialists can provide individualized suggestions to people for nutrients to balance neurotransmitters, based on their test results and on how they feel. The information they provide also helps people have more detailed conversations with their own doctors. ●

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

Dr. Shanti Albani obtained her medical degree in Naturopathic Medicine in 2003 from the National University of Natural Medicine in Portland, Oregon. She practiced medicine for many years in central Mexico specializing in gastrointestinal disorders and hormone balance. During this time, she also owned a nutrition store and taught courses in bioidentical hormone replacement therapy for physicians. She has worked at **Life Extension** since 2010 and is currently the Manager of Clinical Information.

Brussels Sprouts



BY LAURIE MATHENA

Surveys have put Brussels sprouts at the top of the list of most-hated vegetables in the U.S.[1] But if you've been shunning these "miniature cabbages," it's time to give them a second chance.

Cancer

Brussels sprouts contain cancer-fighting compounds called *glucosinolates*, which break down in the body into *indoles* and *isothiocyanates*. These compounds have been shown to inhibit the development of numerous types of cancer in animals, including **bladder**, **breast**, **colon**, **lung**, **liver**, and **stomach cancers**.[2,3]

Diabetes

Studies have shown that a diet high in cruciferous vegetables like Brussels sprouts decreases the risk of **type II diabetes**.[4,5] Brussels sprouts contain *alpha-lipoic acid*,[6] which has been shown to increase insulin sensitivity in type II diabetics.[7]

The best way to prepare Brussels sprouts is by lightly steaming them. Not only will this produce the best flavor and retain the most nutrients, but it will help prevent the unpleasant sulfur smell that can make people turn their noses up at this nutritious vegetable.

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The Indian Vegetarian Cookbook

By Pushpesh Pant

Pushpesh Pant is a leading expert on Indian cuisine. His previous book, *India: The Cookbook*, published in 2010, became a global bestseller and is referred to as the first comprehensive guide to Indian cooking.

Now, in his long-awaited follow-up, *The Indian Vegetarian Cookbook*, Pant provides delicious, authentic, and approachable vegetarian dishes tasty enough to be enjoyed by vegetarians and meat-eaters alike.

The new book draws on the author's unique culinary repertoire shaped by geography, history, culture, and most notably, by his mother.

"My mother excelled at transforming the [ordinary] into the exotic by improvising on what she had tasted in her life's journeys," said Pant. It is what caused him to fall in love with vegetables.

This collection of 150 recipes is largely what Pant considers "simple home recipes that are part of daily Indian fare."

In addition to a broad array of recipes for drinks, salads, vegetables, legumes, and grains, Pant also includes suggested menus, a handy glossary of terms, and spice blends that have come to define the flavor of the region.

Here, ***Life Extension Magazine***® highlights four flavorful recipes from *The Indian Vegetarian Cookbook* that are sure to awaken the senses and transport your kitchen to South Asia. Enjoy them in good health.

—Laurie Mathena

Cabbage Stir-fry with Coconut

MUTTAI KOSE VELLAI PORIYAL • Preparation time: 5-7 minutes • Cooking time: 7 minutes • Serves: 4

This is a traditional stir-fry from south India where such dishes are described as Poriyal. Much less oil is used than in the north and the cabbage is lightly cooked. Freshly grated coconut adds a very pleasant sweetness to it.

INGREDIENTS

2 tablespoons vegetable oil
4-6 curry leaves (optional)
1 teaspoon black mustard seeds
2 teaspoons urad dal lentils (black gram)
5 cups (1 lb/450 g) shredded cabbage
1 teaspoon minced fresh root ginger
2 fresh, green chiles, chopped
1 teaspoon salt
½ teaspoon fresh shredded or dried and grated (desiccated) coconut

PREPARATION: Heat the oil in a skillet (frying pan) over medium heat. When the oil is hot, but not smoking, add the curry leaves, if using, mustard seeds and dal and fry for 30 seconds, or until the mustard seeds sputter and the lentils are golden. Add the cabbage, ginger, and green chiles and fry for 2 minutes, or until well-blended with the spices. Add the salt, then cover and cook over low heat for 3 minutes, or until the cabbage is tender but still crisp. Add the coconut, stir to combine, and remove from the heat to serve.

Split Red Dal

MASOOR DAL • **Preparation time: 15 minutes, plus soaking time** • **Cooking time: 20-25 minutes** • **Serves: 4**

Masoor or Egyptian lentils are arguably the most celebrated dal. There is a story about a temperamental chef in Lucknow who was so enraged with his employer—a Nawab addicted to chess—who kept the chef waiting and allowed the specially cooked dal to get cold. The chef left in a huff after pouring the dal on the stump of a tree. The next day, the dried wood sprouted fresh shoots and the Nawab realized what he had lost.

INGREDIENTS

1½ cups (9 oz/250 g) masoor dal (split red lentils), rinsed and drained
1 teaspoon ground turmeric
1 teaspoon ghee or vegetable oil
4 dried red chiles
½ teaspoon ajwain (carom) seeds, ground
⅓ cup (¾ oz/20 g) chopped cilantro (coriander) leaves
4 fresh, green chiles, halved lengthwise and de-seeded
salt, to taste

PREPARATION: Put 5 cups (2 pints/1.2 liters) water in a large, heavy-based pan and add the masoor dal and turmeric. Bring to the boil and remove the scum from the surface with a slotted spoon, then reduce the heat, season with salt, and simmer for about 20 minutes, or until the dal is soft. Stir to break up the dal.

Heat the ghee or oil in a skillet (frying pan) over medium heat, add the dried red chiles and ground ajwain (carom) seeds and stir-fry for about 2 minutes, or until the chiles turn a shade darker. Pour over the dal, then cover and simmer for about 2 minutes. Add the chopped cilantro (coriander) and green chiles before serving.

Lentil & Vegetable Stew

SAMBAR • Preparation time: 30 minutes • Cooking time: 1 hour • Serves: 4

No Indian meal is complete without a lentil dish and the south-Indian sambar has an unrivalled pan-India following. This vegetable enriched lentil soup is served with snacks such as Dosa and Idli and, accompanied by rice, can also comprise a separate course in a formal meal. There are many regional variations and it would be a very brave man who would hazard to share an 'authentic' recipe. Until a few years ago, many families laboriously pounded sambar masala following a recipe handed down the generations. Now people are more likely to buy it.

INGREDIENTS

scant 1 cup (7 oz/200 g) arhar/toor dal (yellow split pigeon peas), rinsed, soaked in water for 30 minutes, and drained
7 oz/200 g vegetable drumsticks or green beans
4 fresh, green chiles, slit lengthwise
4 oz/120 g medium shallots, left whole
11 oz/300 g medium tomatoes, quartered
1 teaspoon ground turmeric
1 teaspoon chili powder
1 teaspoon Sambar Masala
2 tablespoons tamarind extract
3 teaspoons chopped cilantro (coriander) leaves
salt, to taste

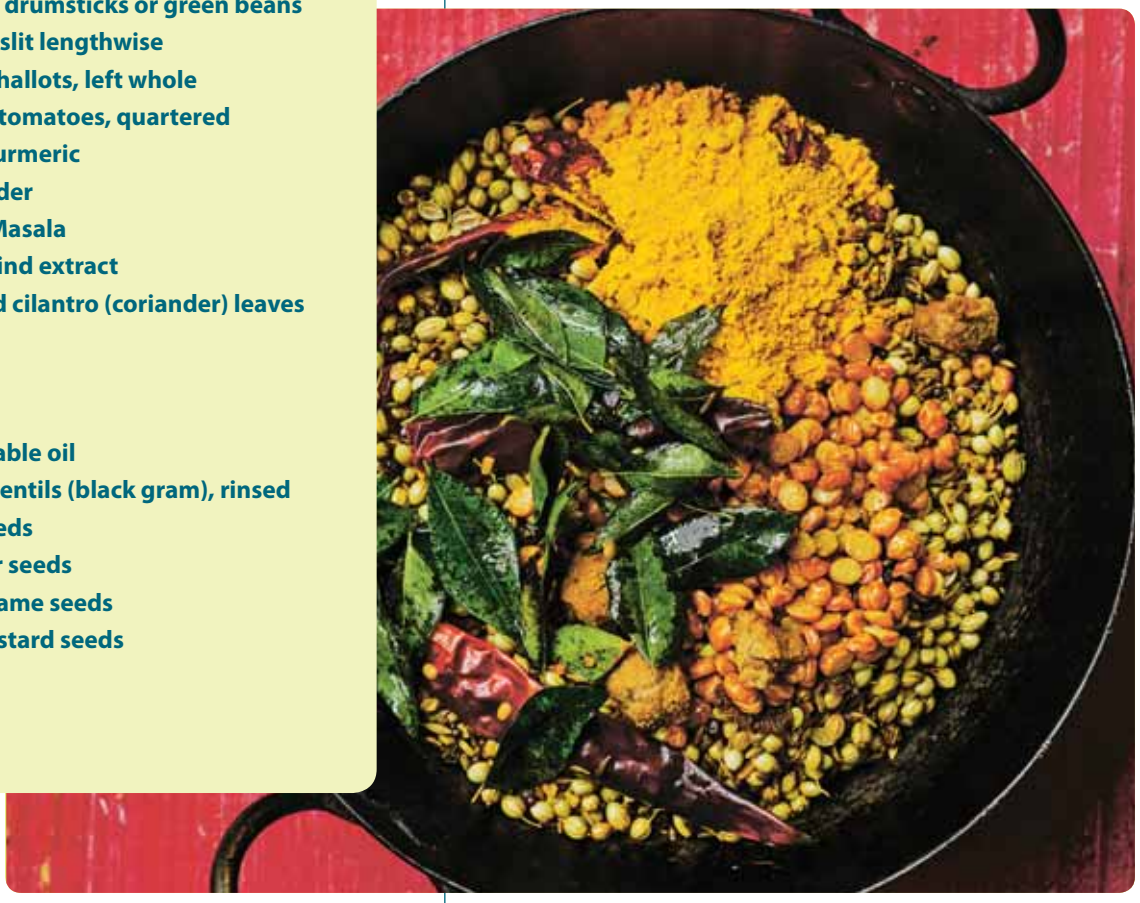
FOR TEMPERING

2 tablespoons vegetable oil
1 teaspoon urad dal lentils (black gram), rinsed
1 teaspoon cumin seeds
1 teaspoon coriander seeds
1 teaspoon black sesame seeds
1 teaspoon black mustard seeds
15-20 curry leaves
pinch of asafoetida

PREPARATION: Put the arhar/toor dal in a large, heavy-based pan, add the vegetable drumstick or green beans, green chiles, shallots, tomatoes, turmeric, and chili powder, 4¼ cups (34 fl oz/1 liter) water, and season with salt to taste. Bring to a boil, then turn the heat down to medium-low, and simmer for 20 minutes. Stir in the Sambar Masala and continue to simmer, stirring occasionally, for 5 minutes.

Heat the oil for tempering in a skillet (frying pan) over medium heat, add the lentils and seeds, and cook for about 1 minute, until the seeds start to sputter. Add the curry leaves and asafoetida, and stirfry, until the leaves sputter. Pour this mixture over the sambar, then add the tamarind extract and stir well. Simmer on low heat for about 15 minutes.

Finally, add the chopped cilantro (coriander) and adjust the seasoning before serving.



Morels in Yogurt Sauce

KANAGUCCHI • **Preparation time: 15 minutes** • **Cooking time: 15 minutes** • **Serves: 4-6**

This recipe from Kashmir is one of the most sublime and subtly spiced of all Indian vegetarian gravy dishes. Morels, locally called gucchi, are a very expensive ingredient and are served on special occasions. They have a delicate flavor that can be easily killed by strong spices.

INGREDIENTS

2 cups (2 oz/50 g) dried morels
3 tablespoons vegetable oil or ghee
1 onion, finely sliced (optional)
5 cloves garlic, peeled and crushed
1 cup (8 fl oz/250 ml) yogurt, whisked
1 teaspoon ground ginger
2 teaspoons ground fennel
½ teaspoon cumin seeds, crushed
1 teaspoon garam masala
salt, to taste
cilantro (coriander) leaves, to garnish

PREPARATION: Soak the morels in hot water for 1 hour, then drain and wash thoroughly to remove any grit. Squeeze dry and set aside.

Heat the oil or ghee in a large, heavy-based pan over medium heat. Add the onion, if using, and fry for 2-4 minutes, until translucent but not browned. Add the garlic and fry for 1 minute, then add the morels, seasoning with salt to taste. Cook, shaking the pan from time to time, for about 8-10 minutes, until all the water has evaporated. Add 1 cup (8 fl oz/250 ml) water and bring to the boil. When boiling, pour in the whisked yogurt and add the ginger and fennel, stirring briskly to ensure that the gravy does not curdle. Reduce heat to low and simmer for about 10 minutes, until the gravy reaches a thin, custard-like consistency. Sprinkle over the crushed cumin seeds, garam masala, and cilantro (coriander) leaves to serve.

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

Reprinted from *The Indian Vegetarian Cookbook* (Phaidon 2019).

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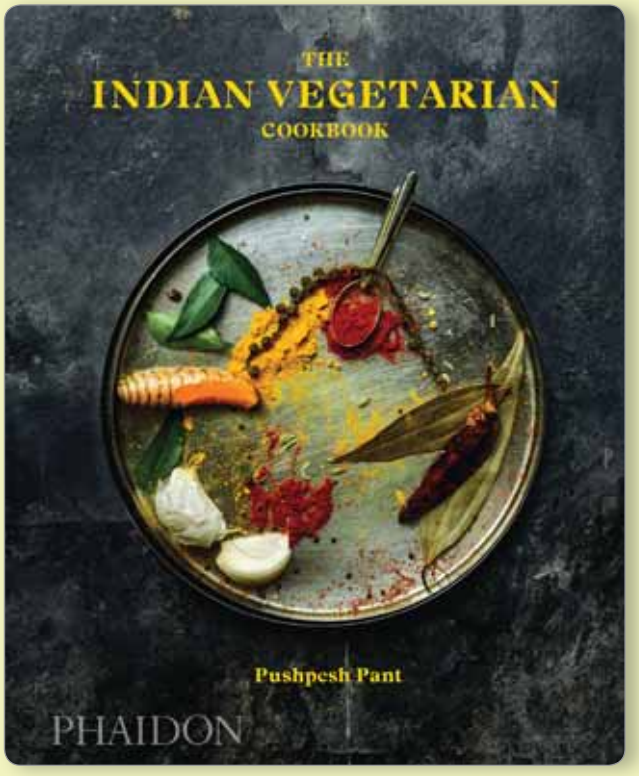

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Wellness Bar–Cookie Dough
Wellness Code™ Advanced Whey Protein Isolate Vanilla
Wellness Code™ Muscle Strength & Restore Formula
Wellness Code™ Plant Protein Complete & Amino Acid Complex
Wellness Code™ Whey Protein Concentrate Chocolate
Wellness Code™ Whey Protein Concentrate Vanilla
Wellness Code™ Whey Protein Isolate Chocolate
Wellness Code™ Whey Protein Isolate Vanilla
Wellness Shake–Chocolate
Wellness Shake–Vanilla

Amino Acids

Arginine & Ornithine Capsules
Arginine Ornithine Powder
Branched Chain Amino Acids
Carnosine
D,L-Phenylalanine Capsules
L-Arginine Caps
L-Carnitine
L-Glutamine
L-Glutamine Powder
L-Lysine
L-Taurine Powder
L-Tyrosine Powder
Taurine

Blood Pressure & Vascular Support

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

Bone Health

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

Brain Health

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

Cholesterol Management

Advanced Lipid Control
Cho-Less™
CHOL-Support™
Red Yeast Rice
Theaflavins Standardized Extract
Vitamin B3 Niacin Capsules

Digestion Support

Betaine HCl
Black Vinegar
Digest RC®
Effervescent Vitamin C - Magnesium Crystals
Enhanced Super Digestive Enzymes
Enhanced Super Digestive Enzymes W/Probiotics
EsophaCool™
Esophageal Guardian
Extraordinary Enzymes
Gastro-Ease™
Ginger Force®
Regimint
TruFiber™

Energy Management

Adrenal Energy Formula
Asian Energy Boost
D-Ribose Powder
D-Ribose Tablets
Forskolin
Mitochondrial Basics with PQQ
Mitochondrial Energy Optimizer with PQQ
NAD+ Cell Regenerator™
Optimized NAD+ Cell Regenerator™ with Resveratrol
PQQ Caps
Rhodiola Extract
RiboGen™ French Oak Wood Extract
Triple Action Thyroid

Eye Health

Astaxanthin with Phospholipids
Brite Eyes III
Eye Pressure Support with Mirtogenol®
MacuGuard® Ocular Support with Saffron
MacuGuard® Ocular Support with Saffron & Astaxanthin
Standardized European Bilberry Extract
Tear Support with MaquiBright®

Fish Oil & Omegas

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

Food

California Estate Extra Virgin Olive Oil
Kenyan Green Tea Crystals
Kenyan Purple Tea Crystals
Rainforest Blend Decaf Ground Coffee
Rainforest Blend Ground Coffee
Rainforest Blend Whole Bean Coffee
Stevia Sweetener

Glucose Management

CinSulin® with InSea2c and Crominex® 3+
CoffeeGenic® Green Coffee Extract
Glycemic Guard™
Mega Benfotiamine
Tri Sugar Shield®

Heart Health

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

Hormone Balance

DHEA (Dehydroepiandrosterone)
Pregnenolone
Triple Action Cruciferous Vegetable Extract with Resveratrol
Triple Action Cruciferous Vegetable Extract

Immune Support

AHCC®
Bio-Quercetin
Enhanced Zinc Lozenges
Immune Modulator with Tinofend®
Immune Protect with PARACTIN®
Immune Senescence Protection Formula™
Kinoko® Gold AHCC
Kinoko® Platinum AHCC
Kyolic® Garlic Formula 102
Kyolic® Reserve
Lactoferrin (Apolactoferrin) Caps
NK Cell Activator™
Optimized Garlic
Optimized Quercetin
Peony Immune
ProBoost Thymic Protein A
Reishi Extract Mushroom Complex
Standardized *Cistanche*
Ten Mushroom Formula®
Ultra Soy Extract
Zinc Lozenges

Inflammation Management

5-LOX Inhibitor with AprèsFlex®
Advanced Bio-Curcumin® with Ginger & Turmerones Turmeric Extract
Black Cumin Seed Oil
Black Cumin Seed Oil with Bio-Curcumin®
Boswella
Cytokine Suppress™ with EGCG
Serraflazyme
Specially-Coated Bromelain
Super Bio-Curcumin® Turmeric Extract
Zyflamend™ Whole Body

Joint Support

Arthro-Immune Joint Support
ArthroMax® Advanced NT2 Collagen™ & AprèsFlex®
ArthroMax® with Theaflavins & AprèsFlex®
ArthroMax® Elite
Fast-Acting Joint Formula
Glucosamine/Chondroitin Capsules
Krill Healthy Joint Formula
MSM (Methylsulfonylmethane)
NT2 Collagen™

Kidney & Bladder Support

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

Liver Health & Detoxification

Anti-Alcohol HepatoProtection Complex
Calcium D-Glucarate
Chlorella
Chlorophyllin
European Milk Thistle
Glutathione, Cysteine & C
HepatoPro
Liver Efficiency Formula
N-Acetyl-L-Cysteine
PectaSol-C®
Silymarin

PRODUCTS

Longevity & Wellness

Alpha-Lipoic Acid
AppleWise Polyphenol Extract
Blueberry Extract
Blueberry Extract with Pomegranate
DNA Protection Formula
GEROPROTECT® Ageless Cell™
GEROPROTECT® Longevity A.I.™
Grapeseed Extract
Green T-Max
Mediterranean Whole Food Blend
Mega Green Tea Extract (decaffeinated)
Mega Green Tea Extract (lightly caffeinated)
Optimized Fucoidan with Maritech® 926
Optimized Resveratrol
Pycnogenol® French Maritime Pine Bark Extract
Resveratrol
RNA (Ribonucleic Acid)
Senolytic Activator
Super R-Lipoic Acid
X-R Shield

Men's Health

Male Vascular Sexual Support
Mega Lycopene Extract
PalmettoGuard® Saw Palmetto with Beta-Sitosterol
PalmettoGuard® Saw Palmetto/Nettle Root Formula with Beta-Sitosterol
Pomi-T®
Prelox® Enhanced Sex for Men
Super MiraForte with Standardized Lignans
Triple Strength ProstaPollen™
Ultra Prostate Formula

Minerals

Boron
Extend-Release Magnesium
Ionic Selenium
Iron Protein Plus
Magnesium Caps
Magnesium (Citrate)
Only Trace Minerals
Optimized Chromium with Crominex® 3+
Potassium with Extend-Release Magnesium
Sea-Iodine™
Se-Methyl L-Selenocysteine
Super Selenium Complex
Vanadyl Sulfate
Zinc Caps

Miscellaneous

Potassium Iodide
Solarshield® Sunglasses

Mood & Stress Management

Cortisol-Stress Balance
Enhanced Stress Relief
5 HTP
L-Theanine
SAMe (S-Adenosyl-Methionine)

Multivitamins

Children's Formula Life Extension Mix™
Comprehensive Nutrient Packs ADVANCED
Life Extension Mix™ Capsules without Copper
Life Extension Mix™ Capsules
Life Extension Mix™ Powder without Copper
Life Extension Mix™ Powder
Life Extension Mix™ Tablets with Extra Niacin
Life Extension Mix™ Tablets without Copper
Life Extension Mix™ Tablets
Once-Daily Health Booster
One-Per-Day Tablets
Two-Per-Day Capsules
Two-Per-Day Tablets

Nerve & Comfort Support

ComfortMAX™
PEA Discomfort Relief

Personal Care

Anti-Aging Rejuvenating Scalp Serum
Biosil
Dr. Proctor's Advanced Hair Formula
Dr. Proctor's Shampoo
European Leg Solution Featuring Certified Diosmin 95
Hair, Skin & Nails Collagen Plus Formula
Life Extension Toothpaste
Venotone
Xyliwhite Mouthwash
Youthful Collagen

Pet Care

Cat Mix
Dog Mix

Probiotics

Bifido GI Balance
FLORASSIST® Balance
FLORASSIST® GI with Phage Technology
FLORASSIST® Heart Health
FLORASSIST® Immune Health
FLORASSIST® Mood
FLORASSIST® Nasal
FLORASSIST® Oral Hygiene
FLORASSIST® Prebiotic
FLORASSIST® Throat Health
Jarro-Dophilus® for Women
Theralac® Probiotics
TruFlora® Probiotics

Skin Care

Advanced Peptide Anti-Glycation Serum
Advanced Growth Factor Serum
Advanced Hyaluronic Acid Serum
Advanced Lightening Cream
Advanced Peptide Hand Therapy
Advanced Triple Peptide Serum
Advanced Under Eye Serum with Stem Cells
All-Purpose Soothing Relief Cream
Amber Self MicroDermAbrasion
Anti-Aging Face Oil
Anti-Aging Mask
Anti-Aging Rejuvenating Face Cream
Anti-Aging Rejuvenating Scalp Serum
Anti-Oxidant Serum with Blueberry & Pomegranate Extracts
Anti-Oxidant Facial Mist Hydrator
Collagen Boosting Peptide Serum
Cucumber Hydra Peptide Eye Cream
DNA Support Cream
Environmental Support Serum
Eye Lift Cream
Face Rejuvenating Anti-Oxidant Cream
Hyaluronic Facial Moisturizer
Hyaluronic Oil-Free Facial Moisturizer
Hydrating Anti-Oxidant Facial Mist
Hydroderm
Lifting & Tightening Complex
Melatonin Advanced Peptide Cream
Melatonin Cream
Mild Facial Cleanser
Multi Stem Cell Hydration Cream
Multi Stem Cell Skin Tightening Complex
Neck Rejuvenating Anti-Oxidant Cream
Rejuvenex® Body Lotion
Rejuvenex® Factor Firming Serum
Renewing Eye Cream
Resveratrol Anti-Oxidant Serum
Shade Factor™
Shade Factor™ Sunscreen Lotion
Shade Factor™ Sunscreen Spray
Skin Care Collection Anti-Aging Serum
Skin Care Collection Body Lotion
Skin Care Collection Day Cream
Skin Care Collection Night Cream
Skin Firming Complex
Skin Lightening Serum
Skin Restoring Ceramides
Skin Stem Cell Serum
Skin Tone Equalizer
Stem Cell Cream with Alpine Rose
Tightening & Firming Neck Cream
Triple-Action Vitamin C Cream
Ultimate MicroDermabrasion
Ultimate Peptide Serum
Ultra Eyelash Booster
Ultra Rejuvenex®
Ultra RejuveNight®
Ultra Wrinkle Relaxer
Under Eye Refining Serum
Under Eye Rescue Cream
Vitamin C Lip Rejuvenator
Vitamin C Serum
Vitamin D Lotion
Vitamin K Cream

Sleep

Bioactive Milk Peptides
Circadian Sleep
Enhanced Sleep with Melatonin
Enhanced Sleep without Melatonin
Fast-Acting Liquid Melatonin
Glycine
L-Tryptophan
Melatonin
Melatonin IR/XR
Optimized Tryptophan Plus
Quiet Sleep
Quiet Sleep Melatonin

Vitamins

Ascorbyl Palmitate
Benfotiamine with Thiamine
Beta-Carotene
BioActive Complete B-Complex
Biotin
Buffered Vitamin C Powder
Fast-C® and Bio-Quercetin Phytosome
Gamma E Mixed Tocopherol Enhanced with Sesame Lignans
Gamma E Mixed Tocopherol/Tocotrienols
High Potency Optimized Folate
Inositol Caps
Liquid Emulsified Vitamin D3
Liquid Vitamin D3
Low-Dose Vitamin K2
Methylcobalamin
MK-7
No Flush Niacin
Optimized Folate (L-Methylfolate)
Pantothenic Acid (Vitamin B-5)
Pyridoxal 5'-Phosphate Caps
Super Absorbable Tocotrienols
Super K
Super K Elite
Super Vitamin E
Vitamin B6
Vitamin B12
Vitamin C and Bio-Quercetin Phytosome
Vitamin D3
Vitamin D3 with Sea-Iodine™
Vitamins D and K with Sea-Iodine™

Weight Management & Body Composition

7-Keto® DHEA Metabolite
Advanced Anti-Adipocyte Formula
Advanced Appetite Suppress
AMPK Metabolic Activator
CalReduce Selective Fat Binder
DHEA Complete
Garcinia HCA
HCActive Garcinia Cambogia Extract
Integra-Lean®
Mediterranean Trim with Sinetrol™ -XPur
Optimized Irvingia with Phase 3™ Calorie Control Complex
Optimized Saffron with Satiereal®
Super CLA Blend with Sesame Lignans
Waist-Line Control™
Wellness Code Appetite Control

Women's Health

Enhanced Sex for Women 50+
Breast Health Formula
Femmenessence MacaPause®
Estrogen for Women
Menopause 731™
Progesta-Care®
Super-Absorbable Soy Isoflavones

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