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September 2020

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Dr. George Church

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GENE THERAPY TO REVERSE AGING

Harvard geneticist
Dr. George Church
is “turning on”
youth-promoting genes.

In this exclusive interview
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how he expects to achieve
human **age reversal**
in the foreseeable future.



WYSS INSTITUTE AT HARVARD UNIVERSITY

7 FRACTURE PREVENTION

A startling **50%** of **women** and **20%** of **men** will experience an osteoporotic **fracture** after age **49**. The enormity of suffering and mortality has generated studies seeking ways to **reduce bone fracture** risk.

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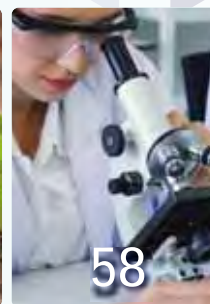
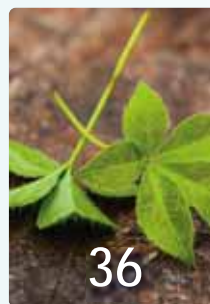
Nootropic compounds *enhance* brain processing speed, learning, and alertness. **Plant-based** nootropics are being used to supercharge brain processing speed, learning, and memory.

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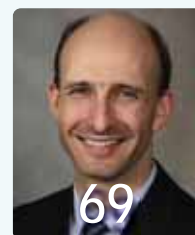
Neuroregeneration pioneer Dr. Terry Burns believes that a paradigm shift, senolytics, and technologies that study the human brain will make diseases like Alzheimer's a distant memory.

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In her book, *Digestive Wellness*, Dr. Elizabeth Lipski explains the connection between digestion and conditions ranging from migraines and skin issues, to arthritis and fibromyalgia.



Evolving Yet Again

You asked, we listened. We're improving font size, the supplement facts panel and adding gluten-free iconography where applicable.

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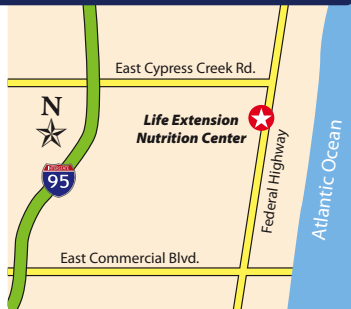


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References

1. *Immun Ageing*. 2009 Jun 12;6:9.
2. <https://www.sciencedirect.com/science/article/abs/pii/S1756464618303621>.
3. *Am J Clin Nutr*. 2004 Mar;79(3):444-50.
4. *J Trace Elem Med Biol*. 2010 Apr;24(2):89-94.



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Fracture Prevention

About 1 in 2 women and 1 in 5 men will suffer an osteoporotic fracture after age 49.¹



WILLIAM FALOON

A report published in the *Journal of the American Medical Association* analyzed the degree of **osteoporotic fracture** reduction that occurred in response to **vitamin D** and **calcium** supplementation.¹

This **meta-analysis** found that combining low doses of **vitamin D** (400 IU to 800 IU) with high **calcium** intake (1,000 mg to 1,200 mg) reduced risk of **any fracture** by 6% and **hip fracture** by 16%.

The problem is that more than **two million** fractures occur each year in the United States related to **osteoporosis**.²

If people rely *only* on **calcium** and **vitamin D**, this means **1.9 million** fractures will continue to occur each year.

To put today's **vitamin D** deficit in perspective, baseline vitamin D **blood levels** in the **vitamin D** *only* segment of this meta-analysis ranged from **10.6 ng/mL** to **26.3 ng/mL**.

This is far less than the **50 ng/mL** to **80 ng/mL** of **25-hydroxyvitamin D** blood levels that many groups consider optimal.

Observational studies included in this meta-analysis found that for each **10 ng/mL** increase in **25-hydroxyvitamin D** there was an associated **7%** reduced relative risk for **any** fracture and **20%** reduced relative risk for **hip fracture**.

The analysis published in the *Journal of American Medical Association (JAMA)* further validates how low-cost **nutrients** can decrease today's **osteoporosis/fracture** epidemic.

This editorial describes other methods to lower **fracture** risk.



Insufficient Potencies

The expectation that **calcium** and/or **vitamin D** can meaningfully protect against osteoporosis and fracture risk has caused a lot of studies to be designed in ways that often fail to show comprehensive bone benefits.

A meta-analysis published in **JAMA** showed a reduced fracture risk in response to vitamin D and calcium supplements. There was no benefit when taking **vitamin D** alone.¹

A look at studies on vitamin D supplementation *alone* (included in this analysis) reveals baseline vitamin D **blood levels** ranging from **deficiency** at **10.6 ng/mL** to an **insufficient** level of **26.3 ng/mL** of *25-hydroxyvitamin D*.

The average **vitamin D3 dose** used in these studies was **833 IU** a day.

Among the clinical trials in the vitamin D-*only* part of the meta-analysis, this low vitamin D dose (**833 IU/day**) was associated with a median blood level change of **8.4 ng/mL** of *25-hydroxyvitamin D*.

This means virtually none of the people evaluated in the **JAMA** study achieved **optimal** blood levels of *25-hydroxyvitamin D*.

Studies using low potencies have been the subject of misguided media reports claiming there is no value to taking **bone-building** supplements.

The reality is no single nutrient can be counted on to maintain **bone integrity** when confronted with the degenerative changes that occur with normal skeletal aging.

Vitamin Deficits Increase Fractures

A **2019** study linked **vitamin K** deficits and other deficiencies to increased **fracture** rates.³

In this study, a Japanese group looked at associations of **multiple** vitamin deficiencies and incident **fractures** in women.³

They used **homocysteine** blood levels as an indicator of **B-vitamin** status. Homocysteine is higher in people deficient in certain **B-vitamins**.

Blood levels of **25-hydroxy-vitamin D** were used to assess **vitamin D** status.

Vitamin K status was evaluated by measuring a protein (undercarboxylated **osteocalcin**) that vitamin K favorably influences to maintain **bone density**.

The **human** study subjects were divided into four groups:

- No vitamin deficiency
- Single deficiency (of either vitamin D, vitamin K or B-vitamins)
- Double deficiencies (of either vitamin D, vitamin K or B-vitamins)
- Triple deficiencies (of vitamin D, vitamin K and B-vitamins)

A total of 889 women were included in this analysis, with an average age of about **68** and average follow-up of about **6.3 years**.

Incident **fractures** were observed in **29.7%** of subjects. This finding alone shows how frequent **fractures** are in women averaging only **68** years.





Drug

Rivaroxaban (Xarelto®)

Apixaban (Eliquis®)

Dabigatran (Pradaxa®)

Compared to Warfarin Users

32% osteoporosis risk reduction

62% osteoporosis risk reduction

(Statistically insignificant 4% increase)

The study found that the number of **vitamin deficiencies** was associated with a **25% increased** risk of incident **fracture**. This association persisted even after adjustment for sources of potential confounding.

The authors of this study concluded:

“Accumulation of vitamin deficiencies was related to incident fractures.”

This study supports data **Life Extension®** reported in the **1990s** showing the role of vitamin/mineral deficiencies in osteoporosis and **fracture risk**.⁴

Warfarin Users Beware

Those with atrial fibrillation, aortic valve replacement, deep vein thrombosis, and other conditions require powerful **anti-coagulant drugs** to reduce the risk of a clot forming inside a blood vessel (thrombosis).

For decades, the drug of choice in these situations was a **vitamin K antagonist** drug called **warfarin** (Coumadin®). Warfarin works by inhibiting the synthesis and activation of **vitamin K**.^{5,6}

Not only does warfarin disable beneficial **vitamin K activity** (such as keeping calcium in bones and out of arteries), but warfarin users are put on strict diets that are extremely low in **vitamin K**.

As a result, long-term warfarin users may suffer **vascular calcification** and **bone loss**, as has been shown in some studies.^{7,8}

Fractures in Warfarin Users

A study published in October **2019**, conducted in Denmark, looked at osteoporotic **fracture incidence** in people prescribed various types of **anti-coagulant** drugs. **Warfarin** was the only **vitamin K antagonist** drug while the other drugs did not have vitamin K antagonistic effects.⁹

This study found overall fracture risk was low in this population, but that those prescribed non-warfarin anticoagulant drugs (like Xarelto® and Eliquis®) had significantly lower risk of **osteoporotic fractures**.

A similar study published in January **2020** conducted in Taiwan looked at **atrial fibrillation** patients treated with warfarin or non-vitamin K antagonist drugs.¹⁰

Compared to warfarin treatment, drugs that did not block **vitamin K** were associated with an **18% lower** risk of osteoporosis.

The box at the top of this column shows the data obtained in the sub-group analysis of this study relating to different anti-coagulant drugs.

The study authors noted the lower **osteoporosis risk** became significantly better in those with *longer* treatment duration and concluded:

“Compared with warfarin, rivaroxaban and apixaban were associated with a significantly lower risk of osteoporosis in patients with atrial fibrillation.”

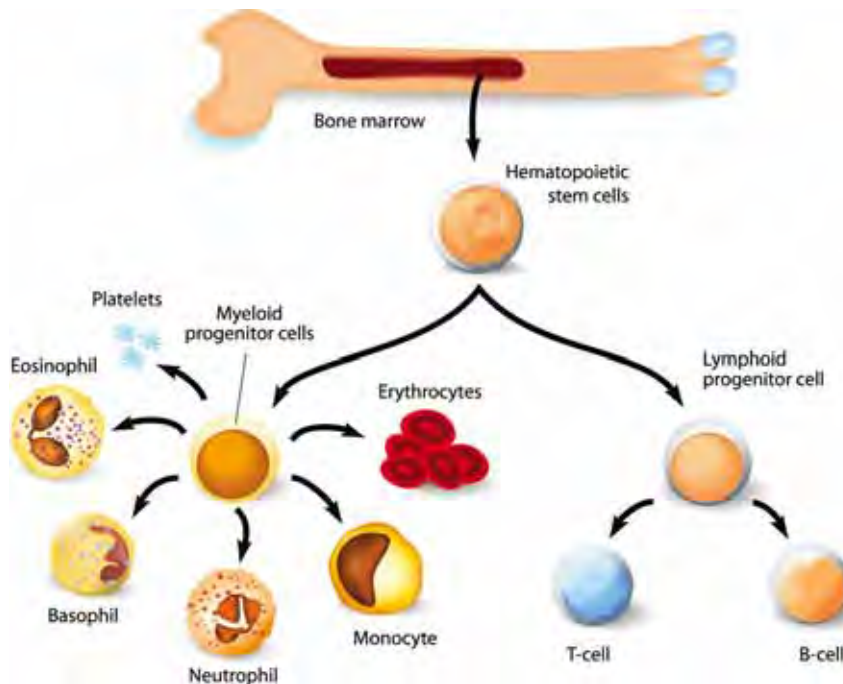
Life Extension® has suggested for decades that **warfarin** users consult their doctor about supplementing with a low dose of **vitamin K2 (45 mcg a day)** and adjusting warfarin dose slightly upward to maintain desired **INR/pro-thrombin time** levels. This can enable one to achieve anti-coagulant benefits without completely depriving the body of vitamin K. More about vitamin K and warfarin can be reviewed at: www.LifeExtension.com/warfarin

Effect of Vitamin K on Bone Density and Fractures

As scientific debates continue, studies published in **2019-2020** point to a role that **vitamin K** has in maintaining healthy bones.

One meta-analysis of randomized, controlled trials found that the odds for a clinical **fracture** were lower in those supplementing with **vitamin K** compared to controls.¹¹

Blood cell formation from differentiation of hematopoietic stem cells in red bone marrow.



Protecting Bone Marrow

The spongy tissue inside our **bones** is known as the **bone marrow**. It contains **stem cells** that can develop into immune cells, red blood cells, mesenchymal stem cells, and platelets.

Given the involvement of bone-marrow-derived cells in the maintenance and formation of the different blood cellular components, a group of researchers investigated how the vitamin K antagonist drug **warfarin** can adversely impact the **bone marrow** microenvironment including mesenchymal stem cells, macrophage immune cells and vital **hematopoietic stem cells**.¹³

Using various in vitro assays, this group showed how **vitamin K antagonists** adversely alter bone physiology and cause a staggering **eight-fold** reduction in functional **hematopoietic stem cells**.

These scientists pointed out that **vitamin K antagonist** drugs (like warfarin) are not directly toxic to **hematopoietic stem cells** but impair them via other mechanisms.

Without providing a causal link, this paper associates the use of vitamin K antagonists with a potential increased risk of **myelodysplastic syndrome**.

About three out of every 10 patients with **myelodysplastic syndrome** (about 30%) develop **leukemia**,¹⁴ which is notoriously difficult to treat.

More human research is needed to assess the ability of **vitamin K** in maintaining healthy **bone marrow**.

The authors of this same study, however, said there was “**insufficient**” evidence to confirm these findings in post-menopausal or osteoporotic patients and that:

“There are too few trials to draw conclusions for other patient groups.”

My rebuttal to these pessimistic conclusions is that many vitamin K trials use lower-than-optimal doses of vitamin **K1**, which does not convert into **vitamin K2** in all persons.¹²

And of course, I would never say **vitamin K2** by itself is enough to provide comprehensive **skeletal support**, as evidenced by the Japanese study cited earlier whereby multiple **nutrient deficiencies** markedly increase **fracture** incidence.

Review of Accumulated Evidence

A review of the accumulated evidence that vitamin K plays a protective role in **age-related** disorders such as cardiovascular disease, osteoarthritis and osteoporosis was published in August **2019**.¹⁵

This assessment identified novel roles that have emerged for vitamin K that extend *beyond* its ability to keep **calcium in bones** and **out** of one’s **arteries** and soft tissues.

Of interest was evidence that vitamin K reduces “**inflammaging**” by suppressing **NF-kB** (nuclear factor-kappa B).¹⁵

This **2019** review highlights the valuable **whole-body** benefits that can be attained with proper **vitamin K** status.

Bones Need Hormones

The major regulator of **bone remodeling** in men and women is the sex hormone **estrogen**.¹⁶

Other hormones that influence bone density include **testosterone**, **DHEA**, and **growth hormone**.^{17,18}

With aging, many of these hormone levels plummet and accelerate loss of **bone density**.

Many men and women use bioidentical hormone replacement therapy to maintain youthful hormone levels and support healthy bones.

Comprehensive **blood tests** enable maturing men and women to achieve optimal **hormone balance**.

Pregnenolone is a “mother” hormone that can cascade in the body into bone-supporting hormones estrogen, progesterone, testosterone, and DHEA.

A review article published in **2020** describes many of the **anti-aging** properties of **DHEA** including its potential to help maintain strong **bones**.¹⁷

Restore Bone Integrity

No single therapy adequately protects against **skeletal deterioration** that occurs with normal aging.

A comprehensive set of **interventions** should be considered, including cutting back on unhealthy lifestyle choices and ensuring that adequate potencies of every bone-building nutrient and hormone are consumed.

Some individuals may wish to consider bioidentical hormone replacement to ensure optimal hormone balance.

I know that many of you are engaging in **intermittent fasting** or other forms of reduced calorie intake.

While there are enormous benefits to these practices, a potential downside is that one may not ingest enough calcium, magnesium, boron, vitamins D and K, and other nutrients required to maintain **bone density**.

The good news for consumers is that bone-building, multi-nutrient formulas are affordable because the ingredients they contain (calcium + magnesium + boron + vitamins D + K) are not expensive.

You can further enhance **bone health** by avoiding lifestyle factors that increase **fracture risk** and discuss with your doctor whether any of your medications (such as warfarin or proton pump inhibitors) might be undermining your bone strength.

What Causes Bone Loss?

Bone is living tissue that undergoes a continual self-regeneration process called **remodeling**. Remodeling removes old bone and replaces it with new bone.^{19,20}

With **aging** this balance shifts to favor greater bone **removal** (resorption) and less new bone **formation**.

The result is **osteoporosis** and increased **fracture risk**.²¹

A variety of factors markedly accelerate loss of bone density and strength. Of course menopause is one, but also the use of drugs like **corticosteroids** and **proton-pump inhibitors** (PPIs), smoking tobacco, drinking excess alcohol, and anti-testosterone treatment for prostate cancer (known as hormone ablation) are a few of the most notable culprits.²²⁻²⁵

Weight-bearing exercise, good nutrition, and maintaining hormone balance help protect aging bones.^{26,27}

Health-conscious individuals are often surprised when a **bone density** test reveals **osteopenia** (loss of bone density, but not to a degree that increases fracture risk) or **osteoporosis** (deterioration in bone density with increased fracture risk).²⁸

Maturing people should recognize that **bone density** peaks early in life (between 18-30 years) and progressively declines thereafter.²⁹



In This Month's Issue...

Calorie restriction can extend healthy longevity, but few people consistently adhere to reduced food intake. Certain **nutrients** are discussed on page 36 that mimic biological effects that occur in response to reduced food intake.

A hallmark of cellular aging is damaged **DNA**. An article on page 58 describes the ability of **tocotrienols** to protect against DNA damage that accelerates systemic aging.

If you wonder where all this is leading, page 48 has an exclusive interview with Harvard geneticist **Dr. George Church** who is developing **gene therapies** aimed at eliminating all human **viruses** and reversing biological **aging**.

The steps taken to protect against **degenerative aging** today will enable more of you to benefit from extended healthy lifespans that may be less than 10 years away.

For longer life,



William Faloon, Co-Founder
Life Extension Buyers Club



References

1. Yao P, Bennett D, Mafham M, et al. Vitamin D and Calcium for the Prevention of Fracture: A Systematic Review and Meta-analysis. *JAMA Netw Open*. 2019 Dec 2;2(12):e1917789.
2. Myneni VD, Mezey E. Regulation of bone remodeling by vitamin K2. *Oral Dis*. 2017 Nov;23(8):1021-8.
3. Kuroda T, Uenishi K, Ohta H, et al. Multiple vitamin deficiencies additively increase the risk of incident fractures in Japanese postmenopausal women. *Osteoporos Int*. 2019 Mar;30(3):593-9.
4. Available at: <https://www.lifeextension.com/magazine/1999/3/cover1>. Accessed July 6, 2020.
5. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK470313/>. Accessed July 6, 2020.
6. Available at: <https://www.drugbank.ca/drugs/DB00682>. Accessed July 6, 2020.
7. Namba S, Yamaoka-Tojo M, Hashikata T, et al. Long-term warfarin therapy and biomarkers for osteoporosis and atherosclerosis. *BBA Clin*. 2015 Dec;4:76-80.
8. Poterucha TJ, Goldhaber SZ. Warfarin and Vascular Calcification. *Am J Med*. 2016 Jun;129(6):635 e1-4.
9. Binding C, Bjerring Olesen J, Abrahamsen B, et al. Osteoporotic Fractures in Patients With Atrial Fibrillation Treated With Conventional Versus Direct Anticoagulants. *J Am Coll Cardiol*. 2019 Oct 29;74(17):2150-8.
10. Huang HK, Liu PP, Hsu JY, et al. Risk of Osteoporosis in Patients With Atrial Fibrillation Using Non-Vitamin K Antagonist Oral Anticoagulants or Warfarin. *J Am Heart Assoc*. 2020 Jan 21;9(2):e013845.
11. Mott A, Bradley T, Wright K, et al. Effect of vitamin K on bone mineral density and fractures in adults: an updated systematic review and meta-analysis of randomised controlled trials. *Osteoporos Int*. 2019 Aug;30(8):1543-59.
12. Halder M, Petsophonsakul P, Akbulut AC, et al. Vitamin K: Double Bonds beyond Coagulation Insights into Differences between Vitamin K1 and K2 in Health and Disease. *Int J Mol Sci*. 2019 Feb 19;20(4):896.
13. Verma D, Kumar R, Pereira RS, et al. Vitamin K antagonism impairs the bone marrow microenvironment and hematopoiesis. *Blood*. 2019 Jul 18;134(3):227-38.
14. Available at: <https://www.cancer.org/cancer/myelodysplastic-syndrome/about/what-is-mds.html>. Accessed June 30, 2020.
15. Simes DC, Viegas CSB, Araujo N, et al. Vitamin K as a Powerful Micronutrient in Aging and Age-Related Diseases: Pros and Cons from Clinical Studies. *Int J Mol Sci*. 2019 Aug 25;20(17):4150.
16. Almeida M, Laurent MR, Dubois V, et al. Estrogens and Androgens in Skeletal Physiology and Pathophysiology. *Physiol Rev*. 2017 Jan;97(1):135-87.
17. Sahu P, Gidwani B, Dhongade HJ. Pharmacological activities of dehydroepiandrosterone: A review. *Steroids*. 2020 Jan;153:108507.
18. Walsh JS. Normal bone physiology, remodelling and its hormonal regulation. *Surgery (Oxford)*. 2015 2015/01/01;33(1):1-6.
19. Kylmaja E, Nakamura M, Tuukkanen J. Osteoclasts and Remodeling Based Bone Formation. *Curr Stem Cell Res Ther*. 2016;11(8):626-33.
20. Prior JC. Progesterone for the prevention and treatment of osteoporosis in women. *Climacteric*. 2018 Aug;21(4):366-74.
21. Almeida M. Aging mechanisms in bone. *Bonekey Rep*. 2012 Jul 1;1:102.
22. Adami G, Saag KG. Glucocorticoid-induced osteoporosis: 2019 concise clinical review. *Osteoporos Int*. 2019 Jun;30(6):1145-56.
23. Cheraghi Z, Doosti-Irani A, Almasi-Hashiani A, et al. The effect of alcohol on osteoporosis: A systematic review and meta-analysis. *Drug Alcohol Depend*. 2019 Apr 1;197:197-202.
24. Andersen BN, Johansen PB, Abrahamsen B. Proton pump inhibitors and osteoporosis. *Curr Opin Rheumatol*. 2016 Jul;28(4):420-5.
25. Lipton A, Smith MR, Ellis GK, et al. Treatment-induced bone loss and fractures in cancer patients undergoing hormone ablation therapy: efficacy and safety of denosumab. *Clin Med Insights Oncol*. 2012;6:287-303.
26. Daly RM. Exercise and nutritional approaches to prevent frail bones, falls and fractures: an update. *Climacteric*. 2017 Apr;20(2):119-24.
27. Kalkan R, Tulay P. The Interactions between Bone Remodelling, Estrogen Hormone and EPH Family Genes. *Crit Rev Eukaryot Gene Expr*. 2018;28(2):135-8.
28. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK499878/>. Accessed July 6, 2020.
29. Weaver CM, Gordon CM, Janz KF, et al. The National Osteoporosis Foundation's position statement on peak bone mass development and lifestyle factors: a systematic review and implementation recommendations. *Osteoporos Int*. 2016 Apr;27(4):1281-386.

Comprehensive Blood Tests at Low Lab Sale Prices

New supporters often ask **Life Extension®** what the most important **nutrients** are.

Our typical reply is we have no idea if you don't have recent **blood test** results.

Commercial labs charge **over \$2,000** for blood tests needed to evaluate vascular, inflammatory, immune, and other degenerative risk factors.

Once a year, **Life Extension®** offers these same tests in comprehensive **Male** and **Female Panels** for **\$224**... a savings of about **90%**. (This year **magnesium** is added to the **Male** and **Female Panels**.)

MALE PANEL

METABOLIC PROFILE

Glucose

Insulin

Hemoglobin A1c

NEW Serum Magnesium

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

CARDIAC MARKERS

Apolipoprotein B (ApoB)

Homocysteine

C-Reactive Protein (high sensitivity)

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

FEMALE PANEL

METABOLIC PROFILE

Glucose

Insulin

Hemoglobin A1c

NEW Serum Magnesium

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

CARDIAC MARKERS

Apolipoprotein B (ApoB)

Homocysteine

C-Reactive Protein (high sensitivity)

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

MALE AND FEMALE PANELS include an assessment of vitamin D status called 25-hydroxyvitamin D.

LAB TEST SALE • EXTENDED TO OCTOBER 5, 2020.



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Sale Price: \$224

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.

After you order and receive our form, you can visit a blood-draw facility we suggest at your convenience in your area or the **Life Extension Nutrition Center** in Ft. Lauderdale.

Lab tests are available in the continental United States and Anchorage, AK, only. Not available in Maryland. Restrictions apply in MA, NY, NJ, and RI. Kits not available in PA.



2



ways to save

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16K12AV110201

DEFEND YOUR HEALTH

VITAMIN D3

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

For full product description and to order **Vitamin D3**, call 1-800-544-4440 or visit www.LifeExtension.com



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



Item #01713 • 5,000 IU • 60 softgels
1 bottle \$7.50 • 4 bottles \$6.50 each

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

HEALTHY BONES = HEALTHY HEART

TWO WAYS TO GET YOUR VITAMIN K

Life Extension® offers two vitamin K formulas:

SUPER K is the best-selling vitamin K formula for bone and heart health. It costs only **25 cents** a day and provides *higher* potencies than most commercial brands. **Super K** is comprised of:

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

Super K Elite provides 2 additional forms of vitamin K and even *higher* potencies of K1, MK4 and MK7. **Super K Elite** costs **60 cents** a day and provides:

Vitamin K1 (converts to K2 in some people)	2,000 mcg
Vitamin K2 (MK-4) (for bone & vascular health)	1,500 mcg
Vitamin K2 (MK-7) (long-acting protection)	181 mcg
Vitamin K2 (MK-9) (added cardiovascular support)	43 mcg
Vitamin K2 (MK-6) (added cardiovascular support)	11 mcg



Super K Item #02334 • 90 Softgels
1 bottle \$22.50 • 4 bottles \$20.25 each



Super K Elite Item #02335 • 30 Softgels
1 bottle \$18 • 4 bottles \$16 each

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

CAUTION: If you are taking anticoagulant or antiplatelet medications, or have a bleeding disorder, consult with your healthcare provider before taking these products.



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.

In the News



Supplementation with Vitamin C Associated with Boost to Immunity

A randomized, double-blind trial reported in *BMJ Military Health* showed that daily vitamin C supplementation resulted in a lower risk of contracting the common cold.*

In their discussion of the findings, the researchers remarked that vitamin C boosts immunity by improving white blood cell function against viruses. It also has an antihistamine action that helps reduce cold symptoms.

The trial included 1,444 men. For a period of 30 days, 695 participants received **2,000 mg** of vitamin C three times per day. The other individuals were given a placebo.

The subjects supplemented with vitamin C were less likely to catch a cold compared to the placebo group.

The protective effect of vitamin C was found to be stronger among those who had never smoked.

Editor's Note: The study participants were enlisted military members in the army of South Korea, whose average age was 21.7 years.

* *BMJ Mil Health*. 2020 Mar 5;bmjmmilitary- 2019-001384.

Vitamin K Deficiency Associated with Harmful Calcium Accumulation

Vitamin K deficiency plays a role in the development of a disease called calciphylaxis, according to a study published in the *Journal of the American Society of Nephrology*.¹

In **calciphylaxis**, calcium accumulates in the small blood vessels of fat and skin tissues. It occurs mainly in patients on dialysis, and can cause blood clots, skin ulcers, skin infections, and ultimately, death.

In a study that included 20 hemodialysis patients with calciphylaxis and 20 without it, researchers found that people with the disease had higher plasma levels of **inactive matrix Gla protein (MGP)**.

MGP is a potent inhibitor of vascular **calcification**, but in order to work properly, MGP needs to be *activated* by an enzyme that requires **vitamin K**.

The researchers found that patients with calciphylaxis had a lower concentration of activated MGP. In fact, for each **0.1 unit reduction** in relative active MGP concentration, there was a more than **2-fold increase** in calciphylaxis risk.

They also found that vitamin K deficiency was associated with a lower concentration of activated GMP.

This study indicates that adequate vitamin K is essential for processes that help prevent calciphylaxis in people on dialysis.

Editor's Note: In a separate study, researchers found that vitamin K showed promise for treating calciphylaxis.²

References

1. *J Am Soc Nephrol*. 2017 Jun;28(6):1717-22.
2. Available at: <https://www.renalandurologynews.com/home/conference-highlights/kidney-week-annual-meeting/kidney-week-2019/vitamin-k-shows-promise-for-calciphylaxis/>. Accessed April 22, 2020.





Connection Between Gum Disease and Alzheimer's Disease Confirmed

A study published in the *Journal of Clinical Investigation* was the first to connect the presence of the gingivitis pathogen *Porphyromonas gingivalis* in the brain to factors associated with Alzheimer's disease.*

Previously, numerous studies had shown that periodontitis (gum disease) is closely associated with cognitive impairment and Alzheimer's disease.

And studies done **post-mortem** had found that the periodontal pathogen *Porphyromonas gingivalis* is present in the brains of Alzheimer's patients.

In the more recent study, researchers induced experimental gingivitis in mice by giving them repeated oral doses of *Porphyromonas gingivalis* for 22 weeks. Another group of mice served as a control group.

Testing revealed that in the mice that received *Porphyromonas gingivalis*, the pathogen was present in the brain tissue in the hippocampus (the area of the brain that plays a major role in learning and memory).

In addition, the study showed that the presence of this pathogen added to numerous processes contributing to Alzheimer's disease, including:

- Neuroinflammation,
- Neurodegeneration,
- Microgliosis and astrogliosis (an indication of brain injury),
- Formation of amyloid plaque, and
- Formation of neurofibrillary tangles.

Editor's Note: The researchers concluded that, "The neuropathological features observed in this study strongly suggest that low grade, chronic periodontal pathogen infection can result in the development of neuropathology that is consistent with that of [Alzheimer's disease]."

* *PLoS One*. 2018 Oct 3;13(10):e0204941.

Nicotinamide Shows Promise for Treating Fibrotic Eye Diseases

Nicotinamide, a form of vitamin B3, has been identified as a possible treatment for fibrotic eye diseases and could potentially prevent vision loss, according to a study published in *Stem Cell Reports*.*

Fibrotic eye diseases occur when aggressive *cell transformations* during wound healing lead to scar tissue, retinal detachment, and ultimately, vision loss and blindness.

When researchers applied nicotinamide to human adult cells in vitro, they found that nicotinamide had three key mechanisms that make it a possible treatment for fibrotic eye diseases:

1. It **inhibits** harmful cell transformations.
2. It **reverses** the development of membranes associated with scar tissue.
3. It **slows** the development of eye diseases that can lead to vision loss and blindness.

Timothy Blenkinsop, Ph.D., the study's co-lead investigator, said, "This discovery helps evolve our understanding of wound healing, as well as good inflammation versus bad inflammation. Good inflammation essentially nudges the system into a regenerative response, while bad inflammation can create harmful scar tissue formation."

Editor's Note: "This is an exciting time to understand how this compound [nicotinamide] can be used to treat and reverse not only fibrotic diseases of the retina but other diseases too," Dr. Blenkinsop said.

* *Stem Cell Reports*. 2020 Apr 14;14(4):631-47.



DHEA

FOR ALL NEEDS

DHEA levels markedly decline with age.

DHEA is an important hormone in your body. It supports healthy immune function, mood, sexual function, bone health, cardiovascular health, and more.

Just one 25 mg DHEA capsule restores **DHEA blood levels** to *youthful* ranges.

DHEA 25 mg capsules

Item #00335 • 100 capsules

1 bottle **\$12**

4 bottles **\$11 each**



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



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



ULTIMATE eye HYDRATION

Moisturize Your Aging Eyes

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

N-acetylcarnosine is used as a stabilizing agent.

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(5 mL each)

1 box **\$25.50**

4 boxes \$24 each



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

'C' TO THE MAX

Humans don't manufacture **vitamin C** internally, so it must be obtained through dietary sources or supplements.

Vitamin C is water soluble and needs to be constantly replenished.*

A highly **absorbable** form of **quercetin** complements vitamin C's activity in the body.

Each tablet provides **1,000 mg** of **vitamin C** and **15 mg** of **Bio-Quercetin Phytosome**.

Item #02227 • 250 vegetarian tablets

1 bottle **\$22.50**

4 bottles \$20 each

For full product description and to order **Vitamin C and Bio-Quercetin Phytosome**, call

1-800-544-4440 or visit
www.LifeExtension.com



* PLoS Med. 2005 Sep;2(9):e307;author reply e309.

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



Promote *Tear* Production From *The Inside* Out



Item #01918 • 30 vegetarian capsules

1 bottle **\$13.50**

4 bottles \$12 each

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

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

The secret is the maqui berry's rich source of **delphinidins**, a source of support for tear-producing glands. When human subjects took just **60 mg** a day of **maqui berry extract**, there was a **45% increase** in lubricating tear production.^{1,2}

References

1. *Food Chem.* 2013;139(1-4):129-37.
2. *Panminerva Med.* 2014;56(3 Suppl 1):1-6.

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



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

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



STRONGER BONES STRONGER YOU

Some people require *extra* support for optimal bone strength and flexibility.

Bone Strength Collagen Formula provides **collagen** as a patented **chelated calcium** designed to support bone health.

Magnesium, silicon, dried plum, vitamin D3, and boron are included to further skeletal support.



For full product description and to order **Bone Strength Collagen Formula**, call 1-800-544-4440 or visit www.LifeExtension.com

Item #01725 • 120 capsules

1 bottle **\$33.75**

4 bottles \$30 each



KoAct® is a patented form of bone collagen with calcium designed to support bone strength and maintain optimal bone health.

KoAct® is a registered trademark of AIDP, Inc. Fruitex B® and OsteoBoron® are registered trademarks of VDF Futureceuticals, Inc. U.S. Patent No. 5,962,049.

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



Nutrients to *Charge Up* BRAIN FUNCTION

BY JASON MCNEIL

Nootropics are compounds that *enhance* **cognition** and facilitate **learning**.

They differ from nutrients that protect against **brain aging**.

Nootropics are for people seeking to *improve* brain **processing speed** and **mental alertness**.

Nutrients with **nootropic** properties have become popular for people of all ages to improve thinking speed and accuracy.

Nootropics Tune Up Your Mind

Nootropics are a different type of brain and cognition supplement. Their goal is to boost cognitive performance *now*.

Nootropics are meant to improve and recall recent and old memories.

Nootropic compounds boost cognitive efficiencies by helping brain cells operate at **peak power**.

Scientists have identified nutrients shown in clinical (human) studies to improve cognitive function, processing speed, and memory.





Bacopa Monnieri Improves Learning

As we age, our ability to process and absorb new information begins to decline.

In seeking to create a plant-based nootropic, researchers focused on compounds associated with **cognitive enhancement** in **human** studies. One key aspect of improved cognition is improving the brain's ability to **learn** and **retain** information.

Research on the flowering herb *Bacopa monnieri* reveals improved memory. In ancient times, the herb was given to scholars to improve their learning and memorization of vast religious texts that were orally handed down from generation to generation.¹

In several **clinical trials**, *standardized* extracts of *Bacopa* have been shown to sharpen several aspects of cognitive function, specifically learning rate and retention of information.²⁻⁹

These human studies also show that *Bacopa* improved additional aspects of cognitive functions such as:

- Auditory verbal learning speed,
- Speed of visual processing,
- Working memory,
- Formation of new memories,
- Recall of memories, and
- Power and speed of attention.

In animal studies, *standardized* extract of *Bacopa* also improved brain activity by promoting the growth of neuron connections in the **hippocampus** and amygdala, another part of the brain involved in perception of emotions.¹⁰⁻¹² The hippocampus is one of the most important brain regions for the formation of new memories. Other benefits included:^{1,12,13}

- Improved spatial learning,
- Increased dendritic length and branching,
- Modulation of neurotransmitter production,
- Increased synaptic concentration,
- Reduced brain inflammation,
- Increased cerebral blood flow, which reduces oxygen and nutrient deficits, and
- Increased nourishment of neurons.

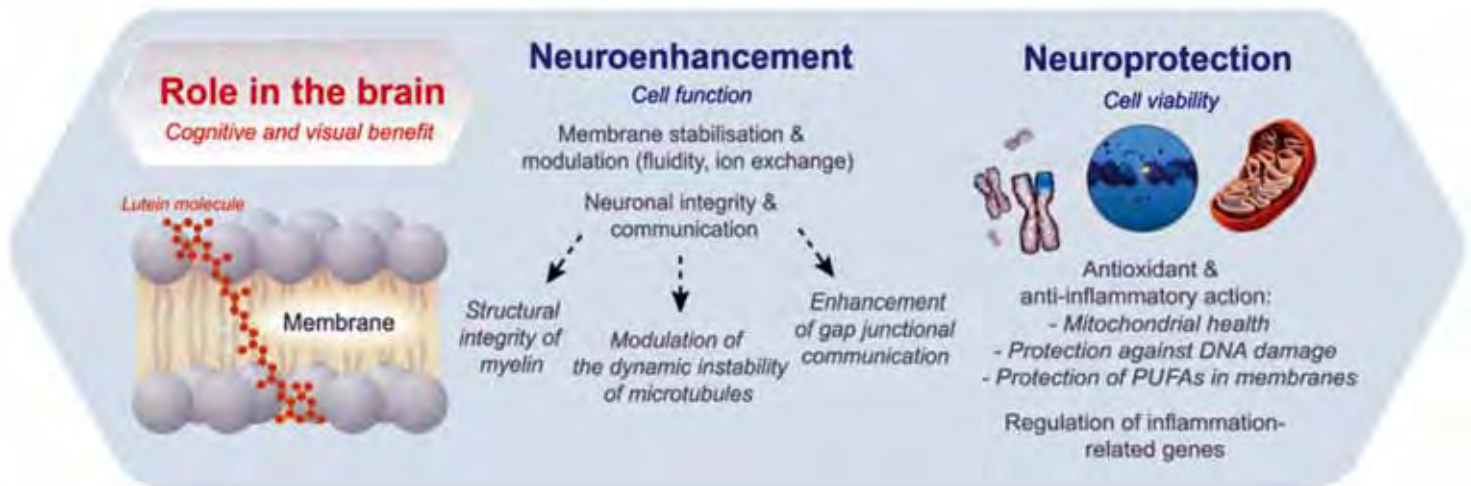
Gotu Kola Improves Reaction Time and Accuracy

The next step in creating a multi-function nootropic was investigating the herb **gotu kola**.

Gotu kola is a flowering herb native to Asia. It has also been used to boost brain power in traditional Eastern medicine for centuries.



Lutein + Zeaxanthin Supports Neuronal Communication



Lutein and zeaxanthin: The possible contribution, mechanisms of action and implications of modern dietary intake for cognitive development in children. *HRB Open Res.* 2019;2:8.

In one clinical trial of healthy, older adults, daily intake of standardized extract of **gotu kola** for two months led to significant improvements in several aspects of brain function.¹⁴

Using **electroencephalography** (EEG), the electrical activity of the brain was recorded and combined with cognitive testing. Researchers saw evidence of improved **attention** and **reaction time** in mental tasks just one hour after supplementation. These improvements in reaction time indicate improved brain processing speed.

By the end of the two-month study, other improvements in cognitive function were seen, including short-term **working memory**, **word recognition**, **spatial memory** and **picture recognition**, and **alertness**.

Gotu kola also improved **mood** and **calmness**. This has implications for managing anxiety and depression, which can interfere with peak mental clarity.¹⁵

In another study, patients with generalized anxiety disorder who supplemented with **gotu kola** noted significantly improved levels of anxiety and stress.¹⁶

Gotu kola has also demonstrated benefits in animal studies.^{17,18} In a mouse model of **dementia**, animals given extracts of **gotu kola** performed significantly better than untreated animals in tests of **learning** and **memory**.¹⁸

WHAT YOU NEED TO KNOW

A Powerful Nootropic Formula

- **Nootropics** are compounds and nutrients meant to enhance cognitive abilities in healthy individuals.
- **Life Extension®** scientists have identified four such plant nutrients, which have *individually* demonstrated the ability to **improve brain function**.
- The carotenoids **lutein** and **zeaxanthin** and standardized extracts of the flowering herbs **gotu kola** and **Bacopa monnieri** have each been shown in clinical trials to enhance cognitive abilities, improve memory and learning, brain processing speed, and more.

The Eye-Brain Connection

Carotenoids are a group of pigments found in many fruits and vegetables.

Two closely related carotenoids, **lutein** and **zeaxanthin**, are taken up and concentrated in the **retina** of the eye, the tissue that senses light and sends information to the brain for visual recognition via the optic nerve.

Lutein and zeaxanthin have long been shown to protect **macular density** necessary for **visual function**.¹⁹⁻²⁴ These carotenoid pigments help maintain sharp sight while protecting the retina from damage due to blue light, chronic inflammation, and other threats.

Scientists have discovered that significant amounts of **lutein** and **zeaxanthin** also concentrate in the **brain**.

This isn't very surprising, since the **retina** is technically an **extension of the brain** that contains **nerve cells** similar to those found in the brain itself.²⁵⁻²⁹

Levels of **lutein** and **zeaxanthin** in the eye and the brain are directly correlated.²⁵⁻²⁹ That means testing their levels in the eye, which is easier to do, allows scientists to also estimate the levels of lutein and zeaxanthin in the brain.

People with the *highest* plasma and macular levels of **lutein** and **zeaxanthin** also have the *highest cognitive function*.^{27,30-35}

Using advanced MRI imaging technology, researchers were able to show that *higher* levels of **carotenoids** in the **brain** were associated with better **efficiency of the brain cells** during tests of learning, memory, perception, decision-making, and motor coordination.³³

Human Studies of Lutein and Zeaxanthin

Based on findings that **lutein** and **zeaxanthin** function as **nootropics**, researchers identified a source derived from marigold flowers.

The combination of **lutein** and **zeaxanthin** has been tested in **nine human** studies on brain function in a wide age range.³⁶⁻⁴⁴

Scientists found that oral intake of lutein-zeaxanthin leads to improvements in brain speed, efficiency, and overall cognitive function.

Research shows that lutein and zeaxanthin improved **brain function** through:^{43,45}

- Improved neuronal communication,
- Increased neural integrity,
- Enhanced memory retention, and
- Increased processing of visual signals.

In healthy young adults, **10 mg of lutein** and **2 mg of zeaxanthin** daily resulted in *significant improvements* in **memory**, **reasoning**, and **complex attention**—the ability to hold complicated ideas in the mind, assess them, and quickly act on them.⁴¹

This improvement in complex attention indicates that brain processing speeds were increased, allowing individuals to better assess complex stimuli and react appropriately.





Similar findings have been seen in older adults. The same dosage of lutein and zeaxanthin improved complex attention and other aspects of cognition in subjects averaging **73.7 years** of age.⁴⁰

In another study of older adults, oral lutein and zeaxanthin helped maintain learning and memory while improving brain blood flow, while these functions deteriorated in participants who received a placebo.³⁹

Scientists believe lutein and zeaxanthin work, in part, by wedging themselves into the walls of brain **cell membranes**.^{25,45-48} This may boost the membrane's functional properties and improve other aspects of membrane integrity.

Summary

The field of **nootropics** research aims to find compounds and nutrients that can boost cognitive performance.

A combination of nootropic compounds has been formulated to enhance **brain function**.

The carotenoids **lutein** and **zeaxanthin**, which are concentrated in the eye and brain, can improve and protect visual *and* mental function.

Standardized extracts of **gotu kola** and **Bacopa monnieri** each enhanced several aspects of cognitive function and mood in clinical trials.

This combination may help people of all ages achieve their full neurological potential.

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

References

1. Aguiar S, Borowski T. Neuropharmacological review of the nootropic herb Bacopa monnieri. *Rejuvenation Res.* 2013 Aug;16(4):313-26.
2. Benson S, Downey LA, Stough C, et al. An acute, double-blind, placebo-controlled cross-over study of 320 mg and 640 mg doses of Bacopa monnieri (CDRI 08) on multitasking stress reactivity and mood. *Phytother Res.* 2014 Apr;28(4):551-9.
3. Calabrese C, Gregory WL, Leo M, et al. Effects of a standardized Bacopa monnieri extract on cognitive performance, anxiety, and depression in the elderly: a randomized, double-blind, placebo-controlled trial. *J Altern Complement Med.* 2008 Jul;14(6):707-13.
4. Morgan A, Stevens J. Does Bacopa monnieri improve memory performance in older persons? Results of a randomized, placebo-controlled, double-blind trial. *J Altern Complement Med.* 2010 Jul;16(7):753-9.
5. Peth-Nui T, Wattanathorn J, Muchimapura S, et al. Effects of 12-Week Bacopa monnieri Consumption on Attention, Cognitive Processing, Working Memory, and Functions of Both Cholinergic and Monoaminergic Systems in Healthy Elderly Volunteers. *Evid Based Complement Alternat Med.* 2012;2012:606424.
6. Raghav S, Singh H, Dalal PK, et al. Randomized controlled trial of standardized Bacopa monnieri extract in age-associated memory impairment. *Indian J Psychiatry.* 2006 Oct;48(4):238-42.
7. Roodenrys S, Booth D, Bulzomi S, et al. Chronic effects of Brahmi (Bacopa monnieri) on human memory. *Neuropsychopharmacology.* 2002 Aug;27(2):279-81.
8. Stough C, Downey LA, Lloyd J, et al. Examining the nootropic effects of a special extract of Bacopa monnieri on human cognitive functioning: 90 day double-blind placebo-controlled randomized trial. *Phytother Res.* 2008 Dec;22(12):1629-34.
9. Stough C, Lloyd J, Clarke J, et al. The chronic effects of an extract of Bacopa monnieri (Brahmi) on cognitive function in healthy human subjects. *Psychopharmacology (Berl).* 2001 Aug;156(4):481-4.

10. Vollala VR, Upadhy S, Nayak S. Enhanced dendritic arborization of amygdala neurons during growth spurt periods in rats orally intubated with Bacopa monniera extract. *Anat Sci Int*. 2011 Dec;86(4):179-88.
11. Vollala VR, Upadhy S, Nayak S. Enhancement of basolateral amygdaloid neuronal dendritic arborization following Bacopa monniera extract treatment in adult rats. *Clinics (Sao Paulo)*. 2011;66(4):663-71.
12. Vollala VR, Upadhy S, Nayak S. Enhanced dendritic arborization of hippocampal CA3 neurons by Bacopa monniera extract treatment in adult rats. *Rom J Morphol Embryol*. 2011;52(3):879-86.
13. Nemetchek MD, Stierle AA, Stierle DB, et al. The Ayurvedic plant Bacopa monnieri inhibits inflammatory pathways in the brain. *J Ethnopharmacol*. 2017 Feb 2;197:92-100.
14. Wattanathorn J, Mator L, Muchimapura S, et al. Positive modulation of cognition and mood in the healthy elderly volunteer following the administration of Centella asiatica. *J Ethnopharmacol*. 2008 Mar 5;116(2):325-32.
15. Robinson OJ, Vytal K, Cornwell BR, et al. The impact of anxiety upon cognition: perspectives from human threat of shock studies. *Front Hum Neurosci*. 2013;7:203.
16. Jana U, Sur TK, Maity LN, et al. A clinical study on the management of generalized anxiety disorder with Centella asiatica. *Nepal Med Coll J*. 2010 Mar;12(1):8-11.
17. Matthews DG, Caruso M, Murchison CF, et al. Centella Asiatica Improves Memory and Promotes Antioxidative Signaling in 5XFAD Mice. *Antioxidants (Basel)*. 2019 Dec 8;8(12).
18. Zhang Z, Li X, Li D, et al. Asiaticoside ameliorates beta-amyloid-induced learning and memory deficits in rats by inhibiting mitochondrial apoptosis and reducing inflammatory factors. *Exp Ther Med*. 2017 Feb;13(2):413-20.
19. Bian Q, Gao S, Zhou J, et al. Lutein and zeaxanthin supplementation reduces photooxidative damage and modulates the expression of inflammation-related genes in retinal pigment epithelial cells. *Free Radic Biol Med*. 2012 Sep 15;53(6):1298-307.
20. Chucair AJ, Rotstein NP, Sangiovanni JP, et al. Lutein and zeaxanthin protect photoreceptors from apoptosis induced by oxidative stress: relation with docosahexaenoic acid. *Invest Ophthalmol Vis Sci*. 2007 Nov;48(11):5168-77.
21. Kijlstra A, Tian Y, Kelly ER, et al. Lutein: more than just a filter for blue light. *Prog Retin Eye Res*. 2012 Jul;31(4):303-15.
22. Loskutova E, Nolan J, Howard A, et al. Macular pigment and its contribution to vision. *Nutrients*. 2013 May 29;5(6):1962-9.
23. Strauss O. The retinal pigment epithelium in visual function. *Physiol Rev*. 2005 Jul;85(3):845-81.
24. Xue C, Rosen R, Jordan A, et al. Management of Ocular Diseases Using Lutein and Zeaxanthin: What Have We Learned from Experimental Animal Studies? *J Ophthalmol*. 2015;2015:523027.
25. Erdman JW, Jr., Smith JW, Kuchan MJ, et al. Lutein and Brain Function. *Foods*. 2015 Dec;4(4):547-64.
26. Power R, Coen RF, Beatty S, et al. Supplemental Retinal Carotenoids Enhance Memory in Healthy Individuals with Low Levels of Macular Pigment in A Randomized, Double-Blind, Placebo-Controlled Clinical Trial. *J Alzheimers Dis*. 2018;61(3):947-61.
27. Vishwanathan R, Iannaccone A, Scott TM, et al. Macular pigment optical density is related to cognitive function in older people. *Age Ageing*. 2014 Mar;43(2):271-5.
28. Vishwanathan R, Schalch W, Johnson EJ. Macular pigment carotenoids in the retina and occipital cortex are related in humans. *Nutr Neurosci*. 2016;19(3):95-101.
29. Vishwanathan R, Neuringer M, Snodderly DM, et al. Macular lutein and zeaxanthin are related to brain lutein and zeaxanthin in primates. *Nutr Neurosci*. 2013 Jan;16(1):21-9.
30. Ajana S, Weber D, Helmer C, et al. Plasma Concentrations of Lutein and Zeaxanthin, Macular Pigment Optical Density, and Their Associations With Cognitive Performances Among Older Adults. *Invest Ophthalmol Vis Sci*. 2018 Apr 1;59(5):1828-35.
31. Feeney J, O'Leary N, Moran R, et al. Plasma Lutein and Zeaxanthin Are Associated With Better Cognitive Function Across Multiple Domains in a Large Population-Based Sample of Older Adults: Findings from The Irish Longitudinal Study on Aging. *J Gerontol A Biol Sci Med Sci*. 2017 Oct 1;72(10):1431-6.
32. Lindbergh CA, Mewborn CM, Hammond BR, et al. Relationship of Lutein and Zeaxanthin Levels to Neurocognitive Functioning: An fMRI Study of Older Adults. *J Int Neuropsychol Soc*. 2017 Jan;23(1):11-22.
33. Mewborn CM, Lindbergh CA, Robinson TL, et al. Lutein and Zeaxanthin Are Positively Associated with Visual-Spatial Functioning in Older Adults: An fMRI Study. *Nutrients*. 2018 Apr 7;10(4).
34. Renzi LM, Dengler MJ, Puente A, et al. Relationships between macular pigment optical density and cognitive function in unimpaired and mildly cognitively impaired older adults. *Neurobiol Aging*. 2014 Jul;35(7):1695-9.
35. Wong JC, Kaplan HS, Hammond BR. Lutein and zeaxanthin status and auditory thresholds in a sample of young healthy adults. *Nutr Neurosci*. 2017 Jan;20(1):1-7.
36. Mewborn CM, Lindbergh CA, Hammond BR, et al. The Effects of Lutein and Zeaxanthin Supplementation on Brain Morphology in Older Adults: A Randomized, Double-Masked, Placebo-Controlled Trial. *J Aging Res*. 2019/12/01;2019:3709402.
37. Ceravolo SA, Hammond BR, Oliver W, et al. Dietary Carotenoids Lutein and Zeaxanthin Change Brain Activation in Older Adult Participants: A Randomized, Double-Masked, Placebo-Controlled Trial. *Mol Nutr Food Res*. 2019 Aug;63(15):e1801051.
38. Lindbergh CA, Lv J, Zhao Y, et al. The effects of lutein and zeaxanthin on resting state functional connectivity in older Caucasian adults: a randomized controlled trial. *Brain Imaging Behav*. 2020 Jun;14(3):668-81.
39. Lindbergh CA, Renzi-Hammond LM, Hammond BR, et al. Lutein and Zeaxanthin Influence Brain Function in Older Adults: A Randomized Controlled Trial. *J Int Neuropsychol Soc*. 2018 Jan;24(1):77-90.
40. Hammond BR, Jr., Miller LS, Bello MO, et al. Effects of Lutein/Zeaxanthin Supplementation on the Cognitive Function of Community Dwelling Older Adults: A Randomized, Double-Masked, Placebo-Controlled Trial. *Front Aging Neurosci*. 2017;9:254.
41. Renzi-Hammond LM, Bovier ER, Fletcher LM, et al. Effects of a Lutein and Zeaxanthin Intervention on Cognitive Function: A Randomized, Double-Masked, Placebo-Controlled Trial of Younger Healthy Adults. *Nutrients*. 2017 Nov 14;9(11).
42. Bovier ER, Hammond BR. A randomized placebo-controlled study on the effects of lutein and zeaxanthin on visual processing speed in young healthy subjects. *Arch Biochem Biophys*. 2015 Apr 15;572:54-7.
43. Bovier ER, Renzi LM, Hammond BR. A double-blind, placebo-controlled study on the effects of lutein and zeaxanthin on neural processing speed and efficiency. *PLoS One*. 2014;9(9):e108178.
44. Johnson EJ, McDonald K, Caldarella SM, et al. Cognitive findings of an exploratory trial of docosahexaenoic acid and lutein supplementation in older women. *Nutr Neurosci*. 2008 Apr;11(2):75-83.
45. Loskutova E, Shah K, Flitcroft ID, et al. Lutein and zeaxanthin: The possible contribution, mechanisms of action and implications of modern dietary intake for cognitive development in children. *HRB Open Research*. 2019;2(8).
46. Gruszecki WI, Strzalka K. Carotenoids as modulators of lipid membrane physical properties. *Biochim Biophys Acta*. 2005 May 30;1740(2):108-15.
47. Stahl W, Sies H. Effects of carotenoids and retinoids on gap junctional communication. *Biofactors*. 2001;15(2-4):95-8.
48. Widomska J, Subczynski WK. Why has Nature Chosen Lutein and Zeaxanthin to Protect the Retina? *J Clin Exp Ophthalmol*. 2014 Feb 21;5(1):326.

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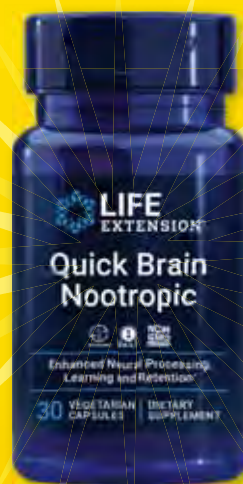
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Nutrients that Provide Benefits of Caloric Restriction

BY NANCY KOVACS

Published studies on a wide range of organisms show:

Caloric restriction can improve health and **extend life**.¹⁻³

But people are challenged when trying to chronically reduce their food intake.¹

Even those who initially succeed often return to regular eating, losing out on the **longevity** benefits that caloric restriction can offer.

Researchers have identified **plant-derived** compounds that help **activate** similar health-promoting cellular responses as **caloric restriction**.



How Caloric Restriction Prolongs Life

Caloric restriction means **limiting** the number of calories consumed each day, while avoiding malnutrition.

Restricting calories extends life and reduces age-related chronic disease in many organisms.^{2,3} These effects have been observed in a wide range of animal models, including mammals.

When caloric intake is *low*, during what's known as a **fasting state**, cells switch into protective mode. They activate processes that rejuvenate themselves and defend against potential threats and stressors.

These changes have long-term benefits for overall health, and possibly for life extension as well.

On the flip side is the dietary excess plaguing modern societies. This chronic, surplus calorie ingestion contributes to a variety of health problems.

Surging rates of obesity, type II diabetes, neurodegenerative disorders, and cancer have all been linked to excessive calorie intake.

Scientists have pinpointed some of the specific cellular changes that occur with caloric restriction. The most practical ways of achieving these benefits are:⁴⁻¹⁰

1. Boosting function of **sirtuins**, proteins that regulate cellular health,
2. Increasing activity of **AMPK**, an *enzyme* that regulates metabolism,
3. Reducing activity of **mTOR**, a protein linked to aging and chronic disease,
4. Blocking **cellular senescence**, when older cells become dysfunctional, and
5. Encouraging **autophagy**, cellular “housekeeping.”

These actions protect against many forms of chronic disease and accelerated aging.^{4,6-10}



GYNOSTEMMA PENTAPHYLLUM

Caloric Restriction and Intermittent Fasting “Mimetics”

Sticking to a restrictive diet is difficult.

It can also be unpleasant. For some, substantial caloric restriction may lead to loss of strength and stamina, loss of libido, loss of bone density, depression, and other undesirable effects.¹

Research is increasingly finding that there are alternatives to severe dietary restriction. Several compounds have been shown to target some of the same cellular **pathways** as caloric restriction, without side effects.^{5,7-9,11}

These compounds are known as caloric restriction **mimetics**. A mimetic is something that mimics the effects of something else.

Some of the nutrients found to be caloric restriction mimetics are health-promoting **polyphenols**.

For each of the five major cellular changes spurred by caloric restriction, science has discovered mimetics that have the same effects.

1. Boosting Sirtuin Function

One way caloric restriction extends lifespan is by ramping up the activity of signaling proteins called **sirtuins**, particularly **SIRT1**.⁶⁻⁸

Sirtuins regulate cellular health and defend cellular components in times of stress. They shield **DNA** from damage that speeds the aging process and makes cells susceptible to disease.^{12,13}

Studies show that improving **sirtuin function** extends lifespan of various organisms.^{12,14-18}

The polyphenol **resveratrol**, found in minute quantities in red wine, grapes, and berries, activates **SIRT1**.^{14-16,19,20}

In mice, resveratrol helps *mimic* the changes induced by dietary restriction, reducing the signs of aging.¹¹

Resveratrol has been shown to stabilize DNA and extend lifespan of yeast by a whopping **70%**.¹⁹

While resveratrol *activates* sirtuins, a cofactor called **NAD⁺** (nicotinamide adenine dinucleotide) is required for **sirtuins** to *function* properly. With advancing age, **NAD⁺** levels drop.^{12,13}

The oral **NAD⁺** precursor nicotinamide riboside boosts **NAD⁺** cellular levels rapidly, helping to support healthy **sirtuin** function.²¹⁻²³

Taken together, resveratrol and nicotinamide riboside maximize the benefits for cellular health and longevity.



2. Activating AMPK

Another longevity-promoting change spurred by caloric restriction is increased **activity** of an *enzyme* called **AMPK**.

Stimulating AMPK has a critical impact on metabolism. It helps prevent weight gain, improves insulin sensitivity, and reduces high blood glucose levels.²⁴⁻²⁷

The most commonly prescribed medication for type II diabetes is **metformin**, which works partially by activating AMPK.

A number of **plant-derived** compounds are also potent activators of AMPK.

Gynostemma pentaphyllum is known as the “immortality herb” in some Asian cultures. Cell and animal studies have shown that *Gynostemma* extracts activate **AMPK**, resulting in health benefits that include reduced body weight and improved cholesterol levels.²⁸⁻³²

In a **2019** study of mice fed an obesity-inducing diet, *Gynostemma* prevented weight gain, reduced fat mass, and improved blood lipid markers.³³

AMPK also stimulates **SIRT1**. In this 2019 study, animals receiving *Gynostemma* had an approximately **4.5-fold** increase in SIRT1 expression compared to untreated animals.

Hesperidin is a plant compound found in citrus fruits that has also been shown to amplify AMPK activity.³⁴⁻³⁷ In mice, it lowers body weight and lipid levels while improving insulin sensitivity and glucose control.³⁵

In humans, **500 mg** of hesperidin daily was found to lead to improvements including better blood vessel reactivity and reduced body-wide inflammation.³⁶

WHAT YOU NEED TO KNOW

The Benefits of Caloric Restriction Without Fasting

- **Caloric restriction** has powerful anti-aging effects, reducing chronic disease and extending life, as shown in many studies.
- Restrictive diets are difficult to adhere to and have potential unpleasant side effects.
- Scientists have identified crucial cell changes that are induced by dietary restriction. These include **sirtuin** activation, boosting **AMPK**, reducing **mTOR** activity, protecting against cell **senescence**, and promoting beneficial **autophagy**.
- Several plant-derived nutrients *mimic* the cellular effects of restricting calories, producing some of the same protective benefits.
- **Resveratrol, nicotinamide riboside, *Gynostemma pentaphyllum*, hesperidin, curcumin, quercetin, theaflavins, and apigenin** are nutrients that closely imitate the beneficial effects of restrictive diets.

3. Decreasing mTOR Activity

mTOR stands for the “**mechanistic target of rapamycin**.”

In youth, balanced **mTOR** activity enables rapid growth.

If **mTOR** activity remains stuck in high gear as people age, it contributes to a number of deleterious effects.

When nutrients are plentiful, **mTOR** activity goes up.

If **mTOR** is not balanced, aging individuals could accumulate unwanted fat stores even when they don't ingest calories excessively.

Caloric restriction *decreases* mTOR activity, protecting health.⁸

Research shows that **resveratrol** and **curcumin**, a compound found in **turmeric** root, have mTOR-inhibiting activity.³⁸⁻⁴²

4. Preventing Cellular Senescence

As cells age, many become dysfunctional and lose the ability to grow or divide. This is referred to as **cellular senescence**.

Senescent cells secrete compounds that damage surrounding cells and promote **chronic inflammation**.



Cellular senescence is a major driver of aging of tissues, loss of function, and development of disease.

Caloric restriction limits the development of senescent cells, shielding tissues from their harmful effects.⁶

Compounds called **senolytics** can help reduce the senescent cells' burdens without caloric restriction.

The most studied senolytic therapy combines the plant pigment **quercetin**, found in many fruits and vegetables, with the chemotherapy drug **dasatinib**.

Several studies show this two-compound cocktail (dasatinib + quercetin) decreases the number of **senescent cells** in tissues, reducing signs of aging and diminishing the occurrence and severity of chronic disease.⁴⁸⁻⁵¹

Early human trials of this therapy are showing promising results, but dasatinib is a synthetic pharmaceutical drug.^{48,52} As a result, many people today would prefer a safer **senolytic** compound.

Scientists have found another way to remove senescent cells, using **plant-based** nutrients found in commonly consumed food and beverages.

Quercetin on its own possesses senolytic properties,⁵³ and **theaflavins** from black tea act in similar cell signalling ways as dasatinib.⁵⁴⁻⁵⁶

Recently, researchers have made another advance in **senolytic** therapy. They've found that **apigenin** (a plant compound) reduces harmful compounds that **senescent cells** emit.^{57,58}

By combining a *highly absorbable* **quercetin** with **theaflavins** and **apigenin**, scientists have created a plant-based formula, available without a prescription, that provides senolytic action without resorting to pharmaceutical drugs.

And even more exciting is the advent of **bioavailable fisetin** that may be the most effective way to remove senescent cells from aging bodies. Look forward to a novel and low-cost **bioavailable fisetin** in the near future.

5. Enhancing Autophagy

As cells get older, they accumulate damaged and worn-out components that interfere with the proper functioning of the cell.

In earlier stages of their life, cells do a kind of “housekeeping” on a regular basis. This involves removing older, damaged components inside cells and replacing them with new, healthy components. This process is referred to as **autophagy**.

With advancing age and poor diet, **autophagy** declines and cell clutter builds up, robbing tissues of their healthy cellular function. Deficient autophagy contributes to many diseases of older age.⁵⁹

Caloric restriction has been shown to stimulate autophagy, refreshing and rejuvenating cells.⁴

A number of nutrients found in plants, particularly **resveratrol** and **curcumin**, have also been shown to stimulate healthy **autophagy**.⁵⁹⁻⁶³

Studies indicate this has protective effects against cancer, neurodegenerative disorders like Alzheimer's disease, and other chronic diseases.⁵⁹⁻⁶³

Look forward to specific plant-derived **autophagy-inducers** being introduced in **2021**. In the meantime, it's good to know that nutrients most readers of this magazine already supplement with have internal **cell-cleansing** properties.

Summary

Caloric restriction is one of the most widely studied methods to prevent disease and extend lifespan.

For people, adhering to rigorous dietary regimens can be difficult, if not impossible.

Scientists have identified cellular processes that are favorably altered by calorie-restricting diets.

Several plant-derived nutrients have been shown to mimic many of the effects of dietary restriction.

Resveratrol and **nicotinamide riboside** boost and maintain healthy levels of protective **sirtuin** function.

Gynostemma pentaphyllum and hesperidin activate the metabolism-regulating enzyme **AMPK**.

Resveratrol and **curcumin** limit harmful activity of the protein mTOR, while stimulating autophagy, or cellular "housekeeping."

Theaflavins and highly absorbable **quercetin** reduce the numbers of old, dysfunctional senescent cells in tissues. And **apigenin** reduces harmful compounds that **senescent cells** emit.

These effects help mimic the longevity-promoting impact of **caloric restriction**. •

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



References

1. Dirks AJ, Leeuwenburgh C. Caloric restriction in humans: potential pitfalls and health concerns. *Mech Ageing Dev.* 2006 Jan;127(1):1-7.
2. Anton S, Leeuwenburgh C. Fasting or caloric restriction for healthy aging. *Exp Gerontol.* 2013 Oct;48(10):1003-5.
3. Golbidi S, Daiber A, Korac B, et al. Health Benefits of Fasting and Caloric Restriction. *Curr Diab Rep.* 2017 Oct 23;17(12):123.
4. Bergamini E, Cavallini G, Donati A, et al. The role of autophagy in aging: its essential part in the anti-aging mechanism of caloric restriction. *Ann N Y Acad Sci.* 2007 Oct;1114:69-78.
5. Calvert S, Tacutu R, Sharifi S, et al. A network pharmacology approach reveals new candidate caloric restriction mimetics in *C. elegans*. *Aging Cell.* 2016 Apr;15(2):256-66.
6. Fontana L, Nehme J, Demaria M. Caloric restriction and cellular senescence. *Mech Ageing Dev.* 2018 Dec;176:19-23.
7. Lee SH, Min KJ. Caloric restriction and its mimetics. *BMB Rep.* 2013 Apr;46(4):181-7.
8. Madeo F, Carmona-Gutierrez D, Hofer SJ, et al. Caloric Restriction Mimetics against Age-Associated Disease: Targets, Mechanisms, and Therapeutic Potential. *Cell Metab.* 2019 Mar 5;29(3):592-610.
9. Roth GS, Ingram DK. Manipulation of health span and function by dietary caloric restriction mimetics. *Ann N Y Acad Sci.* 2016 Jan;1363:5-10.
10. Ungvari Z, Parrado-Fernandez C, Csiszar A, et al. Mechanisms underlying caloric restriction and lifespan regulation: implications for vascular aging. *Circ Res.* 2008 Mar 14;102(5):519-28.
11. Pearson KJ, Baur JA, Lewis KN, et al. Resveratrol delays age-related deterioration and mimics transcriptional aspects of dietary restriction without extending life span. *Cell Metab.* 2008 Aug;8(2):157-68.
12. Imai S, Guarente L. NAD+ and sirtuins in aging and disease. *Trends Cell Biol.* 2014 Aug;24(8):464-71.
13. Johnson S, Imai SI. NAD (+) biosynthesis, aging, and disease. *F1000Res.* 2018;7:132.
14. Cao MM, Lu X, Liu GD, et al. Resveratrol attenuates type 2 diabetes mellitus by mediating mitochondrial biogenesis and lipid metabolism via Sirtuin type 1. *Exp Ther Med.* 2018 Jan;15(1):576-84.

15. Cao W, Dou Y, Li A. Resveratrol Boosts Cognitive Function by Targeting SIRT1. *Neurochem Res*. 2018 Sep;43(9):1705-13.
16. Deng Z, Li Y, Liu H, et al. The role of sirtuin 1 and its activator, resveratrol in osteoarthritis. *Biosci Rep*. 2019 May 31;39(5).
17. Belenky P, Racette FG, Bogan KL, et al. Nicotinamide riboside promotes Sir2 silencing and extends lifespan via Nrk and Urh1/Pnp1/Meu1 pathways to NAD⁺. *Cell*. 2007 May 4;129(3):473-84.
18. Zhang H, Ryu D, Wu Y, et al. NAD(+) repletion improves mitochondrial and stem cell function and enhances life span in mice. *Science*. 2016 Jun 17;352(6292):1436-43.
19. Alcaín FJ, Villalba JM. Sirtuin activators. *Expert Opin Ther Pat*. 2009 Apr;19(4):403-14.
20. Kaeblerlein M, McDonagh T, Heltweg B, et al. Substrate-specific activation of sirtuins by resveratrol. *J Biol Chem*. 2005 Apr 29;280(17):17038-45.
21. Martens CR, Denman BA, Mazzo MR, et al. Chronic nicotinamide riboside supplementation is well-tolerated and elevates NAD(+) in healthy middle-aged and older adults. *Nat Commun*. 2018 Mar 29;9(1):1286.
22. Trammell SA, Schmidt MS, Weidemann BJ, et al. Nicotinamide riboside is uniquely and orally bioavailable in mice and humans. *Nat Commun*. 2016 Oct 10;7:12948.
23. Yang T, Chan NY, Sauve AA. Syntheses of nicotinamide riboside and derivatives: effective agents for increasing nicotinamide adenine dinucleotide concentrations in mammalian cells. *J Med Chem*. 2007 Dec 27;50(26):6458-61.
24. Lyons CL, Roche HM. Nutritional Modulation of AMPK-Impact upon Metabolic-Inflammation. *Int J Mol Sci*. 2018 Oct 9;19(10).
25. Ruderman NB, Carling D, Prentki M, et al. AMPK, insulin resistance, and the metabolic syndrome. *J Clin Invest*. 2013 Jul;123(7):2764-72.
26. Salminen A, Kaamiranta K. AMP-activated protein kinase (AMPK) controls the aging process via an integrated signaling network. *Ageing Res Rev*. 2012 Apr;11(2):230-41.
27. Towler MC, Hardie DG. AMP-activated protein kinase in metabolic control and insulin signaling. *Circ Res*. 2007 Feb 16;100(3):328-41.
28. Gauhar R, Hwang SL, Jeong SS, et al. Heat-processed Gynostemma pentaphyllum extract improves obesity in ob/ob mice by activating AMP-activated protein kinase. *Biotechnol Lett*. 2012 Sep;34(9):1607-16.
29. Nguyen PH, Gauhar R, Hwang SL, et al. New dammarane-type glucosides as potential activators of AMP-activated protein kinase (AMPK) from Gynostemma pentaphyllum. *Bioorg Med Chem*. 2011 Nov 1;19(21):6254-60.
30. Park SH, Huh TL, Kim SY, et al. Antiobesity effect of Gynostemma pentaphyllum extract (actiponin): a randomized, double-blind, placebo-controlled trial. *Obesity (Silver Spring)*. 2014 Jan;22(1):63-71.
31. Wang J, Ha TKQ, Shi YP, et al. Hypoglycemic triterpenes from Gynostemma pentaphyllum. *Phytochemistry*. 2018 Nov;155:171-81.
32. Dong C, Xie Z, Yu Y, et al. Discovery, synthesis, and structure-activity relationships of 20S-dammar-24-en-2 α ,3 β ,12 β ,20-tetrol (GP) derivatives as a new class of AMPK α 2 β 1 γ 1 activators. *Bioorg Med Chem*. 2016 Jun 15;24(12):2688-96.
33. Lee HS, Lim SM, Jung JI, et al. Gynostemma Pentaphyllum Extract Ameliorates High-Fat Diet-Induced Obesity in C57BL/6N Mice by Upregulating SIRT1. *Nutrients*. 2019 Oct 15;11(10).
34. Ohara T, Muroyama K, Yamamoto Y, et al. Oral intake of a combination of glucosyl hesperidin and caffeine elicits an anti-obesity effect in healthy, moderately obese subjects: a randomized double-blind placebo-controlled trial. *Nutr J*. 2016 Jan 19;15:6.
35. Pu P. [Protection mechanisms of hesperidin on mouse with insulin resistance]. *Zhongguo Zhong Yao Za Zhi*. 2016 Sep;41(17):3290-5.
36. Rizza S, Muniyappa R, Iantorno M, et al. Citrus polyphenol hesperidin stimulates production of nitric oxide in endothelial cells while improving endothelial function and reducing inflammatory markers in patients with metabolic syndrome. *J Clin Endocrinol Metab*. 2011 May;96(5):E782-92.
37. Xiong H, Wang J, Ran Q, et al. Hesperidin: A Therapeutic Agent For Obesity. *Drug Des Devel Ther*. 2019;13:3855-66.
38. Beevers CS, Chen L, Liu L, et al. Curcumin disrupts the mammalian target of rapamycin-raptor complex. *Cancer Res*. 2009 Feb 1;69(3):1000-8.
39. Kuo CJ, Huang CC, Chou SY, et al. Potential therapeutic effect of curcumin, a natural mTOR inhibitor, in tuberous sclerosis complex. *Phytomedicine*. 2019 Feb 15;54:132-9.
40. Liu M, Wilk SA, Wang A, et al. Resveratrol inhibits mTOR signaling by promoting the interaction between mTOR and DEPTOR. *J Biol Chem*. 2010 Nov 19;285(47):36387-94.
41. Zhou H, Luo Y, Huang S. Updates of mTOR inhibitors. *Anticancer Agents Med Chem*. 2010 Sep;10(7):571-81.
42. Huang S. Inhibition of PI3K/Akt/mTOR signaling by natural products. *Anticancer Agents Med Chem*. 2013 Sep;13(7):967-70.
43. Den Hartogh DJ, Gabriel A, Tsiani E. Antidiabetic Properties of Curcumin II: Evidence from In Vivo Studies. *Nutrients*. 2019 Dec 25;12(1).
44. Den Hartogh DJ, Gabriel A, Tsiani E. Antidiabetic Properties of Curcumin I: Evidence from In Vitro Studies. *Nutrients*. 2020 Jan 1;12(1).
45. Lu X, Wu F, Jiang M, et al. Curcumin ameliorates gestational diabetes in mice partly through activating AMPK. *Pharm Biol*. 2019 Dec;57(1):250-4.
46. Repossi G, Das UN, Eynard AR. Molecular Basis of the Beneficial Actions of Resveratrol. *Arch Med Res*. 2020 Feb;51(2):105-14.
47. Song J, Huang Y, Zheng W, et al. Resveratrol reduces intracellular reactive oxygen species levels by inducing autophagy through the AMPK-mTOR pathway. *Front Med*. 2018 Dec;12(6):697-706.
48. Hickson LJ, Langhi Prata LGP, Bobart SA, et al. Senolytics decrease senescent cells in humans: Preliminary report from a clinical trial of Dasatinib plus Quercetin in individuals with diabetic kidney disease. *EBioMedicine*. 2019 Sep;47:446-56.
49. Palmer AK, Xu M, Zhu Y, et al. Targeting senescent cells alleviates obesity-induced metabolic dysfunction. *Ageing Cell*. 2019 Jun;18(3):e12950.
50. Zhang P, Kishimoto Y, Grammatikakis I, et al. Senolytic therapy alleviates A β -associated oligodendrocyte progenitor cell senescence and cognitive deficits in an Alzheimer's disease model. *Nat Neurosci*. 2019 May;22(5):719-28.
51. Zhu Y, Tchkonja T, Pirtskhalava T, et al. The Achilles' heel of senescent cells: from transcriptome to senolytic drugs. *Ageing Cell*. 2015 Aug;14(4):644-58.
52. Justice JN, Nambiar AM, Tchkonja T, et al. Senolytics in idiopathic pulmonary fibrosis: Results from a first-in-human, open-label, pilot study. *EBioMedicine*. 2019 Feb;40:554-63.
53. Kim SR, Jiang K, Ogrodnik M, et al. Increased renal cellular senescence in murine high-fat diet: effect of the senolytic drug quercetin. *Transl Res*. 2019 Nov;213:112-23.
54. Han X, Zhang J, Xue X, et al. Theaflavin ameliorates ionizing radiation-induced hematopoietic injury via the NRF2 pathway. *Free Radic Biol Med*. 2017 Dec;113:59-70.
55. Nuberini R, Koolpe M, Lamberto I, et al. Inhibition of Eph receptor-ephrin ligand interaction by tea polyphenols. *Pharmacol Res*. 2012 Oct;66(4):363-73.
56. Nuberini R, Lamberto I, Pasquale EB. Targeting Eph receptors with peptides and small molecules: progress and challenges. *Semin Cell Dev Biol*. 2012 Feb;23(1):51-7.
57. Lim H, Park H, Kim HP. Effects of flavonoids on senescence-associated senescent phenotype formation from bleomycin-induced senescence in BJ fibroblasts. *Biochem Pharmacol*. 2015 Aug 15;96(4):337-48.
58. Perrott KM, Wiley CD, Desprez PY, et al. Apigenin suppresses the senescence-associated secretory phenotype and paracrine effects on breast cancer cells. *Geroscience*. 2017 Apr;39(2):161-73.
59. Forouzanfar F, Read MI, Barreto GE, et al. Neuroprotective effects of curcumin through autophagy modulation. *IUBMB Life*. 2020 Apr;72(4):652-64.
60. Deng S, Shanmugam MK, Kumar AP, et al. Targeting autophagy using natural compounds for cancer prevention and therapy. *Cancer*. 2019 Apr 15;125(8):1228-46.
61. Kou X, Chen N. Resveratrol as a Natural Autophagy Regulator for Prevention and Treatment of Alzheimer's Disease. *Nutrients*. 2017 Aug 24;9(9).
62. Lin KL, Lin KJ, Wang PW, et al. Resveratrol provides neuroprotective effects through modulation of mitochondrial dynamics and ERK1/2 regulated autophagy. *Free Radic Res*. 2018 Dec;52(11-12):1371-86.
63. Perrone L, Squillaro T, Napolitano F, et al. The Autophagy Signaling Pathway: A Potential Multifunctional Therapeutic Target of Curcumin in Neurological and Neuromuscular Diseases. *Nutrients*. 2019 Aug 13;11(8).

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References

1. *Anti-Aging Med.* 2011;8(2):7-14.
2. *Food Chem.* 2012 Dec 15;135(4):2222-8.
3. *Am J Chin Med.* 2011;39(1):15-27.

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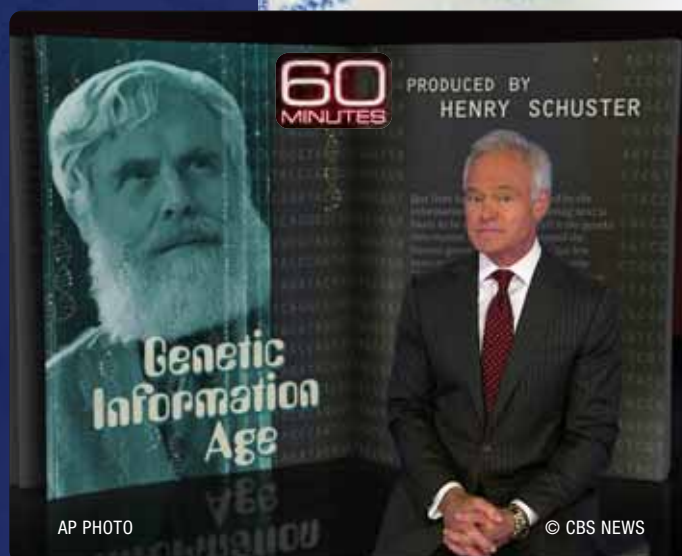
60 MINUTES



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Human Age Reversal *on* CBS NEWS *60 Minutes*

BY BILL FALOON



I first described the work of Harvard geneticist **George Church** in **2015**.

Dr. Church predicted that **human aging** could be eradicated by the year **2030**.

Many of our advisors concurred.

The therapy that aims to **reverse aging** in people involves **gene modification** at the cellular level.

Human Rejuvenation Goes Mainstream

On **December 8, 2019**, CBS News **60 Minutes** reported on Dr. Church's pioneering research that aims to make humans immune from all **viruses** and **reverse** biological **aging**.

This **60 Minutes** broadcast represents a transformational tipping point as it relates to the concept of **human age reversal**. Until recent years, no one thought that old people could grow biologically **younger**.

To view the **60 Minutes** program, visit
www.LifeExtension.com/60minutes

This website enables you to view the **60 Minutes** segment about Dr. Church's **age reversal** research.

It provides a link to subscribe to **CBS All Access** with a free 7-day trial available.

Scott Pelley: “We Need Age Reversal”

The following excerpt from Dr. Church’s *60 Minutes* interview (© CBS NEWS) is an example of how the mainstream is embracing the science of age reversal:

Scott Pelley: One of the things your lab is working on is reversing aging.

Dr. Church: That’s right.

Scott Pelley: How is that possible?

Dr. Church: Reversing aging is one of these things that is easy to dismiss to say either we don’t need it or is impossible or both.

Bill Faloon: Dr. Church expected the typical inane question as to why we want to reverse aging. Look at Scott Pelley’s reply:

Scott Pelley: Oh, we need it.

Bill Faloon: Scott Pelley clearly states, “**we need to reverse it,**” i.e. **aging**. This succinct answer represents a gigantic leap forward in the mainstream’s view on aging research.

Dr. Church: Okay. We need it. That’s good. We can agree on that. Well, aging reversal is something that’s been proven about eight different ways in animals where you can get, you know, faster reaction times or, you know, cognitive or repair of damaged tissues.

Scott Pelley: Proven eight different ways. Why isn’t this available?

Dr. Church: It is available to mice.



WISS INSTITUTE AT HARVARD UNIVERSITY

Scott Pelley (voiceover): In lucky mice, Dr. Church’s lab added multiple genes that improved heart and kidney function and levels of blood sugar. Now he’s trying it in spaniels.

Scott Pelley: So is this gene editing to achieve age reversal?

Dr. Church: This is adding genes. So, it’s not really editing genes. It’s, the gene function is going down, and so we’re boosting it back up by putting in extra copies of the genes.

Scott Pelley: What’s the time horizon on age reversal in humans?

Dr. Church: That’s in clinical trials right now in dogs. And so that veterinary product might be a couple years away and then that takes another 10 years to get through the human clinical trials.

Will You Make it to Year 2030?

The dilemma is that some of us will not be alive in the year **2030**.

This is why current age-delay protocols are so critical, in addition to everything else we do to reduce degenerative disease risks.

Not only may George Church’s gene therapy **reverse aging**, but in the process, it will likely shield all our cells from **viral** infections.

The evidence also points to gene therapy as becoming a virtual universal treatment for all diseases, including **cancer**.

The Allure of Systemic Rejuvenation

Think of how healthy most of us were in youth. Everything seemed to work well until around age 35-50.

Imagine going back to the biological age of 25 and staying there. If you wonder why I have not taken a day off since learning about **George Church**, it’s to identify methods to stay alive until the time when **aging** becomes a relic of the past, just as **smallpox** is today.

On the next page is an exclusive interview conducted by Dr. Shelly Xuelai Fan for **Life Extension®** magazine. In this interview, Dr. Church discusses the promise of gene therapy in reversing the aging process. We’ve condensed the conversation for our readers.

Gene Therapy to Reverse Aging

Harvard's Dr. George Church is pioneering a way to help turn back the aging clock

BY DR. SHELLY XUELAI FAN

Reversing aging was considered impossible until recently.

But renowned scientist **Dr. George Church** says it's within our reach.

He believes **gene therapy** holds the key to eliminating many of our toughest age-related chronic illnesses: diabetes, heart disease, cancer, kidney disease, cognitive decline, and more.

And he envisions a time when a few shots of his gene therapy cocktail will slow, or even **reverse** the aging process.

An "anti-aging vaccine" may sound like science fiction. But if anyone can make it a reality, it's Dr. Church.

A professor of genetics at **Harvard Medical School**, Dr. Church is a master at manipulating genes, the instructions that build life, that are tucked inside every cell.

He helped improve the quality and cost of whole genome sequencing by a million-fold, and he's one of the scientists responsible for developing the breakthrough gene editing tool **CRISPR**.

His company, **Rejuvenate Bio**, doesn't focus on editing genes themselves. It focuses on the **expression** of genes, turning them "on" or "off."

As we age, genes that promote youthful functions shut off. If we can switch these genes on again, the negative consequences of aging can be counteracted as our biological clocks are turned back.

The idea has proven successful in mice with different age-related disorders. Dr. Church is now pursuing the rejuvenation treatment in aging **dogs**.

If all goes well, **human** trials will follow.

LE: Most scientists focusing on "life extension" are either trying to increase **lifespan**, the length of life, or **healthspan**, the years someone is healthy. Which are you focusing on?

Dr. Church: I would add another one, "**aging reversal**." This is a bit different than extending lifespan or healthspan. Anything with "span" in it refers to a long period of



Dr. George Church

time, projecting if you will still be healthy 20 years from now. With aging reversal, you can see in a few weeks if the therapy is working. You can measure biomarkers at a doctor's office. But more importantly, you can see it in the things you care about, such as strength, mobility, and the healing of damaged tissue and organs. **Aging reversal** is what we're focusing on. The therapies are easier to get approved by the FDA, and it's fundamentally what everyone wants.

LE: How can genes slow down aging or reverse age-related damage?

Dr. Church: We're talking about **epigenetics**, changing how genes *work* throughout the body. It's not about changing the code of your genes, just how they're **expressed** [turned on or off]. As you get older, the level of key genes that help maintain life decline in how much they're turned on. You want to boost them back up. So what we're tinkering with using gene therapy isn't "genetic." We're not *changing* the genes, but rather focusing on turning youth-boosting genes back on.

LE: How has your anti-aging gene therapy worked so far?

Dr. Church: We're looking at both specific diseases and overall health. The traditional method is to fix one symptom of one disease. But you can also get at the *core causes* of aging, the **hormones** that are dropping. If you boost these up enough, they'll reinforce each other in a positive, virtuous cycle. If we see enough positive changes with a particular gene therapy, we know we hit one of the core causes.

In our first study, we took three genes that impacted five different age-related diseases and changed their levels in mature mice and found that they *functionally* improved. This is key: Biomarker improvements are great, but you want to see improvements that impact everyday life, like strength, speed, and organ health.

LE: What are the next steps in this research, and who do you think would benefit most from the gene therapy?

Dr. Church: We've already begun clinical trials in aged dogs, which are good models for humans. This will help us determine which ages of humans would best benefit, but we think we'll be able to help people who are already quite old and show signs of decline. We're also looking at extending absolute lifespan, but it's a much longer experiment and reliable results take years.

In the near term, we're also looking to expand the group of age-related diseases that we can treat. With the three genes we've been testing, we've already helped reverse **osteoarthritis**, high-fat **obesity** and **diabetes**, **heart damage**, and **kidney disease**. We're hoping to soon add **cancer** and **neurodegenerative** diseases to the list.

LE: Which diseases do you think we'll see gene therapy impact first?

Dr. Church: If our idea is correct, we should be able to impact all of them at the same time when we target the core causes of aging. When you're rejuvenating cells, you're also boosting all their repair mechanisms. It's possible that certain negative biological changes are rather permanent and hard to restore, but they would be incredibly drastic. The challenge for the near future is using artificial intelligence to design "delivery shuttles" that carry gene therapy where you want it to go. But if we can convince the cells that they're young by giving them a dose of youth-promoting genes, their own repair factory should kick in and restore lots of damage from aging.

Trying to convince every cell in the body is very difficult. Some life-extending, non-gene therapies are trying. We believe that youth-promoting hormones and other biological factors shared from cell to cell hold the key.

Using gene therapy, even if we hit just a few cells, they'll amp up hormone production, diffuse them throughout the body, and immediately amplify the gene therapy's initial effect.

LE: You helped develop **CRISPR**, which *does* alter gene sequences. That's not part of your age-reversal research?

Dr. Church: We did not use CRISPR, even though we helped initiate it as a technology. We need to distinguish between CRISPR and gene therapy, which aren't synonymous. CRISPR is mostly used to eliminate or turn *down* genes and functionality. Classic gene therapy is adding or *boosting* genes. At Rejuvenate Bio, our focus is on the latter.



LE: Many age-related diseases such as Alzheimer's and cancer are due to faulty genes. In those cases, is it possible to use CRISPR to correct those genes and extend life?

Dr. Church: Yes. We need to cast a wide net. There's a gene therapy trial for Alzheimer's that replaces **APOE4**, a gene that greatly increases your chance of Alzheimer's, with the lower-risk version, **APOE2**. But to make the gene therapy work, you'll need to go into many brain cells and swap the gene out with high efficiency, and that's hard but improving rapidly.

In mice, manipulating tumor suppressor genes plus targeting **telomeres**, [the protective end caps of genes that shorten with age] which APOE does, can delay cancer and aging.

Unlike **APOE**, we are aiming for more than a single rare disease, and unlike the telomere strategy, we don't need to target every cell because the genes we're manipulating make "regulatory factors," like hormones, which diffuse out and impact far more than just the cell that gets the gene therapy. This amplifies the effect of the treatment: One dose can hit just a few cells and you could be set for years.

We're focused on boosting pro-youth hormones and enzymes that spread in the body. We think this is most promising, and hence the strategy we're pursuing.

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. Shelly Xuelai Fan is a science journalist based in San Francisco. She completed her PhD and post-doctoral training in neurodegeneration, brain aging, and rejuvenation.

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* *Aging Cell*. 2015 Aug;14(4):644-58.

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References

1. *Curr Opin Virol*. 2011 Dec;1(6):497-512.
2. *Clin Exp Immunol*. 1987 May;68(2):340-7.
3. *Immunology*. 2009 Oct;128(2):151-63.
4. *Cancer Immunol Immunother*. 2013 Mar;62(3):437-45.

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TOCOTRIENOLS

Prevent DNA Damage *and* Combat Aging

BY JULIA CHISEN

Tocotrienols are potent forms of vitamin E that help block **DNA damage** associated with aging.¹⁻⁴

DNA damage is a major degenerative factor.

Human studies demonstrate that **tocotrienols** help maintain youthful brain, bone and arterial structure, along with healthy immune function.

A review concluded that **tocotrienol** supplementation in middle-aged and elderly people can markedly reduce age-associated **DNA damage**.³

The Most Potent Form of Vitamin E

Tocotrienols are emerging as interesting and complex members of the vitamin E family.

Tocotrienols come in four varieties:⁵

- **Alpha-tocotrienol**
- **Beta-tocotrienol**
- **Gamma-tocotrienol**
- **Delta-tocotrienol**

These forms of **vitamin E** are different from “regular” forms of vitamin E that are called **tocopherols**.⁵

Tocotrienols generally have *higher potency* than tocopherols, and they act on a wider range of targets.

For example, **alpha-tocotrienol** prevents neurodegeneration at very small concentrations.⁵

Aging and DNA Damage Prevention

The unique structure and potency of tocotrienols make them valuable for defending aging tissues. A primary **tocotrienol** mechanism is the ability to protect against **DNA damage**, an underlying factor in most aging processes.¹

In a randomized, clinical trial, middle-aged and older adults took either **160 mg** of mixed tocotrienols/tocopherols or a placebo for six months. By three months, there was a significant reduction in **DNA damage**, a benefit that persisted through the six-month mark.¹

The ability to reduce DNA damage shows that tocotrienols can help slow aging at the cellular level.³

Because DNA damage contributes to cellular senescence, supplementing with tocotrienols represents a unique way to delay age-related decline.

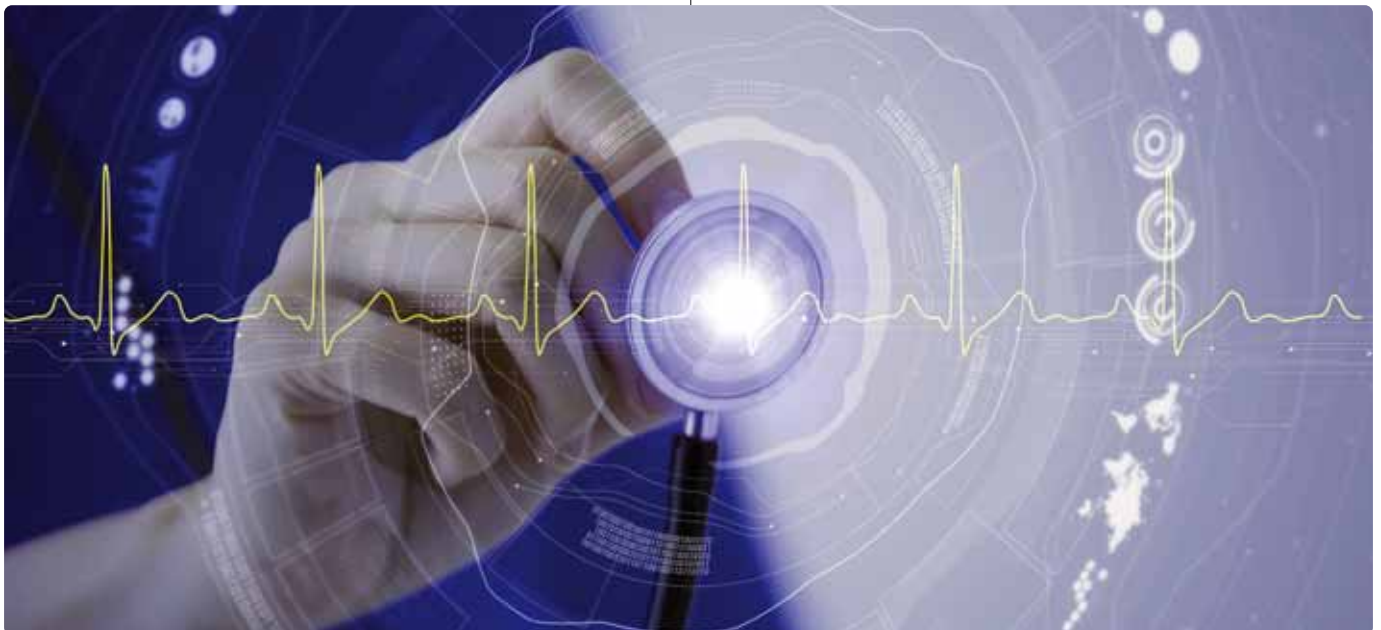
Human studies have shown that tocotrienols can help lower the risk of cardiovascular disease, support bone health, and preserve cognitive function. These benefits make this unique form of vitamin E an interesting player in the fight against premature aging and disease.^{3,5-10}

Cardiovascular Disease Risk Reduction

DNA damage contributes to the aging of blood vessels—a major risk factor for **heart attacks** and **strokes**.¹¹⁻¹³

High levels of cholesterol and triglycerides contribute to **plaque** buildup on artery walls that causes arteries to become hard and stiff. This restricts blood flow and increases the risk of cardiovascular complications.

Tocotrienols act in numerous ways to lower the risk of cardiovascular disease. This was shown in a study of people on chronic hemodialysis for **kidney failure**.





Kidney failure patients have an extremely high risk of cardiovascular disease.

The patients took either a daily dose of **180 mg** of tocotrienols plus **40 mg** of tocopherols (traditional vitamin E) or a placebo for 16 weeks. In the supplemented group, by week 12, triglyceride levels had declined by a significant **33 mg/dL** and then dropped by **36 mg/dL** at 16 weeks. No change was found in the placebo group.¹⁴

Tocotrienols have also been shown to decrease arterial stiffness. When patients took **100 mg/day** and **200 mg/day** of tocotrienols, they experienced significant reductions in two measures of arterial stiffness after just two months, substantially reducing cardiovascular risk.¹⁵

Boosting the Aging Immune System

DNA damage directly contributes to **immune senescence**, or a dysfunctional immune system.^{16,17}

Immune senescence increases an older person's risk of infections, while also increasing the likelihood of an inappropriate immune response that can lead to excessive inflammation and autoimmune disorders.¹⁸

Another consequence of immune senescence is poor response to vaccines. This puts lives at risk because we rely on vaccines to prevent viral infections.



WHAT YOU NEED TO KNOW

Tocotrienols Protect Against DNA Damage

- Tocotrienols have a broad range of cell- and tissue-protecting activities.
- Tocotrienols are instrumental in preventing the DNA damage that accumulates over time and is one of the central causes of aging and disease.
- Studies show that tocotrienol supplementation slows DNA-damage-related aging and protects against heart disease, immune senescence, neurodegeneration, and osteoporosis.

A randomized, placebo-controlled trial showed that taking **400 mg** of mixed tocotrienols/tocopherols daily significantly enhanced the **immune** response to a test dose of a vaccine. This was seen through increased production of protective interferon gamma, increased production of antibodies following the vaccine, and a reduction in immune-dampening IL-6.¹⁹

These results suggest that tocotrienol/tocopherol supplementation can reverse major components of immune senescence, lowering the risk for preventable infections and malignancies.



Neuroprotection

DNA damage is one of the earliest detectable events in neurodegenerative diseases like Alzheimer's, Parkinson's, and ALS (amyotrophic lateral sclerosis) also known as Lou Gehrig's disease. The **white matter lesions** associated with dementia are also DNA damage related.^{20,21}

In one study, adults with white matter lesions were randomly assigned to take either **200 mg** of mixed tocotrienols or a placebo twice daily for two years. While the lesions grew significantly in placebo recipients during that time, they remained stable in supplemented people. This demonstrates the ability of tocotrienols to help slow the progression of the disease.²²

Animal studies have also shown that tocotrienol supplementation led to improved learning and memory as a result of reduced DNA damage.²

Better Bone Health

DNA damage in bone tissue promotes bone mineral loss, or **osteoporosis**, by elevating inflammatory markers and reducing the numbers of bone-forming cells.^{23,24}

Animal studies have shown that tocotrienols protect bone tissue. These benefits were confirmed by a recent study of postmenopausal women (a group at high risk for osteoporosis).

This clinical trial showed that 12 weeks of supplementation with **430 mg/day** or **860 mg/day** of mixed

tocotrienols decreased the excessive bone breakdown seen in osteoporosis and improved healthy bone turnover, compared with a placebo group.²⁵ Among the mechanisms were reductions in inflammation which, in turn, suppressed the aggressive bone resorption that typifies osteoporosis.

Anti-Aging Impact

Tocotrienols are complex nutrients with numerous interactions in cells and tissues.

This broad spectrum of actions means that tocotrienols can inhibit an array of unhealthy, destructive processes, reducing their negative impacts while potentially creating positive changes as well.

The following are six features of tocotrienols that contribute to their anti-aging properties:

- **Tocotrienols reduce oxidative stress.**

Tocotrienols are potent antioxidants that protect against chemical- and radiation-induced DNA damage.^{1,2,26-28}

- **Tocotrienols reduce the activity of HMG-CoA Reductase.**

This enzyme participates in chemical reactions that play a role in cholesterol production inside the body, in cancer, and in osteoporosis.^{8,28-30}

- **Tocotrienols enhance immune function.**

They elevate production of signaling molecules that recruit immune cells and instruct them in their duties, as well as interferon-gamma, a signaling molecule that enhances anti-tumor surveillance.³¹

- **Tocotrienols reduce inflammation.**

They act by suppressing major pro-inflammatory signaling pathways, including NF-kappaB, called the “master inflammation regulator.”⁸

- **Tocotrienols reduce unwanted new blood vessel formation.** This is an important way to fight cancer (which needs new vessels for nutrition) and cardiovascular disease (in which tiny, new blood vessels that grow inside of atherosclerotic plaques contribute to the growth of those plaques).³² Tocotrienols fight the kind of new blood vessel formation that may contribute to cancer and heart disease.^{10,33}

- **Tocotrienols boost mitochondrial energy production.** This property has value in energizing heart and brain tissues during aging.³⁴

Summary

DNA damage is a common underlying factor in numerous age-related disorders.

Studies show that **tocotrienols** can fight DNA damage and slow the aging process in tissues throughout the body.

In human studies, tocotrienols have now demonstrated benefits in regard to DNA-damage-related aging, heart disease, immune regulation, neuroprotection, and bone health.

Formulations of mixed tocotrienols are available as supplements for those seeking this age-decelerating nutrient. •

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



References

- Chin SF, Hamid NA, Latiff AA, et al. Reduction of DNA damage in older healthy adults by Tri E Tocotrienol supplementation. *Nutrition*. 2008;24(1):1-10.
- Taridi NM, Abd Rani N, Abd Latiff A, et al. Tocotrienol rich fraction reverses age-related deficits in spatial learning and memory in aged rats. *Lipids*. 2014;49(9):855-69.
- Georgousopoulou EN, Panagiotakos DB, Mellor DD, et al. Tocotrienols, health and ageing: A systematic review. *Maturitas*. 2017;95:55-60.
- Pathak R, Bachri A, Ghosh SP, et al. The Vitamin E Analog Gamma-Tocotrienol (GT3) Suppresses Radiation-Induced Cytogenetic Damage. *Pharm Res*. 2016;33(9):2117-25.
- Sen CK, Khanna S, Rink C, et al. Tocotrienols: the emerging face of natural vitamin E. *Vitam Horm*. 2007;76:203-61.
- Ahsan H, Ahad A, Iqbal J, et al. Pharmacological potential of tocotrienols: a review. *Nutr Metab (Lond)*. 2014;11(1):52.
- Catalgol B, Batirel S, Ozer NK. Cellular protection and therapeutic potential of tocotrienols. *Curr Pharm Des*. 2011;17(21):2215-20.
- Frank J, Chin XW, Schrader C, et al. Do tocotrienols have potential as neuroprotective dietary factors? *Ageing Res Rev*. 2012;11(1):163-80.
- Rondanelli M, Faliva MA, Peroni G, et al. Focus on Pivotal Role of Dietary Intake (Diet and Supplement) and Blood Levels of Tocopherols and Tocotrienols in Obtaining Successful Aging. *Int J Mol Sci*. 2015;16(10):23227-49.
- Wada S. Chemoprevention of tocotrienols: the mechanism of antiproliferative effects. *Forum Nutr*. 2009;61:204-16.
- Li P, Hu X, Gan Y, et al. Mechanistic insight into DNA damage and repair in ischemic stroke: exploiting the base excision repair pathway as a model of neuroprotection. *Antioxid Redox Signal*. 2011;14(10):1905-18.
- Bautista-Nino PK, Portilla-Fernandez E, Vaughan DE, et al. DNA Damage: A Main Determinant of Vascular Aging. *Int J Mol Sci*. 2016;17(5).
- Pourrajab F, Vakili Zarch A, Hekmatimoghaddam S, et al. The master switchers in the aging of cardiovascular system, reverse senescence by microRNA signatures; as highly conserved molecules. *Prog Biophys Mol Biol*. 2015;119(2):111-28.
- Daud ZA, Tubie B, Sheyman M, et al. Vitamin E tocotrienol supplementation improves lipid profiles in chronic hemodialysis patients. *Vasc Health Risk Manag*. 2013;9:747-61.
- Rasool AH, Rahman AR, Yuen KH, et al. Arterial compliance and vitamin E blood levels with a self emulsifying preparation of tocotrienol rich vitamin E. *Arch Pharm Res*. 2008;31(9):1212-7.
- Picerno I, Chirico C, Condello S, et al. Homocysteine induces DNA damage and alterations in proliferative capacity of T-lymphocytes: a model for immunosenescence? *Biogerontology*. 2007;8(2):111-9.
- Ross OA, Hyland P, Curran MD, et al. Mitochondrial DNA damage in lymphocytes: a role in immunosenescence? *Exp Gerontol*. 2002;37(2-3):329-40.
- Stahl EC, Brown BN. Cell Therapy Strategies to Combat Immunosenescence. *Organogenesis*. 2015;11(4):159-72.
- Mahalingam D, Radhakrishnan AK, Amom Z, et al. Effects of supplementation with tocotrienol-rich fraction on immune response to tetanus toxoid immunization in normal healthy volunteers. *Eur J Clin Nutr*. 2011;65(1):63-9.
- Al-Mashhadi S, Simpson JE, Heath PR, et al. Oxidative Glial Cell Damage Associated with White Matter Lesions in the Aging Human Brain. *Brain Pathol*. 2015;25(5):565-74.
- Coppede F, Migliore L. DNA damage in neurodegenerative diseases. *Mutat Res*. 2015;776:84-97.
- Gopalan Y, Shuaib IL, Magosso E, et al. Clinical investigation of the protective effects of palm vitamin E tocotrienols on brain white matter. *Stroke*. 2014;45(5):1422-8.
- Chen Q, Liu K, Robinson AR, et al. DNA damage drives accelerated bone aging via an NF-kappaB-dependent mechanism. *J Bone Miner Res*. 2013;28(5):1214-28.
- Kim HN, Chang J, Shao L, et al. DNA damage and senescence in osteoprogenitors expressing Osx1 may cause their decrease with age. *Ageing Cell*. 2017;16(4):693-703.
- Shen CL, Yang S, Tomison MD, et al. Tocotrienol supplementation suppressed bone resorption and oxidative stress in postmenopausal osteopenic women: a 12-week randomized double-blinded placebo-controlled trial. *Osteoporos Int*. 2018;29(4):881-91.
- Osakada F, Hashino A, Kume T, et al. Alpha-tocotrienol provides the most potent neuroprotection among vitamin E analogs on cultured striatal neurons. *Neuropharmacology*. 2004;47(6):904-15.
- Shrader WD, Amagata A, Barnes A, et al. alpha-Tocotrienol quinone modulates oxidative stress response and the biochemistry of aging. *Bioorg Med Chem Lett*. 2011;21(12):3693-8.
- Schaffer S, Muller WE, Eckert GP. Tocotrienols: constitutional effects in aging and disease. *J Nutr*. 2005;135(2):151-4.
- Deng L, Ding Y, Peng Y, et al. gamma-Tocotrienol protects against ovariectomy-induced bone loss via mevalonate pathway as HMG-CoA reductase inhibitor. *Bone*. 2014;67:200-7.
- Yeganehjoo H, DeBose-Boyd R, McFarlin BK, et al. Synergistic Impact of d-delta-Tocotrienol and Geranylgeraniol on the Growth and HMG CoA Reductase of Human DU145 Prostate Carcinoma Cells. *Nutr Cancer*. 2017;69(4):682-91.
- Ren Z, Pae M, Dao MC, et al. Dietary supplementation with tocotrienols enhances immune function in C57BL/6 mice. *J Nutr*. 2010;140(7):1335-41.
- Zhu L, Fang L. AIBP: A Novel Molecule at the Interface of Cholesterol Transport, Angiogenesis, and Atherosclerosis. *Methodist DeBakey Cardiovasc J*. 2015;11(3):160-5.
- Eitsuka T, Tatewaki N, Nishida H, et al. Synergistic Anticancer Effect of Tocotrienol Combined with Chemotherapeutic Agents or Dietary Components: A Review. *Int J Mol Sci*. 2016;17(10).
- Schloesser A, Esatbeyoglu T, Piegholdt S, et al. Dietary Tocotrienol/gamma-Cyclodextrin Complex Increases Mitochondrial Membrane Potential and ATP Concentrations in the Brains of Aged Mice. *Oxid Med Cell Longev*. 2015;2015:789710.



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Dr. Terry Burns

Neurosurgeon Discusses the Future of Neuroregeneration

BY LAURIE MATHENA

To date, most regenerative therapies have been studied in mice, but Burns believes true success will only come from studying the human brain itself.

Dr. Terry Burns could have chosen to pursue any number of professional fields.

With a music scholarship to college, as an undergraduate he traveled with the New England Symphonic Ensemble from Europe to Jamaica and played his French horn in prestigious venues like Carnegie Hall in New York City.

His passion for travel and photography has taken him all over the world, capturing magazine-quality photographs in places like Africa and Australia.

But ultimately, it was his fascination with the brain that led him to pursue a career as a neurosurgeon and scientist.

Burns, an MD, PhD splits his time between the operating room, where he removes brain tumors, and the laboratory, where he has one primary goal in mind:

To fix the brain.

A Personal Calling

Like so many people who are passionate about their calling, Burns' interest in the brain is personal. His grandmother died from Alzheimer's disease. She was just one of many people in his family who suffered from neurological issues.

Burns is in a unique position to have an impact on the lives of not only his individual patients, but also of anyone suffering from a neurodegenerative disease like Alzheimer's or Parkinson's.

That's because Burns is one of the leading figures in the field of neuroregeneration.



“When I was trying to figure out which residency path to pursue after medical school, one of my advisors advised against becoming a neurosurgeon, due to the notorious demands of a neurosurgeon’s schedule. ‘What kind of research do you think you’re going to be able to do as a neurosurgeon without any time?’ she asked.”

“The answer,” said Burns, “is the research that really matters. Research on the *human brain*.”

And that’s exactly what he’s doing.

In addition to his work as a brain surgeon, Burns is working on developing regenerative strategies to optimize neurological function in patients with brain tumors as well as those with neurodegenerative diseases.

To date, most regenerative therapies have been studied in mice, but Burns believes true success will only come from studying the human brain itself.

“Why do we have all of these cures for mice, but we don’t have anything that works for patients?” asked Burns. “Our brains are different than those of mice. If I’m going to fix the

brain, I need access to the brain. We need to be putting the drugs in the brain and see what happens. I came up with this strategy of in vivo drug testing, which is the long-term focus of my lab. We need to put the drugs in the human brain and figure out what the biomarkers are that predict whether or not the drug is working or not working and understand why.”

Scheduled Brain Trauma

As a tumor neurosurgeon, Burns sees firsthand the damaging effects of radiating the brain to treat brain tumors. Radiation is necessary and extends life, but it comes at a price: It causes significant problems with memory, concentration, attention, and more.

“The effects of radiation are very much like accelerated aging. The DNA is damaged by the radiation,” said Burns. “I’ve started calling radiation an iatrogenic (caused by therapy) neurodegenerative state.”

This presents a unique opportunity for Burns to test *neuroregenerative* therapies.

Currently, in mouse studies, the most effective treatments for neurodegenerative diseases are given prior to the trauma.

“We don’t have that opportunity with conditions like stroke or traumatic brain injury,” said Burns. “But radiation is essentially scheduled brain trauma. It gives us unique access to these patients to study the human brain of individual patients before, during, and after the injury. Not only will this help improve outcomes of patients with brain tumors, but we believe these insights can help us figure out how to treat patients with other neurological diseases.”

The Future of Regenerative Medicine

One main area of focus for Burns and his research team is in a relatively new field called **senolytics**, which are compounds that remove harmful senescent cells.

Senescent cells have become damaged, but instead of dying off, they stick around and become toxic to the cells around them.

“After patients have had brain radiation, their brain has a lot of these senescent cells, which we believe is a primary issue underlying the side effect of cognitive dysfunction,” said Burns. “These negative effects appear to be improved with senolytic drugs.”

But senescent cells are present in both the radiated brain and in neurodegenerative conditions like stroke and Alzheimer’s. So, studying the use of senolytics in the context of radiation, or “scheduled brain trauma,” may have broader applications for a variety of neurological diseases.

Burns is currently working with a multidisciplinary team to determine if selectively removing senescent cells will combat damage to the central nervous system in conditions like aging, Alzheimer’s, and exposure to brain radiation.

Recent results suggest that certain key mechanisms involved in cognitive performance—like the creation of new brain cells—are enhanced by the effects of senolytic drugs.

An Exciting Work in Progress

One particularly promising senolytic treatment Burns mentioned is the combination of **dasatinib** and **quercetin**. Dasatinib is an anti-can-



cer drug, and quercetin is simply a flavonoid found in natural substances like apples and onions.

Animal studies have shown that this combination selectively removes senescent cells, and as a result, both lifespan and healthspan are improved.

Additionally, Burns explained that a polyphenol called **fisetin**, which is simply a compound found in foods like strawberries, seems to offer specific protection for the brain. There have been positive results in preclinical trials, and now the first clinical trials are about to get started testing fisetin for the treatment of Alzheimer's or mild cognitive impairment.

But the promise of senolytics extends far beyond preventing radiation damage—or even improving other neurological diseases.

Indeed, preclinical studies have shown that removing senescent cells with senolytics successfully treated conditions including frailty, cardiac dysfunction, vascular calcification, diabetes, osteoporosis, pulmonary fibrosis, radiation-induced damage, and more.

"It's an exciting work in progress," said Burns.

Paradigm Shift

In general, Burns believes the best success for treating neurological diseases will come from utilizing a combination of technologies.

"These diseases are complicated. The likelihood that any one drug by itself is ever going to work is very low," he said. "We need a dose of humility, and we need to work together."

Burns explained that the problem with drugs is that pharmaceutical companies tend to want a drug that

only works on one pathway.

"Instead, we need drugs that do multiple things," Burns said. "Those are probably more likely to result from nutraceuticals, Chinese herbs, and other remedies that haven't yet been rigorously studied. The problem is that since nutraceuticals can't be patented, they're not being studied. It's a process that's slowing us down."

Burns believes that increasingly available technologies will allow doctors to learn mechanistically, in real time, how the individual patient's brain responds to whatever therapy is tried. This would allow them to continue to fine tune, layering on the components of the therapeutic cocktail as needed to restore function and optimize resiliency against disease.

Fortunately, Burns says that the process with pharmaceutical companies is starting to become more interactive and collaborative.

"Until now it's been all about the drug—recruit patients to test the drug and decide if the drug is a success or a failure. We need to turn that upside down. I don't care about the drug—this is all about the patient. We must use whatever combination of technologies and therapies is needed to achieve the best outcome for that patient," said Burns.

Making Alzheimer's a Distant Memory

In the end, the goal is to find a treatment that won't just help patients live longer, but to live better.

And while there are many roadblocks in this complicated field, Burns is optimistic about the future.

"We have challenges to overcome,



but I think we are really seeing the needed tools and understanding come into focus," he said. "All of this is totally doable. Within our lifetime, I'm optimistic we'll be able to make diseases like Alzheimer's a distant memory." •

Terence (Terry) Burns, MD, PhD, is a neuroscientist. In addition to his work as a brain surgeon, he is developing regenerative strategies to optimize neurological function and quality of life for patients with brain tumors, neurological injuries, and neurodegenerative diseases.

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References

1. *Appl Physiol Nutr Metab*. 2018 Apr;43(4):412-4.
2. *J Clin Psychiatry*. 2015 Mar;76(3):319-26.
3. *Eur J Nutr*. 2011 Aug;50(5):387-9.
4. *J Alzheimers Dis*. 2015;48(2):403-10.
5. *JAMA Psychiatry*. 2017 Oct 1;74(10):1005-10.



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Vibrant Recipes with Endless Possibilities



INDIAN-SPICED CHICKEN ZOODLE BOWL

Bowls are all-in-one dishes that are becoming popular in restaurants across the country.

Now, the cookbook *Bowls: Vibrant Recipes with Endless Possibilities*, from America's Test Kitchen, gives you a step-by-step guide to building restaurant-quality bowls in your very own kitchen.

At its most basic, a bowl combines a protein, vegetables, and a flavorful sauce over a base like greens, quinoa, or rice. But what sets most bowls apart is a crunchy element—like raw radish slices or bean sprouts.

Bowls are great for lunch or dinner, are easy to make ahead, and only require a few ingredients. Best of all, they can provide a complete, healthy, flavor-packed dish by simply using items in your pantry or leftovers.

In addition to providing 75 complete recipes, *Bowls* takes you through the basics of building your own bowl, including mix-and-match bases, toppings, and sauces.

Bowls are hearty, customizable, and (as the name of the book indicates) provide endless possibilities. Here are four to get you started.

—LAURIE MATHENA

Quinoa Taco Salad Bowl

Serves 2

- 1 cup cooked quinoa
- ½ cup chopped fresh cilantro, divided
- 2 teaspoons lime juice
- 2 teaspoons extra-virgin olive oil
- 1 teaspoon minced canned chipotle chile in adobo sauce
- ½ small head escarole (6-ounces), trimmed and cut into 1-inch pieces
- 2 scallions, sliced thin
- ½ cup Chipotle-Yogurt Sauce*, divided
- ½ cup canned black beans, rinsed
- 4 ounces cherry tomatoes, quartered
- ½ ripe avocado, sliced thin

Combine quinoa, ¼ cup cilantro, lime juice, oil, and chipotle in bowl and toss to coat; season with salt and pepper to taste.

Toss escarole, scallions, and remaining ¼ cup cilantro with half of sauce to coat then season with salt and pepper to taste.

Divide among individual serving bowls then top with quinoa mixture, beans, tomatoes, and avocado. Drizzle with remaining dressing. Serve.

CUSTOMIZE IT

Kick it up a notch: Crumbled queso fresco would add creamy texture here, or add feta cheese for briny, tangy flavor.

Instead of quinoa: You could use any hearty grain, such as farro, barley, or bulgur.

Instead of escarole: You could use any hearty salad green in this recipe.

Add crunch: Top with store-bought tortilla chips.

* See *Chipotle-Yogurt Sauce* recipe on page 79.



Mediterranean Chopped Salad Bowl

Serves 2

½ cucumber, halved lengthwise, seeded, and cut into ½-inch pieces

2 ounces grape tomatoes, quartered

½ teaspoon table salt, divided

2 tablespoons extra-virgin olive oil

4 teaspoons lemon juice

¼ teaspoon pepper

½ small head escarole (6-ounces), trimmed and cut into 1-inch pieces

¼ cup pitted kalamata olives, chopped

2 tablespoons chopped fresh parsley

1 cup canned chickpeas, rinsed

1 ounce feta cheese, crumbled (¼ cup)

Toss cucumber and tomatoes with ¼ teaspoon salt and let drain in colander for 15 minutes.

Whisk oil, lemon juice, remaining ¼ teaspoon salt, and pepper together in bowl. Toss escarole, olives, and parsley with half of vinaigrette to coat, then season with salt and pepper to taste. Divide among individual serving bowls then top with drained cucumber-tomato mixture, chickpeas, and feta. Drizzle with remaining vinaigrette. Serve.



CUSTOMIZE IT

Add crunch: Chopped, toasted walnuts provide pleasant texture.

Instead of escarole: Use romaine.

Instead of feta: Goat cheese would add creamy tang to this salad.

Make it vegan: You can omit the feta and the bowl will still taste great.

Shakshuka Bowl

Serves 2

2 tablespoons extra-virgin olive oil

2 garlic cloves, sliced thin

1½ teaspoons tomato paste

1 teaspoon ground coriander

1 teaspoon hot smoked paprika

½ teaspoon ground cumin

¼ teaspoon red pepper flakes

2 cups canned crushed tomatoes

1 (15-ounce) can cannellini beans, rinsed

1 cup roasted bell peppers, chopped. (To simplify, use jarred roasted red peppers.)

2 large eggs

1 ounce feta cheese, crumbled (¼ cup)

2 tablespoons chopped fresh mint

Heat oil in 12-inch skillet over medium heat until shimmering. Add garlic, tomato paste, coriander, paprika, cumin, and pepper flakes and cook, stirring constantly, until rust-colored and fragrant, about 1 minute. Stir in tomatoes, beans, and roasted red peppers and bring to simmer. Cook, stirring occasionally, until warmed through, about 2 minutes.

Off heat, using back of spoon, make 2 shallow indentations in sauce. Crack 1 egg into each indentation then spoon sauce over edges of egg whites so that whites are partially covered and yolks are exposed.



Bring to simmer over medium heat, cover, and cook until yolks film over and whites are softly but uniformly set, 4 to 6 minutes. Divide among individual serving bowls, then sprinkle with feta and mint. Serve.

CUSTOMIZE IT

For crunch: Serve with crusty bread or croutons.

Add more herbs: Cilantro, chives, and parsley would make great additions to the mint.

Indian-Spiced Chicken Zoodle Bowl

Serves 2

- ½ mango, peeled and cut into ¼-inch pieces
- 1 tablespoon chopped fresh cilantro
- 1 teaspoon lemon juice
- 2 garlic cloves, minced
- 1 teaspoon grated fresh ginger
- 4 teaspoons vegetable oil, divided
- 2 teaspoons garam masala, divided
- ¼ teaspoon table salt, divided
- ¼ teaspoon pepper, divided
- 8 ounces boneless, skinless chicken breasts, trimmed and cut into ½-inch pieces
- 12 ounces zucchini noodles, cut into 6-inch lengths, divided
- ½ cup Herb-Yogurt Sauce*

Combine mango, cilantro, and lemon juice in bowl; season with salt and pepper to taste and set aside until ready to serve. Whisk garlic, ginger, 1 teaspoon oil, 1 teaspoon garam masala, ⅛ teaspoon salt, and ⅛ teaspoon pepper together in medium bowl, then add chicken and toss to coat.

Heat 1 teaspoon oil in 12-inch non-stick skillet over medium-high heat until shimmering.

Add chicken and cook until browned on all sides, 4 to 6 minutes. Transfer to clean bowl, cover with aluminum foil to keep warm, and set aside until ready to serve.

Heat 1 teaspoon oil in now-empty skillet over medium-high heat until shimmering. Add ½ teaspoon garam masala, pinch salt, pinch pepper, and half of zucchini noodles and cook, tossing frequently, until crisp-tender, about 1 minute. Transfer to individual serving bowl and repeat with remaining 1 teaspoon oil, remaining ½ teaspoon garam masala, remaining pinch salt, remaining pinch pepper, and remaining zucchini noodles. Top zucchini noodles with chicken, mango mixture, and sauce. Serve.

Yogurt Sauce

Makes 1 cup

1 cup plain whole-milk yogurt
(Do not substitute low-fat or nonfat yogurt here.)

1 teaspoon grated lemon zest
plus 2 tablespoons juice

1 garlic clove, minced

Whisk all ingredients together in a bowl. Cover and refrigerate until flavors meld, at least 30 minutes. Season with salt and pepper to taste. (Sauce can be refrigerated for up to 4 days.)

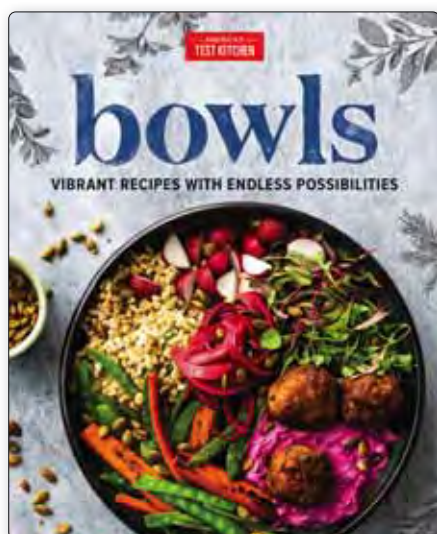
VARIATIONS

Chipotle-Yogurt Sauce

Substitute lime zest and juice for lemon zest and juice. Add 1 tablespoon minced canned chipotle in adobo sauce.

*Herb-Yogurt Sauce

Add 2 tablespoons minced fresh cilantro and 2 tablespoons minced fresh mint.



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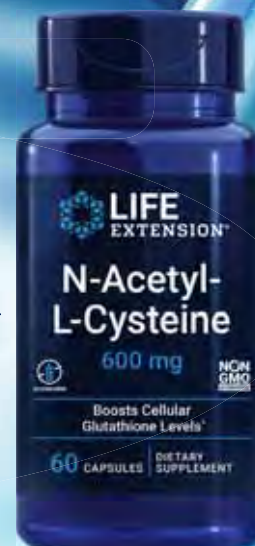
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Digestive Wellness

Strengthen the Immune System & Prevent Disease Through Healthy Digestion

BY DR. ELIZABETH LIPSKI



Hippocrates famously said that *all disease begins in the gut*.

Now, modern research is proving that everything in the body is connected, and that the center of that connection is the gut.

A healthy digestive system does more than prevent gas, bloating, and other intestinal upsets. It helps you sleep better, think more clearly, boost your energy levels, and fight disease.

In *Digestive Wellness, 5th Edition*, Elizabeth Lipski, PhD, CNS, FACN, IFMCP, professor of clinical nutrition, and author of numerous books on digestion, provides the latest scientific research on the connection between faulty digestion and conditions ranging from migraines and skin issues to arthritis and fibromyalgia.

In addition to covering topics like the gut-brain connection, leaky gut syndrome, prebiotics and probiotics, and cancer prevention, *Digestive Wellness* provides natural remedies for common gastrointestinal disorders like acid reflux, celiac disease, and irritable bowel syndrome.

In this interview with **Life Extension®**, Dr. Lipski explains how optimizing digestive wellness can help prevent disease and enhance your overall quality of life.

—LAURIE MATHENA

LE: Can you explain the basic concept of your book, *Digestive Wellness*?

Dr. Lipski: Doctors are trained to identify diseases by where they are located. If you have asthma, it's considered a lung problem; if you have rheumatoid arthritis, it must be a joint problem; if you are overweight, you must have a metabolism problem.

Doctors who understand health this way are both right and wrong. Sometimes the causes of your symptoms do have some relationship to their location, but that's far from the whole story.

As we come to understand disease in the 21st century, our old ways of defining illness based on symptoms and location in the body are not very useful.

Instead, by understanding the origins of disease, and the way in which the body operates as a whole, integrated ecosystem, we now know that symptoms appearing in one area of the body may be caused by imbalances in an entirely different system.

Everything is connected. The center of that connection is the gut.

If your skin is bad or you have allergies, can't seem to lose weight, suffer from an autoimmune disease, struggle with fibromyalgia, or have recurring headaches, the real reason may be that your *gut is unhealthy*.

This may be true even if you have never had any digestive complaints.

LE: How do you go about treating gut-related issues?

Dr. Lipski: In conventional medicine, a clinician makes a diagnosis and there are standard therapies for each diagnosis. In functional medicine, there is no cookie-cutter approach. Finding the underlying mechanisms of disease rather than focusing on symptom relief is the goal.

Two people with the same diagnosis may need completely different therapies. At the same time, two people with completely dissimilar diagnoses may benefit from the same therapy.

For example, irritable bowel syndrome (IBS), migraine headaches, attention deficit disorder, and fibromyalgia may seem like different diagnoses, but they may all have the underlying cause of leaky gut syndrome or food intolerances.

LE: How do you begin looking for underlying mechanisms?

Dr. Lipski: It's called the DIGIN approach. No matter what the diagnosis, by looking at your symptoms and diagnoses through the DIGIN model, you'll find ways to move toward health.

DIGIN is an acronym for the five primary categories of digestive imbalances: **D**igestion/absorption, **I**ntestinal permeability, **G**astrointestinal (GI) microbiota, **I**mmune function and inflammation, and enteric **N**ervous system.

By assessing each of these areas, you can discover how to best get your body back into balance.

LE: Let's talk a little more about just one of these areas. To what conditions has intestinal permeability been connected?

Dr. Lipski: Leaky gut syndrome is really a nickname for increased intestinal permeability, which underlies an enormous variety of illnesses and symptoms.

The list of health conditions associated with increased intestinal permeability grows each year as we increase our knowledge of the synergy between digestion and the immune system. Currently there are more than 13,800 research articles on intestinal permeability.

Depending on our own susceptibilities, we may develop a wide variety of signs, symptoms, and health problems.





Leaky gut syndrome is associated with the following medical problems: allergies, celiac disease, Crohn's disease, HIV, and malabsorption syndrome.

Leaky gut is a triggering factor in every autoimmune condition. These include multiple sclerosis, lupus, rheumatoid arthritis, and psoriasis.

It's also found in people with AIDS, liver diseases including hepatitis and cirrhosis, lung conditions including asthma and bronchitis, and other conditions.

LE: How can something like a leaky gut have an impact on so many areas of the body?

Dr. Lipski: When there is increased intestinal permeability, substances larger than particle size—bacteria, fungi, potentially toxic molecules, and undigested food particles—are allowed to pass directly through the weakened cell membranes into the bloodstream, activating antibodies and alarm substances called cytokines.

The cytokines alert our lymphocytes (white blood cells) to battle the particles. Oxidants are produced in the battle, causing irritation and inflammation far from the digestive system.

LE: What are some steps you can take to restore gut integrity?

Dr. Lipski: If you believe you suffer from leaky gut, it's best to work with a health professional who can help you determine the underlying factors. Fortunately, you can find many ways to heal your gut.

Some involve changing your habits, like chewing your food more completely; others involve taking specific supplements that will help your body repair itself.

Bone broths are a way to use food to heal the gut lining.

LE: What specific supplements could be beneficial?

Dr. Lipski: Glutamine is the first nutrient I think of to repair a leaky gut. Glutamine is alkalizing to the body. It decreases the incidence of infection and stimulates the production of sIgA. Glutamine has also been shown to decrease the risk of bacterial translocation.

Dosages can range from **1 gram** to **30 grams** daily, depending on your needs. Begin with **1 gram** to **3 grams** daily.

I also think about quercetin, which heals the gut lining, works as an antihistamine, and also regulates the immune system.

Be sure to get a high-quality quercetin product. Take between **500 mg** and **3,000 mg** daily.

Zinc may [also] be an essential nutrient for gut repair. The type that shows the most promise for digestive healing is zinc carnosine.

A typical dose is **75 mg** of zinc carnosine twice daily.

LE: What role does the microbiome play in overall health?

Dr. Lipski: In the last decade, research on the human microbiome has mushroomed. There are several emerging concepts and theories about the microbiome:

1. The emerging research suggests that the microbes that we evolved with play an enormous role in determining our overall health.
2. Having a wide diversity of microbes gives us great healthy resilience.
3. Modern people are missing chunks of microbes that used to give us greater diversity. Current research suggests that diversity is the key to optimal health.

The microbiome functions much like an organ, and it acts as a major part of the immune system. It protects us from microbial and parasitic diseases, influences the effects of drugs, affects whether we are fat or thin or happy or sad, determines our nutritional status and overall health, and contributes to our rate of aging.

LE: How can prebiotics help improve the health of your microbiome?

Dr. Lipski: Prebiotics are the food for the gut microbes. They nourish and stimulate growth of *Lactobacilli* and *Bifidobacteria* in the microbiome, while reducing disease-causing bacteria such as *Colstridium difficile*, *Klebsiella*, and *Enterobacter*.

They help build bone, keep blood sugar and insulin levels regulated, lower ammonia levels in people with liver disease, normalize serum triglyceride levels, prevent constipation and diarrhea, and protect against colon cancer.

LE: Can you explain how faulty digestion contributes to something like arthritis?

Dr. Lipski: The dietary connection between rheumatoid arthritis and food sensitivities was first noted by Michael Zeller in 1949 in *Annals of Allergy*. He found a direct cause and effect by adding and eliminating foods from the diet.

Since then, other studies have been done on the relationship between food sensitivities and arthritis. In a study of 43 people with arthritis of the hands, a water fast of three days brought improvement in tenderness, swelling, strength of grip, pain, joint circumference, function, and sedimentation (SED) rate (a simple blood test that determines a breakdown of tissue somewhere in the body).

There is documentation in the literature about arthritis and deficiencies of nearly every known nutrient. When the needed nutrients are supplied, the body can begin to balance itself.

Though many nutritional and herbal products help arthritis sufferers, no one thing works for everyone, so persist until you find the therapies that work best for you. Give each one at least a three-month trial before giving up on it.

LE: What about something like cardiometabolic health?

Dr. Lipski: As research unfolds about the microbiome, it appears that the drivers of liver disease, diabetes, and obesity are tied closely back to gut health. This is a mutual relationship that goes in both directions.

As dysbiosis increases, we also see increases in gut permeability and bacterial lipopolysaccharide

(LPS), inflammation, weight gain, insulin resistance, and metabolic syndrome.

As we improve health by changing diet and lifestyle, losing weight, and rebalancing the gut and microbiome through the DIGIN model, balance is improved and risk is lessened.

LE: Once you identify the problem, what is the solution?

Dr. Lipski: The principles of repair in functional medicine are fairly simple. As one of the pioneers in the field, Sidney Baker, MD, said: Get rid of what you don't need, and get what you do need.

Remove: Nutrient-depleted food, processed foods, poor-quality fats and oils, parasites, molds, metals, chemicals, infections, and foods that don't agree with us. Remove relationships and stressors that no longer serve us.

Replace: Processed foods with whole foods, nutrients, digestive enzymes, hydrochloric acid (HCl), and bile salts. Also, replace poor lifestyle habits with better ones.

Reinoculate: Beneficial probiotics and prebiotics from food and supplements.

Repair: Using foods and supplements such as glutamine, gamma-oryzanol, duodenum glandular, N-acetyl glucosamine, fiber, Boswellia, geranium, licorice, quercetin, and more.

Rebalance: Discover your "new normal," which may be the healthiest you've ever felt or not quite as great as you'd like.

LE: It seems like this approach could take some trial and error.

Dr. Lipski: If at first you don't find major improvement, keep working at it. You may not have found the best remedy or combination of therapies on the first try.

Patience and perseverance bring the best results. It takes time to resolve chronic illnesses.

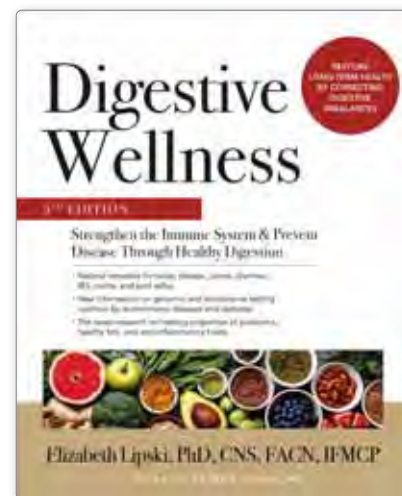
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Dr. Elizabeth Lipski holds a PhD in Clinical Nutrition, has two board certifications in clinical nutrition (CNS and BCHN), is certified in Functional Medicine (IFMCP), and is a Fellow of the American College of Nutrition (FACN). She is a professor and the director of the Academic Development for the Nutrition programs in Clinical Nutrition at Maryland University of Integrative Health. She is also the founder of **InnovativeHealing.com** and Innovative Healing Academy.

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(two-month supply)

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

ACTIVE LIFESTYLE & FITNESS

- 01529 Creatine Capsules
- 02318 Keto Brain and Body Boost
- 02020 Super Carnosine
- 02023 Tart Cherry with CherryPURE®
- 02146 Wellness Bar—Chocolate Brownie
- 02147 Wellness Bar—Cookie Dough
- 02246 Wellness Code® Advanced Whey Protein Isolate Vanilla
- 02221 Wellness Code® Muscle Strength & Restore Formula
- 02127 Wellness Code® Plant Protein Complete & Amino Acid Complex
- 02261 Wellness Code® Whey Protein Concentrate Chocolate
- 02260 Wellness Code® Whey Protein Concentrate Vanilla
- 02243 Wellness Code® Whey Protein Isolate Chocolate
- 02242 Wellness Code® Whey Protein Isolate Vanilla
- 02220 Wellness Shake • Chocolate
- 02219 Wellness Shake • Vanilla

AMINO ACIDS

- 01039 Arginine & Ornithine Capsules
- 00038 Arginine Ornithine Powder
- 01253 Branched Chain Amino Acids
- 01829 Carnosine
- 01671 D,L-Phenylalanine Capsules
- 01624 L-Arginine Caps
- 01532 L-Carnitine
- 00345 L-Glutamine
- 00141 L-Glutamine Powder
- 01678 L-Lysine
- 00133 L-Taurine Powder
- 00326 L-Tyrosine Tablets
- 01827 Taurine

BLOOD PRESSURE & VASCULAR SUPPORT

- 01824 Advanced Olive Leaf Vascular Support with Celery Seed Extract
- 02004 Arterial Protect
- 70000 Blood Pressure Monitor Arm Cuff
- 70004 Blood Pressure Monitor Digital Wrist Cuff
- 02497 Endothelial Defense™ Pomegranate Plus
- 02320 NitroVasc™ Boost
- 00984 Optimal BP Management
- 01953 Pomegranate Complete
- 00956 Pomegranate Fruit Extract
- 02024 Triple Action Blood Pressure AM/PM
- 02102 VenoFlow™

BONE HEALTH

- 01726 Bone Restore
- 02123 Bone Restore-Sugar-Free
- 01727 Bone Restore with Vitamin K2
- 01725 Bone Strength Collagen Formula
- 00313 Bone-Up™
- 01963 Calcium Citrate with Vitamin D
- 01506 Dr. Strum's Intensive Bone Formula
- 01476 Strontium Caps

BRAIN HEALTH

- 01524 Acetyl-L-Carnitine
- 01974 Acetyl-L-Carnitine Arginate
- 01659 Citicoline® (CDP-Choline)
- 02321 Cognitex® Basics
- 02396 Cognitex® Elite
- 02397 Cognitex® Elite Pregnenolone
- 01540 DMAE Bitartrate (dimethylaminoethanol)
- 02006 Dopa-Mind™
- 02212 Focus Tea™
- 01658 Ginkgo Biloba Certified Extract™
- 01527 Huperzine A

- 00020 Lecithin Granules
- 02101 Memory Protect
- 00709 Migra-Eeze™
- 01603 Neuro-Mag® Magnesium L-Threonate Caps
- 02032 Neuro-Mag® Magnesium L-Threonate Powder
- 00888 Optimized Ashwagandha Extract
- 01676 PS (Phosphatidylserine) Caps
- 02406 Quick Brain Nootropic
- 01327 Vinpocetine

CHOLESTEROL MANAGEMENT

- 01828 Advanced Lipid Control
- 01359 Cho-Less™
- 01910 CHOL-Support™
- 01030 Red Yeast Rice
- 01304 Theaflavins Standardized Extract
- 00372 Vitamin B3 Niacin Capsules

DIGESTION SUPPORT

- 53348 Betaine HCl
- 54160 Black Vinegar
- 30747 Digest RC®
- 07136 Effervescent Vitamin C - Magnesium Crystals
- 02021 Enhanced Super Digestive Enzymes
- 02022 Enhanced Super Digestive Enzymes and Probiotics
- 02033 EsophaCool™
- 01737 Esophageal Guardian
- 01706 Extraordinary Enzymes
- 02100 Gastro-Ease™
- 01122 Ginger Force™
- 00605 Regimint
- 01386 TruFiber®

ENERGY MANAGEMENT

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

EYE HEALTH

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

FISH OIL & OMEGAS

- 02311 Clearly EPA/DHA Fish Oil
- 00463 Flaxseed Oil
- 01937 Mega EPA/DHA
- 02218 Mega GLA Sesame Lignans
- 01983 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract

- 01988 Super Omega-3 Plus EPA/DHA Fish Oil, Sesame Lignans, Olive Extract, Krill & Astaxanthin
- 01982 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 120 softgels
- 01985 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 60 enteric coated softgels
- 01984 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 120 enteric coated softgels
- 01986 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 240 softgels
- 01812 Provinal® Purified Omega-7
- 01640 Vegetarian DHA

FOOD

- 02008 California Estate Extra Virgin Olive Oil
- 02170 Rainforest Blend Decaf Ground Coffee
- 02169 Rainforest Blend Ground Coffee
- 02171 Rainforest Blend Whole Bean Coffee
- 00438 Stevia™ Organic Liquid Sweetener
- 00432 Stevia™ Sweetener

GLUCOSE MANAGEMENT

- 01503 CinSulin® with InSea²® and Crominex® 3+
- 01620 CoffeeGenic® Green Coffee Extract
- 02122 Glycemic Guard™
- 00925 Mega Benfotiamine
- 01803 Tri Sugar Shield®

HEART HEALTH

- 01066 Aspirin (Enteric Coated)
- 01842 BioActive Folate & Vitamin B12 Caps
- 01700 Cardio Peak™ with Standardized Hawthorn and Arjuna
- 02121 Homocysteine Resist
- 02018 Optimized Carnitine
- 01949 Super-Absorbable CoQ10 Ubiquinone with d-Limonene • 50 mg, 60 softgels
- 01951 Super-Absorbable CoQ10 Ubiquinone with d-Limonene • 100 mg, 60 softgels
- 01929 Super Ubiquinol CoQ10
- 01427 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 50 mg, 30 softgels
- 01425 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 50 mg, 100 softgels
- 01437 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 100 mg, 30 softgels
- 01426 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 100 mg, 60 softgels
- 01431 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 200 mg, 30 softgels
- 01733 Super Ubiquinol CoQ10 with PQQ
- 01859 TMG Liquid Capsules
- 00349 TMG Powder

HORMONE BALANCE

- 00454 DHEA (Dehydroepiandrosterone) 15 mg, 100 capsules
- 00335 DHEA (Dehydroepiandrosterone) 25 mg, 100 capsules
- 00882 DHEA (Dehydroepiandrosterone) 50 mg, 60 capsules
- 00607 DHEA (Dehydroepiandrosterone) 25 mg, 100 tablets (dissolve in mouth)
- 01689 DHEA (Dehydroepiandrosterone) 100 mg, 60 veg capsules
- 02368 Optimized Broccoli and Cruciferous Blend
- 00302 Pregnenolone • 50 mg, 100 capsules
- 00700 Pregnenolone • 100 mg, 100 capsules
- 01468 Triple Action Cruciferous Vegetable Extract
- 01469 Triple Action Cruciferous Vegetable Extract with Resveratrol

IMMUNE SUPPORT

- 00681 AHCC®
- 02302 Bio-Quercetin
- 01961 Enhanced Zinc Lozenges
- 01704 Immune Modulator with Tinofend®
- 00955 Immune Protect with PARACTIN®
- 02005 Immune Senescence Protection Formula™
- 29727 Kinoko® Gold AHCC
- 24404 Kinoko® Platinum AHCC
- 00316 Kyolic® Garlic Formula 102
- 00789 Kyolic® Reserve
- 01681 Lactoferrin (Apolactoferrin) Caps
- 01903 NK Cell Activator™
- 01394 Optimized Garlic
- 01309 Optimized Quercetin
- 01811 Peony Immune
- 00525 ProBoost Thymic Protein A
- 01708 Reishi Extract Mushroom Complex
- 01906 Standardized Cistanche
- 13685 Ten Mushroom Formula®
- 01097 Ultra Soy Extract
- 01561 Zinc Lozenges

INFLAMMATION MANAGEMENT

- 01639 5-LOX Inhibitor with AprèsFlex®
- 02324 Advanced Curcumin Elite™
Turmeric Extract, Ginger & Turmerones
- 01709 Black Cumin Seed Oil
- 02310 Black Cumin Seed Oil and Curcumin Elite™
Turmeric Extract
- 00202 Boswellia
- 02467 Curcumin Elite™ Turmeric Extract • 30 veg capsules
- 02407 Curcumin Elite™ Turmeric Extract • 60 veg capsules
- 01804 Cytokine Suppress® with EGCG
- 02223 Pro-Resolving Mediators
- 00318 Serrafazyme
- 01203 Specially-Coated Bromelain
- 01254 Zyflamend™ Whole Body

JOINT SUPPORT

- 02404 Arthro-Immune Joint Support
- 02238 ArthroMax® Advanced NT2 Collagen™ & AprèsFlex®
- 01617 ArthroMax® with Theaflavins & AprèsFlex®
- 02138 ArthroMax® Elite
- 00965 Fast-Acting Joint Formula
- 00522 Glucosamine/Chondroitin Capsules
- 01600 Krill Healthy Joint Formula
- 01050 Krill Oil
- 00451 MSM (Methylsulfonylmethane)
- 02231 NT2 Collagen™

KIDNEY & BLADDER SUPPORT

- 00862 Cran-Max® Cranberry Whole Fruit Concentrate
- 01424 Optimized Cran-Max® with Ellirose™
- 01921 Uric Acid Control
- 01209 Water-Soluble Pumpkin Seed Extract

LIVER HEALTH & DETOXIFICATION

- 01922 Advanced Milk Thistle • 60 softgels
- 01925 Advanced Milk Thistle • 120 softgels
- 02240 Anti-Alcohol HepatoProtection Complex
- 01651 Calcium D-Glucarate
- 00550 Chlorella
- 01571 Chlorophyllin
- 01522 Milk Thistle • 60 veg capsules
- 02402 FLORASSIST® Liver Restore™
- 01541 Glutathione, Cysteine & C
- 01393 HepatoPro
- 01608 Liver Efficiency Formula
- 01534 N-Acetyl-L-Cysteine

- 00342 PectaSol-C® Modified Citrus Pectin Powder
- 01080 PectaSol-C® Modified Citrus Pectin Capsules
- 01884 Silymarin
- 02361 SOD Booster

LONGEVITY & WELLNESS

- 00457 Alpha-Lipoic Acid
- 01625 AppleWise Polyphenol Extract
- 01214 Blueberry Extract
- 01438 Blueberry Extract with Pomegranate
- 02270 DNA Protection Formula
- 02119 GEROPROTECT® Ageless Cell™
- 02133 GEROPROTECT® Longevity A.I.™
- 02401 GEROPROTECT® Stem Cell
- 02211 Grapeseed Extract
- 00954 Mega Green Tea Extract (decaffeinated)
- 00953 Mega Green Tea Extract (lightly caffeinated)
- 01513 Optimized Fucoidan with Maritech® 926
- 02230 Optimized Resveratrol
- 01637 Pycnogenol® French Maritime Pine Bark Extract
- 02210 Resveratrol
- 00070 RNA (Ribonucleic Acid)
- 02301 Senolytic Activator
- 01208 Super R-Lipoic Acid
- 01919 X-R Shield

MEN'S HEALTH

- 02209 Male Vascular Sexual Support
- 00455 Mega Lycopene Extract
- 02306 Men's Bladder Control
- 01789 PalmettoGuard® Saw Palmetto with Beta-Sitosterol
- 01790 PalmettoGuard® Saw Palmetto/Nettle Root Formula with Beta-Sitosterol
- 01837 Pomi-T®
- 01373 Prelox® Enhanced Sex for Men
- 01940 Super MiraForte with Standardized Lignans
- 01909 Triple Strength ProstaPollen™
- 02029 Ultra Prostate Formula

MINERALS

- 01661 Boron
- 02107 Extend-Release Magnesium
- 30731 Ionic Selenium
- 01677 Iron Protein Plus
- 02403 Lithium
- 01459 Magnesium Caps
- 01682 Magnesium (Citra)
- 01328 Only Trace Minerals
- 01504 Optimized Chromium with Crominex® 3+
- 02309 Potassium with Extend-Release Magnesium
- 01740 Sea-Iodine™
- 01879 Se-Methyl L-Selenocysteine
- 01778 Super Selenium Complex
- 00213 Vanadyl Sulfate
- 01813 Zinc Caps

MISCELLANEOUS

- 00577 Potassium Iodide
- 00657 Solarshield® Sunglasses

MOOD & STRESS MANAGEMENT

- 02312 Cortisol-Stress Balance
- 00987 Enhanced Stress Relief
- 01074 5 HTP
- 01683 L-Theanine
- 02175 SAMe (S-Adenosyl-Methionine)
200 mg, 30 enteric coated tablets
- 02176 SAMe (S-Adenosyl-Methionine)
400 mg, 30 enteric coated tablets
- 02174 SAMe (S-Adenosyl-Methionine)
400 mg, 60 enteric coated tablets

MULTIVITAMINS

- 02199 Children's Formula Life Extension Mix™
- 02498 Comprehensive Nutrient Packs ADVANCED
- 02354 Life Extension Mix™ Capsules
- 02364 Life Extension Mix™ Capsules without Copper
- 02356 Life Extension Mix™ Powder
- 02355 Life Extension Mix™ Tablets
- 02357 Life Extension Mix™ Tablets with Extra Niacin
- 02365 Life Extension Mix™ Tablets without Copper
- 02292 Once-Daily Health Booster • 30 softgels
- 02291 Once-Daily Health Booster • 60 softgels
- 02313 One-Per-Day Tablets
- 02317 Two-Per-Day Capsules • 60 capsules
- 02314 Two-Per-Day Capsules • 120 capsules
- 02316 Two-Per-Day Tablets • 60 tablets
- 02315 Two-Per-Day Tablets • 120 tablets

NERVE & COMFORT SUPPORT

- 02202 ComfortMAX™
- 02303 PEA Discomfort Relief

PERSONAL CARE

- 01006 Biosil™ • 5 mg, 30 veg capsules
- 01007 Biosil™ • 1 fl oz
- 00321 Dr. Proctor's Advanced Hair Formula
- 00320 Dr. Proctor's Shampoo
- 02322 Hair, Skin & Nails Collagen Plus Formula
- 01278 Life Extension Toothpaste
- 00408 Venotone
- 00409 Xyliwhite Mouthwash
- 02304 Youthful Collagen
- 02252 Youthful Legs

PET CARE

- 01932 Cat Mix
- 01931 Dog Mix

PROBIOTICS

- 01622 Bifido GI Balance
- 01825 FLORASSIST® Balance
- 02125 FLORASSIST® GI with Phage Technology
- 01821 FLORASSIST® Heart Health
- 02250 FLORASSIST® Mood Improve
- 02208 FLORASSIST® Nasal
- 02120 FLORASSIST® Oral Hygiene
- 02203 FLORASSIST® Prebiotic
- 01920 FLORASSIST® Throat Health
- 52142 Jarro-Dophilus® for Women
- 00056 Jarro-Dophilus EPS® • 60 veg capsules
- 21201 Jarro-Dophilus EPS® • 120 veg capsules
- 01038 Theralac® Probiotics
- 01389 TruFlora® Probiotics

SKIN CARE

- 80157 Advanced Anti-Glycation Peptide Serum
- 80165 Advanced Growth Factor Serum
- 80170 Advanced Hyaluronic Acid Serum
- 80154 Advanced Lightening Cream
- 80155 Advanced Peptide Hand Therapy
- 80175 Advanced Probiotic-Fermented Eye Serum
- 80177 Advanced Retinol Serum
- 80152 Advanced Triple Peptide Serum
- 80140 Advanced Under Eye Serum with Stem Cells
- 80137 All-Purpose Soothing Relief Cream
- 80139 Amber Self MicroDermAbrasion
- 80118 Anti-Aging Mask
- 80151 Anti-Aging Rejuvenating Face Cream
- 80153 Anti-Aging Rejuvenating Scalp Serum
- 80176 Collagen Boosting Peptide Cream

80156 Collagen Boosting Peptide Serum
 80169 Cucumber Hydra Peptide Eye Cream
 80141 DNA Support Cream
 80167 Environmental Support Serum
 80163 Eye Lift Cream
 80123 Face Rejuvenating Anti-Oxidant Cream
 80109 Hyaluronic Facial Moisturizer
 80110 Hyaluronic Oil-Free Facial Moisturizer
 80138 Hydrating Anti-Oxidant Facial Mist
 00661 Hydroderm
 80103 Lifting & Tightening Complex
 80168 Melatonin Advanced Peptide Cream
 80114 Mild Facial Cleanser
 80172 Multi Stem Cell Hydration Cream
 80159 Multi Stem Cell Skin Tightening Complex
 80122 Neck Rejuvenating Anti-Oxidant Cream
 80174 Purifying Facial Mask
 80150 Renewing Eye Cream
 80142 Resveratrol Anti-Oxidant Serum
 01938 Shade Factor™
 02129 Skin Care Collection Anti-Aging Serum
 02130 Skin Care Collection Day Cream
 02131 Skin Care Collection Night Cream
 80166 Skin Firming Complex
 02096 Skin Restoring Ceramides
 80130 Skin Stem Cell Serum
 80164 Skin Tone Equalizer
 80143 Stem Cell Cream with Alpine Rose
 80148 Tightening & Firming Neck Cream
 80161 Triple-Action Vitamin C Cream
 80162 Ultimate MicroDermabrasion
 80173 Ultimate Peptide Serum
 80160 Ultra Eyelash Booster
 80101 Ultra Wrinkle Relaxer
 80113 Under Eye Refining Serum
 80104 Under Eye Rescue Cream
 80171 Vitamin C Lip Rejuvenator
 80129 Vitamin C Serum
 80136 Vitamin D Lotion
 80102 Vitamin K Cream

SLEEP

01512 Bioactive Milk Peptides
 02300 Circadian Sleep
 01551 Enhanced Sleep with Melatonin
 01511 Enhanced Sleep without Melatonin
 02234 Fast-Acting Liquid Melatonin
 01669 Glycine
 02308 Herbal Sleep PM
 01722 L-Tryptophan
 01668 Melatonin • 300 mcg, 100 veg capsules
 01083 Melatonin • 500 mcg, 200 veg capsules
 00329 Melatonin • 1 mg, 60 capsules
 00330 Melatonin • 3 mg, 60 veg capsules
 00331 Melatonin • 10 mg, 60 veg capsules
 00332 Melatonin • 3 mg, 60 veg lozenges
 02201 Melatonin IR/XR
 01787 Melatonin 6 Hour Timed Release
 300 mcg, 100 veg tablets
 01788 Melatonin 6 Hour Timed Release
 750 mcg, 60 veg tablets
 01786 Melatonin 6 Hour Timed Release
 3 mg, 60 veg tablets
 01721 Optimized Tryptophan Plus
 01444 Quiet Sleep
 01445 Quiet Sleep Melatonin

VITAMINS

01533 Ascorbyl Palmitate
 00920 Benfotiamine with Thiamine
 00664 Beta-Carotene
 01945 BioActive Complete B-Complex
 00102 Biotin
 00084 Buffered Vitamin C Powder
 02229 Fast-C® and Bio-Quercetin Phytosome
 02075 Gamma E Mixed Tocopherol Enhanced with
 Sesame Lignans
 02070 Gamma E Mixed Tocopherol/Tocotrienols
 01913 High Potency Optimized Folate
 01674 Inositol Caps Liquid Emulsified
 02244 Liquid Vitamin D3 • 2,000 IU, 1 fl oz
 02232 Liquid Vitamin D3 • 2,000 IU, 1 fl oz, mint
 01936 Low-Dose Vitamin K2
 01536 Methylcobalamin • 1 mg, 60 veg lozenges
 01537 Methylcobalamin • 5 mg, 60 veg lozenges
 00065 MK-7
 00373 No Flush Niacin
 01939 Optimized Folate (L-Methylfolate)
 01217 Pyridoxal 5'-Phosphate Caps
 01400 Super Absorbable Tocotrienols
 02334 Super K
 02335 Super K Elite
 01863 Super Vitamin E
 02028 Vitamin B5 (Pantothenic Acid)
 01535 Vitamin B6
 00361 Vitamin B12
 02228 Vitamin C and Bio-Quercetin Phytosome
 1,000 mg, 60 veg tablets
 02227 Vitamin C and Bio-Quercetin Phytosome
 1,000 mg, 250 veg tablets
 01753 Vitamin D3 • 25 mcg (1,000 IU), 90 softgels
 01751 Vitamin D3 • 25 mcg (1,000 IU), 250 softgels
 01713 Vitamin D3 • 125 mcg (5,000 IU), 60 softgels
 01718 Vitamin D3 • 175 mcg (7,000 IU), 60 softgels
 01758 Vitamin D3 with Sea-Iodine™
 02040 Vitamins D and K with Sea-Iodine™

WEIGHT MANAGEMENT & BODY COMPOSITION

00658 7-Keto® DHEA Metabolite • 25 mg, 100 capsules
 02479 7-Keto® DHEA Metabolite • 100 mg, 60 veg capsules
 01509 Advanced Anti-Adipocyte Formula
 01807 Advanced Appetite Suppress
 02207 AMPK Metabolic Activator
 02478 DHEA Complete
 01738 Garcinia HCA
 01292 Integra-Lean®
 01908 Mediterranean Trim with Sinetrol™ -XPur
 01492 Optimized Irvingia with Phase 3™ Calorie Control Complex
 01432 Optimized Saffron with Satiereal®
 00818 Super CLA Blend with Sesame Lignans
 01902 Waist-Line Control™
 02151 Wellness Code® Appetite Control

WOMEN'S HEALTH

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

Sweet DREAMS

Choose the Melatonin That's Right For You

Healthy sleep is one of the best ways to feel revitalized and maintain optimal health.

While many people find melatonin helps improve sleep, others take it nightly for its **immune** protection effects.

Individual doses range from **300 mcg to 10 mg** taken 30-60 minutes before going to sleep.

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

Sensoril® and Capros® are patent protected and registered trademarks of Natreon, Inc.

MicroActive® Melatonin is a registered trademark of Bioactives LLC. Lactium® is used under license.

For occasional sleeplessness.



Melatonin Timed Release 300 mcg

100 vegetarian tablets

Price: **\$9**
Item # 01787



Melatonin 3 mg

60 vegetarian capsules

Price: **\$6**
Item # 00330



Melatonin 500 mcg

200 vegetarian capsules

Price: **\$13.50**
Item# 01083



Melatonin 3 mg

60 vegetarian lozenges

Price: **\$6**
Item# 00332



Melatonin Timed Release 750 mcg

60 vegetarian tablets

Price: **\$6**
Item # 01788



Melatonin Timed Release 3 mg

60 vegetarian tablets

Price: **\$9**
Item # 01786



Melatonin 1 mg

60 capsules

Price: **\$3.75**
Item# 00329



Enhanced Sleep with Melatonin

30 capsules

Price **\$16.50**
Item# 01551



Melatonin 10 mg

60 vegetarian capsules

Price: **\$21**
Item# 00331



Enhanced Sleep without Melatonin

30 capsules

Price: **\$16.50**
Item# 01511



Melatonin 300 mcg

100 vegetarian capsules

Price: **\$5.25**
Item# 01668



Melatonin IR/XR

60 capsules

Price: **\$9**
Item# 02201



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

Munch

Crunch Digest Your Lunch

(Or breakfast, or dinner...)



Uncomfortable after eating?

Digestive enzymes are specialized proteins that help you break down the foods you eat. Probiotics help maintain a healthy gut microbiota—the good bacteria in your gut.

Our Best-in-Class Enhanced Super Digestive Enzymes and Probiotics combines 10 vegetarian-friendly enzymes plus the probiotic *B. coagulans* to help you break down hard-to-digest foods and encourage a healthy gastrointestinal balance...so you can feel good after you eat!



Item #02021 • 60 Vegetarian Capsules

1 bottle \$16.50 | 4 bottles \$15.00 each

For full product description and to order **Enhanced Super Digestive Enzymes**, call **1-800-544-4440** or visit **LifeExtension.com**.

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



The Science of a Healthier Life®

PO BOX 407198
FORT LAUDERDALE, FLORIDA 33340-7198



IN THIS EDITION OF *LIFE EXTENSION*® MAGAZINE



7 FRACTURE PREVENTION

Researchers are seeking ways to reduce **bone fracture risk** that impacts **50%** of women and **20%** of men after age **49**.



26 NUTRIENTS TO CHARGE UP BRAIN FUNCTION

Plant-based **nootropics** are being used to **supercharge** brain processing speed, learning, and memory.



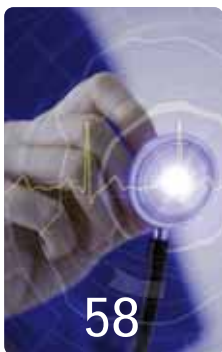
36 CALORIC RESTRICTION WITHOUT UNDER-EATING

Plant-derived compounds mimic some of the beneficial effects that occur in response to **calorie restriction**.



48 GENE THERAPY TO REVERSE AGING

Harvard geneticist **Dr. George Church** is “turning on” **youth-promoting genes** that may enable older people to grow biologically *younger*. (Photo: WYSS INSTITUTE AT HARVARD UNIVERSITY)



58 TOCOTRIENOLS PREVENT DNA DAMAGE

Human studies show that **tocotrienols** reduce DNA damage and help protect against several degenerative disorders.



69 WELLNESS PROFILE

Neuroregeneration pioneer Dr. Terry Burns believes **senolytics** and other advances will make diseases like Alzheimer's a distant memory.

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