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March 2021

FEATURE ARTICLES

- 7 Internal Cellular Cleansing
- 34 Magnesium and Heart Health
- 44 Oral Probiotics Protect Gum Tissue
- 52 Brain-Protecting Effects of Green Tea
- 64 Hidden Dangers of Tattoos
- 71 Clinical Impact of CoQ10

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AUTOPHAGY



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\* *Br J Pharmacol.* 2004 Mar;141(5):825-30.

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REPORTS

24 ON THE COVER

RESTORE YOUTHFUL  
CELLULAR FUNCTION

Scientists have identified methods to reduce toxic waste that accumulates inside cells by turning on a natural cleansing process called **autophagy**.



34 MAGNESIUM'S ROLE IN HEART HEALTH

Multiple studies reveal magnesium's cardio-protective effects. One found that those with the *highest* magnesium levels had a **44% lower** risk of **heart failure**. More than half of all Americans have *low* magnesium levels.



44 PROTECT GUM TISSUE WITH BENEFICIAL BACTERIA

Daily brushing and flossing may not be enough to prevent **gum disease**. Two **probiotics** *improve gum health* and *reduce oral plaque*.



52 BRAIN-PROTECTIVE EFFECTS OF GREEN TEA

**Green tea** polyphenols promote the formation of new brain cells and the ability of brain cells to create neural connections. In people who regularly drank green tea, **cognitive disorders** were found to be **35%** lower.



64 HIDDEN DANGERS OF TATTOOS

Tattoo inks are often derived from **toxic heavy metals** that raise the risk of DNA damage. A tattoo may have serious health consequences.

DEPARTMENTS

7 AS WE SEE IT:  
CELLULAR HOUSEKEEPING

Excess levels of **mTOR** interfere with a vital cell housecleaning process called **autophagy**. Fortunately, there are various strategies to suppress excess mTOR and restore more youthful autophagy.

17 IN THE NEWS

Glucosamine and chondroitin lower premature mortality risk; omega-3s help improve periodontitis; healthy diet decreases depression risk in adults over 45; ashwagandha enhances sleep, alertness, and quality of life in older adults.

71 ASK THE DOCTOR

**Dr. Joel Kahn** tells *Life Extension*® how **coenzyme Q10** helps cardiac patients prevent heart failure, heart attacks, and other cardiovascular issues.

79 WELLNESS PROFILE

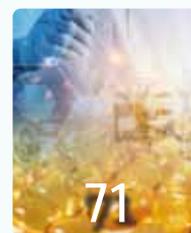
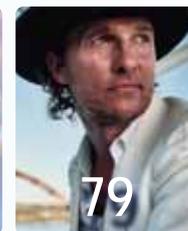
Actor Matthew McConaughey, author of *GREENLIGHTS*, prioritizes hard work, lifestyle choices, and physical, mental, and emotional health. From caloric restriction and exercise to supplements, his health protocols are still evolving.

85 AUTHOR INTERVIEW

In his book *Food Fix*, Mark Hyman, MD, provides practical solutions for creating healthier individuals, healthier farming practices, and ultimately a healthier planet.

91 SUPER FOODS

Lupini beans are packed with protein and digestible plant fiber but low in carbs. Replacing meat with lupini beans improves longevity, cardiovascular disease, and weight management.





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# CELLULAR HOUSEKEEPING



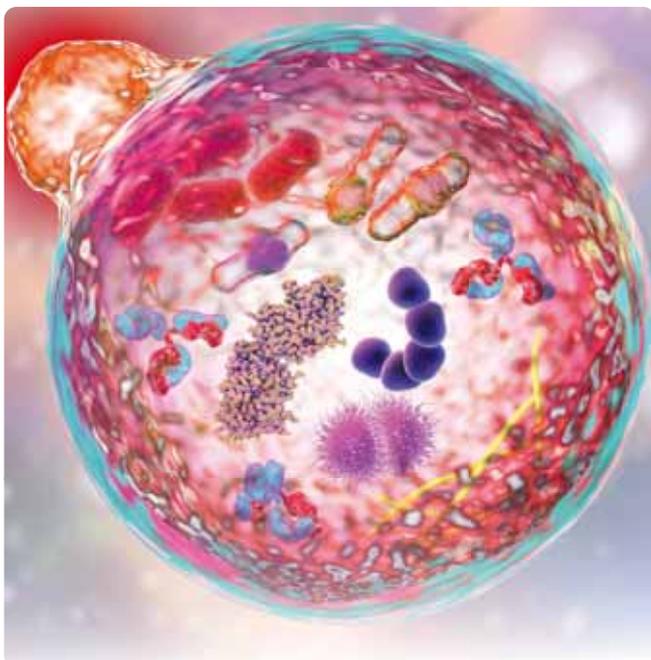
WILLIAM FALOON

*Rapamycin is a drug that extends lifespan in virtually every animal tested.<sup>1-4</sup> It may also protect against age-related diseases.<sup>5-9</sup>*

In 2016, **CNN** aired a broadcast showing an **old dog** behaving like a **young** dog after taking **rapamycin**.<sup>10</sup>

Animal studies show **50-60%** lifespan *increases* in response to rapamycin. This prompted the **National Institutes of Health** to fund a **\$23 million** study of **10,000** pet dogs.<sup>11,12</sup> **Rapamycin** will be given to **500** of the dogs.

Scientists will then evaluate healthspans and conduct genetic testing to identify what



**biological mechanisms** are responsible for rapamycin's benefits. The pet dogs will stay at home and be cared for by their owners, which is more humane and realistic than keeping them in kennels.

Rapamycin's anti-aging properties include suppressing excess signaling of a cellular protein called **mTOR**.<sup>13</sup>

When **mTOR** activity is constantly elevated, it increases risk of degenerative disorders.<sup>14</sup>

A complication of excess **mTOR** signaling is inhibition of a cellular **housekeeping** process called **autophagy**.<sup>14</sup>

**Autophagy** is nature's way of clearing damaged proteins, stored fat, and other waste products inside our cells.<sup>15,16</sup>

Almost **every** intervention shown to extend **healthy longevity** involves activation of **autophagy** (removing toxic cellular waste).<sup>17,18</sup>

This article will describe how *everyone* can easily improve their cellular housekeeping.

**Autophagy** is the body's **self-cleaning** process that removes damaged byproducts from inside cells that accumulate from normal metabolic processes.

Insufficient **autophagy** is a driver of **aging** and degenerative illnesses.<sup>17,18</sup>

Restoring balanced **autophagy** is a critical factor in **reversing** systemic degeneration.<sup>17</sup>

Most **Life Extension**® readers turn on beneficial **autophagy** by using **AMPK** activators, and **NAD+** precursors, and by cutting back on **excess calories**.

Those who engage in **intermittent fasting**, be it avoiding food for **16-18 hours** most days, or fasting two days a week, are **cleansing** their cells via activation of **autophagy**.<sup>19</sup>

People are participating in **clinical trials** evaluating the **autophagy-enhancing** effects of **rapamycin** and its potential to induce systemic **rejuvenation**.<sup>20-27</sup>

We eagerly look forward to the results of these **rapamycin** studies but people today need real-world solutions.

A novel approach has been developed to enhance more youthful **autophagy**. The objective is to enable aging individuals to cleanse their cells of toxic debris.

## Autophagy Declines with Age

Young cells remove metabolic waste products so they can operate at optimal efficiency.

However, even in youth, chronic ingestion of **high calorie** diets (three large meals a day + snacking in between) may preclude effective **autophagy**. This might help explain why more younger people are developing metabolic disorders such as **obesity** and **type II diabetes**.

Incidences of **heart failure** in people under age 65 are rising.<sup>28</sup> This is largely a result of the **obesity** epidemic.

Accumulation of unwanted **body fat** is partially caused by excess **mTOR** that turns down autophagy's natural removal of cellular fat, damaged proteins, and other metabolic waste.<sup>29</sup>

Normal aging results in **autophagy** decline unless interventions are initiated such as **intermittent fasting** and/or aggressive **exercise**.

Fortunately, there are natural ways to improve **autophagy** even in those who don't follow optimal dietary and physical-activity programs.



## Effect of Luteolin On Autophagy

A plant flavonoid called **luteolin** was identified by *Life Extension*<sup>®</sup> in **1985** as a potential **anti-cancer** supplement.<sup>30</sup>

Found in celery, broccoli, green pepper, parsley, and thyme, **luteolin** demonstrated **cancer prevention** properties in animal and cell studies.<sup>31,32</sup>

Associations have been found between diets rich in flavonoid-containing plant foods and lower cancer rates.<sup>33</sup>

The challenge in **1985** and in recent years was finding an affordable source of supplemental **luteolin**.

That roadblock has been resolved. And data indicate that using **luteolin** in **higher** doses has **autophagy-inducing** effects.

In animals with traumatic **brain injury** where efficient repair of cell structures is needed, **luteolin** activated a marker of **autophagy** by about **25%**, with a corresponding **25% reduction** in a marker of **inflammation**.<sup>34</sup>

Brain injury and corresponding inflammation are causes of short- and long-term neurological impairments.<sup>35</sup>

**Luteolin** has been shown to **activate** positive regulators of **autophagy** (such as AMPK and lysosome components) and **suppress** inhibitors of autophagy such as **mTOR** and **PI3K/Akt** signaling pathways.<sup>36-38</sup>

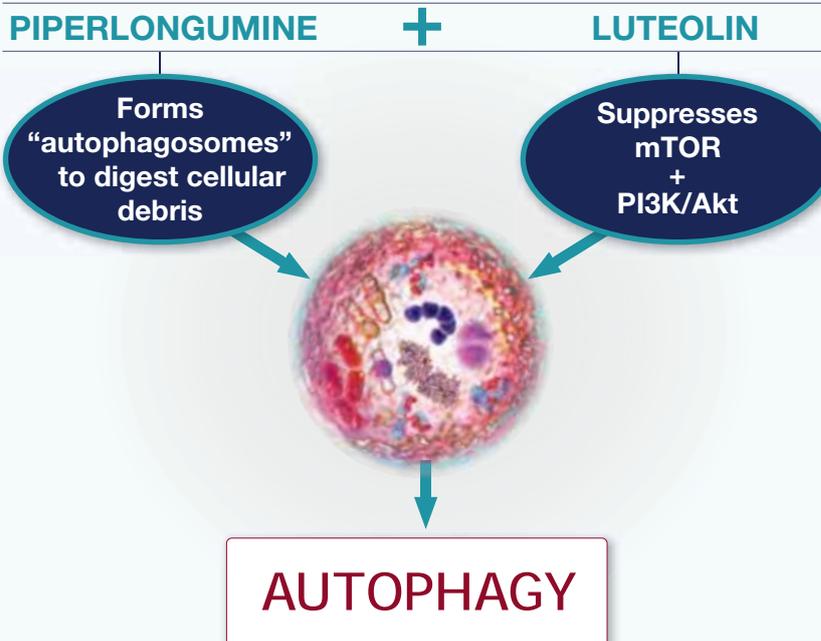
These **autophagy-inducing** effects also help protect cells against malignant propagation.<sup>39</sup>

## Fruit of the Pepper Plant

A biologically active alkaloid from the **pepper fruit** (piperlongumine) has demonstrated the ability to enable recovery of motor deficits in animals with brain cell damage and movement deficits.

A marker of **autophagy induction** nearly **doubled** in animals given this **pepper fruit** extract compared to controls.<sup>40</sup>

## Nutrients that Support Healthy Autophagy



Luteolin and piperlongumine enhance **autophagy** through several mechanisms that include suppressing **mTOR** and **PI3K/Akt** and promoting formation of **autophagosomes**.

Adapted from Bareja et al 2019, Pedro et al 2019, Maiuri & Kroemer 2019, Wang et al 2017, Choi et al 2013, Liao et al 2018, You et al 2019, Yang et al 2016

This **pepper extract** initiated a favorable cycle of cellular events that resulted in formation of "**autophagosomes**."

This is another mechanism that young, healthy cells naturally use to remove accumulated waste products.

## In this month's issue...

The toxic effects of waste products that accumulate inside our aging cells were recognized long ago.

Only recently, however, have effective **autophagy-inducing** compounds and aggressive fasting regimens been identified.

An article on page 24 of this issue explores the various ways people can safely turn on **autophagy** to rid aging cells of debris that inhibits youthful function of their internal machinery.

On page 44 we discuss the systemic damage that occurs in response to poor **oral hygiene**.

Starting on page 71 there is an interview with a cardiologist who describes his clinical observations when prescribing **coenzyme Q10** to cardiac patients.

## Commitment to Funding Research

In **1980**, **Life Extension®** began publishing a newsletter that described methods to reduce one's risk of degenerative disorders.

Back in those early days, we advocated controversial positions relating to cardiovascular disease prevention. These included lower reference ranges for **blood glucose**, **lipids**, and **blood pressure** that are now recognized by the medical establishment.

Compared to our first publication **41 years ago**, we are light-years ahead in our knowledge of what causes aging and how to partially forestall it.

I am actively engaged and donate monies to find ways to **reverse aging** in elderly persons.

Your support helps fund this clinical research aimed at benefiting all of humanity.

The accumulation of **cellular waste** products interferes with vital body functions needed to sustain life.

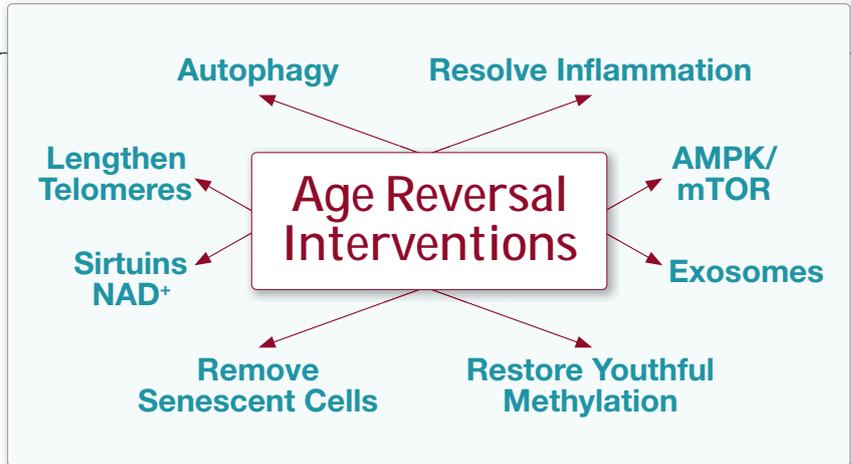
There are now ways to remove this toxic debris that clogs healthy cellular functions via a natural process called **autophagy**.

The boxes on the right are from live presentations I give to describe **age-reversal** research, including projects that relate to boosting cellular autophagy.

For longer life,



William Faloon, Co-Founder  
Life Extension Buyers Club



## Old Dogs, New Tricks

**10,000 PETS NEEDED**  
for aging study

**NIH Funds \$23 Million Dog Study that includes RAPAMYCIN**

Daniel Promislow, principal investigator of the Dog Aging Project

<https://www.heraldnet.com/northwest/old-dogs-new-tricks-10000-pets-needed-for-study/>

## The Wall Street Journal

“Dog owners may soon be able to add years to their pets’ lives, thanks to an experimental anti-aging pill.

In tests on mice, the medication rapamycin has been shown to lengthen lifespans up to 60%.

Scientists at the University of Washington’s Dog Aging Project are studying whether it works in canines.”

(September 17, 2017)



## Excess mTOR and Abdominal Obesity



Excess mTOR causes insulin resistance, diabetes, inflammation, and obesity.

AMPK activators indirectly suppress mTOR.

Rapamycin directly inactivates mTOR pathways.

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# FISETIN

## The Longevity Flavonoid



**Fisetin**, a flavonoid found in strawberries and apples, is currently being studied for its effectiveness as a **senolytic** in humans.<sup>1</sup>

In preclinical studies, fisetin:

- Mimics effects of **calorie reduction**<sup>2</sup>
- Targets longevity pathways<sup>2-6</sup>
- Extends lifespan of mice by about **10%**<sup>7</sup>
- Removes **senescent** cells through **senolytic** action<sup>7</sup>
- Suppresses excess **mTOR** activation<sup>8</sup>

**Fisetin** is poorly *absorbed* due to its breakdown in the small intestines.

**Bio-Fisetin** solves this problem by enclosing **fisetin** with a compound from the fenugreek herb.

A **human** trial showed **bioavailability** of this new **fisetin** compound increased up to **25 times** compared to fisetin by itself.<sup>9</sup>

Just one capsule daily of **Bio-Fisetin** helps manage **senescent cells** and may support overall longevity.

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**Item #02414** • 30 vegetarian capsules

1 bottle **\$11.25** • 4 bottles \$10 each



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

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*LEARN, RETAIN and Think FAST!*

# QUICK BRAIN



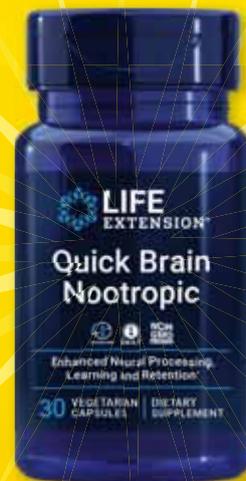
**Nootropics** speed up information processing in the brain, resulting in **faster thinking**.

**Quick Brain Nootropic** provides extracts from **bacopa, gotu kola**, and a **lutein-zeaxanthin** blend that have **clinical support** for:

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- **Learning** function
- Healthy **memory**

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ACTIVATE CELLULAR

# Autophagy



Help Your Cells Remove  
Internal Debris

GEROPROTECT® Autophagy Renew stimulates the body's natural "cellular cleanup" process essential to youthful cellular function and overall health.

This new longevity formula contains luteolin and piperlongumine to:

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† Developed in collaboration with Insilico Medicine, Inc.



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# TRIPLE ACTION **SENOLYTIC** FORMULA

## COMBAT SENESCENT CELLS AND AGING

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**Senolytic** compounds selectively help target senescent cells in the body.

Laboratory studies show evidence of **systemic rejuvenation** when the **senescent cell** burden is reduced.\*

### ONCE-WEEKLY SENOLYTIC FORMULA

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The suggested dose is to take two capsules of **Senolytic Activator** just **once weekly**.

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



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1 box \$18 • 4 boxes \$16

(Each box lasts three months.)

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# In the News



## Glucosamine and Chondroitin Intake Linked to Lower Risk of Premature Mortality

Regular supplementation with glucosamine and chondroitin is associated with a lower risk of mortality, according to the results of a study published in the *Journal of the American Board of Family Medicine*.\*

The study included 16,686 participants in the National Health and Nutrition Examination Survey (NHANES) from 1999 to 2010. Participant interviews ascertained the use of dietary supplements during the previous month. Individuals who reported using glucosamine and chondroitin for a year or more were identified as glucosamine/chondroitin users in the current investigation.

During a median follow-up period of 107 months, 3,366 deaths occurred, of which 674 were caused by cardiovascular disease. Regular use of glucosamine/chondroitin was associated with a **58% lower** adjusted risk of dying from cardiovascular disease and a **27% lower** risk of dying from any cause during follow-up.

**Editor's Note:** Glucosamine and chondroitin are nutrients that are often consumed in combination to support joint health. Many individuals use glucosamine and/or chondroitin supplements on a regular basis to help maintain healthy joints or relieve some of the symptoms of arthritis.

\* *J Am Board Fam Med.* Nov-Dec 2020;33(6): 842-847.

## Omega-3 Fatty Acids as Add-On Therapy for Periodontitis

A review and meta-analysis included six studies that involved the use of the omega-3 fatty acids **EPA** and **DHA** in the treatment of periodontitis.<sup>1</sup> In four of the six studies, clinical attachment level and probing depth revealed significant improvement in association with omega-3 supplementation, compared to a placebo.

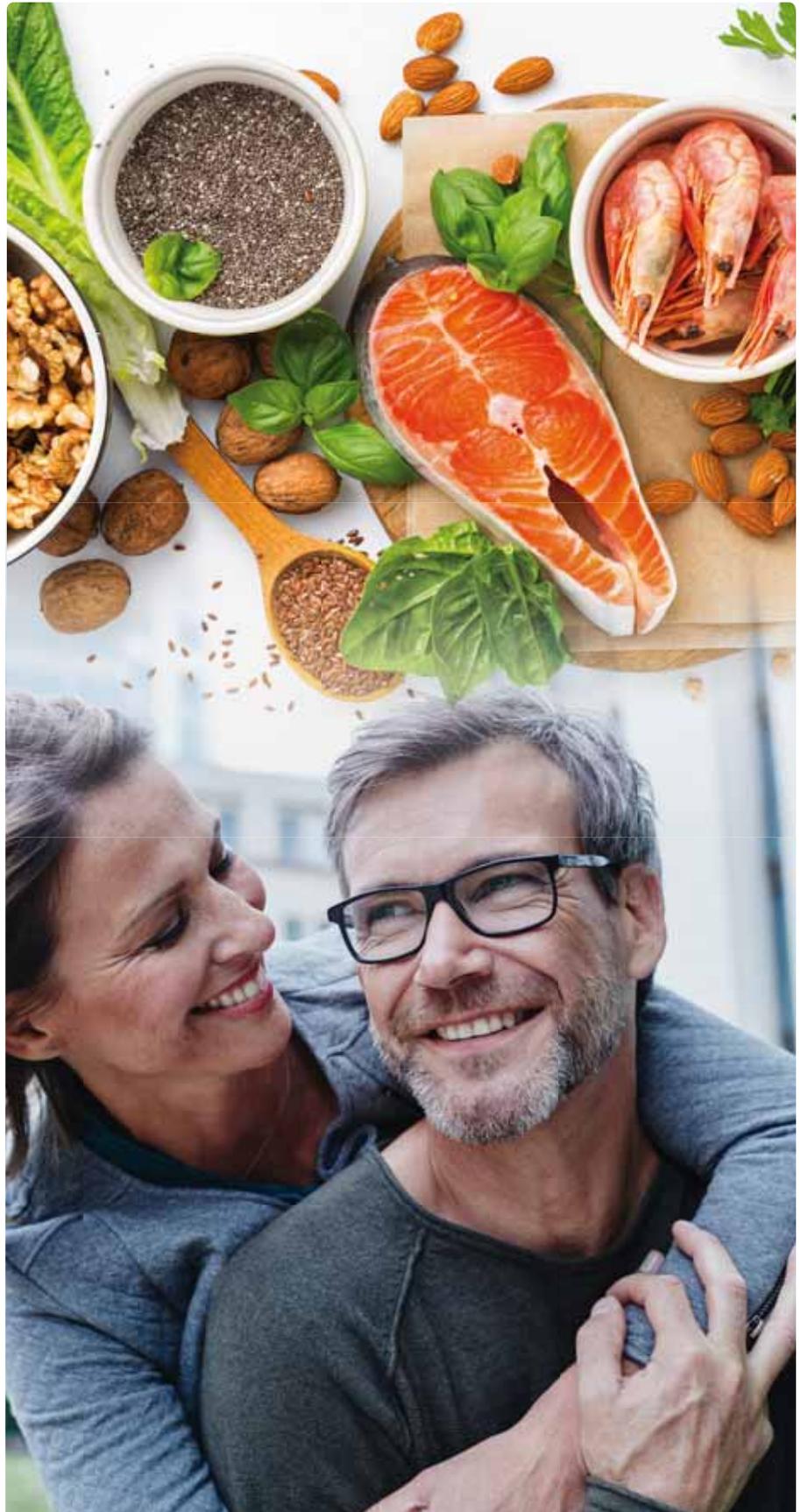
A randomized trial evaluated the effects of omega-3 supplementation in participants with chronic, moderate periodontitis.<sup>2</sup> Clinical attachment level improved at both one and three months among participants who received omega-3 in comparison with the control group, and compared to the beginning of the study.

In another trial, patients with periodontitis received scaling and root planing, while some of the subjects also received EPA and DHA.<sup>3</sup> The study documented improvement in clinical attachment loss, bleeding on probing, and probing depth in the group that received omega-3.

**Editor's Note:** These studies provide growing evidence that omega-3 supplementation could be a promising adjunct to standard periodontitis therapy. As the authors of the review and meta-analysis noted, an alternative to antibiotics used in periodontal therapy could help solve, in part, the potential problem of antibiotic resistance in this group of patients.

### References

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## Adults Over 45 with Healthy Diets are Less Prone to Depression

The intake of fruit, vegetables, and omega-3 fatty acids can help protect against the risk of depression in older adults, according to an article in *BMC Psychiatry*.\*

The study included 27,162 men and women between the ages of 45 to 85 who participated in the Canadian Longitudinal Study on Aging. Demographic data, depression, physical health, dietary intake, and other factors were assessed upon enrollment.

For men, being in a relationship, having a high intake of omega-3 fatty acids, fruit and vegetables, calcium, and high vitamin D sources, as well as other factors, were protective against depression.

Among women, chronic pain, stage 1 hypertension, low intake of fruit and vegetables, and other factors were associated with a greater risk of depression.

**Editor's Note:** The authors note that fruit and vegetables contain magnesium, zinc, and selenium that may help reduce inflammation, which is associated with depression. Additionally, fruit and vegetables contain antioxidants that decrease the effects of oxidative stress on psychological health.

\* *BMC Psychiatry*. 2019 Nov 6;19(1):329.

## Ashwagandha Supplementation Associated with Improved Sleep, Alertness, Quality of Life

A randomized trial published in *Cureus* found improvement in sleep, alertness, and quality of life among older men and women treated with the herb ashwagandha.\*

The trial included 50 men and women between the ages of 65 to 80. Half of the group received **ashwagandha root extract** twice daily and the remainder received a placebo for 12 weeks. Quality of life, daytime sleepiness, sleep quality, and mental alertness upon rising were evaluated at the beginning of the trial, at four and eight weeks, and at the end of the treatment period.

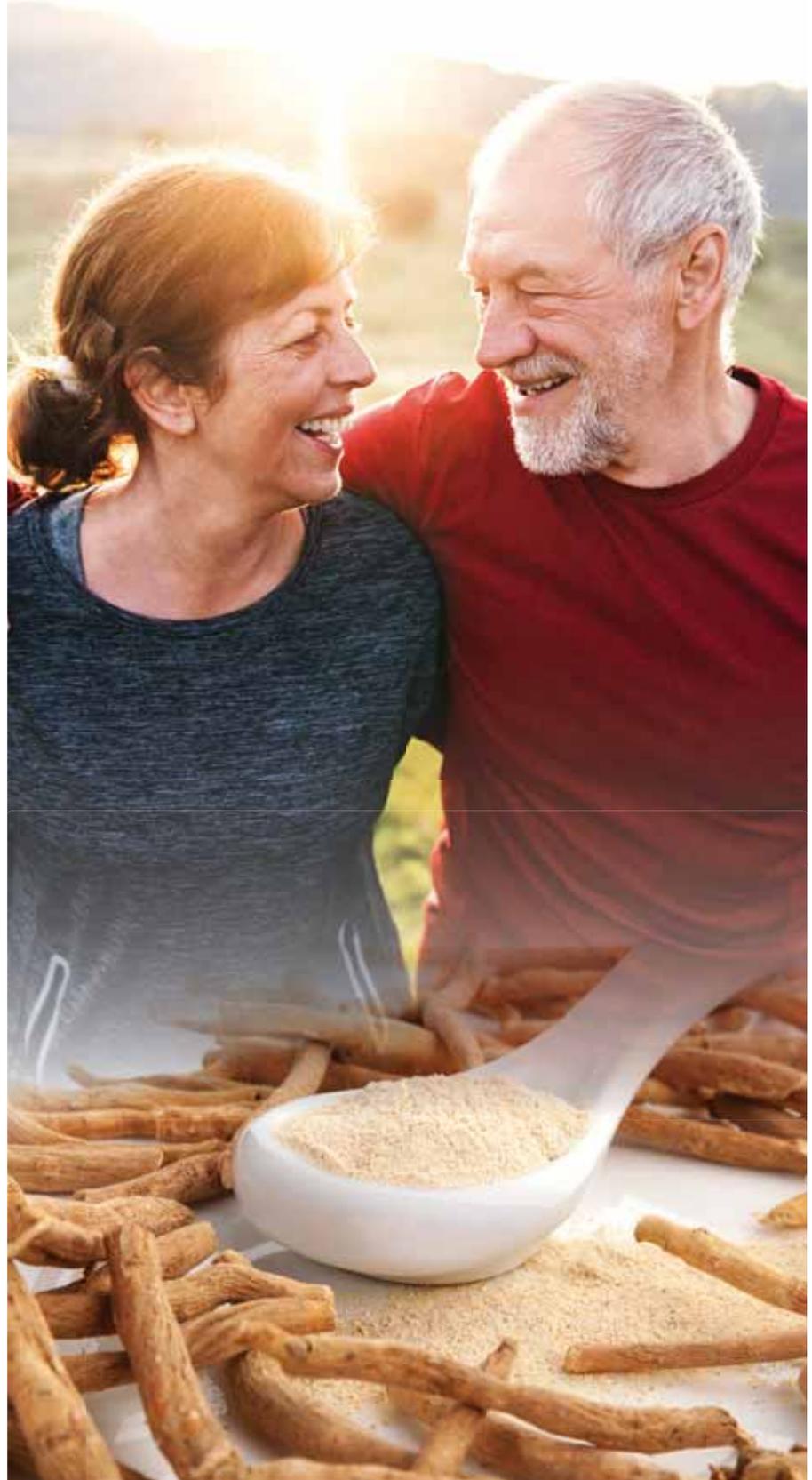
Quality of life, including global, physical, psychological, social, and environmental aspects, significantly improved from baseline levels among the group that received ashwagandha.

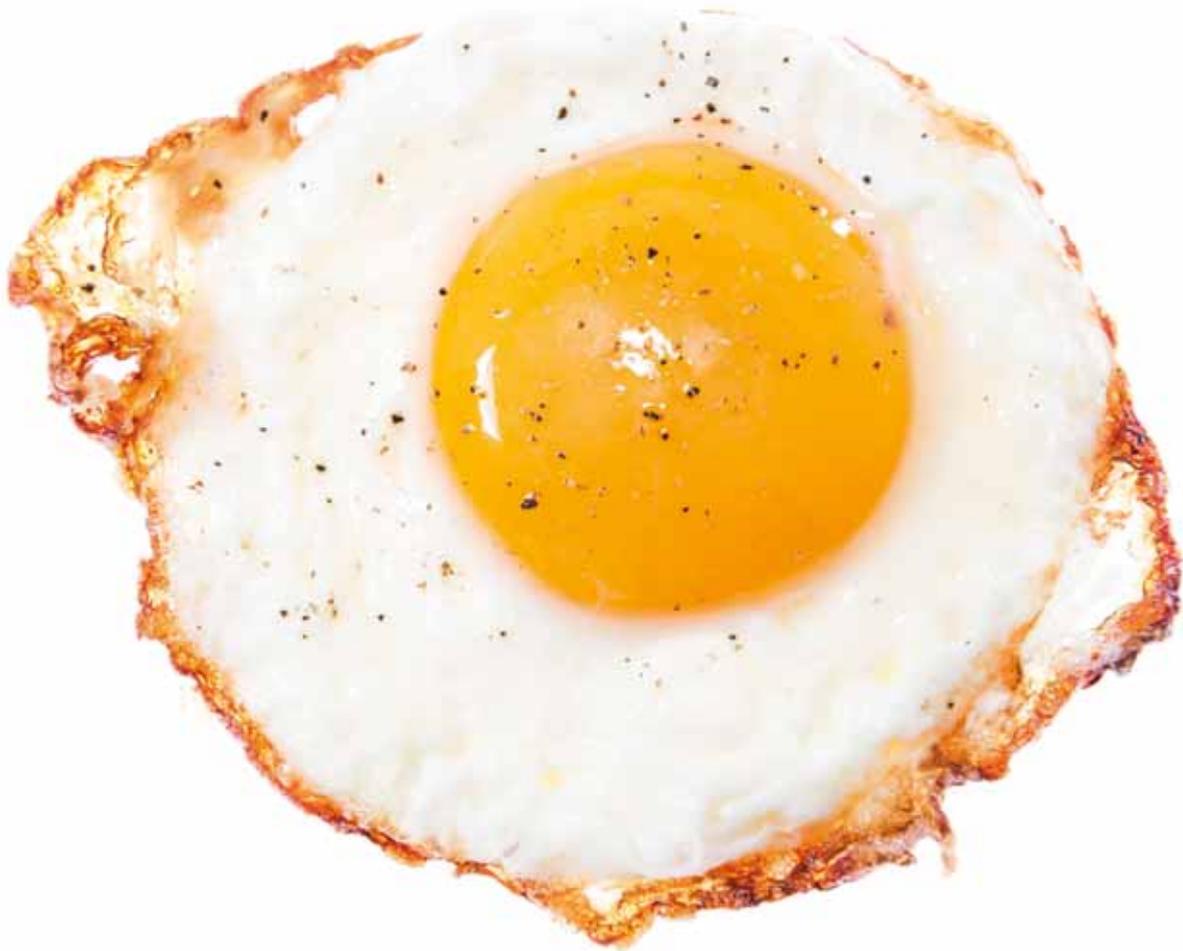
In comparison with the placebo, sleep quality and mental alertness improved in the ashwagandha-treated group.

Ashwagandha was well tolerated and reported as safe and beneficial by those who received it.

**Editor's Note:** Ashwagandha is one of the most important herbs used in Ayurveda. It has been found to increase testosterone levels and lower cortisol levels in humans, lengthen the life of roundworms, and increase the activity of telomerase, an enzyme that lengthens telomeres (protective genetic material that caps and protects the ends of chromosomes) in cell cultures.

\* *Cureus*. 2020 Feb 23;12(2):e7083.





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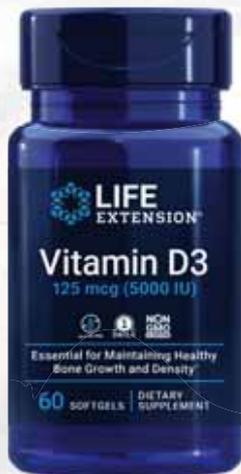
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# D

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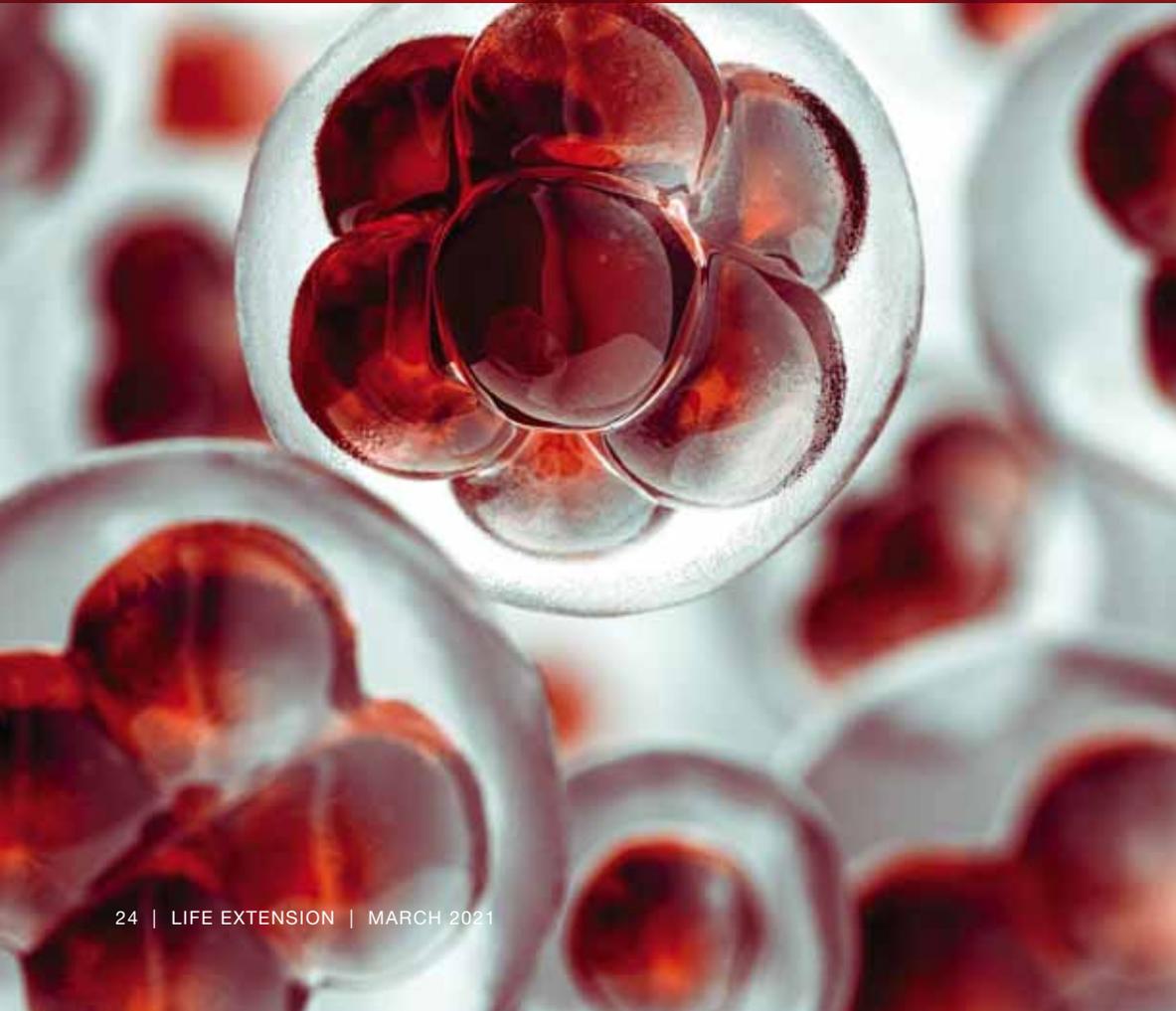
**CAUTION:** Individuals consuming more than 50 mcg (2000 IU)/day of vitamin D (from diet and supplements) should periodically obtain a serum 25-hydroxy vitamin D measurement. Do not exceed 10000 IU per day unless recommended by your doctor. Vitamin D supplementation is not recommended for individuals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

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# Restore Youthful Cell Function via AUTOPHAGY

BY CELIA SIMMONS





With age, the insides of our cells accumulate damaged proteins and other debris that impair youthful function.

Humans are equipped with a built-in process that removes these toxic waste products to make room for healthy internal regeneration.

This natural, cell housekeeping process is called **autophagy**.

Autophagy *declines* with age and poor diet,<sup>1</sup> causing cells to be damaged at an increasing rate.<sup>2</sup>

Animal studies show that *stimulating autophagy* leads to improvements in healthspan and *increased longevity*.<sup>3-5</sup>

Scientists at **Life Extension®**, in collaboration with the **Insilico Medicine** research group, identified two plant extracts that stimulate **autophagy**.

## What Is Autophagy?

Every cell in the body contains **proteins** and other components that serve vital metabolic purposes, from regulating cellular function to facilitating biochemical reactions.

When we are young, our internal cell machinery and its built-in cleaning process (autophagy) work at peak efficiency. This enables younger cells to clean up their metabolic waste.

The literal definition of autophagy is **self-eating**. In this process, the cell consumes and breaks down old cellular parts and debris.

This normal autophagy process supports healthy tissue function and **promotes overall health**.

But aging and poor diet contribute to *lower* rates of autophagy.<sup>1,4</sup>

As autophagy slows down, metabolic waste products and toxins accumulate. This slowdown compromises optimal cellular function.

The result is that cell health and function rapidly *decline*. This autophagy decline has been linked to many diseases of older age.<sup>4,6-10</sup>

## Boosting Autophagy Extends Healthy Lifespan

In recent years, scientists investigating ways to maximize lifespan and reduce risk of chronic disease have increasingly focused on **autophagy**.<sup>4,6-9</sup>

In several animal studies, *stimulating* autophagy led to **increased longevity**.<sup>3-5</sup>

One study activated **autophagy** in mice by altering gene expression. The **lifespan** of these mice was extended by an average of **17.2%**.<sup>5</sup>

This would be the equivalent of increasing the **average human lifespan** in the U.S. from **78.5 years** to **92 years**.

These animals didn't just live longer. They were also healthier.

They maintained **lower body weight** than normal mice well into older age. They had increased insulin sensitivity, indicating improved metabolic health. And they had better physical functioning.

When the scientists inhibited the **autophagy** process, all these beneficial effects disappeared. That indicates that autophagy stimulation was the factor responsible for the health and longevity improvements.





### Ways to Stimulate Autophagy

Research has shown that during times of **intermittent fasting** or **caloric restriction**, when nutrients are scarce, cells activate **autophagy** on their own.<sup>11,12</sup>

Physical **exercise** also stimulates autophagy.<sup>13</sup>

At a cellular level, two regulatory proteins play a key role in controlling autophagy: **mTOR** and **AMPK**.

The protein **mTOR** acts as a nutrient sensor. When **caloric intake** is high and nutrients are abundant, mTOR is activated and **shuts off** autophagy.<sup>14</sup> Inhibiting excess **mTOR activity**, on the other hand, can lead to **increased autophagy** (removal of cellular waste).

Said differently, constant consumption of **calories** denies aging cells the ability of clean house via **autophagy**. Fasting **16-18 hours** most days can facilitate autophagy, but most people need ancillary support in the form of drugs or nutrients that suppress excess **mTOR**.

**AMPK** is an **activator** of autophagy. Stimulating AMPK has been shown to improve metabolic health and lifespan.<sup>14-16</sup>

Using this knowledge, scientists set out to discover effective ways to stimulate autophagy.

### WHAT YOU NEED TO KNOW

## Keep Cells Working Smoothly

- Autophagy is a process cells use to remove old and damaged parts and replace them with new ones. This helps keep cells clear of debris, youthful, and fully functional.
- With age comes a decrease in autophagy, combined with an increase in accumulated damage, accelerating the aging process and increasing risk for many chronic diseases.
- Scientists have identified two nutrients that can stimulate autophagy: the flavonoid luteolin and piperlongumine, a compound isolated from the long pepper plant.
- Working in overlapping and distinct ways, these nutrients can help to maintain cells clear of debris, and functioning to promote better health.



## Autophagy Enhancers and Senolytics: A Powerful Pair

Cellular **senescence** is a major contributor to the aging process. Senescent cells have become old and dysfunctional but refuse to die off to make room for new, healthy cells.

Compounds called **senolytics** can *remove* these harmful cells from tissues.

One effective senolytic approach is a weekly combination of **quercetin**, **theaflavins**, and **apigenin**, together with the recently *bioavailable* **fisetin**.

Using senolytics *and* nutrients that activate **autophagy** is a way to help fight aging.

**Autophagy** helps to keep cells healthy and potentially functioning longer, while **senolytics** get rid of cells that are *already* damaged.

These interventions may help keep tissues in peak form and prevent age-related deterioration and disease.

Working with advanced **artificial intelligence (AI) technology**, they focused on two nutrients, **luteolin** and **piperlongumine**.

Each has been shown to induce **autophagy** individually via overlapping and distinct mechanisms.

### Luteolin Protects Brain and Body

**Luteolin** belongs to the **flavonoid** group of plant nutrients. It is found in several fruits, vegetables, and herbs, including broccoli, parsley, and thyme.

Luteolin has been shown to both **increase AMPK** activity and **inhibit mTOR** signaling.<sup>17-20</sup> The cumulative effect is that **autophagy** is activated, and cellular metabolism is improved.

In animals and cell culture, treatment with **luteolin** has been shown to protect the brain, heart, and tested cells.<sup>21-29</sup>

For example, animals with a **brain injury** fared better than their non-treated counterparts when given **luteolin**.<sup>27</sup>

Autophagy was activated, inflammation was reduced, and the overall outcome and recovery from the injury were improved.

## Piperlongumine Keeps Cells Youthful

**Piperlongumine** is a compound isolated from the **long pepper** plant.

Like luteolin, piperlongumine has been shown in animal and cell-culture studies to **activate autophagy** by inhibiting mTOR signaling.<sup>30,31</sup> There is also evidence that it activates AMPK.<sup>32</sup>

But piperlongumine encourages autophagy in another way that's distinct from luteolin.

A protein known as **beclin-1** is a critical *activator* of **autophagy**. Another protein, called **Bcl-2**, binds to beclin-1 and *blocks* its ability to start autophagy.

Piperlongumine causes the release of **beclin-1** from Bcl-2, allowing it to activate autophagy.<sup>30</sup>

Luteolin and piperlongumine hold promise in maximizing healthy autophagy, rejuvenating cells, and maintaining their optimal function.

### Summary

**Autophagy declines** with age and poor diet, causing cells to become overwhelmed by damage and metabolic waste at an increasing rate. This leads to accelerated aging and increased risk for **chronic disease**.

**Stimulating autophagy** can help prevent this slide into old age, improving the health and extending the lifespan of animals.

Scientists at the **Insilico Medicine** group in collaboration with LifeExtension® have found two nutrients that activate autophagy: **luteolin** and **piperlongumine**.

In overlapping and distinct ways, they stimulate beneficial autophagy. Together, they can help keep cells functioning youthfully for improved health. •

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

### What is Insilico Medicine?

Discovery of new medicines and nutraceuticals often takes years. Insilico Medicine has created a paradigm shift by using advanced **artificial intelligence** that reduces development time and costs by analyzing thousands of data points to identify nutrients that reduce aging factors.

With over 120 scientists, the Insilico Medicine group uses **deep-learning artificial intelligence technology** to identify compounds to circumvent deleterious aging processes.

A unique aspect of Insilico's research into dietary ingredients is referred to as "geroprotectors" that mimic the young, healthy signaling state in older human tissues. This research has allowed Insilico to identify nutrients that target aging factors such as **cellular senescence**, declining **stem cell health** and reduced **autophagy**. These nutrient-based "geroprotectors" provide research-driven data to create formulations that foster longevity and increased lifespan.

In addition to nutrient discovery, Insilico works with global pharma and biotech to discover new therapeutics to treat cancer, immune dysfunction and senescence



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# Magnesium's Role in HEART HEALTH

BY MICHAEL DOWNEY





Magnesium is a hard-working mineral.

It helps **300 enzymes** perform vital functions throughout the body.

Magnesium's benefits range from building bone to producing energy and synthesizing proteins.<sup>1</sup>

But it doesn't stop there.

It also helps prevent an array of **cardiovascular disorders**.

Dietary surveys have shown *deficient* intake of **magnesium** is epidemic in the United States.

Data from the *National Health and Nutrition Examination Survey* show that **48%** of Americans of all ages have intake *below* the **estimated average requirement**.<sup>1,2</sup>

Inadequate magnesium levels have been linked with an increased risk for cardiovascular disease, including stroke, coronary heart disease, heart failure, arrhythmias, and death.<sup>3,4</sup>

*Higher* blood levels of **magnesium** are associated with a *lower* cardiovascular disease risk.<sup>4</sup>

## Hidden Danger of Low Magnesium

**Magnesium** is a mineral found in many foods, including leafy vegetables, whole grains, beans, nuts, yogurt, and fish.

But it's difficult to get and **absorb** enough from dietary sources alone.

Approximately **64%** of all men and **67%** of women in the U.S. have inadequate dietary intake of magnesium. Among those above age 71, roughly **81%** of men and **82%** of women have inadequate dietary intake of magnesium.<sup>5,6</sup>

That's a serious problem.

Magnesium is involved in critical metabolic functions.<sup>7</sup> This means that myriad bodily systems and functions *depend* on **adequate** magnesium and suffer when **deficiency** occurs.<sup>5</sup>

Adequate magnesium is especially important for healthy and efficient function of **heart muscle** and **blood vessels**.

Recent human studies confirm a strong association between *low* magnesium levels and *higher* heart disease risk.<sup>5</sup>



## Correcting Arrhythmias

People with *low* magnesium levels are *more* susceptible to developing **arrhythmias**, potentially fatal disorders of heart rhythm.<sup>8</sup>

Arrhythmias involve abnormal conduction of the electrical impulses that govern heartbeat, causing a beat that is irregular, too fast, or too slow.<sup>9</sup>

**Atrial fibrillation**, an irregular and often rapid heartbeat, is the leading cardiac cause of **strokes**. This happens when a fluttering **atrial** chamber in the heart causes a clot (thrombus) to form that travels up a carotid artery and blocks blood flow to a portion of the brain. This is called an **ischemic stroke**; the term "ischemia" means "**no blood flow**".

One large study found that people with the lowest blood magnesium levels were approximately **50% more likely** to develop **atrial fibrillation** than those with the *highest* levels. This association occurs even in people *without* cardiovascular disease.<sup>10</sup>

**Magnesium** intake has been shown to correct low-magnesium-related arrhythmias.<sup>11,12</sup>

For example, intravenous (IV) magnesium is routinely used *before* many heart surgeries that are known to induce postoperative arrhythmias.<sup>13-17</sup>

**Oral magnesium** is often recommended for those with arrhythmias and low magnesium levels.

## Fighting Endothelial Dysfunction

**Endothelial dysfunction** occurs when the cells lining the inside walls of blood vessels (the **endothelium**) lose normal, healthy function.<sup>18</sup>

This promotes the formation of artery-blocking plaque, resulting in **atherosclerosis**, a narrowing of the arteries that restricts blood flow.<sup>19,20</sup>

In cultured human endothelial cells, magnesium *deficiency* activates the protein complex **NF-kB** (nuclear factor kappa B), a major facilitator of atherosclerosis.<sup>21</sup>

In a randomized, controlled human trial, women aged 40-65, all of whom had high blood pressure and were on diuretic therapy, took either a placebo or **600 mg of magnesium** daily.<sup>22</sup>

After six months, those taking magnesium had significantly improved **endothelial function**, which led to *reductions* in blood pressure and *increased blood vessel dilation* (widening).

Systolic blood pressure fell, on average, from **144 mmHg** to **134 mmHg**, and diastolic blood pressure decreased from **88 mmHg** to **81 mmHg**.



## WHAT YOU NEED TO KNOW

### The Cardiovascular Benefits of Magnesium

- **Magnesium** is a mineral needed for at least **300 enzymes** throughout the body to perform their metabolic functions.
- Human studies confirm a strong association between *low* magnesium levels and *higher* risks of **cardiovascular diseases**.
- Almost half of Americans of all ages are below the estimated average requirement for magnesium.
- Human studies demonstrate that taking **oral magnesium** helps ward off cardiovascular problems and supports overall heart health.

In addition, the thickness of the carotid artery—a measure of unhealthy arterial thickening—rose in placebo patients but remained unchanged in magnesium-treated patients.<sup>22</sup> Thickening of the carotid artery indicates progression of atherosclerosis.

### Preventing Heart Failure

**Heart failure** occurs when the heart doesn't pump enough blood to meet the body's needs.

Currently there are about **6.2 million** adults in the U.S. with **heart failure**.<sup>23</sup>

In one study of 22 patients with symptomatic chronic heart failure, an **800 mg/day** dose of magnesium for three months produced a significant *increase* in **arterial compliance** (a measure of how well an artery can relax and contract in response to blood flow).<sup>24</sup>

This suggests improved **endothelial function** and improved ability of the arteries to deliver oxygen-rich blood to target organs.

**Blood levels** of magnesium are *also* strongly associated with cardiovascular risk.

An epidemiological study of 3,523 men aged 60-79, with no prior history of cardiovascular disease, demonstrated that **risk for heart failure** declined steadily with rising magnesium levels.<sup>25</sup>

## Heartburn Drugs Linked to Dangerously Low Magnesium

The U.S. Food and Drug Administration has advised doctors to check patients' magnesium levels *before* prescribing medications known as **proton-pump inhibitors** or **PPIs**.<sup>38</sup>

Proton-pump inhibitors like Prevacid®, Prilosec®, and Nexium® are taken for the treatment of **heartburn**, also known as **gastroesophageal reflux disease (GERD)**. They are also used to treat peptic ulcer disease.

A scientific review of 35 studies from 2010 to 2018 suggests that, in some people, taking proton-pump inhibitors *causes* low magnesium levels.<sup>39</sup>

These low levels are associated with increased risk of **cardiac arrhythmias**, and with one often-deadly type in particular, **tor-sade de pointes** (or **TdP**), which can result in sudden **cardiac arrest**.<sup>39</sup>

Talk to a doctor about whether to check your magnesium levels before taking proton-pump inhibitors.

Those with the *highest* magnesium blood levels had a **44% lower** risk of heart failure than those with the lowest levels. Higher magnesium levels in this study were associated with reduced markers of **inflammation** and **endothelial dysfunction**.<sup>25</sup>

### Reducing High Blood Pressure

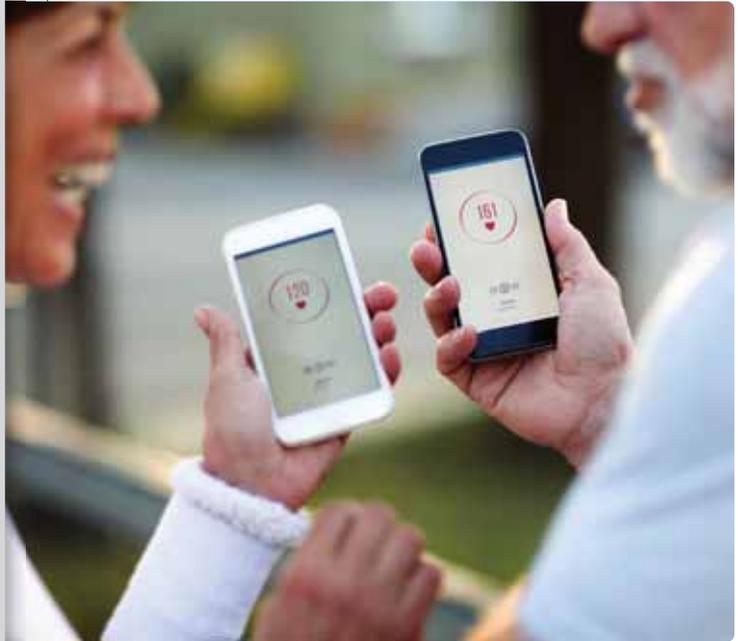
Excess body weight, lack of physical activity, diabetes, and normal aging increase the chances of developing high blood pressure.<sup>26,27</sup>

A link between magnesium and hypertension has been shown in several human clinical trials.<sup>28-30</sup>

These studies show that the *lower* the magnesium level in patients, the *higher* the systolic blood pressure.

One meta-analysis of trials that enrolled more than 2,000 subjects, found that supplementation with magnesium reduced **systolic** and **diastolic blood pressure** in hypertensive patients.<sup>31</sup>

Those who fail to achieve optimal systolic blood pressure under 120 to 130 mm Hg should consider an anti-hypertension drug like telmisartan.



### Lowering Heart Attack and Stroke Risk

Human studies also demonstrate an association between *low* magnesium and *increased* risk of heart attack and stroke.<sup>6,32-35</sup>

In one analysis of human trials that included a whopping **241,378 participants**, researchers found that every **100 mg** of **magnesium** in the daily diet was associated with an **8% lower** risk of **stroke**.<sup>34</sup>

A similar association was found in a later published meta-analysis.<sup>35</sup>

### Combating Coronary Artery Disease

**Coronary artery disease** occurs when the arteries to the heart become narrowed due to atherosclerotic plaque. This reduces blood flow and significantly boosts the risk of a heart attack.

It is the leading cause of death in men and women in the U.S.<sup>36</sup>

**Magnesium** intake has been shown to improve heart function *and* exercise tolerance in patients with coronary artery disease.

In one study, scientists gave 53 men with coronary artery disease **365 mg** of **oral magnesium citrate twice daily**. After six months, they had improved oxygen utilization during exercise and greater pumping action in their left ventricle, the heart's main pumping chamber.<sup>37</sup>

These effects indicate that magnesium improved blood flow and oxygen delivery in these patients.

## Summary

The mineral **magnesium** is vital for **heart health**.

More than **80%** of people over **age 71** have inadequate dietary intake of magnesium, placing them at risk for serious cardiovascular events.

Cardiovascular disease, including stroke, coronary heart disease, heart failure, arrhythmias, and even death, has been associated with inadequate magnesium levels.

Low-cost **magnesium supplements** offer an easy solution to replenish this essential mineral. •

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

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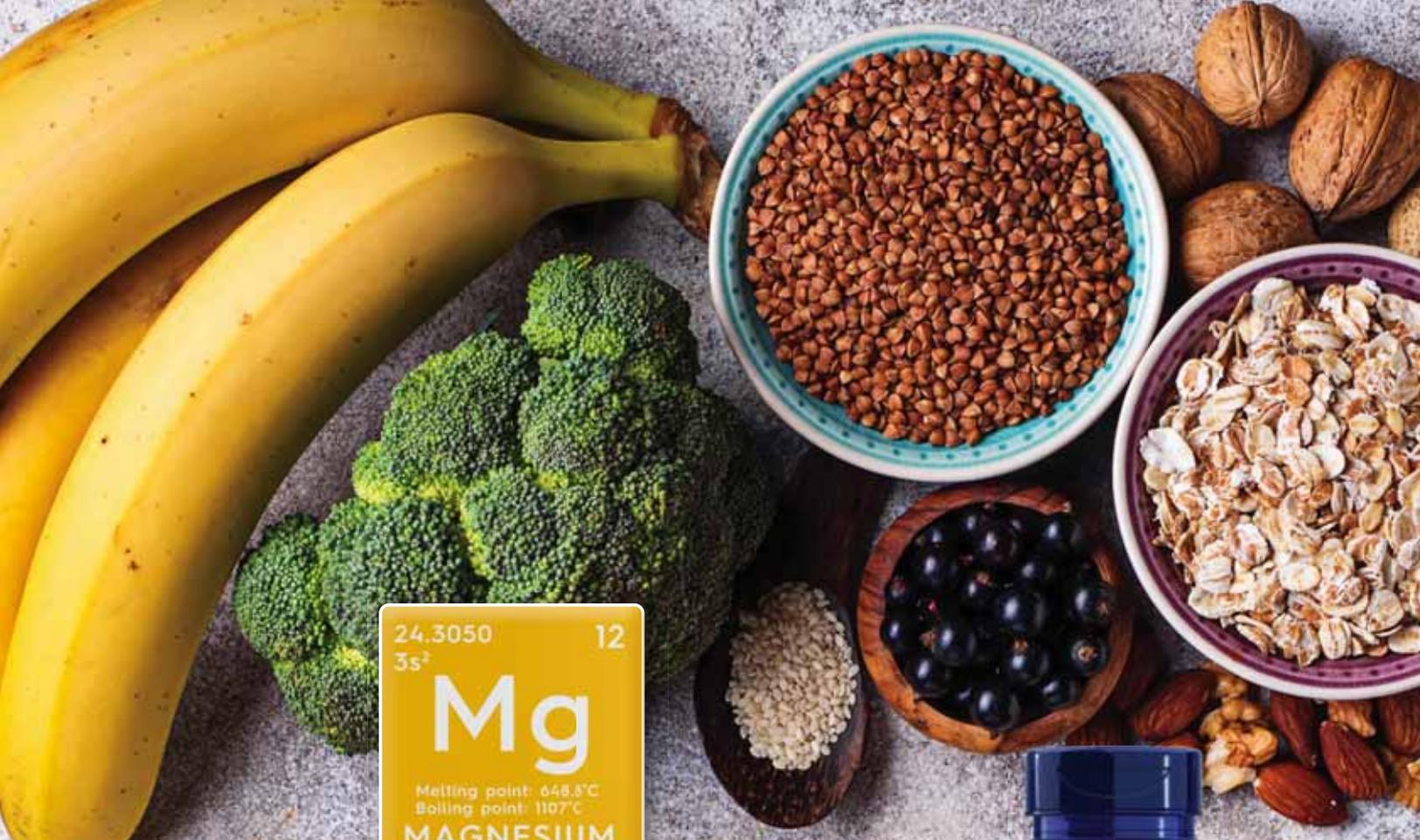
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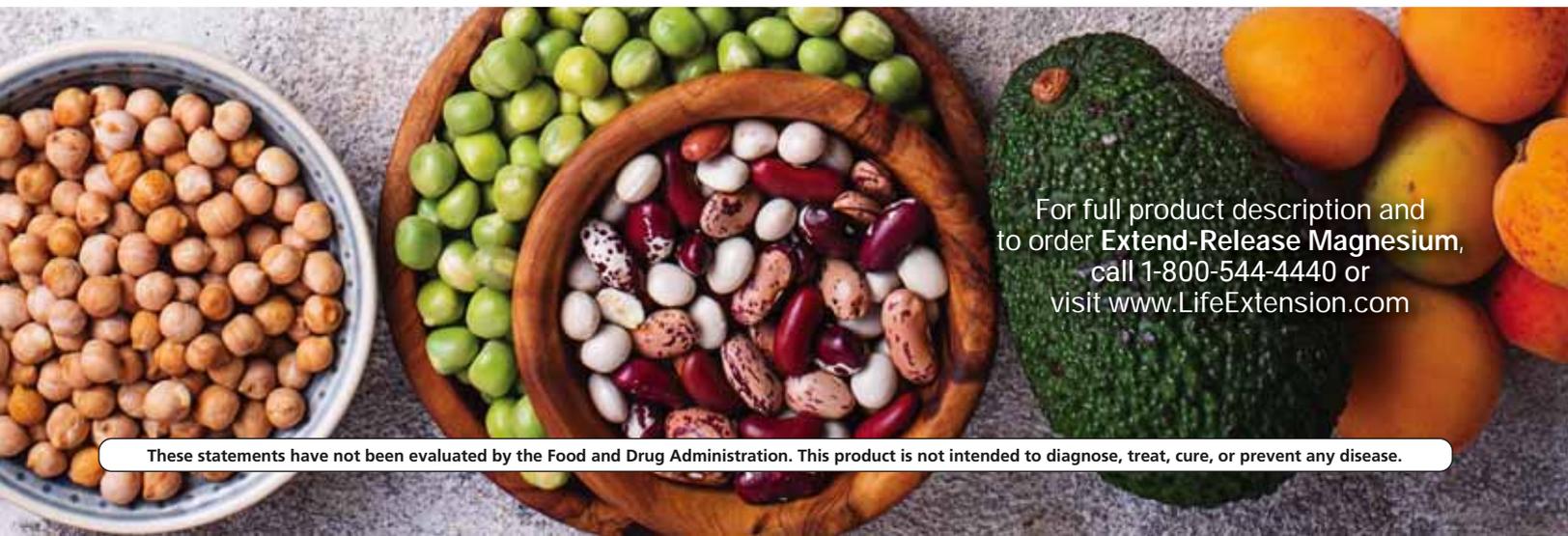
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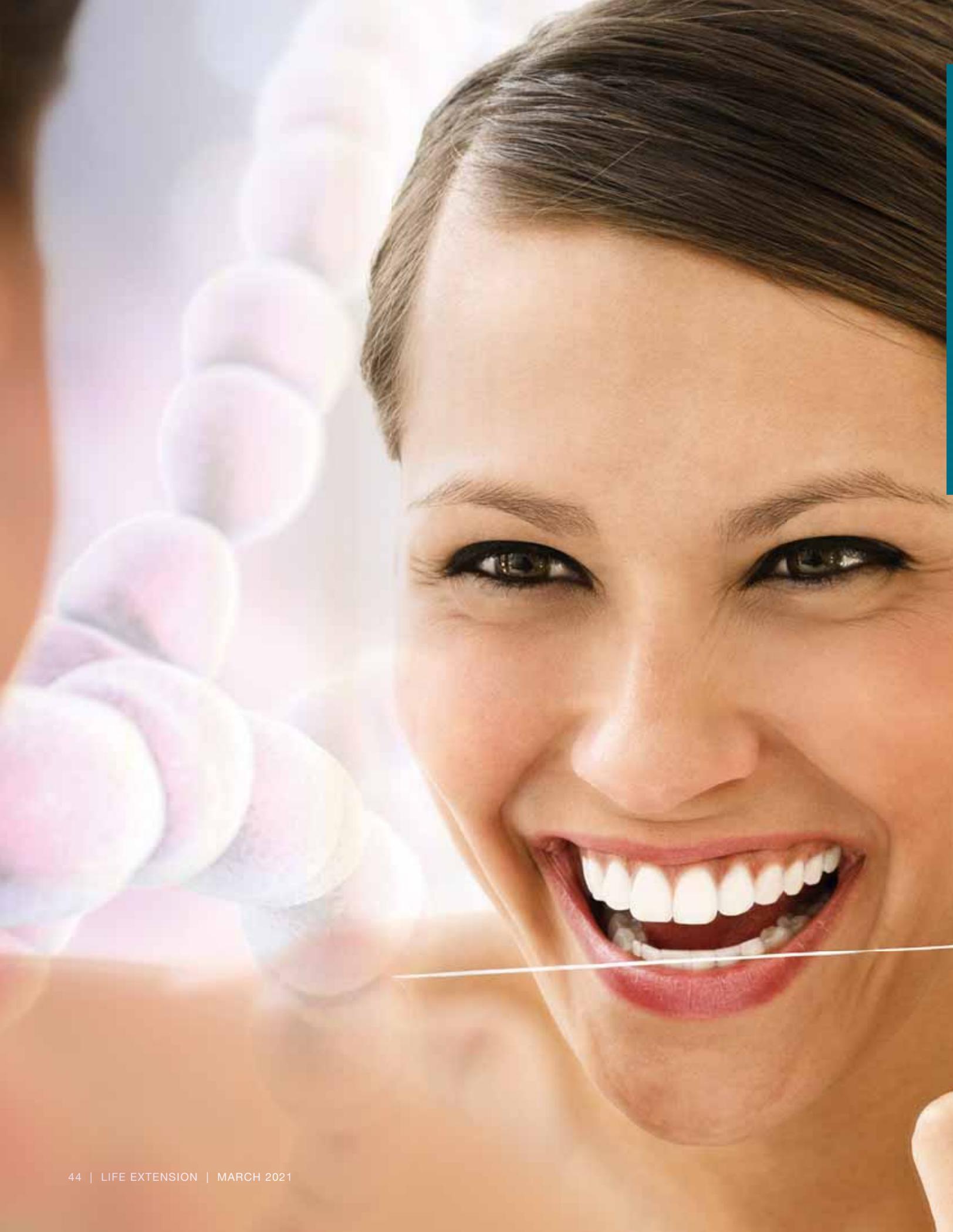
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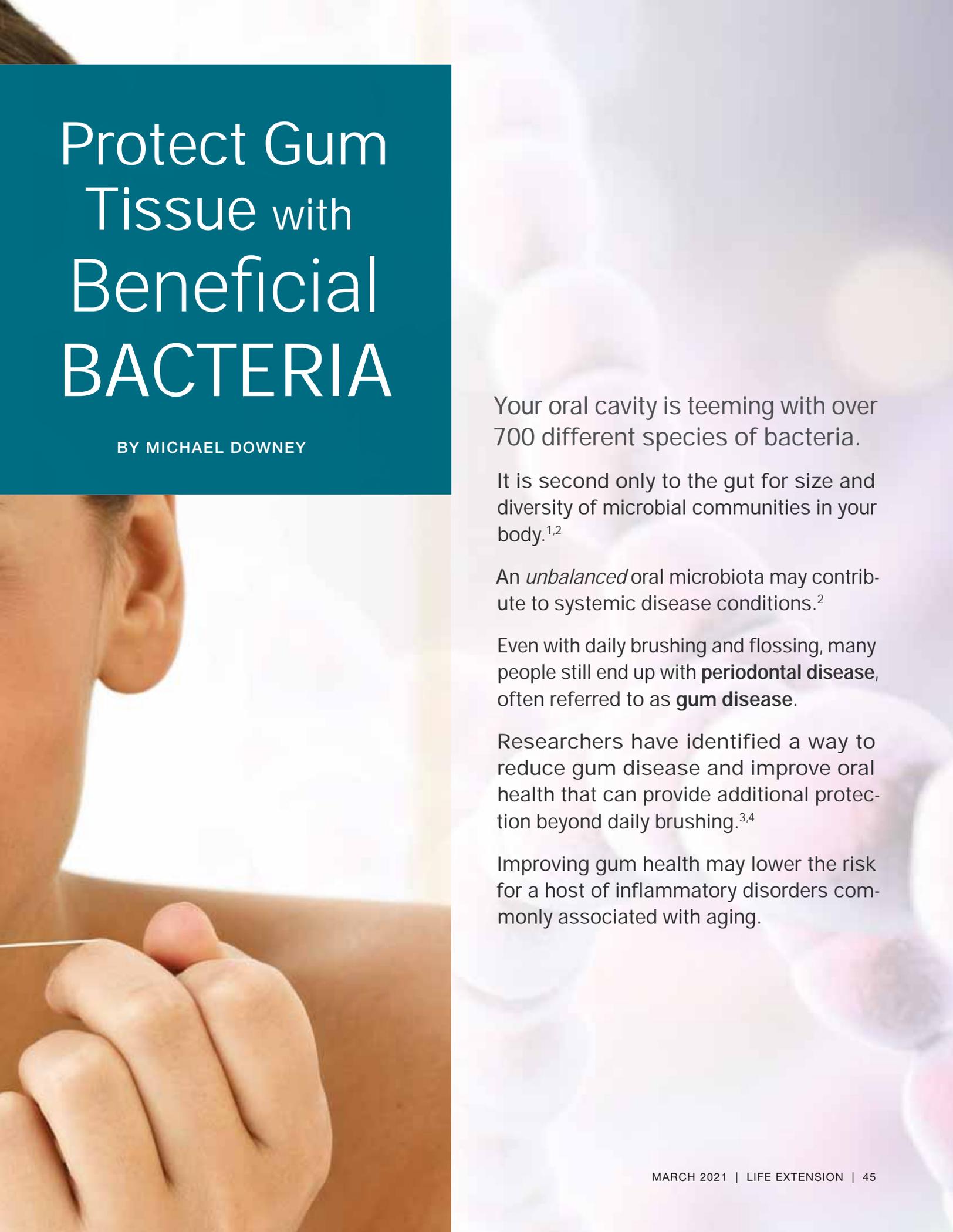
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# Protect Gum Tissue with Beneficial BACTERIA

BY MICHAEL DOWNEY

Your oral cavity is teeming with over 700 different species of bacteria.

It is second only to the gut for size and diversity of microbial communities in your body.<sup>1,2</sup>

An *unbalanced* oral microbiota may contribute to systemic disease conditions.<sup>2</sup>

Even with daily brushing and flossing, many people still end up with **periodontal disease**, often referred to as **gum disease**.

Researchers have identified a way to reduce gum disease and improve oral health that can provide additional protection beyond daily brushing.<sup>3,4</sup>

Improving gum health may lower the risk for a host of inflammatory disorders commonly associated with aging.

## Gum Disease Threatens the Whole Body

More than **47%** of people over age 30 have **gum disease**. After age 65, the rate rises to a shocking **70%**.<sup>5</sup>

Gum disease, or **periodontal disease**, is associated with disorders throughout the body, including cardiovascular, lung, kidney, bone, and Alzheimer's diseases.

An underlying link is periodontal disease's effect on the **oral microbiota**, the natural community of microbes living in the oral cavity.

When healthy, the oral microbiota supports and protects the delicate mucous membranes as well as the surface of the teeth themselves.

However, inadequate oral hygiene, as well as poor diet and lifestyle factors, drugs, and disease, can disrupt this balance. The resulting microbial imbalance—often called **dysbiosis**—allows excessive growth of pathogenic (disease-causing) organisms in the oral cavity.

This, in turn, disrupts the mouth's immune system and creates a vicious cycle that can have disastrous effects on many body systems,<sup>6</sup> causing diseases in parts of the body far removed from the mouth itself.<sup>7</sup>

## Two Beneficial Bacteria Halt Gum Disease

**Probiotics** are beneficial live bacteria. They have been used for years to rebalance the **gut microbiota**, supporting the growth of helpful organisms and crowding out harmful ones.

The **oral cavity** holds the *second largest and diverse microbiota* after the gut.<sup>1</sup>

Beneficial bacteria reduce the dangerous strains, which allows a wider range and number of beneficial microbes to succeed.

After studying numerous types of bacteria, scientists identified **two specific strains** that can restore oral health and halt the process of periodontal disease:<sup>3,8,9</sup>

- ***Lactobacillus plantarum* L-137**, which boosts oral immune function and promotes healing, and
- ***Streptococcus salivarius* M18**, which kills harmful oral bacteria and then flourishes.

## Beneficial Effects

Scientists conducted research into understanding how these two bacteria promote oral health.

They found that a heat-treated form of ***Lactobacillus plantarum* L-137** could improve the immune system's fighting ability.<sup>3</sup>

In a rat model of metabolic syndrome, oral treatment with ***L. plantarum* L-137** was shown to have **anti-inflammatory** effects on cardiac and fat tissue. That resulted in *reduced*:<sup>10</sup>

- Heart dysfunction,
- Accumulation of fat mass under the skin,
- Insulin resistance (a cause of high blood sugar), and
- Levels of pro-inflammatory **IL-6**.

The probiotic ***Streptococcus salivarius* M18** was shown to:

- Colonize the human mouth to generate healthy bacteria to compete with harmful bacteria,<sup>8,9</sup>
- Generate bacteria-suppressing weapons called *bacteriocins*, which function like antibiotics at the local level,<sup>11-13</sup> to inhibit tooth and **gum disease**-producing organisms,<sup>8,12-14</sup>



- Produce the enzymes **dextranase** and **urease**, which break down dental plaque,<sup>8</sup>
- Promote a neutral oral **pH**, which supports the oral microbiota,<sup>8</sup> and
- Reduce **IL-6**, lowering the inflammation that accelerates gum disease and threatens the body.<sup>8</sup>

Researchers then set out to validate these strains in **clinical** trials.

### ***L. plantarum* L-137** Fights Gum Disease

Scientists conducted a controlled, randomized trial of ***L. plantarum* L-137** on 39 volunteers with chronic **periodontitis**.<sup>3</sup>

Some participants received a placebo. Others took a capsule containing heat-treated ***L. plantarum* L-137**.<sup>3</sup>

Researchers used a periodontal probe to measure the **pocket depth**, the distance from the gum line to the bottom of the tiny pocket between the gum and tooth root. Healthy gum pockets are **3 mm** or less, while a depth of **4 mm** or more is clinically defined as **periodontal disease**.<sup>15</sup>

After 12 weeks, those treated with ***L. plantarum*** had a **64%** greater improvement in pocket depth than placebo recipients.<sup>3</sup>

These results demonstrate that periodontal disease can be improved with ***L. plantarum* L-137**.

### ***S. Salivarius*** Improves Oral Health

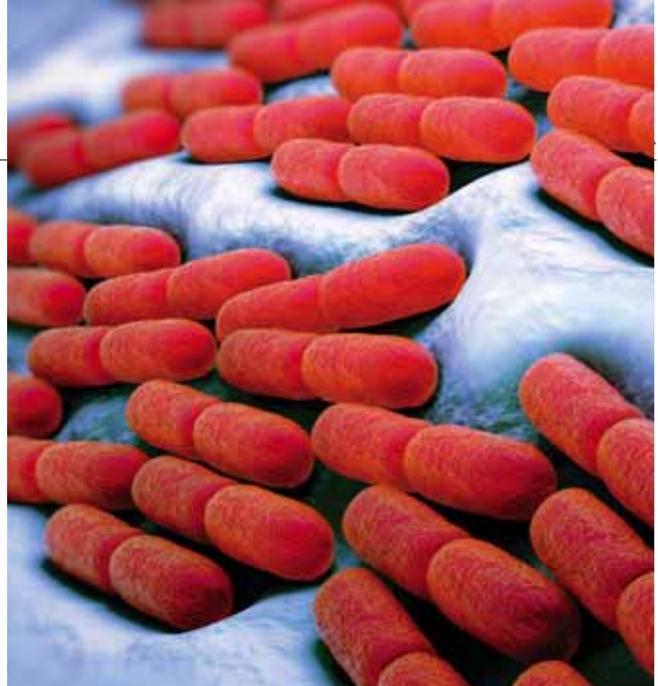
Reducing pocket depth is just one piece of the periodontal disease puzzle, another is dental plaque.

One clinical trial showed that **88%** of ***S. salivarius*** recipients maintained **plaque** scores *lower* than their pretreatment values after a three-month treatment period, compared with **44%** of placebo recipients.<sup>8</sup>

Investigators then conducted a trial to test how ***S. salivarius* M18** affected broader parameters of oral health.<sup>4</sup>

Scientists recruited men and women, aged 20-60, with moderate or severe **gingivitis** (inflammation of the gums) and moderate **periodontitis**.

For 30 days, half received no treatment, and half took lozenges containing **200 million** bacteria of the ***S. salivarius* M18** strain daily after brushing.<sup>4</sup>



## WHAT YOU NEED TO KNOW

### Beneficial Bacteria Promote Oral Health

- **Gum disease** is extremely common in older adults. It often leads to bleeding gums and tooth loss.
- Gum disease is associated with body-wide health problems, including cardiovascular disease, lung and kidney diseases, cancer, and others.
- Maintaining a healthy and balanced **oral microbiota** protects against gum disease.
- A heat-treated form of the probiotic strain ***L. plantarum* L-137** *boosts* oral immune function, reducing inflammation and promoting healing.
- The probiotic strain ***S. salivarius* M18** has been documented to rebalance the bacterial populations of the mouth, improving oral health.
- Taken daily, these two beneficial bacteria can help prevent gum disease, enhancing oral *and* total body health.

On the last day of treatment, compared to the untreated group, those in the **S. salivarius M18** group had:<sup>4</sup>

- **44%** lower mean **plaque index** scores,
- **42%** lower mean **gingival index** scores (which assess the prevalence and severity of gingivitis),
- **53%** lower modified **sulcus bleeding index** scores (a measurement of gum bleeding), and
- **20%** lower **pocket depth** measurements.

Treatment was then stopped, and measurements were taken 30 days later. Even then, *a month after treatment had ended*, the lozenge group had:<sup>4</sup>

- **37%** lower mean **plaque index** scores,
- **35%** lower mean **gingival index** scores,
- **51%** lower modified **sulcus bleeding index** scores, and
- **22%** lower probing **pocket depth** measurements.

This means that the probiotic lozenge significantly improved periodontal health—and sustained these benefits long after treatment stopped.

## Summary

**Gum disease** affects more than **70%** of older adults. It often leads to tooth loss and is associated with an increased risk of serious disorders throughout the body.

A cofactor in the development of periodontal disease is an imbalance in the normal microbial community of the oral cavity.

Scientists have shown that a heat-treated form of the probiotic strain **L. plantarum L-137** boosts oral immune function, reduces inflammation, and promotes healing.

A second probiotic strain, **S. salivarius M18**, rebalances the bacterial populations of the mouth, crowding out harmful microbes.

Studies show that these two beneficial bacteria strains help prevent gum disease and protect oral *and* total body health.

The ideal time to initiate **oral probiotics** is after a professional teeth cleaning.



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

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#### References

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2. *Neurosci Bull.* 2016;32(6):591-6.



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A woman with long, wavy grey hair is sitting in a white wicker chair. She is wearing a purple long-sleeved top and white pants. She is holding a white mug with both hands and looking towards the camera with a slight smile. The background is a bright, out-of-focus indoor setting with a window showing blinds.

# GREEN TEA'S Neuroprotection Benefits

BY SHELDON CANNON



Scientists are finding that compounds found in **green tea** can bolster and protect brain health.<sup>1-4</sup>

One meta-analysis found that the rate of cognitive disorders was **35%** lower in people who regularly drank tea.<sup>5</sup>

Parkinson's disease risk was reduced by **26%** for *every two cups per day* of tea consumed in another study.<sup>6</sup>

The healthful compounds found in green tea work in several different ways to boost brain function and guard against cognitive decline.

For those who do not consume enough green tea, standardized **extracts** provide the beneficial polyphenols called **catechins**.

## Green Tea Medicine: Catechins

The tea plant, *Camellia sinensis*, is packed with the health-promoting compounds known as **catechins**.

One of the most abundant and widely studied catechins in green tea is **epigallocatechin gallate (EGCG)**.

Studies of whole tea consumption, extracts of green tea, and individual isolated catechins, have all demonstrated health benefits.<sup>7-13</sup>

Scientists have identified scores of mechanisms by which green tea wards off disease and the ravages of aging.

The widespread consumption of green tea has led to large observational studies that evaluate its association with risk for various disorders, including age-related cognitive decline.

## Improving Brain Performance and Mood

Many of these effects of green tea help maintain strong mental function well into the future. But it also has *immediate* effects that improve brain function *now*.

Researchers used memory tasks and an advanced imaging technology called **functional MRI** to evaluate

cognitive functions in healthy volunteers.<sup>14</sup> They found that people who were given a **green tea** extract performed better on memory tasks. They also observed enhanced connectivity between areas in the brain involved in the tasks.

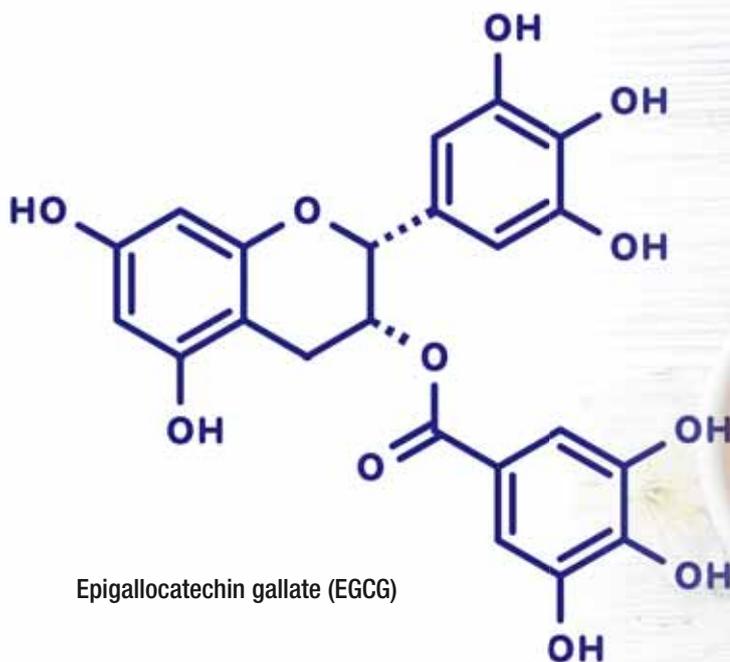
This means they were able to demonstrate *physiological changes in the brain* that correlated with improved mental function.

Another study, using an electroencephalogram to monitor brain activity, saw an overall *increase* in brain wave activity after consuming an EGCG (green tea extract) supplement.<sup>15</sup>

Cognitive enhancement isn't the only mental function impacted by green tea. In studies in healthy adults, green tea also **reduced psychological stress**, including feelings of anxiety and depression, and led to a feeling of calmness.<sup>15,16</sup>

## Cognitive Impairment, Alzheimer's, & Dementia

Studies in humans have demonstrated a clear association between tea consumption and a lower occurrence of cognitive disorders, including everything from mild cognitive impairment to Alzheimer's.<sup>5, 17-20</sup>



One of the largest studies, a pooled analysis of 52,503 participants in countries around the world, found that tea significantly *reduced* the rate of multiple kinds of **cognitive disorders** by **35%**.<sup>5</sup>

Another large meta-analysis evaluated the risk of cognitive disorders in 48,435 individuals.<sup>19</sup> Overall, *higher* tea intake correlated with a significant *reduction* in **cognitive disorders**.

However, when researchers further analyzed these results, they found that **green tea** consumption was more reliably associated with the cognitive benefit than oolong or black tea.

The rate of cognitive disorders in habitual drinkers of **green tea** was **36%** lower than in non-habitual drinkers. Scientists also found a dose-response relationship: The *more* green tea consumed, the *greater the protection* from cognitive dysfunction. In practical terms, those who drank **16 ounces** of green tea per day derived nearly six times more protection from development of cognitive disorders than those who drank **3.5 ounces**.

Other studies have examined tests of cognitive function, rather than diagnoses of cognitive disease.<sup>17,18</sup>

In older adults, green tea was associated with superior performance on these tests. Green tea drinkers scored better for overall cognition, memory function, executive function, and the speed of information processing. And once again, *more* tea intake was linked to *higher* scores.

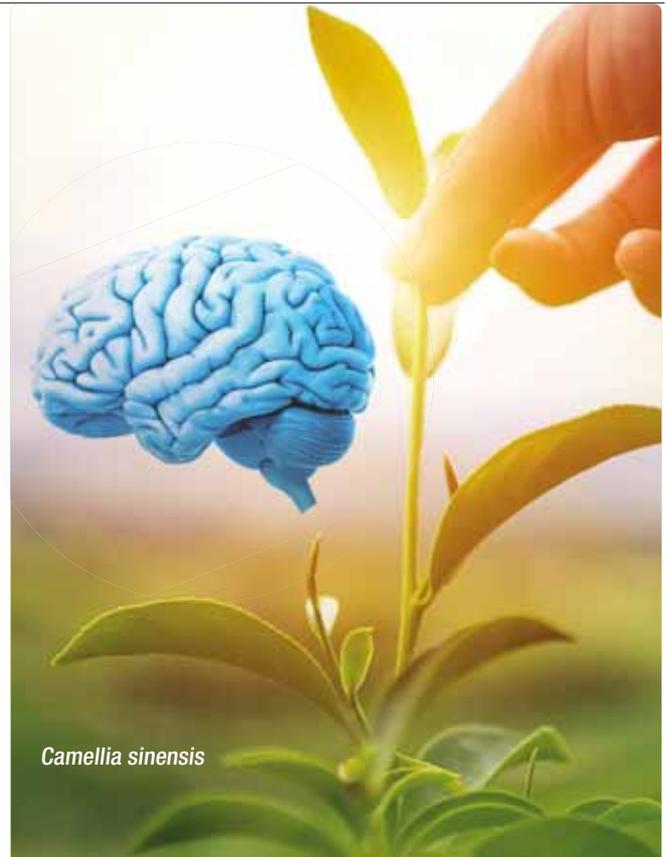
### Parkinson's Disease

Parkinson's disease is a neurodegenerative disorder that mostly affects nerve cells in the brain that produce the neurotransmitter dopamine.

It's marked by a progressive loss of motor function, creating difficulties including tremors, slowed movement, and difficulty initiating movements. In more advanced cases, cognitive loss occurs as well, leading to slowed thinking and dementia.

Case-control studies in non-western populations demonstrate a strong protective effect of tea against the development of Parkinson's disease.<sup>21-23</sup> Up to a **41%** lower rate of Parkinson's was found when comparing those who routinely consume the largest amounts of tea with those who rarely drink tea.

A large meta-analysis included data from a whopping 344,895 individuals all over the world.<sup>6</sup> As was observed in the studies of cognitive disorders, researchers noted that the *amount* of green tea



*Camellia sinensis*

## WHAT YOU NEED TO KNOW

### Green Tea

- Green tea polyphenols have been associated with many diverse health benefits.
- In the brain, green tea offers neuroprotective effects and shields the brain from age-related decline by boosting the creation of *new* brain cells and neural connections.
- Green tea also reduces the risk for neurodegenerative disorders such as Alzheimer's and Parkinson's disease.
- Many large, human studies have demonstrated that green tea intake is significantly associated with reduced risk for age-related cognitive decline and dementia.

intake correlated with the *degree of protection* from Parkinson's disease. In fact, they found that risk of Parkinson's was reduced by **26%** for every **two cups** per day consumed. This effect was more pronounced in European and Asian populations.

### Functional Disability

One large, prospective study evaluated the impact that green tea can have on functional disability, regardless of the underlying cause.<sup>24</sup> Almost 14,000 Japanese individuals over the age of 64 were followed over time. Researchers found a significant protective effect of greater green tea intake, *reducing* the risk for disability and the need for support for daily activities.

Yet again, the *more* tea a person consumed, the *greater* the protection observed. Those who drank **five or more cups** per day were **33%** less likely to have a significant functional impairment than those who consumed **less than a cup** per day. It's difficult to consume this much green tea but extracts typically contain the amount of polyphenols equivalent to many cups.

### Summary

Green tea and its extracts are widely recognized for their numerous health benefits.

In the nervous system, **green tea** provides many protective effects, including:

- Boosting **neurogenesis** (the creation of new brain cells) and **neuroplasticity** (the ability of the brain to adapt) into old age,<sup>13, 25-33</sup>
- Shielding from the progressive damage that leads to **neurodegenerative** disorders,<sup>2, 34-38</sup> and
- Offering **neuroprotection** against injuries such as stroke and head trauma.<sup>29, 39-42</sup>

In the short term, green tea also boosts cognitive function, supporting attention, focus, improvement in mood, and enhanced memory.

Large studies in humans have demonstrated that green tea and its extracts are capable of guarding against age-related brain dysfunction and risk for dementia.





While drinking **five or more cups** of tea per day is difficult, green tea extracts that provide high quantities of polyphenols (catechins) are available in capsule form.

Green tea extracts are available in decaffeinated forms, for those sensitive to caffeine.

For those interested in the biological mechanisms that enable green tea to confer brain protection, turn to the next two pages.

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

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(References continue on page 60.)

## HOW GREEN TEA HELPS THE BRAIN

Green tea has been found to offer multiple beneficial effects for health and metabolism that support whole-brain health.

### Boosting Neurogenesis and Neuroplasticity

When we're young, our brains operate at peak performance.

**Neurogenesis**, the growth of *new* brain cells, occurs in the greatest amount during the embryonic stage and continues throughout adulthood. But it wanes with advancing age.

**Neuroplasticity**, the brain's ability to adapt and form new neural connections, is critical to learning and maintaining memory and other cognitive functions. It also decreases as we grow older.

Green tea can support both neurogenesis *and* neuroplasticity.

In animal models and in cell cultures, it's been shown to *stimulate* neurogenesis.<sup>25-27</sup> In studies like these, EGCG supported new brain cell growth and survival in the hippocampus, a

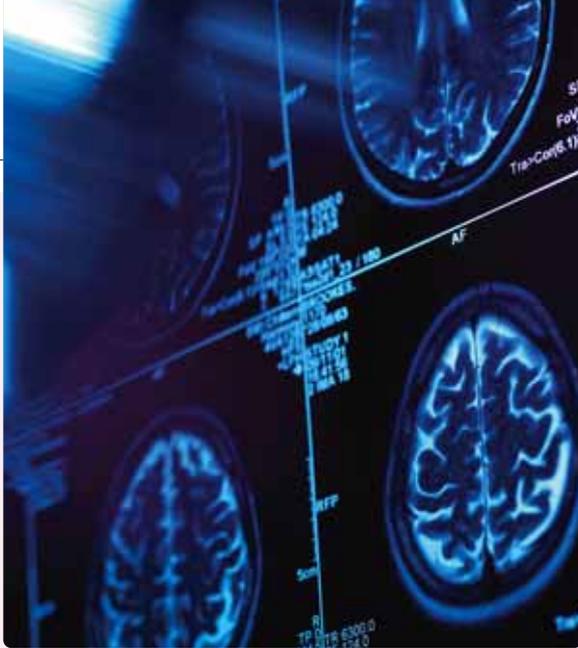
part of the brain critical for the formation of new memories.<sup>25,28</sup> In an animal study, it also aided stem cell growth in the brain after a traumatic injury.<sup>29</sup>

One of the most important mediators of neuroplasticity is a growth factor called brain-derived neurotrophic factor (BDNF). Its levels tend to diminish in old age,<sup>30</sup> impairing the ability of the brain to adapt and resist injury.

Green tea has the ability to *stimulate* production of BDNF to help maintain optimal brain function.

In one study, the drop in BDNF levels in aging rat brains was *prevented* by supplementing their diet with green tea.<sup>31</sup> And in older mice, green tea supplementation prevented the decline in BDNF levels and alleviated learning and memory deficits associated with aging.<sup>13,32,33</sup>





## Protection from Age-Related Damage

Cognitive disorders are a terrifying scourge of old age. The two most common are **mild cognitive decline** and **Alzheimer's disease**, the most prevalent type of **dementia**.

The pathology in the brain associated with these disorders includes the deposition of abnormal proteins that accumulate to toxic levels. These proteins, including **beta-amyloid** and **hyperphosphorylated tau**, create the plaques and tangles that cause cognitive function to slow dramatically in Alzheimer's patients.

They also incite neuroinflammation, leading to further injury and cognitive decline.

Green tea protects against these age-related threats in a number of ways.

In several animal studies, green tea was found to significantly *reduce* the build-up of both these toxic proteins, and even to aid in clearing them from brain tissue.<sup>34-36</sup> Reduction of amyloid and tau deposits in these studies protected cognition, preventing age-related memory and learning deficits.

Green tea also has powerful anti-inflammatory effects in the nervous system, acting to reduce the harmful neuroinflammation associated with these diseases.<sup>37</sup>

**Parkinson's disease** has been found to respond to supplementation with green tea as well.<sup>2</sup> The buildup of **alpha-synuclein** and resulting neuroinflammation and neurotoxicity associated with this disease is *also* reduced by green tea.<sup>38</sup>

## Guarding Against Strokes and Injury

Cognitive disorders aren't the only risks to brain function in later life. Damage to the brain is also common from strokes and head trauma.

**Strokes** occur most often as a result of blood vessel disease, which can cause either a blockage of blood flow to the brain or bleeding into the brain. These typically occur suddenly and without warning.

Green tea intake can **reduce the risk of brain damage** from strokes in multiple ways. For one, green tea's cardiovascular health benefits help prevent blood vessel disease in the first place. This lowers the risk, not only for stroke, but also for coronary artery heart disease and other conditions.<sup>39,40</sup>

Green tea can also provide a **neuroprotective** effect, reducing the impact if an injury *does* occur. This was demonstrated in a recent study in rats that had suffered a stroke, which found that green tea reduced the severity of injury.<sup>41</sup> The degree of tissue necrosis (death), oxidative stress, and cognitive deficits were all lowered by tea, and the neuroprotection was greater with green tea than other types of tea.

Neuroprotection of this type is also observed in animal models of **head trauma**. Green tea reduces both the severity of injury *and* the functional deficits that result.<sup>29,42,43</sup>

*(Scientific references are on the previous and following pages.)*

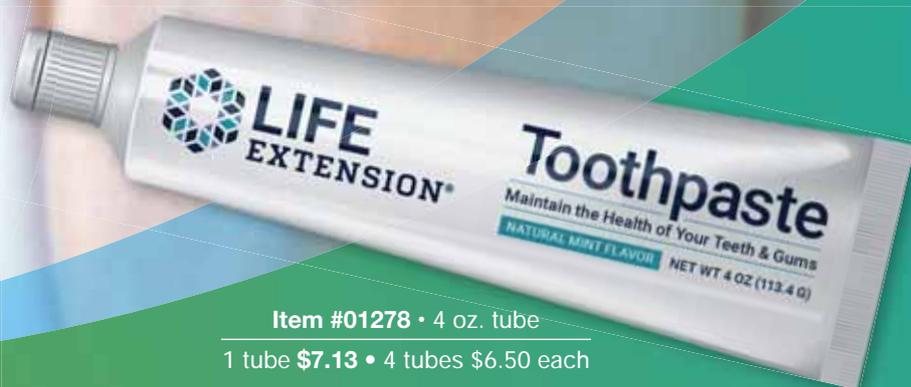
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\* **EGCG** is the acronym for **epigallocatechin gallate**, which is the polyphenol in green tea that has demonstrated the most robust health benefits.

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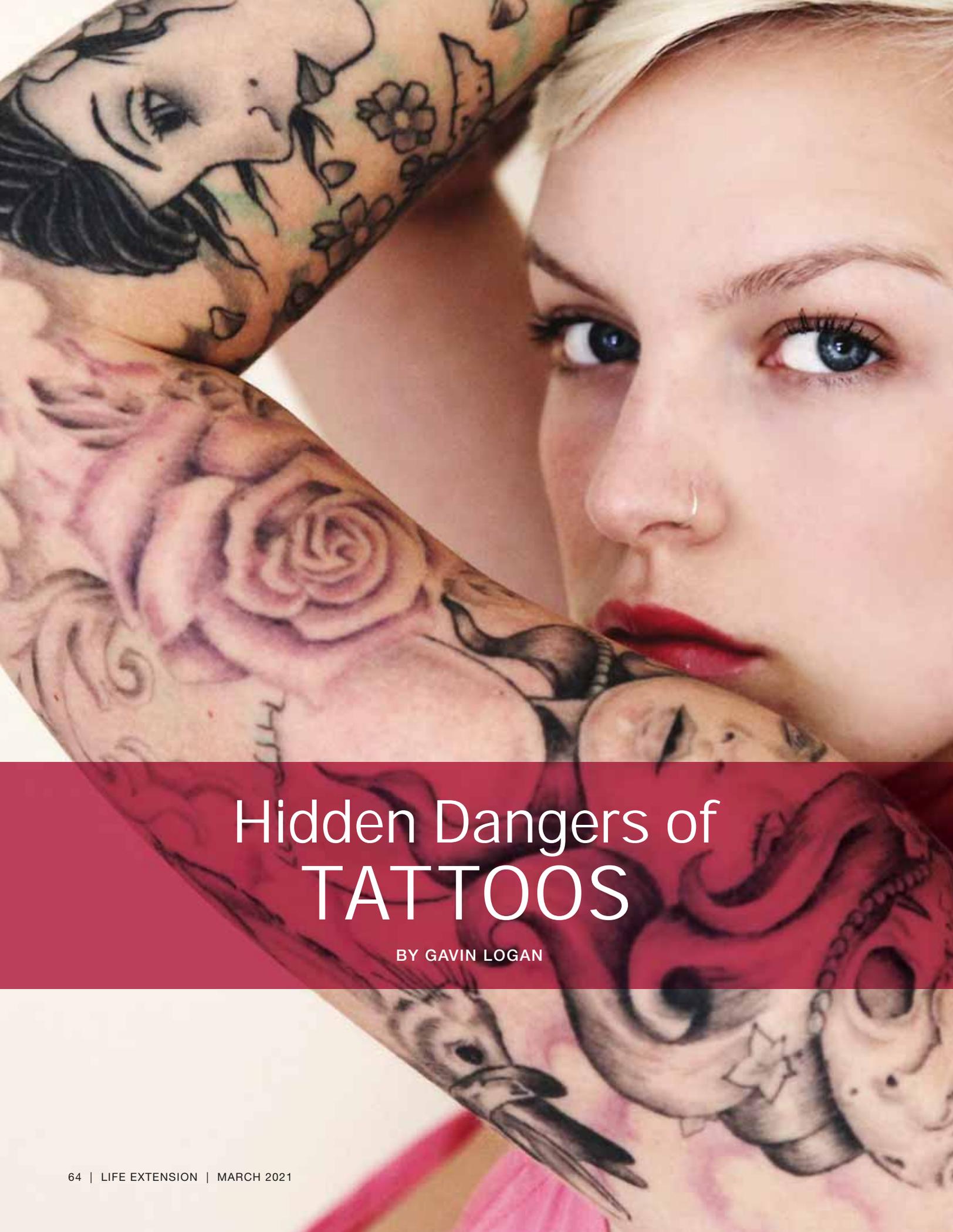
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# Hidden Dangers of TATTOOS

BY GAVIN LOGAN



The numbers of people getting **tattoos** have markedly increased starting more than 20 years ago.

Roughly **38%** of people ages 18-29 now have *at least* one tattoo.<sup>1</sup>

Most are unaware of the risks, from infection to exposure to heavy metals, to being unable to detect an early skin cancer.

The **inks** used in tattoos contain pigments that are often derived from **heavy metals**.

There is concern that these **toxins** could raise the risk of cancer, DNA damage, inflammation, oxidative stress, and weakening immune function.

Tattoos remain popular, but they are not without consequential health risks.

## Toxic Ink in Tattoos

The moment a tattoo artist gets to work, risks arise. People can have **allergic reactions** to skin dyes or develop a **skin infection** from the wound.<sup>2</sup>

In May 2019, the U.S. Food & Drug Administration (FDA) issued a **safety advisory**, warning that tattoo ink could be contaminated with **microorganisms**, which can cause infections and scarring.<sup>3</sup>

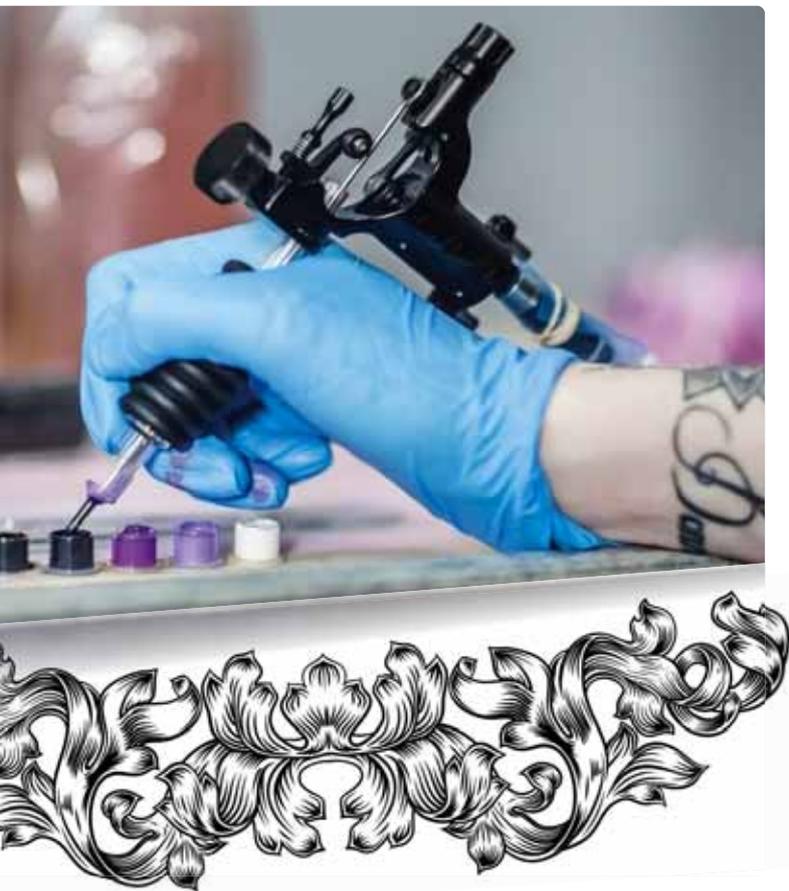
The *long-term* effects are potentially more serious.

To make designs, a tattoo artist injects ink into the **dermis**, the second layer of skin.<sup>4</sup>

Some of the pigments used may be derived from **toxic heavy metals**, including mercury, lead, nickel, and cadmium.<sup>5</sup> Some of these have been classified as **human carcinogens** by the International Agency for Research on Cancer *and* the U.S. Environmental Protection Agency.<sup>6</sup>

Other pigments are similar to clothing and leather dyes called **azo pigments**. Many of *these* have been shown to be **carcinogenic** or **genotoxic** (damaging to DNA).<sup>7</sup>

These substances can eventually enter the bloodstream.<sup>8</sup>



## Spreading Throughout the Body

There are two main ways the potentially toxic ink from tattoos can be carried throughout the body:

- The incisions made by the tattoo needle cause the immune system to send cells called **macrophages** to the area to help close the wound and destroy foreign invaders. These macrophages can transport *larger* ink particles to the **lymph nodes**, glands that filter harmful substances.<sup>4</sup>
- Tiny ink particles called **nanoparticles** can penetrate through the skin layers and enter the bloodstream.<sup>8</sup> **Carbon black**, the most common ink used in tattoos, is most often associated with *higher* levels of nanoparticles.<sup>9</sup>

In one study, researchers tattooed the backs of mice. Within 42 days, **32%** of the ink from the tattoo had been leached away from the tattoo site.<sup>10</sup>

A 2017 analysis found potentially toxic dyes and metals in the lymph nodes of deceased individuals who had had tattoos.<sup>4</sup>

The lymph nodes are a vital part of the **immune system**. A build-up of toxic particles there may *weaken* immunity, hurting the body's ability to ward off infections and illnesses of all kinds.<sup>11</sup>

## Potential Risk of Cancer

Recent studies have shown that metal nanoparticles have the potential to cause **DNA damage**.

A 2019 study of breast cancer cells in animal models showed that exposure to these nanoparticles led to **accelerated tumor growth** and a greatly increased ability for cancer to **metastasize** (spread).<sup>12</sup>

A 2018 review of the medical literature found at least 64 reported cases of **tattoo-associated skin cancer** in humans.<sup>13</sup>

## Increased Inflammation

It has been determined in preclinical studies that ink nanoparticles have the ability to cause **chronic inflammation**.<sup>14</sup>

Inflammation has been associated with increased risk for type II diabetes, heart disease, strokes, arthritis, Alzheimer's disease and other forms of dementia, and many other illnesses.

The presence of tattoo ink nanoparticles in the skin, lymphatic system, and liver could potentially contribute to increased **oxidative stress**, production of pro-inflammatory **cytokines**, and **cell death** in all these areas.

A review study presented data on nanoparticle ingestion by *inhalation*, which was associated with many potential health problems in addition to cancer, including:<sup>15</sup>

- Alzheimer's and Parkinson's disease,
- Asthma, bronchitis, and emphysema,
- High blood pressure and blood clots,
- Heart disease,
- Diseases of the kidneys and liver,
- Crohn's disease (a chronic inflammatory bowel disease), and
- Autoimmune disorders.

Exposure to toxins has also been associated with an increase in **senescent cells** and shortening of **telomeres**.

Both of these effects are associated with a shortened lifespan and increased disease risk.

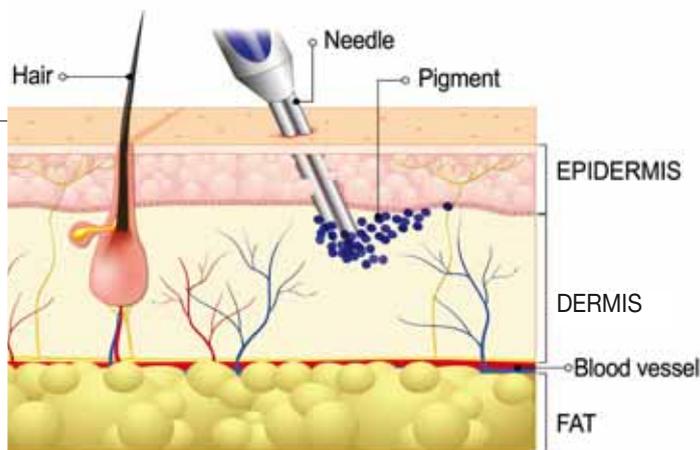
### Tattoo Removal

Removing a tattoo is usually done by laser. It involves breaking up ink pigments into a smaller size, so they can more easily migrate away from the skin.

It has been suggested that in the short term, this process could *increase* the amount of metal nanoparticles in the bloodstream, lymph nodes, and liver. Tattoo removal also does further damage to the skin.

Over the next decade, we can expect to see the development of many more **rapid tattoo removal** techniques.<sup>16</sup> This may convince people to see tattoos as a **temporary** decision and get them more frequently.

The harmful impact of a tattoo may be permanent, though. Each time one is applied and then removed, damage to the skin increases, as does exposure to potential toxins.



Cross section of human skin with tattoo needle

## WHAT YOU NEED TO KNOW

### The Risks of Getting Tattooed

- The popularity of **tattoos** has been growing for years, especially among young adults.
- Several risks are well known, including skin **infections** from the wound or infections and scarring from contaminated needles.
- A neglected potential danger is the *ink* used for tattoo designs. They are often derived from **toxic heavy metals**, including mercury and lead, or dyes called **azo pigments**. Many of these are known **carcinogens**.
- Tiny ink particles can enter the bloodstream and lymphatic system, potentially even migrating to the liver. This in turn could potentially increase the risk of certain types of **cancer**.
- Getting a tattoo removed may not undo the damage.
- Though long-term research into the dangers of tattoos needs to be done, their potential to cause harm may have been overlooked



### Conclusion

Little conclusive research has been done into the health effects of **tattoos**. But some of the inks tattoo artists use are derived from **toxic heavy metals and dyes**.

These substances have been found to **damage DNA** and to be **carcinogenic**.

Tiny **nanoparticles** from the ink can enter the bloodstream and spread to the lymphatic system and the liver.

They may increase the risk of some cancers and contribute to dangerous chronic inflammation, oxidative stress, and weakening of immune function.

While you or someone you know may be considering getting a tattoo, this is not a decision that should be made lightly, given the potential health risks. ●

PHOTOGRAPHY BY PATRINA LOGAN



Gavin Logan is a longtime supporter who resides in New Zealand. He authored this article and donated it to *Life Extension*® Magazine so that it could be widely disseminated.

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# Why I Recommend CoQ10 For My Patients

BY JOEL KAHN, MD



**Coenzyme Q10 (CoQ10)** is a nutrient found in every cell in our bodies.

It's required to make an important cell energy factor called **adenosine triphosphate**, known as **ATP**.

Blood levels of CoQ10 drop as we age, and studies have shown that **oral intake** can provide a wide variety of benefits—especially for **heart health**.

In this interview, leading cardiologist and anti-aging expert, **Dr. Joel Kahn** tells *Life Extension*<sup>®</sup> how CoQ10 can help prevent heart failure, heart attacks, and other cardiovascular issues.

**LE:** How did you first come to start treating patients with CoQ10?

**Dr. Kahn:** Many years ago, I was browsing the National Library of Medicine, searching for ways to treat a special patient's advanced **congestive heart failure**. I found article after article on basic and clinical trials indicating that it was possible to boost production of **cardiac ATP** by using **CoQ10**. After studying several papers, I began recommending CoQ10 routinely for my patients, particularly those with congestive heart failure.

The response over the past 15 years has been transformative. The majority of patients have experienced better energy, improved breathing, and fewer visits to the hospital. I was so convinced that I transitioned my career from interventional to **metabolic cardiology**, which focuses on the role of cellular energy transfer in preventing and treating heart disease.

**LE:** How long has CoQ10 been used in clinical cardiology practice?

**Dr. Kahn:** CoQ10 was first discovered in 1957. Nobel Prize-winning chemist Peter Mitchell revolutionized the science behind CoQ10 in the 1960s, when he showed that it plays an integral role in carrying energy to cells. Beginning in the early 1980s, CoQ10 was sold in Japan as a **prescription drug** for heart disease. Today, it is one of the most affordable ways to promote cardiac health and well-being.

**LE:** Our bodies naturally produce CoQ10. Why do we need additional intake?

**Dr. Kahn:** By about the age of 40, the production of CoQ10 throughout the body begins to decline. In diseases like **congestive heart failure** (when the heart doesn't pump as well as it should), it may fall even further. And in patients treated with **statin** cholesterol medications, the production of CoQ10 is partially blocked, because the same processes that produce cholesterol also produce CoQ10.

**LE:** Can you get CoQ10 from dietary sources?

**Dr. Kahn:** CoQ10 is found in foods such as whole grains, fish, and organ meats like liver, heart, and kidney. Other than the whole grains and fish, these organ-meat foods are bad for cardiac health,

making this path ill-advised. Additionally, the amount available in foods is not sufficient for therapeutic benefits. Directly taking **oral CoQ10** boosts blood and tissue levels.

**LE:** How does CoQ10 benefit those with **heart failure** or other cardiac problems?

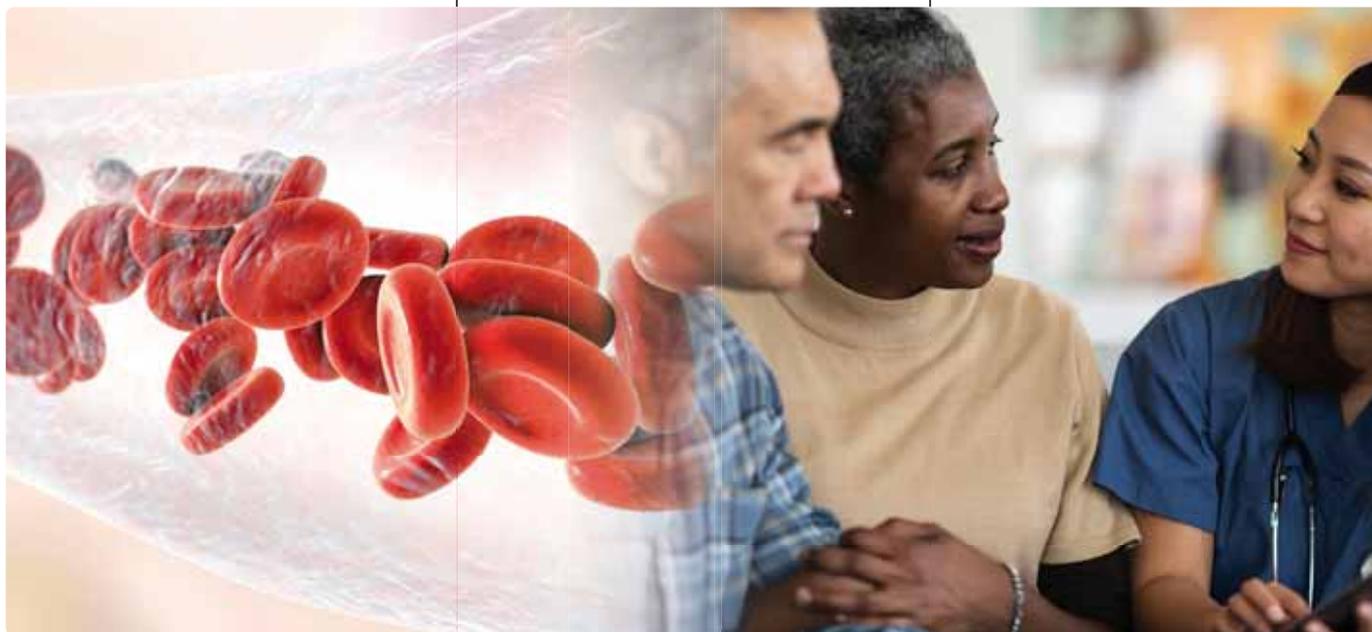
**Dr. Kahn:** A scientific presentation reported on 420 patients with congestive heart failure who received either **100 mg of CoQ10** or a placebo three times a day. After two years, **26%** of the patients on placebo had a cardiac event, but only **15%** of those on CoQ10 had one. Even more impressive, **18%** of patients in the placebo group **died** versus **10%** in the CoQ10 group. And a significant improvement in the class of heart failure was measured.<sup>1</sup>

Overall, CoQ10 was found to be safe, to improve symptoms, and to reduce major adverse cardiovascular events. A meta-analysis of studies on congestive heart failure also demonstrated increased exercise capacity and reduced mortality with CoQ10 intake.<sup>2</sup>

**LE:** **High blood pressure** can lead to heart failure, heart attacks, strokes, and more. Should people with high blood pressure be taking CoQ10?

**Dr. Kahn:** My general protocol for *all* patients seen at my preventive heart clinic is to include CoQ10 in their program, especially if they are on a statin cholesterol medication. The role of CoQ10 in reducing blood pressure has been studied, and it has been found help lower **systolic blood pressure**.





**LE:** There has been a great deal of research on the connection between **oral health** and heart health. Can CoQ10 play a role here as well?

**Dr. Kahn:** Inflammation of the gums, or **periodontal disease**, may trigger inflammation that affects the whole body, including blood vessels and the heart.

CoQ10 can be deficient in gum disease and boosting levels in the gums by taking oral CoQ10 or applying CoQ10 topically is an approach that studies show leads to faster healing.

In view of the very strong connection between optimal **oral health** and **optimal cardiovascular health**, using CoQ10 for oral health is another way to support healthy vascular systems.

**LE:** Are there other nutrients people should take *with* CoQ10 for prevention of heart disease?

**Dr. Kahn:** In addition to CoQ10, the mineral **selenium** is essential for optimal antioxidant defenses. A *deficiency* in antioxidative capacity can

lead to the development of various illnesses, **atherosclerosis** in particular, (when plaque builds up in artery walls, restricting blood flow), and **heart failure**.

The *combination* of selenium and CoQ10 could lead to a more “fuel-efficient” body, better equipped to carry out functions with less damage. This may be especially important for the protection of the heart and optimizing cardiovascular function.

**LE:** Can you talk about any studies that have been done on the **CoQ10-selenium combination**?

**Dr. Kahn:** Researchers in Sweden designed a randomized, double-blind, placebo-controlled trial among healthy citizens with an average **age of 78**. They enrolled 443 participants who were given either a placebo or a combined **200 mcg** of selenium and **200 mg** of **CoQ10** daily for four years.<sup>3</sup>

At the five-year follow-up, a significant *reduction* of cardiovascular mortality was found in the treatment group compared to the placebo group (**5.9%** mortality in

CoQ10-selenium treated patients vs. **12.6%** mortality in placebo-treated patients). A marker of cardiac dysfunction was also significantly lower in the CoQ10-treatment group. And, using echocardiography, better cardiac function was found in the treated group compared to the placebo group.

At the **10-year** follow up, those who had received the CoQ10-selenium combination still had a *reduction* in cardiovascular mortality. The protective action was not confined to the intervention period but persisted during the follow-up periods. Reduced all-cause mortality was also observed during this time.

Even after **12 years**, a significant reduction in cardiovascular mortality persisted, with a rate of **28%** in the treatment group and **45%** in the placebo group. In the study subjects with ischemic heart disease, diabetes, hypertension, and impaired functional capacity, there was a significantly reduced cardiovascular mortality risk. The decline in quality of life was also less in those treated with selenium and CoQ10.

Overall, the use of a combination of selenium and CoQ10 was shown to have a remarkable ability to safely improve cardiovascular survival and, to some extent, all-cause mortality.

**LE:** Do you recommend that patients who are taking CoQ10 also take selenium for heart health?

**Dr. Kahn:** I do, for optimal antioxidant function. There are some multivitamins and antioxidant blends that include **selenium**, with the usual amount being **200 mcg** daily. If patients are receiving that dose, no additional selenium is advised.

If they are *not* already taking any selenium, I like a complex combining three different forms of selenium, **Se-Methyl L-Selenocysteine**, **L-Selenomethionine**, and **sodium selenite**, providing **200 mcg** overall, often combined with a small amount of vitamin E.

**LE:** Aside from heart health, what other benefits have you come across for CoQ10?

**Dr. Kahn:** Studies have suggested a benefit for the treatment of **migraine headaches**. In a recent meta-analysis of randomized clinical trials, daily CoQ10 significantly reduced the frequency of migraine attacks.<sup>4</sup> The addition of other nutrients, like **curcumin**, to CoQ10 for migraines has been reported to reduce not only the frequency but also the severity and duration of headaches.

**LE:** As a specialist in metabolic cardiology, have you found that CoQ10 plays a role in metabolic health?

**Dr. Kahn:** **Metabolic syndrome** and **inflammation** may be the underlying drivers of many diseases



like diabetes and heart disease. In a recent meta-analysis, CoQ10 intake in individuals with metabolic syndrome led to changes in biomarkers associated with benefit for overall metabolic health.<sup>5</sup> Moreover, CoQ10 significantly lowered inflammation markers in individuals with metabolic syndrome compared to those on a placebo.

Such benefits with CoQ10 were related, in part, to the accompanying improvement in **glucose control** and **liver function**. The overall findings suggest that optimal regulation of inflammation is crucial for the beneficial effects of CoQ10 in improving metabolic health.

**LE:** How important a role does CoQ10 play in your medical practice overall?

**Dr. Kahn:** For the past 40 years, the data to support the use of CoQ10 have been strong and growing. The role of oral CoQ10 intake for a variety of biological functions, none more important or supported than **cardiovascular health** and **longevity**, is obvious. Fortunately, intake of CoQ10, even at doses higher than those used in heart trials, was found to be well-tolerated and safe. I will continue to advise all my clinic patients to optimize their health with the daily use of CoQ10. •

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

Joel Kahn, MD, is the founder of the Kahn Center for Cardiac Longevity in Bingham Farms, Michigan.

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# Matthew McConaughey

## The Art of Catching *Greenlights*

BY LAURIE MATHENA



Matthew McConaughey is an Academy Award-winning actor, best known for roles in box-office hits *Magic Mike*, *Failure to Launch*, *Wolf of Wall Street*, and *How to Lose a Guy in 10 Days*.

But underneath his winning smile, chiseled muscles, and party-boy persona, McConaughey is a deep thinker who is on a lifelong quest to better himself.

He's a guy whose number one goal in life was to become a father, who values a relationship with God, and who has kept a journal since he was 15 years old.

McConaughey has lived his life in the spotlight—and he always looked good doing it. Even though he recently turned 50, he's still turning heads.

It's not from good fortune or good genes; it's from being dedicated to working hard and making good lifestyle choices. From caloric restriction and exercise, to supplements like CoQ10 and 7-Keto DHEA, McConaughey's personal health protocols continue to evolve.

McConaughey has always prioritized his physical, mental, and emotional health—and now he's helping others do the same with his nonprofit foundation devoted to teaching high school students to make healthy lifestyle choices.

## Staying Fit

Staying physically fit has been important to McConaughey, both professionally—for roles like the dragon slayer in *Reign of Fire* and the stripper in *Magic Mike*—and personally.

Besides eating a healthy diet and drinking lots of water, McConaughey said he doesn't eat his main meal after 6:30 p.m., and he prefers to eat smaller amounts of food, four to five times per day. He drinks a bottle of kombucha (a fermented tea) every day, and he tries to get nine-and-a-half hours of sleep every night.

McConaughey said that breaking a sweat once a day—preferably outside—helps him mentally handle the stress of day-to-day life.

“Stress is part of life. It means you give a damn,” said McConaughey on the *Joe Rogan Experience* podcast. “But I know I handle things better... and the outcome is always better... and I enjoy doing it better if I break a sweat and get those endorphins going. That presses reset for me.”

McConaughey is known for making dramatic physical transformations for the roles he plays, and he tries to do them in as healthy a way as possible.

For example, he turned to Certified Strength and Conditioning Specialist and supplement expert, Chris Lockwood, PhD, to help him prepare for his role as a male stripper in *Magic Mike*.

Since McConaughey was already in impressive shape and following a healthy diet, Lockwood told *Bodybuilding.com* that he merely tweaked McConaughey's diet by having him increase the amount of lean protein he was eating, decrease the amount of carbs, and add whey protein shakes.

McConaughey had already been taking key supplements like a multivitamin, a green tea product, and CoQ10, but Lockwood said that he also added supplements like 7-Keto DHEA, which is beneficial for burning fat and for metabolic support.

After filming *Magic Mike*, McConaughey once again enlisted

the help of nutritionists to help him safely lose over 50 pounds to play the role of an AIDS patient in *Dallas Buyers Club*.

By consuming a diet of three egg whites for breakfast, five ounces of fish and a cup of vegetables for lunch and dinner, and red wine at night, McConaughey dropped from 188 pounds down to 135.

Most people were stunned by the physical transformation, but McConaughey was struck by the dramatic benefits to his brain from the calorie-restricted diet.

“My mental gain was so acute and so on point,” said McConaughey. “I had an incredible amount of mental energy.”

Indeed, studies have shown that calorie restriction significantly improves verbal memory scores.<sup>1</sup> And animal studies have shown that it could possibly help you live longer.<sup>2</sup>

Other roles have called on McConaughey to bulk up his muscles, such as his role as a dragon slayer in *Reign of Fire*. He joked that the McConaugheys are known for their large triceps. “Biceps are for show, but triceps are for dough,” his dad would say. McConaughey said he utilizes creatine to help them pop.

“If I take a little bit of creatine, my triceps go bananas,” McConaughey said.

## The just keep livin Foundation

McConaughey and his wife Camila started the **just keep livin Foundation** in 2009, a nonprofit organization dedicated to empowering high school students by providing them with the tools to lead active lives and make healthy lifestyle choices.



McConaughey explained, “just keep livin [is] lowercase because life is nobody’s proper noun, and there’s no “g” on the end of *livin* because life’s a verb.”

The just keep livin Foundation teaches students how to be involved in their health, with specific focus on fitness, nutrition, wellness, and community service. It currently serves over 2,500 students in 52 inner-city high schools across the U.S.

The program sets these kids up for success by teaching them to value both themselves and others.

“We just want them to change a few small habits in ways that they can, and in ways that they find enjoyable to do,” said McConaughey.

Just keep livin also teaches important principles to live by, such as finishing what you start. For example, one particular lesson plan is based on this inspirational quote by McConaughey:

“FINISH. Ninety-five percent of people don’t finish what they started. However small the task, only when you finish it can you be proud. No matter what the outcome... FINISH.”

### *Greenlights*

McConaughey recently turned 50. He’s not slowing down, but he is looking back.

McConaughey has journaled since he was 15 years old. He recently revisited those journals, spending months alone poring over 35 years of musings, quotes, and memories, looking back to look forward.

The result was his autobiography, *Greenlights*, a book that quickly topped the *New York Times* Best Selling Books list.

This book is more than the story of McConaughey’s life. Instead, he



said, it’s a “playbook, based on adventures in my life.”

In the book he writes about the greenlights in his life, which he defines as “approvals, support, praise. They’re also cash money, birth, health, success, joy, and fresh starts.”

But perhaps more importantly, he shares how the red and yellow lights—those times he didn’t get the job, or when his father died—were just as important for his learning and personal growth.

He recalls his early life in a tumultuous, working class family, where his parents were divorced twice and married three times to *each other*.

He recalls the miserable year he spent in Australia as an exchange student:

“The time at the [exchange family’s house] was torturous. A livin mental hell,” said McConaughey in *Greenlights*. “Only later did I come

to realize that the suffering and loneliness I experienced would be one of the most important sacrifices of my life. Before my trip to Australia I was never an introspective man. On that trip I was forced to look inside myself for the first time to make sense of what was going on around me. It was a year that shaped who I am today. A year when I found myself because I had to.”

He was also candid about his struggles to stay grounded in the midst of his success, and how he sought peace—and *himself*—by hiking through the jungles of the Amazon and by spending time with the primitive Dogon tribe in Mali, Africa.

“I believe everything we do in life is part of a plan. Sometimes the plan goes as intended, and sometimes it doesn’t. *That’s* part of the plan. Realizing that is a greenlight in itself,” said McConaughey. “The problems



we face today eventually turn into blessings in the rearview mirror of life. In time, yesterday’s red light leads us to a greenlight. It’s a matter of how we see the challenge in front of us and how we engage with it.”

Today, as a married father of three, he has finally found peace with his family, life, and career.

“I’ve always believed that the science of satisfaction is about learning when, and how, to get a handle on the challenges we face in life,” said McConaughey. “We all have scars, we’ll get more. So rather than struggle against time and waste it, let’s dance *with* time and redeem it, because we don’t live longer when we try not to die, we live longer when we’re too busy living.” •

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

Matthew McConaughey is an Academy Award-winning actor who has starred in over 60 movies. He is the founder of the just keep livin Foundation, a nonprofit organization that helps at-risk high school students make healthier mind and body choices. He is a professor of practice at the University of Texas at Austin, where he teaches a Script to Screen class that he created, and the brand ambassador to the Lincoln Motor Company. In 2020, McConaughey wrote an autobiography called *Greenlights*, which topped the *New York Times* Best Selling Books list.

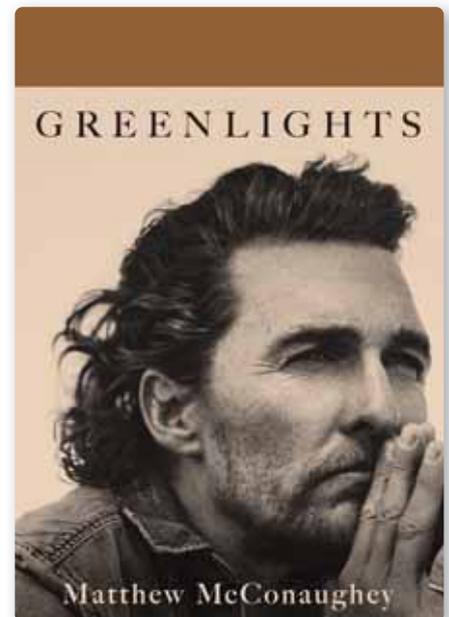
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To order a copy of *Greenlights*, call 1-800-544-4440 or visit [www.LifeExtension.com](http://www.LifeExtension.com)

**WARNING:** This book contains information about Matthew McConaughey's personal life meant for mature audiences.

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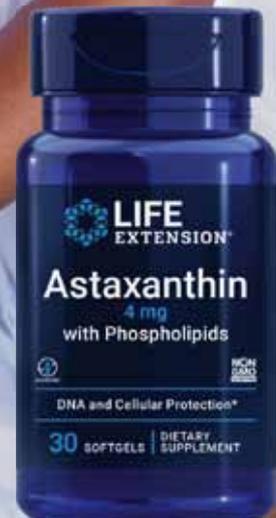
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# Food Fix

*How to Save Our Health, Our Economies,  
Our Communities, and Our Planet—One Bite at a Time*

BY MARK HYMAN, MD



Reversing the global epidemic of chronic disease, healing the environment, and reviving economies, can all be accomplished through, in one word: Food.

In his latest book, *Food Fix*, Mark Hyman, MD, Cleveland Clinic doctor and best-selling author, explains how our current agriculture policies are driving chronic disease, climate change, poverty, violence, and more.

According to Hyman, ultraprocessed foods kill **11 million** people every year and make **60%** of Americans sick with a chronic disease.

How we grow food is the number one cause of climate change—and the culprit behind the alarming loss of soil, water, biodiversity, and pollinators.

Due to current farming practices, it is estimated that the world will run out of topsoil in just 60 more harvests. No topsoil means no food.

We are depleting fresh water sources at **one trillion gallons** more per year than can be replenished by rain.

According to Dr. Hyman, we don't need to fix the food system for a better future; we need a food fix for a *future*.

Fortunately, there are solutions.

In addition to highlighting the enormity of the problem, *Food Fix* provides practical solutions for creating healthier individuals, healthier farming practices, and ultimately a healthier planet.

In this interview with *Life Extension*<sup>®</sup>, Dr. Hyman talks about why we desperately need a “food fix”—and provides specific suggestions for ways to restore the broken system.

—LAURIE MATHENA

**LE:** Why are we in such desperate need of a “food fix?”

**Dr. Hyman:** Our most powerful tool to reverse the global epidemic of chronic disease, heal the environment, reverse climate change, end poverty and social injustice, reform politics, and revive economies is food.

The food we grow, how we grow it, and the food we eat have tremendous implications not just for our waistlines but also for our communities, the planet, and the global economy.

Chronic disease is now the single biggest threat to global economic development. Lifestyle-caused diseases such as heart disease, diabetes, and cancer now kill nearly 50 million people a year, more than twice as many as die from infectious disease.

Lobbyists’ influence over policy makers has put corporations, not citizens, at the center of every aspect of our food system, from what and how food is grown to what is manufactured, marketed, and sold.

When money rules politics, it results in our current uncoordinated and conflicting food policies, which subsidize and protect and facilitate Big Food’s and Big Ag’s domination of our food system to the detriment of our population and our environment.

**LE:** How do these companies have such a big influence on the system?

**Dr. Hyman:** Big Ag and Big Food co-opt politicians, public health groups, grassroots advocacy groups, scientists, and schools, and pollute science and public opinion with vast amounts of dollars and misinformation campaigns.

The consolidation and monopolization of the food industry over the last 40 years from hundreds of different processed-food companies, seed companies, and chemical and fertilizer companies into just a few dozen companies make it the largest collective industry in the world, valued at approximately \$15 trillion, or about **17%** of the entire world’s economy.

And it is controlled by a few dozen CEOs who determine what food is grown and how it is grown, processed, distributed, and sold. This affects every single human on the planet.

We are also depleting nature’s capital—capital that, once destroyed, may only be able to be partially reclaimed. The threat is not only to our health and our children’s future, but also to the health of the planet that sustains us.

Our industrial agricultural and food system is the single biggest cause of climate change, exceeding all use of fossil fuels.

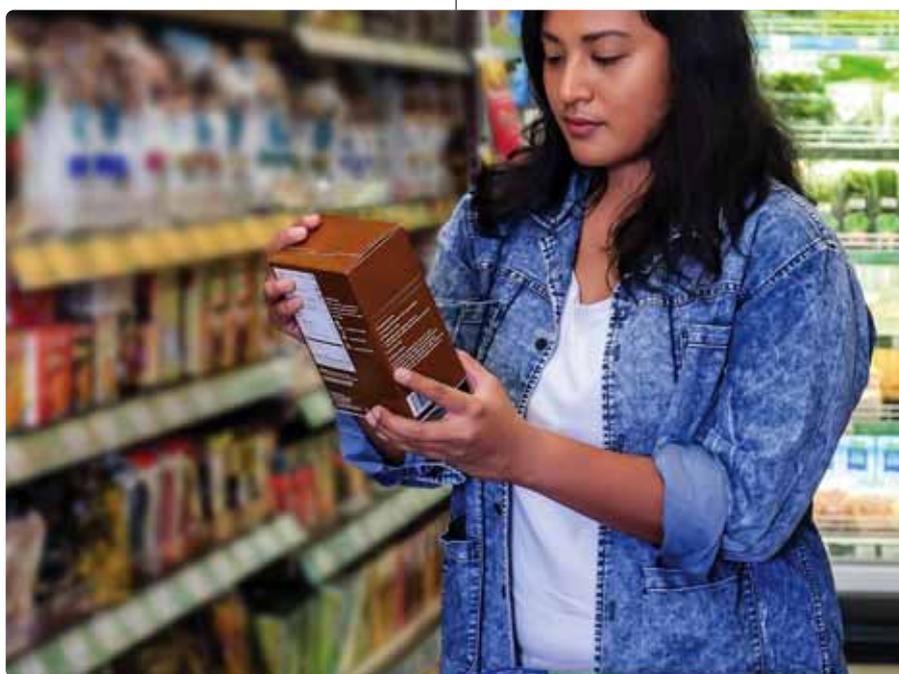
Current farming practices may cause us to run out of soil and fresh water in this century. We are destroying our rivers, lakes, and oceans by the runoff of nitrogen-based fertilizers, which is creating vast swaths of marine dead zones.

**LE:** How do current farming practices impact our health?

**Dr. Hyman:** Eleven million people die every year from a bad diet. And more than a billion people in the world are overweight and sick from eating our processed, industrialized diet and not eating a healthy, whole foods diet. In fact, the number one factor causing these deaths is the lack of fruits and vegetables in our diet.

The sad thing is that in America only **2%** of our farmland is used to grow fruits and vegetables, despite our government’s recommendations that **50%** of our diet should be fruits and vegetables.

Fifty-nine percent of our farmland is used to grow commodity crops (corn, wheat, soy) that get turned into ultraprocessed foods that we know are deadly. These processed foods make up about **60%** of our diet!





Why does this matter? For every **10%** of your diet that comes from processed food, your risk of death goes up **14%**. That means a lot of extra deaths because we support agriculture that creates food that makes us sick and fat and harms the environment, and not the production of fruits and vegetables and whole foods that make us healthy.

The complexity of the problem prevents people from connecting the dots and taking action. And most of the true costs are not even recognized, limiting the motivation to change the system.

**LE:** What is the economic impact?

**Dr. Hyman:** The World Economic Forum estimated that between 2010 and 2030 the global health care costs for chronic disease will exceed \$47 trillion.

They declared this the single biggest threat to global economic development. General Motors spends more on health care than on steel, and Starbucks spends more on health care than on coffee beans!

Any way you slice it, the costs of obesity and chronic disease are weighing the world down. There is little health care infrastructure, few doctors and nurses to treat these problems, and even less money. The “cheap” food that causes disease is not so cheap after all.

**LE:** How do America’s food policies impact this situation?

**Dr. Hyman:** If I had to describe the state of America’s food policies in one word, it would be this: chaos! If I got a second word, it would be: disaster.

Eight agencies oversee the government’s food-related policies, and they largely work in silos. They rarely coordinate with one another to achieve a common goal, which makes their policies confused and conflicted. In many cases, they directly contradict one another.

On top of that, most of our food and agriculture policies undermine public health, harm the environment, and increase private profits.

**LE:** How is the government subsidizing this problem?

**Dr. Hyman:** Some of the most heavily subsidized foods, like corn and soybeans, are plants that are not inherently unhealthy. But the vast majority of these crops are not consumed whole.

Only **1%** of American-grown corn is sold and eaten whole as corn on the cob. Much of the rest is either fed to factory-farmed livestock to fatten them up before slaughter or converted into biofuels.

As for what does hit your plate, America’s heavily subsidized bounty of corn and soy may start out as whole foods, but by the time you eat them, they’ve been manufactured into ultraprocessed oils and sweeteners and food additives.

Even worse: If those farmers want to diversify and grow tomatoes and broccoli on their farms, they lose all their government support.

As a result of farm subsidies, taxpayers are footing the bill for the chronic disease epidemic while simultaneously underwriting the production of the very foods that are causing it.

**LE:** Food is the problem...but it’s also the solution.

**Dr. Hyman:** The reason this problem is pretty much ignored or attacked piecemeal is that this epidemic has come on fast and furiously over the last 40 years and blindsided society and governments. And better medication or medical care can’t solve these chronic diseases.

The solution? Our forks.

Mounting research proves that food is medicine and demonstrates how whole foods, especially an increase in vegetables and fruit, can prevent or reverse chronic disease.

At Geisinger Health Systems, providing food-insecure poorly controlled type II diabetics with a year's worth of whole foods reduced health care costs by **80%** and dramatically improved their health outcomes.

According to Dr. Dariush Mozaffarian, "The idea of food as medicine is not only an idea whose time has come. It's an idea that's absolutely essential to our health care system."

**LE:** Let's switch gears and talk about the environmental impact of our current food system. How are current farming practices harming the planet—and threatening our future?

**Dr. Hyman:** Our food system isn't just making the world's population sick; it's making the environment sick. Innovations in agriculture over the last century have allowed us to produce more food than ever, but at a serious cost.

The methods we use to grow food are contributing to our future inability to grow food, by increasing

greenhouse gas emissions, raising temperatures, and making current cropland unfarmable.

The U.N. projects that in 60 years we may completely "mine" all our topsoil, making it almost impossible to grow food. Soil gone. No food. No people. That's 60 more harvests.

What will your grandchildren eat?

Water scarcity is also a huge issue; at the World Economic Forum, I heard Jim Kim, the former head of the World Bank, say, "The wars of the future will be fought over water, not oil."

Through tillage and erosion, soils have lost 133 billion tons of carbon into the atmosphere since we started farming, driving global warming.

Big fertilizer conglomerates produce 20 million metric tons of fertilizer a year using fossil-fuel-intensive processes. When that fertilizer is applied to farms, the damage is wrought on the soil, and it weakens plants, pollutes water systems, and drives huge external costs.

Halting land degradation has become an urgent global imperative.

**LE:** How could regenerative agriculture help solve the water shortage problem?

**Dr. Hyman:** Water is a limited resource. Only **5%** of water on the planet is fresh water. We are depleting our ancient aquifers faster than rainfall can replenish them.

The biggest one in America, the Ogallala Aquifer in the Midwest, is being depleted by more than a trillion gallons more a year than can be refilled by rain. Irrigation of crops is the main cause.

Dirt can't hold water. Soil can. If we switched to range (grass)-fed regenerative livestock production, we would restore soils, draw down carbon (reversing climate change), and store massive amounts of water, which can prevent floods and droughts.

**LE:** What could be done politically to change this destructive system?

**Dr. Hyman:** For starters, the government has to reform its subsidies system. Farmers need incentives to





#### FOR MORE INFORMATION

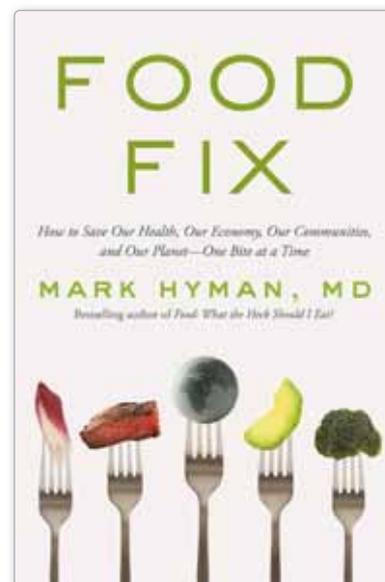
For a quick reference guide to all the solutions outlined in *Food Fix*, visit [www.foodfixbook.com](http://www.foodfixbook.com). To learn more about any of the issues that stem from our food industry, take a look at the online resource guide for articles, studies, reports, books, videos, companies, and organizations that are raising awareness and changing the conversation at [www.foodfixbook.com/resources](http://www.foodfixbook.com/resources).

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grow more nutritious foods using regenerative practices.

Subsidies should also support farmers to transition to organically or regeneratively grown crops, grass-fed and grass-finished pasture-raised livestock, and organically produced milk. These subsidies can help farmers buy new seeds, develop new crops, and purchase new farm equipment that will help them transition to more regenerative practices.

Beyond subsidies, the federal government feeds millions of people in schools, hospitals, and prisons, as well as military and government workers.

It can promote healthy eating and create markets for farmers by requiring that schools, prisons, and military bases use a percentage of their budgets to buy locally sourced food from nearby farms and, at the very least, healthy whole foods that promote health rather than disease.

A national food policy would transform our broken food system into one that aligns public health objectives with economic and

environmental goals. It would make healthful choices the default option for Americans while slashing health care costs and helping farmers, protecting the environment, and reversing climate change.

**LE:** How can individuals advocate for change?

**Dr. Hyman:** These are just a few of the many innovations and ideas moving from the margins to the center and providing a road map for fixing our food system.

It is the great work of our time. And it depends on all of us.

We need a national (and ultimately global) campaign to fix our food system. If you're interested in helping transform our food system and want to learn more, please join our campaign and prescription for a new food system at [www.foodfix.org](http://www.foodfix.org). •

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

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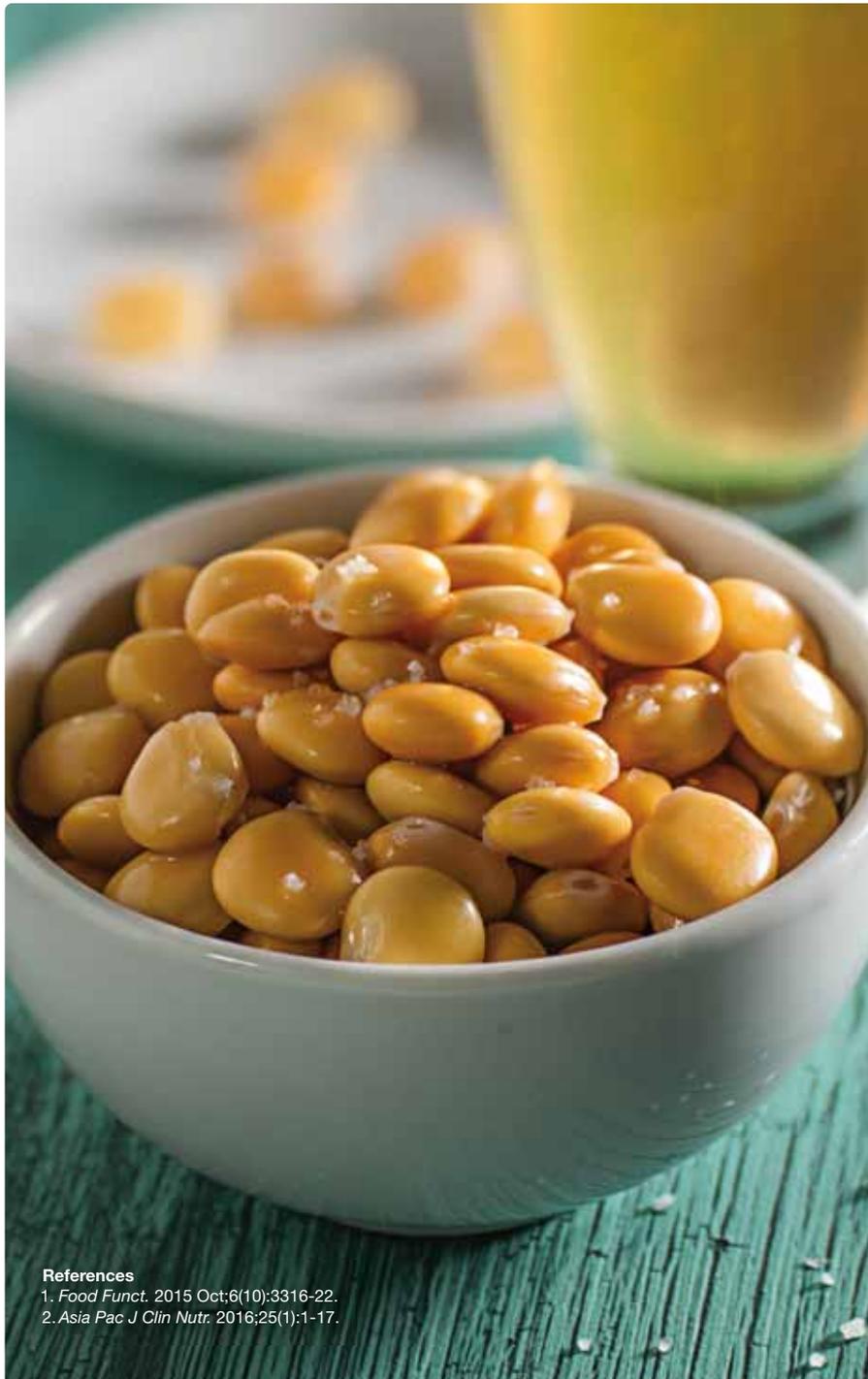


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# Lupini Beans

BY LAURIE MATHENA



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Lupini beans are a common snack in Mediterranean regions, dating back as far as 4,200 years. But they've only made an appearance in the U.S. in recent years.

Raw lupini beans are a protein powerhouse ready to meet the growing demand for plant-based protein sources.

Lupini beans (also called *lupin* beans) provide **more** protein than chickpeas, **fewer** carbs than pistachios, and **fewer** calories than almonds.

They also have more fiber than chickpeas, oats, and quinoa.

Lupini beans contain very little starch or sugar, making them an ideal low-carb option for type II diabetics or anyone else concerned about keeping their blood sugar balanced.

An in-vitro study found that lupini beans increase the generation of short-chain fatty acids in the gut, while also increasing the population of good gut bacteria.<sup>1</sup>

Numerous randomized, controlled clinical trials have shown that replacing meat with legumes like lupini beans has a positive impact on longevity, diabetes, cardiovascular disease, and weight management.<sup>2</sup>

Eating lupini beans may also lower blood pressure, improve blood lipids, and improve insulin sensitivity.<sup>2</sup>

Consumed whole, lupini beans can be added to salads or combined with roasted vegetables.

When they're ground up, these beans have a neutral taste, making them a versatile dish that can take on the flavor of any spices for which you're in the mood. They also provide a low-carb option to quinoa or rice.

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- 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
- 00065 MK-7
- 00373 No Flush Niacin
- 01939 Optimized Folate (L-Methylfolate)
- 01217 Pyridoxal 5'-Phosphate Caps
- 01400 Super Absorbable Tocotrienols
- 02334 Super K
- 02335 Super K Elite
- 01863 Super Vitamin E
- 02028 Vitamin B5 (Pantothenic Acid)
- 01535 Vitamin B6
- 00361 Vitamin B12 Methylcobalamin
- 01536 Vitamin B12 Methylcobalamin • 1 mg, 60 veg lozenges
- 01537 Vitamin B12 Methylcobalamin • 5 mg, 60 veg lozenges
- 02228 Vitamin C and Bio-Quercetin 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
- 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

# Find SUGAR Balance



## NEXT-GENERATION Glucose-A1c Management

**Glycemic Guard™** contains **250 mg** of polyphenol-rich **clove extract** and **200 mg** of **maqui berry** extract. These **plant extracts** help maintain healthy *after-meal* blood **glucose** and **A1c** levels.

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

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

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



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

For full product description and to order **Glycemic Guard™**, call 1-800-544-4440 or visit [www.LifeExtension.com](http://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.

HIGHLY PURIFIED

# Fish Oil



EPA/DHA FISH OIL +  
SESAME LIGNANS + OLIVE EXTRACT

EPA/DHA FISH OIL +  
SESAME LIGNANS + OLIVE EXTRACT +  
KRILL + ASTAXANTHIN



**SUPER OMEGA-3\***  
EPA/DHA Fish Oil,  
Sesame Lignans & Olive Extract  
(2,400 mg of EPA + DHA in four softgels)

Item #01982 • 120 softgels  
1 bottle \$24 • 4 bottles \$21 each

**Super Omega-3**  
provides components found  
in Mediterranean diets,  
including sesame lignans  
to extend the stability  
of DHA in the blood.



**SUPER OMEGA-3 PLUS**  
EPA/DHA Fish Oil, Sesame Lignans,  
Olive Extract, Krill & Astaxanthin  
(2,520 mg of EPA + DHA in four softgels)

Item #01988 • 120 softgels  
1 bottle \$33.75 • 4 bottles \$31.50 each

For full product description and to order **Super Omega-3**, or  
**Super Omega-3 Plus**, call 1-800-544-4440 or visit [www.LifeExtension.com](http://www.LifeExtension.com)

CAUTION: If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product.

\* Highest Independent 5-star rating, International Fish Oil Society For Over Nine Years.  
IFOSTM certification mark is a registered trademark of Nutrasource Diagnostics, Inc.

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.



# LIFE EXTENSION®

The Science of a Healthier Life®

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## IN THIS EDITION OF *LIFE EXTENSION*® MAGAZINE



### 24 RESTORE YOUTHFUL CELL FUNCTION

Scientists have identified methods to reduce toxic waste that accumulates inside aging cells by turning on a natural cleansing process called **autophagy**.

### 34 MAGNESIUM'S ROLE IN HEART HEALTH

More than half of all Americans have *low* magnesium levels, which predisposes them to higher risks of illnesses including cardiovascular disorders.



### 44 PROTECT GUM TISSUE WITH BENEFICIAL BACTERIA

Two **probiotics** *improve gum health* and *reduce oral plaque*.

### 52 BRAIN-PROTECTIVE EFFECTS OF GREEN TEA

**Green tea** polyphenols promote the formation of new brain cells and neural connections. Green-tea drinkers were shown to have a **35% reduced** incidence of cognitive disorders.

### 71 WHY I RECOMMEND CoQ10 FOR MY PATIENTS

**Dr. Joel Kahn** discusses how **coenzyme Q10** helps cardiac patients prevent heart failure, heart attacks, and other cardiovascular issues.



### 79 MATTHEW McCONAUGHEY'S PERSONAL AGE-DELAY PROGRAM

Acclaimed actor **Matthew McConaughey** follows a holistic health program that includes caloric restriction, exercise, and supplements. He details it all in his book, *GREENLIGHTS*.

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